INUIT PEOPLES AND CANADA'S POLICY INITIATIVES TOWARDS CLIMATE CHANGE

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Date: 21 July 2016

DECLARATION

I declare that the thesis entitled **"Inuit Peoples and Canada's Policy Initiatives Towards Climate Change"** submitted by me for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this University or any other university.

CHONGOM ARON AIMOL

CERTIFICATE

We recommend that this thesis be placed before the examiners for evaluation.

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(SUPERVISOR)

CONTENTS

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LIST OF FIGURES, MAPS AND TABLES

ABBREVIATIONS

ACAMSR:	Agreement on Cooperation on Aeronautical and Maritime Search and Rescue
ACC:	Arctic Athabaskan Council
ACIA:	Arctic Climate Impact Assessment
ACRC:	Arctic Climate Research Centre
ADRDM:	American Declaration of the Rights and Duties of Man
AEPS:	Arctic Environmental Protection Strategy
AEPS:	Arctic Environmental Protection Strategy
AFF:	Conservation of Arctic Flora and Fauna
AGW:	Anthropogenic Global Warming
AHDI:	Arctic Human Development Report
AHHRI:	Aboriginal Health Human Resources Initiative
AIA:	Aleut International Association
AICA:	Arctic Climate Impact Assessment
AIM:	Association of Indigenous Minorities
AIMWAP:	Alianat Inuit Mental Wellness Action Plan
AIPNADKR:	Association of the Indigenous Peoples of the North of the Aleut District of the Kamchatka Region of the Russian Federation
AMAP:	Arctic Monitoring and Assessment Programme
AMSA:	Arctic Marine Shipping Assessment
AMSL:	Above Mean Sea Level
APS:	Aboriginal Peoples Survey
ARHC:	Arctic Regional Hydrographic Commission
ATA:	Arctic Tourism Association
BBC:	British Broadcasting Corporation
CA:	Copenhagen Accord
CAFF:	Conservation of Arctic Flora and Fauna programme

CAIPAP: Canadian Arctic Indigenous Peoples Against POPs

CBD: Convention on Biological Diversity

CBMP: Circumpolar Biodiversity Monitoring Programme

CCAA: Climate Change Accountability Act

CCAP: Climate Change Adaptation Programme

CCCDF: The Canada Climate Change Development Fund

CCHS: Canadian Community Health Survey

CCHS: Canadian Community Health Survey

CCL: Canadian Council on Learning

CDM: Clean Development Mechanism

CE: Callendar Effect

CEPA: Canadian Environmental Protection Act

CER: Certified Emission Reduction

CFC: Chlorofluorocarbon

CHAP: Community Harvester Assistance Programme

CIDA: Canadian International Development Agency

CIEH: Chartered Institute of Environmental Health

CINE: Centre for Indigenous Peoples' Nutrition and Environment

CLRTAP: Convention on Long-Range Trans-boundary Air Pollution

CM: Climate Models

CNS: Canada's Northern Strategy

COP: Conference of the Parties

CPB: Conservation of Polar Bears

CPC: Canada Post Corporation

CPHO: Chief Public Health Officer

CRFRI: Common Reporting Framework in the Reporting Instructions

CSD: United Nations Commission on Sustainable Development

DDT:	Dichlorodiphenyltrichloroethane
DECE:	Department of Education, Culture and Employment
DGCLIMA:	Directorate-General for Climate Action
DOE:	Designated Operational Entity
EAC:	Ecology Action Centre
EC:	Environment Canada
EC:	European Community
ECOSOCU:	United Nations Economic and Social Council
EEA:	Energy Efficiency Act
EITEI:	Emission Intensive Trade Exposed Industries
EMEP:	European Monitoring and Evaluation Programme
EPA:	Environmental Protection Agency
EPPR:	Emergency Prevention, Preparedness and Response working group
EPPR:	Emergency Prevention, Preparedness and Response
ESRL:	Earth System Research Laboratory
FAO:	Food and Agricultural Organisation
FASD:	Foetal Alcohol Spectrum Disorder
FMP:	Food Mail Program
FPT:	Federal, Provincial and Territorial
FSDSA:	Federal Sustainable Development Strategy Act
GAP:	Global Arctic Programme
GAP:	Global Arctic Programme
GCI:	Gwich’in Council International
GCM:	The global climate model/general circulation model
GDP:	Gross Domestic Product
GECAFS:	Global Environmental Change and Food Systems
GEF:	Global Environment Facility

GF:	Growing Forward
GHE:	Greenhouse Effect
GHG:	Greenhouse Gases
GHR:	Global Humanitarian Forum
GMD:	Global Monitoring Division
GNWT:	Government of Nunavut and Western
GOGS:	Going Off, Growing Strong
HC:	Health Canada
HELCOM:	Helsinki Convention
HFC:	Hydro-fluorocarbon
HSP:	Harvester Support Programmes
IACHR:	Inter-American Commission on Human Rights
IAI:	Inter-American Institute for Global Change Research
IASC:	International Arctic Science Committee
ICC:	Inuit Circumpolar Council
ICG:	Inuvik Community Garden
ICR:	International Centre for Reindeer Husbandry
ICSU:	International Council for Science
IDRC:	Canada's International Development Research Centre
IFAD:	International Fund for Agricultural Development
IFRC:	International Federation of Red Cross
IFSWG:	Inuit Food Security Working Group
IGBP:	International Geosphere-Biosphere Programme
IGEC:	International Global Environmental Change
IHAP:	Inuvialuit Harvesters Assistance Programme
IHDP:	International Human Dimensions Programme
IHFTSP:	Inuit Hunting, Fishing and Trapping Support Programme

IHHRFAP:	Inuit Health Human Resources Framework and Action Plan
IIBA:	Inuit Impact and Benefit Agreement
IIPBM:	Inupiat-Inuvialuit Polar Bear Management Agreement
ILC:	Inuit Land Claims
ILO:	International Labour Organisation
IMO:	International Maritime Organisation
INAC:	Indian and Northern Affairs Canada
INDC:	Intended Nationally Determined Contributions
IOHS:	Inuit Oral Health Survey
IPCC:	Intergovernmental Panel on Climate Change
IPO:	Indigenous Peoples' Organisations
IPS:	Indigenous Peoples Secretariat
IPYAIHS:	International Polar Year Adult Inuit Health Survey
IPYICHS:	International Polar Year Nunavut Inuit Child Health Survey
IQ:	Inuit Qaujimajatuqangit
IRC:	Inuvialuit Regional Corporation
IRDR:	Integrated Research on Disaster Risk
ISSC:	International Social Science Council
ITK:	Inuit Tapiriit Kanatami
IUCN:	International Union for Conservation of Nature
JBNQA:	James Bay Northern Quebec Agreement
JDM:	Jericho Diamond Mine
KC:	Keeling Curve
KP:	Kyoto Protocol
KPIA:	Kyoto Protocol Implementation Act
LIA:	Little Ice Age
LRTAP:	Long-range Trans-boundary Air Pollution

LUCF: Land-Use Change and Forestry

LULUCF: Land Use, Land-Use Change and Forestry

MC: Makivik Corporation

MCM: Minamata Convention on Mercury

MLO: Mauna Loa Observatory

MP: Montreal Protocol

NAC: Nunavut Arctic College

NAHO: The National Aboriginal Health Organisation

NASA: The National Aeronautics and Space Administration

NASP: Northern Air Stage Programme

NC: Nordic Council

NCC: The Nutrition North Canada

NCCAH: National Collaborating Centre for Aboriginal Health

NCIV: Netherlands Centre for Indigenous Peoples

NDHSS: Nunavut Department of Health and Social Services

NEU: Nunavut Employees Union

NFPS: Nunavut Food Price Survey

NFSS: Nunavut Food Security Strategy

NGO: Non-Governmental Organisation

NHIST: Nunavut Hunters Income Support Trust

NHS: National Household Survey

NHS: Nunavik's Hunter Support Programme

NHSP: Nunavut Harvesters Support Programme

NIFSS: National Inuit Food Security Strategy

NIHS: Nunavik Inuit Health Survey

NIPCC: Nongovernmental International Panelirc on Climate Change

NLCA: Nunavut Land Claims Agreement

NNC:	Nutrition North Canada
NOAA:	National Oceanic and Atmospheric Administration
NOAA:	National Oceanic and Atmospheric Administration
NRBHSS:	Nunavik Regional Board of Health and Social Services
NRC:	Nunavik Research Centre
NSAT:	Near-surface Air Temperatures
NSPS:	Nunavut Suicide Prevention Strategy
NTI:	Nunavut Tunngavik Incorporated
NTPP:	Nunavik Trichinellosis Prevention Programme
NWT:	Northwest Territories
OAS:	Organisation of American States
OCAO:	International Civil Aviation Organisation
OECD:	Organisation for Economic Co-operation and Development
OHCHR:	Office of the United Nations High Commissioner for Human Rights
ONPP:	Ontario Naloxone Program for Pharmacies
PAME:	Protection of the Arctic Marine Environment working group
PBA:	Polar Bears Agreement
PBSG:	Polar Bear Specialist Group
PCBs:	Polychlorinated Biphenyls
PFC:	Per-fluorocarbons
PHAC:	Public Health Agency of Canada
PIA:	Pleistocene Ice Ages
PM:	Particulates or Particulate Matter
PMP:	Prevention of Marine Pollution
POP:	Persistent Organic Pollutants
RAIPON:	Russian Association of Indigenous Peoples of the North
RCAP:	Royal Commission on Aboriginal Peoples

RCMP:	Royal Canadian Mounted Police
RCS:	Red Crescent Societies
SAR:	Second Assessment Report
SC:	Sámi Council
SCA:	Canada Shipping Act
SDH:	Social Determinants of Health
SDU:	Sustainable Development and Utilisation
SIO:	Scripps Institution of Oceanography
SPEC:	Society Promoting Environmental Conservation
SPSWG:	Suicide Prevention Strategy Working Group
SST:	Sea Surface Temperature
START:	System for Analysis, Research and Training
SYR:	Synthesis Report
TCMHC:	The Canada Mortgage and Housing Corporation
TEK:	Traditional Ecological Knowledge
TFF:	Territorial Formula Financing
TK:	Traditional Knowledge
TKTH:	Take a Kid Trapping and Harvesting
TYIHAP:	Ten Year Inuit Housing Action Plan
UKDID:	United Kingdom Department for International Development
UNCED:	UN Conference on Environment and Development
UNCSD:	United Nations Commission on Sustainable Development
UNDRIP:	United Nations Declaration on the Rights of Indigenous Peoples
UNECE:	The United Nations Economic Commission for Europe
UNEP:	United Nations Environment Programme
UNFCCC:	United Nations Framework Convention on Climate Change
UNGA:	United Nations General Assembly

UNO:	United Nations Organisation
UNPFII:	United Nations Permanent Forum on Indigenous Issues
UNSD:	United Nations Statistics Division
UNCSD:	United Nations Commission on Sustainable Development
US:	United States
UV:	Ultraviolet
VBNC:	Voisey's Bay Nickel Mine
WCRP:	World Climate Research Programme
WFF:	World Wide Fund for Nature
WFP:	World Food Programme
WG:	Working Group
WHO:	World Health Organisation
WMO:	World Meteorological Organisation
WRHC:	World Reindeer Herders' Congress
WTP:	Walrus-Testing Programme

CHAPTER 1

INTRODUCTION

Introduction

Climate change is a global issue and recognised to be one of the most serious challenges to mankind in the twenty-first century. It has been acknowledged by and large as real and is already affecting the planet in many ways. According to Kofi A. Annan (former UN Secretary-General and chair of the Global Humanitarian Forum Geneva), "climate change is an all-encompassing threat, directly affecting the environment, the economy, health and safety. Many communities face multiple stresses with serious social, political and security implications, both domestically and abroad. Millions of people are uprooted or permanently on the move as a result. Many more millions will follow" (Global Humanitarian Forum 2009: ii).

Climate change is widely affecting and threatening to the environments and ecosystems on earth. It is also challenging sustainable development by influencing the socio-economic, livelihood, cultural activities, food security and health of the communities across the world. The effects of climate change vary from rising of the sea level, submergence of low-lying islands and coastal lands to the melting ice and thawing permafrost that occurs in the Arctic, and thawing of the glaciers or mass ice in the Arctic, the Alps, and the Himalayas, due to rising global temperatures. Some regions and communities in the world are more vulnerable to climate change than others. Sheila Watt-Cloutier (then/former chair of the Inuit Circumpolar Council and Inuit climate/environmental activist) stated that "what we Inuit are experiencing here in the Arctic at the present you will experience soon. The Arctic is the world's climate change barometer, and we Inuit are the mercury in that barometer" (Watt-Cloutier 2005).

The impact of climate change is more severely evident in the northern hemisphere of the planet, particularly in the Arctic or Circumpolar region than in the southern hemisphere, where multiple layers of ice, and glaciers are decreasing at an exceptional rate in recent years. Thus, climate change is really threatening the Inuit communities across the Arctic or Circumpolar region because of melting permafrost and Arctic ice. In fact, climate change is

directly and indirectly, threatening and challenging the Inuit cultural identity and way of life (Inuit Circumpolar Conference and UNEP/GRID-Arendal 2004).

Even the United Nations Environment Programme (UNEP) and the United Nations Framework Convention on Climate Change (UNFCCC) have described the Arctic as the world's climate change indicator and barometer (UN Chronicle 2007; UNEP/GRID-Arendal 2009; Prosser 2011). Due to climate change in the Arctic, the Inuit communities have faced many challenges such as that of travel and transportation. At the same time, uncertain weather prediction in the Arctic such as prevalence of rainfall, floods, coastal or shoreline erosion and landslides make life unpredictable and tough for the communities. Decreasing rate of snowfall, unavailability and poor quality of freshwater in the circumpolar region has already impacted the health of Inuit communities, wildlife, and environment or biodiversity. Besides, increase in the sea/ocean and surface temperatures and the warmer weather in summertime in the region has led to thinner sea ice that results in shoreline erosion and landslides. At the same time, new species of flora and fauna are found in the region, and changes in animal migration patterns, movements, and wildlife behaviour are also being observed (ACIA 2004 and 2005; Prosser 2011; Peace 2012).

The Chapter begins by introducing the research objective and scope of the study, research questions, hypotheses as well as the research methodology of the study in the first section. In an attempt to understand the concept of climate change, the chapter in the second section focuses on the theoretical and conceptual frameworks of climate change from three perspectives or approaches namely – anthropogenic approaches (human influences and activities or actions), solar variations (natural variations), and Inuit perspectives on climate change. Each of these perspectives or approaches on climate change will be thoroughly discussed and analysed. This chapter also traces the history of the environmental and climate change issues in Canada in the third section.

Research Objectives and Scope of the Study

Climate change is challenging and threatening the Arctic ecosystem upon which the Inuit communities depend for their livelihood and cultural survival for the past thousand years. According to the Sheila Watt-Cloutier, "the Arctic is not the wilderness or a frontier, it is our home" (Inuit Circumpolar Conference and UNEP/GRID-Arendal 2004: 17; Watt-Cloutier 2007: 14). The Inuit are one of the northern circumpolar peoples, approximately 160,000 in

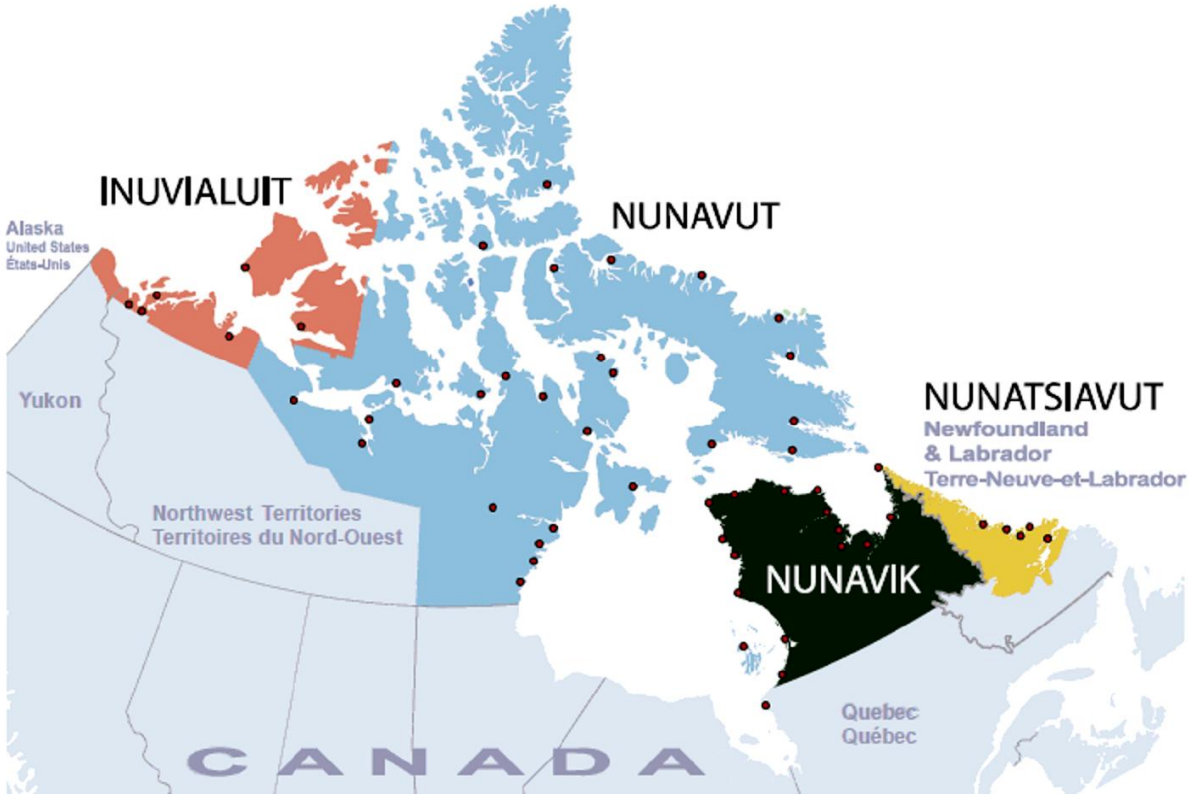
number inhabiting the four Arctic regions/countries in Alaska (US), Chukotka (Russia), Greenland (Denmark), and Inuit Nunangat (Canada) united by a common culture, language and way of life.

The objective of the study is to explore the ramifications of climate change on the Canadian Inuit communities, particularly in the Canadian Arctic focusing on the four regions of Inuit Nunangat (Inuit homeland of Canada): Inuvialuit region (northwest portion of Northwest Territories and northern portion of Yukon), Nunatsiavut (northern coastal Labrador), Nunavik (northern Quebec) and Nunavut, comprising more than one-third of Canada's land mass, as shown in Map 1 (Inuit Tapiriit Kanatami 2014).According to the 2011 Canada's Census of Population, the Canadian Inuit are about59,440 in number living in 53 communities in the four Inuit Nunangat regions across Canada (Inuit Tapiriit Kanatami 2014; Statistics Canada 2013).

According to the 2011 National Household Survey (NHS), approximately 73.1 per cent or 43,460 of the population were inhabiting Inuit Nunangat, whereas about 26.9 per cent or 15,985 Inuit lived outside the Inuit Nunangat across Canada i.e. above 76 per cent were living in the metropolitan cities such as Ottawa, Montreal, Toronto, Edmonton, Yellowknife, and Winnipeg (Inuit Tapiriit Kanatami 2014; Statistics Canada 2013).

In Inuit regions, around 5.6 per cent of the Inuit population lived in the Inuvialuit region, 3.9 per cent of the Inuit were inhabiting Nunatsiavut, about 18.1 per cent of the Inuit population settled in Nunavik and 45.5 per cent of the Inuit lived in Nunavut in 2011 (Statistics Canada 2013). The NHS 2011 indicated that the Canadian Inuit population represented approximately 4.2 per cent of the overall total Canadian indigenous population and only 0.2 per cent of the total population of Canada (Table 1.1 and Table 1.2).

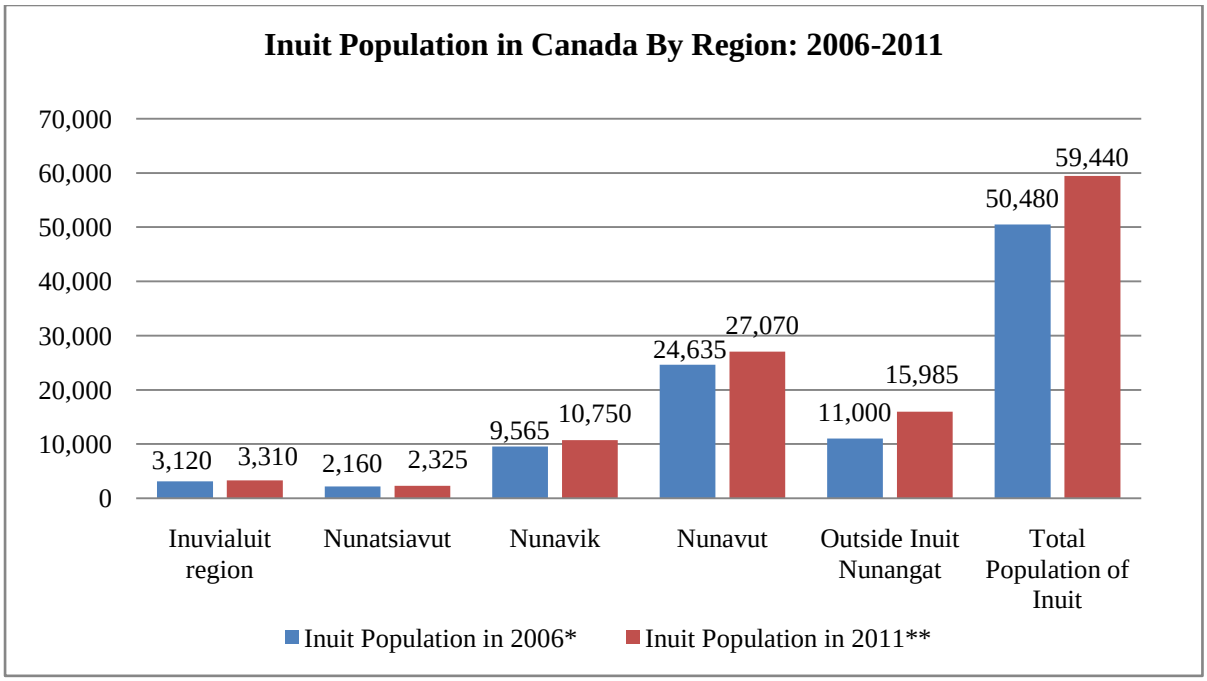
Map 1: Map of Inuit Nunangat: Physical Map of Four Inuit Regions of Canada



Source: Inuit Tapiriit Kanatami (Statistics Canada 2015).

The environment of the circumpolar Arctic has actually been changing for the past few decades. The Inuit communities who live in Alaska in the US, Canada, Greenland and Chukotka in Russia have witnessed the changing of the natural environment as a result of global warming for the past 20 years to 30 years. The changes in climate system, weather patterns, and environment are reported by different communities across the Arctic, particularly by the Aleut in the US and Russia; the Athabaskans in Canada and the US; the Inuit in Russia, Greenland, Canada and the US; the Gwich'in in Canada and the US, Chukchi and Nenets in Russia; Sámi in Norway, Finland, Russia, Sweden and the US, and many other indigenous peoples in northern Russia.

Table 1.1: Inuit Population in Canada By Region: 2006-2011



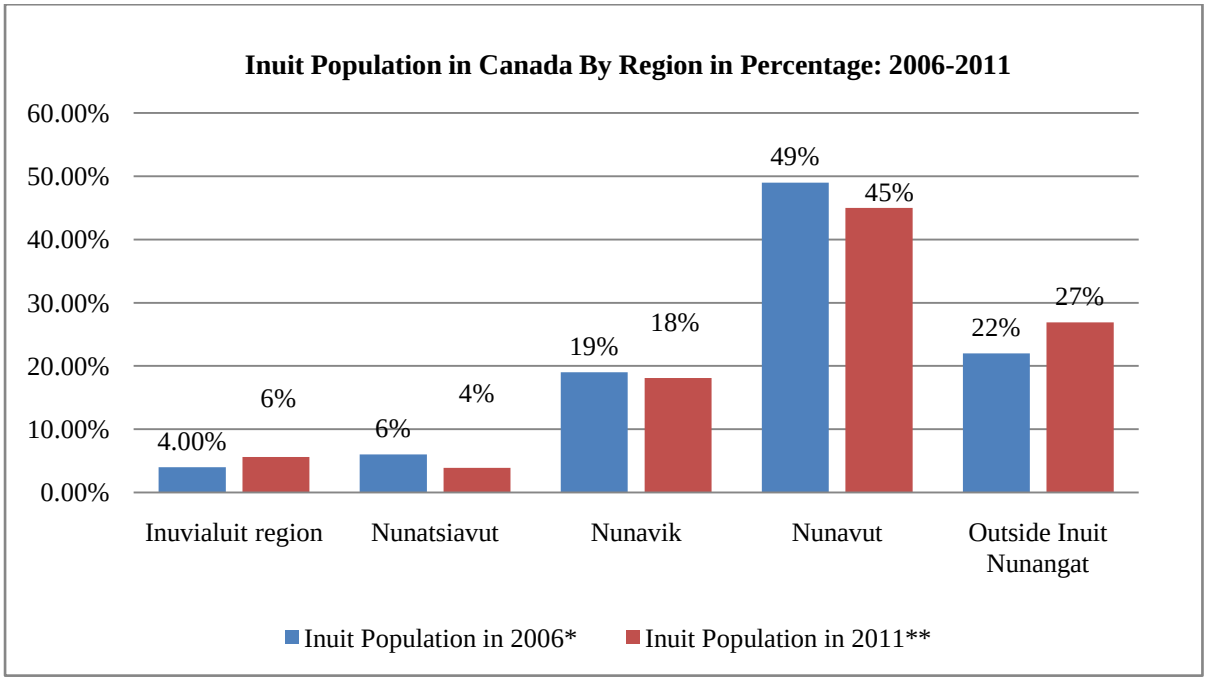
Source:*2006 Census of Population (Statistics Canada 2008). **National Household Survey 2011 (Statistics Canada 2013).

In fact, climate change is affecting the traditional and cultural activities of these indigenous peoples/communities in the circumpolar region including the indigenous/traditional knowledge (TK), such as prediction of weather patterns, snowfall and thickness or density of the ice on land surface as well as sea, animal behaviour and migration patterns in the Arctic. TK in the past has been passed down from generation to generation in the communities. This is how the TK or the world has worked, but nowadays it is less accurate than it was due to these changes taking place at a much faster pace on land, sea, water and ice in the circumpolar Arctic. Climate change is not just a theoretical problem and issue to be solved for future generations but communities are already struggling to adjust or adapt and mitigate it (Smith 2007; IPCC 2007; UNEP/GRID-Arendal 2009).

The Government of Yukon, one of the territorial governments in Canada has stated that climate change is not only a regional but a global issue, and brings challenges that threaten all parts and regions of the world. The majority of climate scientists and climatologists have concluded that global temperatures in the atmosphere are rising unprecedentedly and that

warming temperatures in the past 50 years have been sped up by human or anthropogenic activities that release greenhouse gases (GHG) into the atmosphere of the earth.

Table 1.2: Inuit Population in Canada By Region in Percentage: 2006-2011



Source:*2006 Census of Population (Statistics Canada 2008; Tait 2008). **National Household Survey 2011 (Statistics Canada 2013).

In northern Canada, and across the circumpolar Arctic, the effects of climate change are becoming more clear and are better understood. Northern Canada is experiencing impacts of climate change, or more extreme weather events such as thawing of the Arctic ice and permafrost, rapid glacial melting, that led to rising sea levels on the northern Canadian coast, and the strange beetle and insect infestations across southern spruce forests in the sub-Arctic region. The impact of climate change is multidimensional and varied from increasing the risks, costs and impacts of forest fires in the sub-arctic areas, to threatening and challenging the structural integrity of housing buildings, constructions sites, damaging heritage sites, highway infrastructure, and impacting traditional ways of life, livelihood, economy and health (Government of Yukon and Environment Yukon 2006).

The recent research and study on the impact of climate change in the circumpolar Arctic, including the comprehensive report of the Intergovernmental Panel on Climate Change (IPCC), Arctic Climate Impact Assessment (ACIA) have increased the knowledge base and understanding of climate change, particularly in the polar Arctic region. The series of research data and information or reports of the IPCC and ACIA indicate that the average temperatures in the Arctic have risen at approximately twice the global average rate in the past some decades and that this trend is expected to continue more severely in the future. The climate models (CM) have projected that the temperatures of the earth could rise by at least 3 to 5 degrees Celsius over land and up to 7 degrees Celsius over the oceans over the next century and future. Moreover, the levels of precipitation in northern Canada are also expected to increase in winter against the summer in the near future due to climate change (Government of Yukon and Environment Yukon 2006: 1).

In an attempt to understand all about climate change and its impact on the communities' health, food system, socio-economic, cultural activities and their livelihood in the circumpolar Arctic, it is important to put raise questions.

The study seeks to answer the following research questions:

1. What are the differing views on climate change in Canada?

2. What kind of impact has climate change had on the Inuit peoples in Canada?

3. What are the long-term implications of projected climate change on the Inuit food, health, economy, society and culture?

4. How have the Inuit Arctic residents adapted to the impact of climate change so far?

5. How has climate change adaptation been working at the community level?

6. How far do policy-makers in Canada use local responses to climate change in framing their policy?

7. What are the reasons for Canada not taking an effective stand on climate change particularly on mitigation policy at the international level?

8. How far has the policy of climate change impacted the community?

Based on the above research questions, the study seeks to test the following hypotheses:

1. Traditional sources of livelihood of the Inuit are more vulnerable to climate change rather than their socio-cultural practices.

2. Blending traditional knowledge with western scientific methods is imperative for the Canadian Inuit to adapt to climate change and protect their community rights and livelihood.

Taking the anthropogenic approach, this study attempts to explore Canada's approach to dangerous climate change. It examines the Government of Canada's understanding of climate change and compares it with that of researchers and scholars working on the subject. Based on this understanding, the study seeks to describe the policy measures that Canada has so far taken internationally and domestically to adapt and mitigate climate change. The study thus will be descriptive and analytical, making a critical evaluation of Canada's main agenda in the Arctic and its approach to Inuit rights and livelihood. In order to do this, the study will examine the conditions that create vulnerability in the Arctic communities, be it climatic or non-climatic and assess the importance of climatic change on the Inuit. A further assessment of strategies that have been used to overcome or adapt to these changes will be made.

The study is based on primary as well as secondary sources, and the data collected and collated from various governmental as well as non-governmental sources:(a) the Canadian Federal and the Provinces or Territorial Governments data and publications like the Environment Canada, Statistics Canada, Health Canada, the Department of the Indigenous and Northern Affairs of Canada (INAC); (b) the Inuit institutions or organisations like the Inuit Tapiriit Kanatami (ITK), the Inuit Circumpolar Council (ICC), the National Aboriginal Health Organisation (NAHO) data and publications; (c) the international institutions and the organisations like the United Nations Environmental Programme (UNEP), the Arctic Climate

Impact Assessment (ACIA), the United Nations Framework Convention on Climate Change (UNFCCC), the National Aeronautics and Space Administration (NASA), the Intergovernmental Panel on Climate Change (IPCC), World Meteorological Organisation (WMO) data, reports and publications, and the researchers and scholars working on the subject.

In order to understand these issues and challenges to the Inuit communities in the Arctic, the study is organised into four main chapters: First, the introductory chapter discusses the concept of climate change based on the anthropogenic theoretical perspectives from the scientific knowledge to Inuit traditional knowledge (TK) or Inuit traditional ecological knowledge (TEK) as well as the solar variability approach. The second chapter of the study examines whether climate change is a real phenomenon in the Arctic by observing the weather patterns, precipitations, temperatures, animals or wildlife behaviours and movements, sea ice patterns and the environments through both the traditional or indigenous knowledge of Inuit and modern scientific study. In this chapter of the study also discusses the positive impacts of climate change or new opportunities associated with natural resources exploration and new infrastructure in the Canadian Arctic or Inuit Nunangat regions.

In the third chapter, the study seeks to determine the impacts of climate change on the Inuit health, food security, social, cultural, economic and livelihood in the Canadian Arctic or Inuit Nunangat. The fourth chapter seeks to examine how policy intervention can help the Canadian Inuit population to adapt to climate change, and reduce the environmental stress in the Arctic. Since the primary focus of the research/study is on the impacts of climate change on the Inuit communities in the Arctic, the focus of the study in chapter four will be given to Canada's policy initiatives towards climate change that has implications for the Inuit communities in the country. The study also analyses the Canadian federal, provincial/territorial governments and the community organisations or government programmes and policy initiatives towards climate change by studying the implications of various programmes related to food security, health care services, socio-economics, and traditional way of life programmes like Harvesting Supporter Programmes (HSP) and the Nutrition North Canada (NNC) programme for the Inuit communities and the northerners in the Canadian Arctic. At the same time, the study also highlights Canada's mitigation policy of climate change at the national as well as international levels.

Discourse on Climate Change

Climate change is referred to as the significant change in climate over a period of time. The cause(s) of climate change could be due to the natural or solar variability, or as a consequence of human activity, especially as a result of the industrial revolution in the world, or both. Article 1 of Section 2 of the 1992 United Nations Framework Convention on Climate Change (UNFCCC), defines 'climate change' as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (United Nations 1992).

Climate change is a long-term significant change in the measures of climate and weather conditions, events, features, and patterns or surface variability of significant quantities of weather patterns such as precipitation, temperature, and the wind pattern over epochs of time that vary from several decades to hundreds or thousands of years in the region or the whole parts of the world. According to the World Meteorological Organisation (WMO), the standard period or epoch of time for measuring the weather patterns or features of climate in the region, is at least, three decades or more to hundreds or thousands of years. In this context, climate change is a change in the average weather conditions or a change in the distribution of weather events that is related to the average weather or more severely extreme weather of temperatures such as heat or cold weather events in a region or the whole parts of the world. The impacts of climate change will be more severe to some particular regions or the entire parts of the planet (Environmental Protection Agency 2016; Papa 2010; NASA 2005). In order to understand the concept of climate change, it is important to study first about what is weather and climate?

Weather and Climate: Weather is the condition of the air or atmosphere at a particular place or region over a short epoch of time. There are actually several components of weather including air, atmospheric pressure, blizzards, cloudiness or cloud cover, flooding, fog, frost, hail storms or sleet, ice storms, rain to freezing rain or rains from a cold front or warm front, precipitation, sunray or sunshine, snow, thunderstorms, extreme heat, heat waves in summer and extreme cold and cold waves in winter, and wind patterns. Weather can change from hour to hour, day to day, week to week, and season to season in most places in terms of atmospheric pressure, temperature, brightness, cloudiness, humidity as in high and low

pressure, precipitation, wind or wind velocity, and visibility (Environmental Protection Agency 2016; NASA 2005).

On the other hand, climate is the circumstance of the long-term average pattern of weather in a particular area, region or place and time period, generally measured by a minimum of 30 years and more to hundreds, thousands or millions of years, in terms of the averages of atmospheric condition, humidity, precipitation, sunshine, temperature, wind velocity, and other measures of the weather patterns including ice sheets or sea ice and ocean or sea surface temperature described and illustrated by statistics. Climate in broader terms is the condition and state of weather. This encompasses satellite data or recording, statistical data and description of the climate system such as rain gauge or measurement data, lake, sea and reservoir levels during a summer, or an area of land that was drier than average in a particular place of any other particular season. If the condition of climate and weather continues to be drier than normal over the course of many summers or any other particular season in the region then it would possible to signify a change in the climate of the region. Notably, the difference between climate and weather is that weather comprises short-term changes in the atmosphere patterns whereas climate consists of the long-term significant changes in the air and atmospheric patterns of the particular place or region. In essence, the difference between the two is that climate is like an extremely hot summer or severely cold winter, and whereas weather is like a very hot day with the highest temperature of the week (Environmental Protection Agency 2016; NASA 2005).

Notably, the meteorologists have been measuring and studying weather characteristics of the planet since the late 1800s, such as atmospheric pressure, cloudiness, humidity, precipitation, temperature, and wind or wind speed. Scientists and meteorologists use different methods for collecting data to study the weather characteristics such as the direction from land-based stations to weather balloons methods (NASA 2005).

Earth's climate is very complex to know and understand due to climate variability, and many features of climate are not completely understood (Desonie 2008). In order to be able to know and get the information of climate of any particular region or zone of the Earth, modern

scientists used Climate Models[1] (CMs) to study the climate system based on the biological, chemical, and physical characteristics and principles (Goosse et al. 2008).

CMs for Earth have been organised into four categories such as atmosphere, ice, land surface, and ocean or sea, which are made into a grid. The standards of the predicted climate patterns and variables such as humidity, rainfall, surface pressure, temperature, and the wind velocity are collected and calculated at each grid in a particular place or region at particular points of time, to forecast their future values and outcomes. Time measurement used in the climate models method depend on the function of the grid size. For example, in order to have better resolution shorter intervals are required between each calculation and computation of a grid. In general, a climate model with a 100 km horizontal or parallel level resolution and 20 vertical or upright level points, would normally use a time-step of at least, 10 to 20 minutes. This means that the study for a one-year model with this description and calculation would need to develop and process the information and data for each of the 2.5 million grid points for over 27,000 times. Consequently, this kind of work could be done only by supercomputers (World Meteorological Organisation 2016).

Scientists and meteorologists are collecting and gathering data and information from both the paleoclimate (past climate) and the current climate of the atmosphere, ice, land, and oceans to create climate models. A climate model can be created or constructed for a particular region or for the whole planet. Climate models are used to forecast the effect of the rising air or atmospheric temperature and the sea surface temperature (SST) since the year 1980 (Desonie 2008).

However, climate models are not easy to create and construct. For example, the outcome of rising temperature on separate layers of the atmosphere can be joined into a climate model for the whole atmosphere. If climate models put additional factors such as ocean temperature or sea ice temperature or sea surface temperature into the model, then the outcome would be more complex and less certain. Moreover, some factors are not well and completely understood. Clouds have two opposite results on climate system: one, clouds reflect sunlight back into the sky (as when a cloud passes overhead), and two, clouds trap heat (as on a

[1] Climate Models (CMs) are a mathematical description and representation of the climate system based on the biological, chemical, and physical characteristics and principles. The CMs are used for a range of functions and purposes from study of the boisterous and dynamics of the climate system to the calculations and projections of future climate information (World Meteorological Organisation 2016; Goosse et al. 2008).

cloudy night). In this context, if warmer temperatures increase cloud cover, the results are unclear and as a result, it is difficult to create a model (Desonie 2008: 45-46).

Climate is influenced by various human-made factors such as industrialisation, infrastructure and developmental work, urbanisation, and population. Consequently, air, noise and water pollution levels continue to increase, leading to rising distress and stress on the environment. Such changes in climate and weather patterns, and environmental quality and environmental consequences widely affect quality or value of ecosystems and life on earth. At the same time, Earth's climate is also influenced by sun variability and the composition of the atmosphere, ocean currents or sea surface temperature, and the layer of greenhouse gases that surrounds the earth. At the local or regional level, climate is influenced by some particular factors such as latitude (the space between south or north of the equator of the earth as calculated and measured in degrees), altitude (distance or height above mean sea level) (AMSL), wind velocity and patterns, approach to the ocean or sea, and the structure and composition of its surface. Moreover, carbon cycle and water cycle are both essential to climate (Dangermond and Artz 2010).

Concentrations of particulates or particulate matter (PM) in the atmosphere of the earth, called aerosols varies in the atmosphere depending on windblown dust, mineral dust, volcanic ash, smoky soot and dust storms from fires, or forest and grassland fires and pollutants. The incoming sunlight or solar radiation is blocked by these aerosols as they spread into the atmosphere of the earth. The rate of the PM and aerosols are blown very high in the atmosphere when there is a large volcanic eruption. However, other aerosols such as the smoky soot and smoky dust are absorbed in the lower part of the atmosphere. Those aerosols that reflect the sunlight cool the atmosphere of the earth while those that absorb the sunlight warm it. Gravity of the earth holds gases in the atmosphere, which are very dense closer to the Earth's surface and become less dense at a higher altitude (Desonie 2008: 9).

The atmosphere of the earth is divided into six main layers: (i) troposphere (0 to 8 kilometres extends up to 14.5 kilometres or 0 to 5 miles extends up to 9 miles high altitudes); (ii) stratosphere (14 to 50 kilometres or 9 to 31 miles high altitudes); (iii) mesosphere (50 to 85 kilometres or 31 to 53 miles high altitudes); (iv) thermosphere (85 to 600 kilometres or 53 to 372 miles high altitudes); (v) ionosphere (600 to 965 kilometres or 372 to 600 miles high altitudes high altitudes); and (vi) exosphere (965 to 10,000 kilometres or 600 to 6,200 miles

high altitudes). The densest layer nearest to the surface of the earth in the atmosphere is called the troposphere. In essence, nearly all weather patterns and conditions are in this atmosphere. Thus, the most important and main heat source of the troposphere is the earth's surface, and therefore, it displays a decrease in temperature with altitude (Desonie 2008: 9; NASA/Goddard/Zell 2013).

The stratosphere begins just above the layer of the troposphere and contains the ozone layer that absorbs, scatters, and disperses the solar ultraviolet radiation. The most significant public health implication is present in this layer. Since the stratosphere is heated by the sun's ultraviolet (UV) rays, this layer contains more heat. The ozone in the stratosphere is known as 'good ozone' because it provides a protective shield and guards life and health on earth by absorbing the lethal ultraviolet (UV) radiation (Desonie 2008: 9; NASA/Goddard/Zell 2013).

While climate change is measured scientifically, it is a complex issue that is influenced culturally, economically, politically, and socially. In essence, how does one interpret the cause of climate change? Is it because of human activity or is it caused by natural variability in the universe or Earth's climate? In an attempt to answer these questions, it is essential to study and understand the theoretical frameworks of viewing climate change from the four different approaches or perspectives such as anthropogenic or human-made, natural or solar variability, the Inuit perspective as well as Canada's approach towards climate change, the main focus of this study.

Anthropogenic Approach

The climatic condition of Earth has been changing frequently throughout the history. At the end of the Little Ice Age (LIA) (1300-1800) climate of Earth started warming. In fact, since the Industrial Revolution (1750-1850) the climate of the Earth has been warming at an exceptional rate (Farley 2008; Davidson 2015). Consequently, scientists and climatologists are now concerned about the rise in global temperatures that are increasing at a much faster pace than what is considered normal (Desonie 2008). According to the first assessment report of the IPCC that was published in 1990, temperatures of the earth have generally risen unnoticed at a high rate in the past 100 years. The warmest years have been experienced in the last30 to 50 years. Majority of the scientists and climatologists affirmed that human activities are mainly responsible for global warming and climate change. Human activities such as burning fossil fuels, particularly coal, natural gas and oil, and forests and

deforestation activities release greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)into the atmosphere. The abundant presence of greenhouse gas levels in the atmosphere trap more heat and raise global temperatures. Rising temperatures or global warming of the past 60 to 100 years on earth is known as climate change (Desonie 2008; Farley 2008).

In this context, it is essential to discuss the work of some exponents of the anthropogenic cause of climate change. In 1896, Svante Arrhenius (a Swedish chemist) stated that industrial activities and the human civilisation would increase the natural greenhouse effect. He proposed that this greenhouse effect might be beneficial for future generations of the world population (BBC 2009).

Svante Arrhenius' proposed work was continued by Guy Callendar (a British steam engineer and inventor) in 1938 by studying the climatic conditions and the records of weather patterns from at least 147 weather stations across the world. According to Guy Callendar, the temperatures of the earth had risen over the past 100 years. He also proved that carbon dioxide (CO_2) concentrations in the atmosphere had increased over the previous century, and suggested that this caused global warming (Callendar 1938). His work or main contribution is known as "Callendar Effect". Although the Callendar Effect (CE) was generally rejected by meteorologists in those days, Callendar's contribution to the anthropogenic theory of climate change was the initial discovery that linked increasing carbon dioxide (CO_2) presence in the atmosphere to global temperature and warming. Remarkably, Callendar was the first person and pioneer to ascertain that the planet had warmed due to concentration or present of CO_2 in the atmosphere (BBC 2009; Applegate 2013).

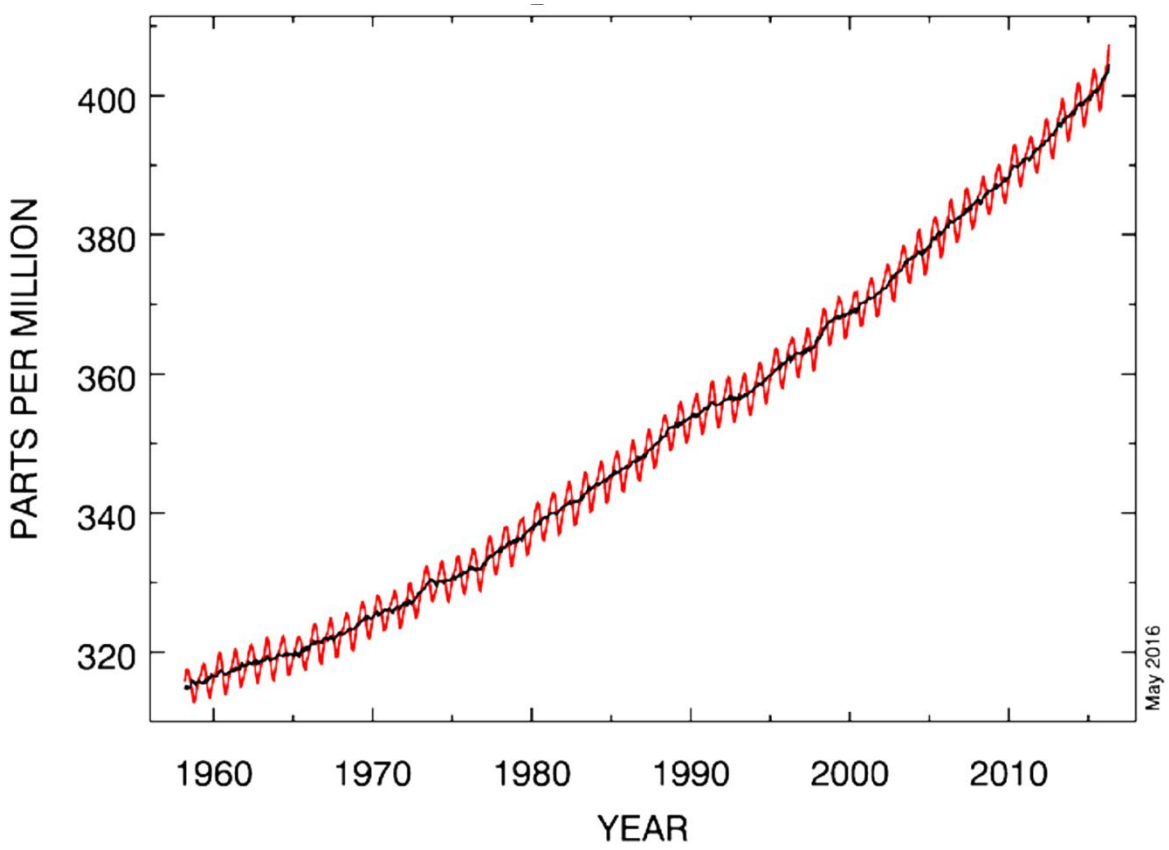
The Callendar Effect or anthropogenic global warming (AGW) was furthered advocated and developed by Charles David Keeling (an American scientist) by observing, recording, and measuring CO_2 emissions in the earth's atmosphere at the Mauna Loa Observatory (MLO). The MLO is now a part of the US National Oceanic and Atmospheric Administration (NOAA) in Hawaii, which was initiated in the month of March 1958 (IPCC 2007). Keeling (1961 and 1998) certified that CO_2 emissions that concentrated in the earth's atmosphere is what is changing the composition of the earth's atmospheric temperatures. He was the first scientist of the contemporary world who alerted humanity to the anthropogenic contribution,

towards the greenhouse effect (GHE), which is leading to increasing temperatures, global warming and climate change (IPCC 2007).

Keeling's data and measurements of CO_2 emission and CO_2abundance in the atmosphere observed at the MLO in Hawaii provides factual information and data of the earth carbon cycle with regular recording of the combustion of fossil fuels such as coal, diesel, kerosene oil, petroleum, and natural gas for the past 50 to 70 years. Data and the measurements of CO_2 emission levels maintain an accuracy, meticulousness, and precision in the atmosphere that helps the scientists to separate anthropogenic activities or human-made emissions from those owing to the natural and normal annual or seasonal cycle of the biosphere, atmosphere, and ocean phenomena (IPCC 2007:100). Keeling's work or his measurements of CO_2 emission or concentration in the earth's atmosphere is also known as the 'Keeling Curve'. The Keeling Curve (KC) is a grid or graph that represents the ongoing change and development in the concentration of CO_2 in the atmosphere of the earth since March 1958, based on uninterrupted measurements and information collected at the MLO in Hawaii that started under the supervision of Keeling. The Keeling Curve or measurements of the CO_2 level is recognised and approved by many scientists around the world that attract the world's attention to the rising and existing levels of CO_2 in the atmosphere of the earth (IPCC 2007; Briggs 2007).

As shown in Table 1.3, the red curve/zigzag line represents the monthly mean atmospheric carbon dioxide (CO_2) data and information, whereas the black curve/middle line represents the seasonally average trend corrected data and information of CO_2, which is calculated or measured as the mole fraction in dry air at Mauna Loa Observatory (MLO) in Hawaii, United States of America (US). It represents the longest data and documentation of direct measurements of carbon dioxide in the atmosphere of the earth, which was started by Charges David Keeling of the Scripps Institution of Oceanography (SIO) in San Diego, California, in the month of March 1958, at present a branch of the National Oceanic and Atmospheric Administration (NOAA) (Keeling 1976; NOAA/ESRL/GMD 2016). Notably, the NOAA had started its own carbon dioxide measurements since May 1974 (Thoning et al. 1989; NOAA/ESRL/GMD 2016). The data and information are collected as a dry mole fraction described as the number of molecules of carbon dioxide (CO_2) divided by the number of molecules of dry air multiplied by one million or parts per million (ppm) (NOAA/ESRL/GMD 2016).

Table 1.3: Monthly Measurements of Carbon Dioxide (CO_2) Concentrations in the Atmosphere at Mauna Loa Observatory, Hawaii: March 1958 to May 2016



Source: Scripps Institution of Oceanography/ NOAA Earth System Research Laboratory (NOAA/ESRL/GMD 2016).

According to the Keeling Curve's monthly mean atmospheric CO_2 data and information of the Mauna Loa Observatory (MLO), 315.71 ppm and 317.50 ppm were recorded as the concentration of CO_2 in the atmosphere of the earth in March and May 1958 respectively (Table 1.3). In May 1960, CO_2 was measured at 320.03 ppm in the atmosphere, compared to 317.24 ppm as a regular trend of CO_2 in 1960 which meant it had increased by around 2.5 ppm within 2 years of starting the measurement. The abundance of CO_2 in the atmosphere was recorded at 328.07 in May 1970, compared to 325.27 ppm as an average trend of carbon dioxide level in 1970. There was at least 9.5 ppm to 11.00 ppm of CO_2 level had escalated in the past 12 years. In May 1980, the concentration level of CO_2 was estimated at 341.47 ppm, whereas 338.45 ppm as an average trend of CO_2 in the atmosphere in 1980. It had been

increased by over 24 ppm of the CO_2 level in the atmosphere of the earth in the past 22 years of its inception (NOAA/ESRL/GMD 2016).

The data and information from the Mauna Loa Observatory (MLO) indicate that global warming is a product of the anthropogenic activities or human endeavours. The concentration of CO_2 level in the Earth's atmosphere had reached 357.29 ppm in May 1990, compared to 354.10 ppm as a regular trend of CO_2 in the atmosphere in 1990. It had increased the level of CO_2 by above 40 ppm in the past 32 years of the CO_2 emission recording at the MLO in Hawaii (Table 1.3). In May 2000, the level of CO_2 in the atmosphere was recorded at 371.51 ppm, at 393.04 ppm in May 2010, and at 408.34 ppm, compared to 407.80 as an average trend of the CO_2 level in the atmosphere of the earth in May 2016 (Table 1.3; NOAA/ESRL/GMD 2016).

Thus the anthropogenic conception of climate change states that human activities such as agricultural practices, burning fossil fuels and wood, deforestation and land clearing or emissions of greenhouse gases (GHG), particularly carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are the main causes of global warming in the present century. Human activities enhance the greenhouse effect (GHE) on Earth (Bast 2010). GHE is actually a natural process that warms and increases the temperature of the Earth's surface and sea surface temperature (SST). When the sun's light reaches the atmosphere, it is reflected back to space. Green house gases help in absorbing some of this reflected heat. Greenhouse gases (GHG) consist of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), water vapour, and various non-natural chemicals such as chlorofluorocarbons (CFCs) and other miscellaneous gases. The absorbed energy or sunlight warms the Earth's atmosphere, ocean or sea surface and maintains the Earth's temperature. This is what supports life on Earth (Department of the Environment 2016).

In fact, without the greenhouse effect (GHE), the average atmospheric temperature of the earth would be around minus (-) 18 degrees Celsius, but GHE increases it by 33 degrees Celsius, thus maintaining it at an average of 15 degrees (Desonie 2008: 6). Some scientists argue that water vapour (H_2O) is the main contributor to the GHE accounting for about 36 to 90 per cent of the greenhouse effect, followed by carbon dioxide (CO_2), methane (CH_4) and ozone (O_3). Although the greenhouse effect (GHE) caused directly by human-made greenhouse gases (GHGs) is perhaps small, the anthropogenic theory of climate change or

anthropogenic global warming (AGW) affirms that this small increase in temperature is multiplied manifold by the presence of water vapour which further holds the temperature in the atmosphere. Warming of the Earth causes more evaporation and thus more water vapour in the atmosphere (Bast 2010: 7; Desonie 2008: 3-4).

Global warming also generates the release of methane (CH_4) from agricultural activities, frozen mosses, peat bogs, and wetlands, and carbon dioxide (CO_2) from the oceans and sea. The exponents of the anthropogenic theory assert that about 0.7 degrees Celsius warming of the past 100 to 150 years, and at least 0.5 degrees Celsius increase of the past 60 to 100 years can be mostly attributed to human-made greenhouse gases. The exponents of the AGW use computer or climate models (CMs) based on physical principles, data and information to predict that an increase of carbon dioxide (CO_2) in the atmosphere would cause the temperature of the earth to go up by 3.0 degrees Celsius by 2100 (Bast 2010: 7).

The first assessment report (FAR) and the second assessment report (SAR) of the Intergovernmental Panel on Climate Change (IPCC) came out in the year 1990 and 1996 respectively. They recognised that GHGs emissions are a consequence of human activities particularly of the developed countries. It was also accepted that developed countries are predominantly responsible for the existing high levels of greenhouse gases emissions in the atmosphere as a consequence of the past 150 to 200 years of industrial activity. As a result, the Kyoto Protocol (KP) treaty was adopted in Kyoto, Japan, on the 11th of December 1997 and it came into effect on the 16th of February 2005 (UNEP/GRID-Arendal 2009).

The Kyoto Protocol (KP) is the first international agreement signed by the governments of the independent states/countries in the world that associated themselves to the UN Framework Convention on Climate Change (UNFCCC). The UNFCCC has setup international obligations to reduce the emission of the 6 GHGs, particularly for the developed countries along with the European Community (EC). A reduction of 5 per cent of emission of GHGs against 1990 levels by these countries was required over five years from 2008 to 2012 as its first commitment. The KP agreement has listed six GHGs or groups of gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur-hexafluoride (SF_6), hydro-fluorocarbons (HFCs) and per-fluorocarbons (PFCs). The last three (SF_6, HFCs and PFCs) are collectively known as F-gases. There are also other miscellaneous GHGs apart from the ones enclosed by the KP. However, these six GHGs or groups of gases constitute a huge

portion of overall GHGs emissions from human activities and are the most pertinent in terms of direct human responsibility. The overall greenhouse gas (GHGs) emissions from human activities have developed and increased since the industrial period that started from the 1750s. Notably, around 70 per cent of the GHGs emission has taken place between 1970 and 2004 (UNFCCC 2014).

According to the fourth assessment report (FAR) of the IPCC, the overall concentration of carbon dioxide (CO_2) in the atmosphere prior to the beginning of the Industrial Revolution was approximately 280 parts per million (ppm). But its concentration level had reached up to 379 ppm by 2005. The annual escalation rate of CO_2 in the atmosphere was higher between 1995 and 2005 than the previous average record of the atmospheric measurements in the 1950s. As a result, the earth atmospheric concentrations of CO_2, CH_4, and N_2O have risen noticeably due to the human activities since the 1750s (period of industrial revolution) (IPCC 2007; UNEP/GRID-Arendal 2009).

The Assessment Reports of the IPCC: It is a scientific intergovernmental body and research group for the assessment of climate change on Earth under the aegis of the United Nations. The IPCC was established in 1988 by two agencies/bodies of the United Nations Organisations (UNO) – the UN Environment Programme (UNEP) and the WMO. In the same year it was legitimised by the Resolution of the United Nations General Assembly (UNGA) on the 6th of December 1988, for the protection of the earth's climate for current and future generations of humankind. The objectives of the IPCC are to provide a comprehensive scientific view on the current, conditions and status of the Earth and its potential ecological, environmental, human food systems or food security, health, and socio-economic impacts (UNEP/GRID-Arendal 2009; IPCC 2007; IPCC 2013a and 2014).

IPCC is working on projects for adaptation to and mitigation of climate change and has published several assessment reports. The first and second assessment reports of the Intergovernmental Panel on Climate Change (IPCC) was published in 1990 and 1996 respectively. The IPCC third assessment report (TAR) in 2001 is organised into three major Working Groups (WG) reports, and followed by a synthesis report (SYR) on the climate of the earth planet and climate change issues in the world. While the IPCC WG I assessment report has covered the basic science climate change, the IPCC WG II assessment report has described and characterised the impacts, adaptation, and vulnerability to climate change, and

the IPCC WG III assessment report has focused on the mitigation of climate change (IPCC 2007, 2013a and 2014).

According to the latest or fifth assessment reports (AR5) of the IPCC 2013 and 2014, global warming is real. The concentrations of CO_2, CH_4, and N_2Oin the earth's atmosphere have increased to unprecedented levels in the last 60 years and it is most likely that human influence was its main cause (IPCC 2013a, 2013b and 2014).

Solar Variability

In contrast to the anthropogenic theory of climate change, the Milankovitch theory of climate change predicts that global ice volume and sea surface temperature changes were controlled by long-term quasi-periodic variations in the parameters of the Earth's orbit or the obliquity, precession and eccentricity of the solar system (Pillans et al. 1998: 5).

On the most significant issue of climate change, the IPCC affirms that "most of the observed increase in the global average temperatures of the earth's atmosphere since the 1950s is very likely (defined by the International Panel on Climate Change (IPCC) as between 90 percent to 99 percent certainty) due to the observed increase in anthropogenic greenhouse gases (GHG) concentrations in the earth's atmosphere," (IPCC 2013: 36). The Non-governmental International Panel on Climate Change (NIPCC) claims the opposite and concludes that natural causes are likely to be the dominant cause of climate change (Singer ed. 2008: iv) even though anthropogenic greenhouse gases (GHG) do cause some warming (Singer ed. 2008).

The Milankovitch premise/theory of climate change is based on two principles: firstly, that the earth's climate is controlled and influenced by the seasonal cycle and latitudinal distribution and forces of the solar system. Secondly, that the climate system is linked to the increasing and decreasing cycle of the northern hemisphere ice sheets, especially during the earth's Quaternary period, and is controlled and regulated by deliberate variation in the orbital system of the earth (Pillans et al. 1998: 6; Berger 1978: 139-140).

Milutin Milankovitch (a Serbian geophysicist and astronomer), who studied the phenomena and came up with the theory in the 1930s, relates it to the solar system. The Milankovitch theory is also known as Milankovitch Cycles, a description of long-term nature-induced

climate change. It says that the orbital forces and axial variations in the solar system influence climate change on Earth in long-term natural cycles defined as, 'ice ages' and 'warm periods' or 'glacial' and 'interglacial' epochs. This is a result of the cyclical glaciations of the past hundred to million years because of the variations in the earth's orbit and rotational motion. This theory proposes that solar phenomena influences Earth's climate (Milankovic 1941; Hays et al. 1976; Huybers and Wunsch 2004; Desonie 2008; Singer 2008).

Solar radiation can vary from place to place on Earth depending upon its position relative to the sun in the solar system. Large deviation in solar radiation has influenced climate system of the Earth. Ice ages like the Pleistocene Ice Ages (PIA) and Little Ice Age (LIA) are good examples (Desonie 2008: 25-26; Milankovic 1941; Huybers and Wunsch 2004).

The Milankovitch theory put forth three hypotheses to prove that global warming and climate change occur due to natural solar variations in the Earth's position. First, Earth's climate is influenced by variations of the orbit of the earth around the sun, particularly during a more elliptical or oblique one on a cycle of approximately 90,000 years to 100,000 years in the solar system. This process of the variation is known as eccentricity. When the orbit of the planet is circular, as it is at present, the volume of the solar radiation reaching Earth's surface during a year varies by merely 6 per cent. On the other hand, when the orbit is at its most elliptical or oval, the amount of the solar radiation/rays reaching the surface of the Earth during a year differs by about 20 to 30 per cent. This big change in solar radiation deeply affects the global climate leading to global warming and climate change on Earth (Desonie 2008: 25-26; Milankovitch 1941).

Second, the axis of rotation points of the Earth wobbles or moves. When the Earth moves on its axis of rotation, this movement or wobble is called precession. Precession moves the direction of the axis of rotation of the earth, which takes approximately 12,000 years when it will be directed toward the star Vega. At that point in time, the northern hemisphere of the planet will have summer when the Earth is nearest to the sun (in contrast to the current position). On the other hand, winter of the northern hemisphere of the planet will take place when Earth is moving furthest away from the sun (also not like the present position) in the solar system. As a result, Earth's winters will be extremely cold and summers will be much warmer than the current summer (Desonie 2008: 27; Milankovitch 1941; Hays et al. 1976).

Third, seasons of Earth are actually caused by about 23.5 degrees angle of the axis of rotation of the planet. When Earth orbits around the sun, the tilt of Earth's axis to the sun changes during the year. When solar radiation reaches the farthest north of the Earth, the northern hemisphere of the earth is tilted towards the sun on either June 21 or 22. This is known as the summer solstice. On the other hand, when the northern hemisphere of the earth is tilted farthest away from the sun on either December 21 or 22 it is known as the winter solstice. However, this phenomenon of the axial tilt or obliquity movement of the earth is not constant and regular. Thus over a period of time, that is, in approximately 41,000 years the axial tilt varies between 22.1 and 24.5 degrees. When the smaller axis of the earth is tilted toward the sun, there is less variation between winter and summer in the middle and high latitudes of the planet. Glaciers and sea ice are more likely to form when the summers of Earth are colder and winters are chillier and milder in the high latitudes of the planet (Desonie 2008: 28; Hays et al. 1976; Milankovitch 1941).

The Milankovitch theory explained the superimposition of these three variations in the pattern of climate in the past 100,000 years. Some climatologists and scientists have claimed that the climate in the past thousand or million years has been strongly connected with the 100,000 years of the solar system. Thus it seems to be natural phenomena (Desonie 2008; Milankovitch 1941; Hays et al. 1976).

According to the data and information of the Nongovernmental International Panel on Climate Change (NIPCC) 2008, the climate system of the earth has changed locally and globally a number of times in Earth's history. In support of the Milankovitch theory, NIPCC too believes that climate change takes place due to several natural causes, such as variations in the energy of the solar radiation and the position of the continents. Small factors such as volcanic eruptions and asteroid impacts can also have an impact for short time periods (Desonie 2008: 24; Singer 2008).

Ever since it came into existence, the sun has been very gradually developing and steadily increasing its radiation. It is now 20 to 30 per cent more powerful than it was. However, Earth had almost the same temperature levels back then as it does at present because carbon dioxide (CO2) levels in the atmosphere were higher than before. Thus, the average solar radiation heating the earth has changed just slightly during the past few hundred million years

in the solar system (Desonie 2008: 24-25; Huybers and Wunsch 2004; Milankovitch 1941; Hays et al. 1976).

Another natural phenomenon to be taken into consideration are sunspots which are magnetic storms that appear as dark, relatively cool regions on the sun's surface which represent short-term variations in solar radiation. In general, the sunspot activity varies. When the number of sunspots is high, the solar radiation is also relatively high (Desonie 2008; Jochum et al. 2012).

NIPCC's satellite data reveals however, that in the past two sunspot cycles have revealed a variation in solar radiation of up to 0.1 per cent that is unlikely to influence Earth. The amount of the solar radiation or sun rays that reach the surface of the earth through the atmosphere is known as insolation. In general, the level of the solar insolation energy is mostly influenced by the amount or volume of the air pollution, fly ash or volcanic ash, clouds, and dust particles. Swift changes in the insolation of the solar system could also be caused by asteroid impacts and volcanic eruptions which affect the climate for a short period of time as has been stated earlier. Thus sunspots should not be given too much significance (Desonie 2008; Singer 2008).

Inuit Perspectives

As has been discussed so far, while the main scientific interpretations and explanations of climatic change have generally concentrated and focused on the anthropogenic activities such as greenhouse gas (GHG) emission levels, there are denier groups of scientists and climatologists, who are engaging with NIPCC research work and interpretations who believe that global warming is a natural phenomena or due to solar variations. However, the Inuit understanding and their interpretations of observed climate change are more often wider or varied than the two scientific interpretations and explanations of climate change in many ways.

According to Weart (2003), climate science deals with weather patterns and climate systems, but is very limited by the lack of subject experts and specialists working in an area which is becoming increasingly complex. Climate research requires interlinking of different disciplines such as environmental and physical sciences, social sciences, cultural and humanities (Weart 2003: ix; Leduc 2007: 238). Weart (2003) further states that climate

change is not a single issue, and therefore cannot be comprehended by a single story. One of these significant stories is that of the Inuit communities of the circumpolar Arctic. The Inuit Qaujimajatuqangit (IQ), which is literally known as the Inuit Traditional Knowledge (TK) encompasses Inuit beliefs, laws, principles and values of their society (Nunavut Department of Education 2007).

Jaypeetee Arnakak (an Inuk/Inuit philosopher, policy-maker/worker, and writer) tries his best to define Inuit Qaujimajatuqangit (IQ) in the following words: "The question itself is like asking how many grains of sand there are on Baffin Island. We can never hope to count each and every single grain of sand, but we can describe what a grain of sand generally looks like, and that was how we approached the issue of Sustainable Development" (Arnakak 2000) He further interprets the IQ as an epistemology, a theory of knowledge in the following ways: first, it is a set of teachings on practical truisms about human nature, society, and experience that is passed on orally from generation to generation in Inuit society. Second, it is the knowledge of country or community that covers climate systems, environments, weather patterns, ecology, wildlife, seasonal cycles, use of resources, and the interrelationships and the linkages of these elements on earth. Third, it is dynamic, holistic, cumulative and growing in its approach to knowledge, learning and teaching that one discovers through observing, doing or action and experience (Arnakak 2000).

According to the Nunavut Social Development Council (1999), "the Inuit Qaujimajatuqangit (IQ) embraces all aspects of traditional Inuit culture including knowledge, language, life skills, social organisation, values, worldview, perceptions and expectations" (Government of Nunavut 2005: 5; Nunavut Department of Education 2007: 22; Canadian Council on Learning 2007: 20). The IQ is the wisdom that is passed on from generation to generation orally and has been traditionally acquired from experience of values of Inuit society, the Inuit way of life, the Inuit way of doing things, and Inuit traditional ecological knowledge (TEK) (Nunavut Department of Education 2007).

The Canadian Council on Learning (CCL) (2007: 20), bases the Inuit Qaujimajatuqangit (IQ) on three types of laws: (i) communal laws (tirigusuusiit in Inuktitut), (ii) cultural laws (piqujat in Inuktitut), and (iii) natural laws (maligarjuat in Inuktitut). IQ is structured on the traditional Inuit family-kinship representation that has conferred the means of passing on ideas, knowledge, skills and values, from elders to younger generations. In fact, IQ is a living

technology which has persisted for generations. The Government of Nunavut has included IQ into its policy initiatives, strategy and programme development, including in the field of education, food security programmes, health care, community well-being and sustainable development programmes in the communities (Arnakak 2000; Canadian Council on Learning 2007: 20).

IQ is all about strong healthy, sustainable communities regaining their rights to govern their lives using principles and values, which are regarded as integral to who and what they are in Inuit society.

The Inuit Tapiriit Kanatami (ITK), an organisation that represents the Inuit in Canada has stated that in order to prove whether climate change is real and to address the impacts of climate change, it is prudent to engage with the communities who are most affected by it. The Inuit communities, who are inhabiting the vast region of the circumpolar Arctic, have already felt substantial effects of global warming and climate change in recent decades. Inuit view on climate change can be broadly categorised into two: the traditional and contemporary perspectives.

Inuit Traditional Perspective: The study of the Inuit traditional view on climate change is based on the understanding of the 'Sila', the Inuit traditional (religious) beliefs, or Inuit traditional (mythological) stories, and the Inuit Qaujimajatuqangit (IQ) or the Inuit Traditional Knowledge (TK) focused on the Inuit Indigenous/Traditional Ecological Knowledge (IEK/TEK). The Inuit explanations of climate change are more intimately linked with the IQ or TK that are based on the ethical, spiritual wisdom, cultural and cosmological frameworks, or ethnographic representation. In many different parts of the world the many diverse cultural and belief systems of the indigenous and local communities/peoples, particularly the Inuit, have traditionally interpreted the adverse weather conditions, catastrophic situations, and disastrous events on earth as punishments and retributions for human transgressions and wrongdoings. The traditional Inuit interpretations on global warming and adverse climate change contain strong ethical elements, often expressed in terms of a spiritual balance, beliefs, principles, values, and practices, which is concerned about future generations (Salick and Byg 2007: 17).

According to Riedlinger and Berkes (2001: 315), IQ is very significant to global warming and climate change research and studies on at least three rationale grounds: (i) the significance of the Arctic as an early environmental indicator and barometer of global warming and climate change; (ii) climate science has very limited and insufficient scientific knowledge, particularly, of the ecological or environmental and physical processes in the Arctic; and (iii) by wanting historical baseline data against which to measure information and data. These complexities suggest that IQ can be helpful to the climatologists and scientists since its information of changes are based on cumulative and holistic knowledge of local tendencies, processes, patterns, and trends, which are attained from generations of community reliance on the land and environment for thousands of years (Riedlinger and Berkes 2001: 315; Leduc 2007: 238).

The manifestation of Sila has an extensive range of meanings: it encompasses the air, the winds, the weather; the sun, Earth's atmosphere, oceans; nature, the natural order, the breath of plants and animals in the world and the universe; common sense, reason; consciousness; the open sky, the place or space outside; the concept of Sila covers them all (Merkur 1983: 23; Petersen 1966/67: 262). Scholarly and scientific efforts to understand the Inuit conception of Sila have varied. Inuit demonstrate the inherent importance of IQ, and its understanding of Sila in relation to global warming and climate change:

> Sila is a strong spirit, upholder of the universe, of the weather and climate of the cosmos. He (Sila) is the sustainer of all life on earth, so mighty that his speech to man comes not through ordinary words, but through storms, snowfall, rain showers, the sea, through all the forces that man fears, or through the sunshine, calm seas or small, innocent children... When times are good, he has nothing to say to mankind, but disappeared into his infinite nothingness and remains away as long as people do not abuse life but have respect for their daily food. No one has ever seen him. His place is so mysterious that he is with us and infinitely far away at the same time (Leduc 2010: 21-22).

Sila thus can be understood to be the life-giving element and spirit, which encompasses the air or atmospheric forces, the land, the water body or the oceans of the planet that provides for all living things and organisms, and without which there can be no life on Earth and in the cosmology. Williamson (1974: 22) explains that Sila is the word for air, which means, that without air there is no life or there will be no life. In essence, Sila as air is essential for all creatures including human beings and for living being, lack of air means they cease to exist.

Thus according to the Inuit all living things are part of Sila, the life-giving spirit, to which they are all connected (Williamson 1974: 22; Merkur 1983: 23-24).

This means that the Inuit are not merely talking about weather changes when they refer to Sila as a god or deity of the weather, or the spirit of the air or power, or a god-like 'supreme being', but they may possibly also be referring to cultural, ethical, and spiritual dimensions that interpret global warming and adverse climate change as the world's ethical response to human wrongdoing (Leduc 2007: 242). Jaypeetee Arnakak points out that "climate change is predominantly relevant when it is taken within a cultural context where Sila is understood as sentient and responsive to human actions", with severe weather changes taking place in the circumpolar Arctic (Leduc 2007: 245).

At the same time, Weart (2003) argues that climate change appears to be challenging the cultural beliefs of the Inuit especially the idea that Sila power links humanity to global climate and regional weather patterns. This challenge has appeared in the form of unpredictability of weather patterns and climatic uncertainties (Weart 2003: 198; Leduc 2007: 247). However, Inuit cultural knowledge based on IQ that has been passed on to them from generations by their ancestors are fundamental to their survival, endurance, resourcefulness, patience and inventiveness (Bennett and Rowley 2004: xxi). Inuit Qaujimajatuqangit (IQ) has a unique interpretation of the changes in the Arctic climate and ecosystem and of the local changes in terms of weather, ice cycles, animal migration patterns and the climate. According to Krupnik and Jolly (2002: 7), when they approached Mabel Toolie, an Inuk/Inuit elder, (while researching on the Inuit Indigenous/Traditional Ecological Knowledge (IEK/TEK), he told them that the fast changing weather and climate in the Arctic are due to the 'earth moving faster'. Correspondingly, another Inuk/Inuit elder, named Aqqiaruq explained to them that these changes in the Arctic are happening due to 'uggianaqtuq', which literally meant that the weather or Sila is 'acting unexpectedly or without warning', or 'acting in an unfamiliar or a strange way' (Fox 2002: 44; Leduc 2007).

Inuit Contemporary Perspective: Any discussion on climate change often tends to focus on economic, political, and technical issues rather than impacts of climate change on human population. In fact, the Inuit communities and other indigenous communities/peoples are already facing the impacts of climate change in the circumpolar Arctic, and they are bound to

experience adverse problems with potential cultural and social disruption in the future generations (Watt-Cloutier 2007: 14).

Sheila Watt-Cloutier argues that "climate change in the Arctic is not just an environmental issue with unwelcome economic consequences. It is a matter of livelihood, a matter of food and a matter of individual and cultural survival. It is a human issue affecting our children, our families, our communities" (Watt-Cloutier 2007: 15). Jaspeetee Arnakak has always stressed that the issue of climate change for the Inuit is about defining a balanced relation between economic livelihood, sustainable development, knowledge, and wisdom (silatuniq in Inuktitut). Such a balance is essential to a sustainable way of living as well as sustainable development for humanity. While Watt-Cloutier considers that "climate change is a cultural issue" for Inuit communities in the circumpolar Arctic, climate change is also a cultural issue in Western nations and societies (Leduc 2011).

The Inuit came to understand these unfamiliar and adverse environmental changes in the Arctic through fluctuations in temperatures, increasing levels of ice on land as well as in the seas and open water, or the melting of ice and thawing of permafrost. The key indicators of these adverse changes in the circumpolar Arctic are unpredictable weather and seasons, a strange increasing level of precipitation in the region, warmer and longer summers and shorter winters, the unpredictable and unfamiliar frequent occurring of thunder and lightning, change in migratory patterns of wildlife, particularly the shifting population of caribou and polar bears, and appearance of new species of birds and fish in the Arctic (Riedlinger and Berkes 2001; Leduc 2007: 238).

Despite the fact that the concentrations and emissions of greenhouse gases (GHG) like CO2 in the atmosphere are almost entirely outside the circumpolar Arctic region, it is affecting the health of human as well as animal populations and the environment in the Arctic (Nuttall and Callaghan 2000: xxv). The Inuit manifestation of Sila suggests that the Western emissions of the GHGs are reflective of ecologically or environmentally unsustainable cultural thought patterns. This implies that the sentience of Sila is reacting to GHG emissions that have largely originated through Western culture and action (Leduc 2007: 247). About 80 per cent of the growing carbon dioxide (CO2) emissions released into the atmosphere has been mainly produced by developed and industrial countries, such as the United States and Canada since 1990 affecting Inuit environment in the Arctic (Earthtrends 2005; Leduc 2007: 247).

Mary Simon, the former/then chair of Inuit Tapiriit Kanatami, speaking on behalf of Inuit Circumpolar Conference (ICC) at the 12th session of the United Nations Commission on Sustainable Development (CSD-12) in 2004 in New York, had drawn attention to the fact that Inuit are on the front line of climate change and global warming. Yet, Inuit are not powerless victims. They are resolved to remain connected to the land, environments and the ice in the Arctic, and are adequately resilient to adapt to changing weather, climate, and environment. However, she further stated that she could not know how well the Inuit would be able to adapt to the impact of human-induced climate change, global warming, and trans-boundary contaminants in the circumpolar Arctic (Simon 2004).

While people around the world are now worried about the polar bear in the Arctic becoming extinct by 2070 because of melting ice, Sheila Watt-Cloutier points out that the Inuit culture is also going to be faced with extinction for the same reason. At the same time, Inuit know that the ice is thawing and the weather changing and with it the Inuit dynamic, unique and vibrant culture and way of life as well. However, the Inuit communities want to show that they are not powerless victims but require drastic measures would be required to combat the adverse climate change (Brown 2003).

In December 2003, Sheila Watt-Cloutier, (then elected chair of the ICC and Inuit climate/environmental activist), led 62 Inuit communities from Canada and Alaska of the US and filed a legal complaint against the US government claiming they face extinction because of climate change and global warming (Watt-Cloutier 2004: 10; Watt-Cloutier 2007: 15). The Inuit Circumpolar Conference/Council (ICC) filed the petition to the Inter-American Commission on Human Rights (IACHR) against the government of the United States' violation of pre-existing Inuit human rights because of its failure to take action to reduce the emission of greenhouse gases (GHG) despite the fact that the US was the world's largest carbon dioxide (CO2) emissions producer for many decades (Watt-Cloutier 2004: 10; Doelle 2004: 189). The Inuit believe that the American Declaration of the Rights and Duties of Man (ADRDM) 1948, which is supported by the IACHR, could help and provide an effective means for the Inuit to defend their cultural activities, social practices, the way of life and livelihood (Watt-Cloutier 2007: 15).

According to the United Nations Statistics Division (UNSD), the United States (US) produced almost 25 per cent of the global emissions of greenhouse gases (GHG). The Inuit thus argued that if the US cannot be held accountable for its emissions of the GHGs under international law, particularly human rights law, then it sets to reason that no country can in the world (Wagner and Goldberg 2004). The TAR (Third Assessment Report) of the IPCC published in 2001 stated that 'new and stronger evidence' of the human emissions of GHGs are the major cause of the global warming in the 1950s (IPCC 2001). Nevertheless, then president George W. Bush of the United States of America and his government withdrew the US from the Kyoto Protocol (KP) process immediately after he took the office in the White House in 2001 (BBC 2009).

Subsequently, a human rights petition was filed by the Inuit communities to the IACHR against the administration/government of George W. Bush of the United States (US) on account of the failure of the US to reduce its national emissions which has contributed substantially to environmental and human health degradation and damage, to the communities in the circumpolar Arctic (Wagner and Goldberg 2004).

Shiela Watt-Cloutier defends the cultural and social interests of the Inuit communities living in the circumpolar Arctic of Canada (Inuit Nunangat), the US (Alaska), Denmark (Greenland) and Russia (Chukotka). She sends out three strong messages to the world from the circumpolar communities: first, adverse and dangerous climate change is already happening in the Arctic and it will have a global impact as well. Second, climate change in the Arctic is increasing rapidly and it is going to get worse. And third, climate change in the Arctic is important to the world for many reasons as well. For the Inuit, climate change and global warming in the region are prone to disrupt their cultural activities, livelihood, and way of life, or even destroy their hunting and food-sharing culture as reduced sea ice and ice on the land causes the animals and other wildlife to perish (Watt-Cloutier 2005 and 2007: 15).

While this is true, Watt-Cloutier (2007) also argues that the Inuit are not asking the industrial countries like the United States, Canada, the EU countries, or China and India, and the world to take a backward economic step. What the Inuit are suggesting is that each nation and government in the world must develop their economies by using appropriate and right technologies that drastically reduce greenhouse gas emissions. She further states that Inuit and other communities in the Arctic are at peril because most of the industrial countries are

taking a short-term view favoured by some businesses. The purpose of this campaign is to educate and encourage the global community to join in dealing with dangerous climate change and global warming. In fact, "the Inuit communities want to change the international dialogue from dry technical discussions to debates about human values and human rights at the United Nations conferences on the environment, with the sense of urgency" (Watt-Cloutier 2007: 15).

Subsequently, the Inuit communities have recommended and suggested that "there is great continuity between the past and the present, tradition and modernity. Inuit have always known how to adapt to new contexts. They do not just want to go back to the traditions of the past, but they also wish to apply Inuit traditions that have proven their value to solving modern problems. They wish to integrate the good and useful traditions from the past into modern institutions" (Canadian Council on Learning 2007: 7; Oosten and Laugrand 2002). The Inuit Circumpolar Council (ICC) and other indigenous communities/peoples organisations of the Arctic would like to ensure the recognition and inclusion of the Inuit indigenous/traditional knowledge (TK) or IQ in the policy making, particularly in the environmental or climate change and sustainable development issues because it is more than simply science (Watt-Cloutier 2007: 14-15).

The Inuit traditional knowledge or IQ and beliefs are the direct guides to a society's views of good behaviour, relationship, disciplines, and wisdom, covering everything from relationship to the environment to relationships with people or communities, childrearing and communicating with others. The IQ and beliefs teach self-discipline, skill, building personal and community developments, and help to shape and strengthen the identity of the community. There are often serious consequences to not following the IQ and beliefs, causing disruptions in the life cycle, the cycle of seasons or the weather and climate (GNWT/DECE 1996: 31-32; Nunavut Department of Education 2007: 23).

The Climate Change Issue in Canada

The Government of Canada recognises that climate change is a global issue challenging mankind. For that reason the Government of Canada supports strong action to achieve real environmental, economic and health benefits for all Canadians of the present and future generations (Environment Canada 2012). The Government of Canada is developing policies, strategies, and programmes, and also conducting scientific research on climate change and

global warming through collaborations with provincial and territorial governments and their departments, and international organisations and partners in order to achieve the environmental goal of sustainable development in Canada (Government of Canada 2012).

The initial environmental conservation efforts in Canada were important, but they did not have the early beginnings or wide support that similar efforts sometimes had in Europe and the United States until the later 1960s and the early 1970s when organisations and institutions, such as the Pollution Probe at the University of Toronto in 1969, the Ecology Action Centre (EAC) in Halifax in 1971 and the Society Promoting Environmental Conservation (SPEC) in Vancouver in 1969 were established (Paehlke 2009: 2-3; Hummel 2010). However, contemporary environmental issues come before the courts in different forms, and each form raises different issues in Canada. Decisions in a few cases like Hydro-Quebec and Spraytech have had the potential to influence policy development in the Constitutional and Charter Litigation, Judicial Review of administrative action and civil actions in Canada (Valiante 2009: 32).

The Canadian joint venture on Acid Rain control 1981-1991 helped to reach agreements between Canada and the United States to reduce the emissions of sulphur dioxide (SO2) and nitrogen oxide (NOx) in the atmosphere (Hummel 2010). In 1983, Canada adopted a target load of reducing 20 kilograms of wet sulphate per hectare per year as a first step in controlling the effects of acid rain on surface waters in the Canada. It was estimated that a reduction of the emissions of SO2 and NOx rates in the atmosphere of this value would protect reasonably sensitive water bodies like lake ecosystems, and could be achieved by reducing SO2 emissions by approximately 50 per cent in Canada as well as north American including the US. In this context, the federal government of Canada and the eastern Canadian provinces have signed a number of federal-provincial agreements in 1987 aiming and targeting to reduce emissions of SO2 and NOx in the atmosphere by 50 per cent by 1994. In essence, Canada has followed a more specific standard protocol in this regard which is called the ‘critical load’ since 1990. Critical load is the maximum amount of pollutants an ecosystem is able to tolerate without exhibiting negative ecosystem effects in the region (Ferguson and Jeffries 2013).

According to Houghton (2012), concern about the environmental issues and climate change in the 1970s and 1980s was of interest to the scientific community alone. Subsequently, an

international conference/ministerial meeting was held in June 1988 in Toronto on the 'Changing Atmosphere: Implications for Global Security', (White 2010), hosted by Environment Canada. The primary agenda of the conference was to reduce global emissions of carbon dioxide (CO2) by 20 per cent by the year 2005, to protect the earth's atmosphere and to establish a funding arrangement through a tax on fossil fuels (WMO 1989; Bodansky 2001: 27). The important outcome of the international ministerial conference in Canada was that climate change began to be recognised as a serious political issue at both the national and international levels. The same year, the Intergovernmental Panel on Climate Change (IPCC) was formed by the UNEP and the WMO and began its work. The IPCC had been set up in 1988 to provide an objective source of scientific information about the dangers of so-called greenhouse gas (GHG) emissions (Heap et al. 2012: 68-69).

Notably, the Canadian government and Canadian scientists were playing a key role in drafting the text of the Montreal Protocol (MP) which was held in Montreal on 17 September 1987, and represented by almost every country of the world. In spite of deadlocked negotiations, the most important international treaty to protect life on earth since the 1962 treaty to stop the atmospheric nuclear weapons testing was signed. The MP committed the industrialised countries to reduce emissions of GHGs (May 2006). The work of the IPCC and its report in 1990 led to the Earth Summit in Rio de Janeiro, Brazil in 1992 where the issue of climate change and the action that needed to be taken was addressed (Heap et al. 2012: 68-69).

According to the Government of Canada and Environment Canada (2014), the data and measurements of the temperatures between 1948 and 2012 indicated that the annual average surface air temperature across Canada's landmass has warmed by approximately 1.7 degrees Celsius, which was about two times above the global average. While the warming trends are observed consistently across the country during, stronger trends are found in the northern and western parts of the country, particularly during the winter and spring seasons. Northern Canada or the Canadian Arctic (at north of 60 degrees latitude) has warmed at a rate of about 2.5 times above the global average since the late 1940s. But it is more complicated to assess and provide the strong regional variability in precipitation trends and its different states, such as freezing rain, rain, snow, and the wind. As a result, it can be gathered that Canada has generally become wetter in recent decades.

While the total annual precipitation in Canada has increased over the 1948 to 2012 period in most of the parts of southern Canada (at the south of 60 degrees latitude), there has been a decrease in snowfall. An increase in rainfall is a trend consistent with warmer temperatures in these parts of the country. At the same time, the rise in temperatures and changing precipitation patterns have led to a wide range of impacts, including decreasing or less ice cover in the Arctic, and changes in timing, weather patterns, and amount of surface water availability, and also increased evaporation contributing to lower levels in the Great Lakes. This has increased the depth and extent of permafrost melting in the Arctic, which is resulting in shorter seasons for the ice roads in the Canadian Arctic, and increased loss of forests due to pests and wildfires. Besides, more frequent rainfall and flooding in the Arctic region has increased risks from food-borne and water-borne diseases among the communities in the country (Government of Canada and Environment Canada 2014: 10).

Canada is one of the largest energy consuming countries in the world. There are commonly three reasons to explain the high level of energy consumption as a whole for Canada. First, Canada needs a huge amount of energy owing to the extremely cold climate. Second, Canada is a vast country in proportion to its population and that necessitates more energy consumption. Third, much of the economy is based on energy-intensive resource extraction, such as coal, gas, oil industries, and mining, compared to manufacturing and services. All of these factors explain the high level of energy use in Canada (White 2010: 10).

Climate change policy has commonly been framed as a matter of international governance for which global policy strategies could be readily employed (Rabe2007). The signing of the Kyoto Protocol in 1997 means a far more complex process involving a wide range of policy options and varied engagement by multiple levels of governance systems is in place. However, the experiences of Canada suggest that formal engagement in the international realm of policy by itself is not a good indicator of domestic policy development or emissions reductions of the GHG. The different contexts of intergovernmental relations, wide-ranging resources available to sub-national governments coordinating with various departments for policy development and implementation, and the role of sub-national leaders in policy making or formation and development have emerged as significant factors in explaining national differences in both the national and global levels.

Canada's has also recognised that GHG emissions had risen significantly in the atmosphere by over 50 per cent equivalent of carbon dioxide (CO_2) between 1850 and 2005. The Kyoto Protocol of 1997 followed the UNFCCC goals and principles where the political leaders of the developed and developing nations had agreed to cut emissions of the GHG by 5.2 per cent by 2010 and to achieve stabilisation of GHG concentrations in the Earth's atmosphere at a level that would prevent dangerous anthropogenic (human-instigated) interference with Earth's climate (Rabe 2007; White 2010).

When Canada signed the Copenhagen Accord in December 2009, it committed to reduce its greenhouse gas (GHG) emissions to 17 per cent below 2005 levels by 2020, establishing a target of 607 Megatons (Mt). According to the International Energy Agency, Canada's CO2 emissions from fuel combustion in 2009 accounted for approximately 2 per cent of global emissions. Canada's share of GHG total global emissions, like that of other developed countries, is expected to continue to decline in the face of rapid GHG emissions growth from developing countries (Environment Canada 2012). Under the Copenhagen Accord, Canada along with other industrialised and developed countries would provide funding to help developing economies to reduce emissions of GHGs and adapt to climate change in the future. Under the Copenhagen Accord, developed or industrial countries have committed to provide a fast-track financing deal of at least US$ 30 billion for 2010 and 2012 to support climate change mitigation and adaptation programmes in developing countries. As a constructive and active partaker to the United Nations Framework Convention on Climate Change (UNFCCC) of 1992, Canada has drastically scaled up its climate change related support to accelerate global progress and effective action by all countries with an overall commitment of at least US$1.2 billion in fresh and additional climate change financing for the fiscal years 2010-2011, 2011-2012 and 2012-2013 respectively (Government of Canada 2012a).

After the 7th Conference of the Parties (COP-7) of the UNFCCC in Marrakech in 2001, Canada faced a set of unappealing policy choices within the Kyoto Protocol framework agreement. While the United States (US) has accounted for approximately 25 per cent or one-quarter of the world's emissions of GHG, it signified clearly that the US rejects the Kyoto Protocol framework and the US will neither ratify the Kyoto Protocol commitments nor implement alternative commitments that would have a similar effect. Non-ratification by the key industrialised and developed countries in the world present a significant problem to the

success of the Protocol in combating climate change. In spite of the considerable body of the protocol agreement that details the objectives and possible alternatives, there has been little clear thinking about the possible solution to climate change in future (Rabe 2007; White 2010).

Notably, the Kyoto Protocol agreement came into force in 2005, and Canada committed to reducing its greenhouse gas (GHG) emissions to 6 per cent below 1990 levels during the period of 2008 to 2012. However, recent data and information indicate that Canada's emissions of GHGs are more than 30 per cent above the target level (Curry and McCarthy 2011). Accordingly, about 6 per cent of reduction in the GHG emissions was negotiated by the federal government of Canada in Kyoto, but the government of Canada has failed to meet these targets. Moreover, Canada formally withdrew from the Kyoto Protocol on the emissions of GHG targets in 2012, abandoning the world's only legally binding agreement to tackle climate change and global warming. The former/then Canadian Environment Minister Peter Kent had made this Protocol withdrawal official when he confirmed that the government of Canada would withdraw from the Kyoto Protocol agreement and that other countries in the world would also follow the same footsteps: "Kyoto Protocol for Canada, is over, it is in the past. …It is, in fact, only for the European countries who are staying with Kyoto Protocol agreement" (Curry and McCarthy 2011).

However, many Canadian civil society organisations, non-governmental organisations and the other political parties in Canada like Greenpeace have strongly criticised and opposed the Conservative Party government at the federal level decision on the Kyoto Protocol withdrawal in 2012. As a result, the Greenpeace Canada spokesman Mike Hudema argued that the Harper government "has imposed a death sentence on many of the world's most vulnerable populations by pulling out of Kyoto Protocol". Hudema further argued that "this decision was a further signal that the Harper government is more concerned about protecting polluters than communities and peoples across Canada and the world" (Kennedy 2011)

In 2010 the Climate Change Accountability Act had been defeated by the Senate after being passed by Canada's House of Commons. The Act would have committed Canada to reducing greenhouse gas (GHG) emissions to 25 per cent below the 1990 levels by 2020. Ford et al. (2010: 188) state that adaptation of climate change is needed to protect the social, cultural, economics and livelihood of society in a changing climate. This is particularly an issue for

the Canadian Inuit communities in the Arctic and their livelihood, social and cultural practices or the way of life where climate change has already taken place. In fact, it is challenging and threatening Inuit human rights and is clearly mentioned and defined as specific rights of Inuit in the Canadian Charter of Rights and Freedoms of the Canadian Constitution, 1982. While Section 25 of the Charter states that the Charter does not derogate the existing Canadian Aboriginal rights and freedoms, including treaty rights, hunting, fishing, logging, the right to land, which are applicable for the Inuit in Canada. The right to enforcement of treaties receives more direct constitutional protection under Section 35 of the Canadian Constitution Act, 1982. As a result, Ford et al. (2010) state that climate change adaptation policy and programmes can reduce current climate vulnerability, and bring future benefits, target socio-economic development along with managing the outcomes of current and future climate change in the Arctic. Lobbying by Inuit social and political actors including Inuit environmental activists, Inuit political leaders, Inuit politicians or organisations representing the Inuit in the regional, provincial or territorial and national governments in Canada, and also at the circumpolar level, particularly the Arctic Council will be helpful in fighting and demonstrating against the impacts of climate change as well as arguing for mitigation of climate change (Ford et al. 2010:188). More recently, a strong concern about environmental changes in Canada has come to the fore in the circumpolar Arctic. In fact, the issue of climate change for the past few decades has been taken up as a political issue which has brought about significant changes in the political-governmental complexion in the Arctic both at the national, international and the circumpolar level.

Conclusion

Changes in the weather patterns and climate events have been observed and studied since 1950. Most of these changes such as a decrease in cold temperatures, a decrease in the winter season, but an increase in warm temperatures, a decrease in ices cover sea and land particularly in the polar regions of the earth planet that led to an increase in extreme high sea levels in many parts of the world. At the same time, an increase in the number of heavy precipitation events in a number of regions resulting in floods, diseases, and affects on food and health in the society have been linked to human activities, forces, and influences in a number of ways.

The atmospheric concentrations of greenhouse gases (GHG), such as CO2, CH4, and N2O have increasing in the past, at least eight hundred thousand years. The CO2 concentrations in

the atmosphere have increased by about 40 per cent since the 1750s, mainly from the fossil fuel emissions of coal, oil or natural gases, and deforestation and secondarily from net land use change including agricultural activities and practices. This increase in GHG causes an enhanced greenhouse effect, which warms the planet. As a result, each of the GHG affect the Earth's atmosphere to a different degree, and continue to exist for a different length of time. The ocean on the other hand, has absorbed at least 30 per cent of the emitted anthropogenic CO2, which is causing the ocean to become acidic (IPCC 2007; Farley 2008).

By comparing a number of natural factors and human activities, that led to global warming and climate change, scientists have proved that human actions and activities are responsible for a significant part of the rising temperature on earth. While scientists do not refute that some natural forces or factors also do cause temperature fluctuations on earth, their argument is that in the current cycle of climate change, the impact caused by human actions and activities are far greater. There is no indication, however, that the two sides of the climate change debate, 'anthropogenic versus nature factors,' will reach a consensus in the near future on what policy decisions should be adopted in dealing with dangerous climate change (Herath 2011).

In addition, the temperature of the Earth predicted by climate models (CM) that take into account natural factors alone stay well below the definite temperatures measured. The CM climate measurements which include human influence on climate show a clear increase in temperature of the planet. This information accurately reflects the actual climate pattern that has been experienced. The climate models also predict more warming of the troposphere layer of the Earth's atmosphere in the tropics than has been observed by the radiosonde measurements and satellites (Bast 2010).

However, the exponents of anthropogenic theories argue that the information and data shown by the computer/climate models show a lot of discrepancy and disparity. They argue that human-made or anthropogenic GHGs, particularly CO2 is responsible for global warming, harsh weather, droughts, floods, crop failures, famines, spread of diseases, ocean coral bleaching, species extinctions, and many other devastations, disasters, and catastrophes happening around the world. All these catastrophes will occur more frequently and be more extreme as temperatures continue to rise on Earth. As a consequence, nothing less than remarkably speedy reductions in the anthropogenic emissions of the GHGs will save the

Earth from these disastrous and terrible events in the future (Bast 2010: 7; IPCC 2007 and 2013a).

Climate change is not just a theory to the Inuit in the Arctic, it is a harsh and dangerous reality. Human-induced climate change is affecting the ecosystem in the Arctic upon which the Inuit communities are depending for their livelihood and cultural survival from time immemorial (Watt-Cloutier 2007: 17). Canada recognises that climate change is a global issue and the Government of Canada is concerned about adverse climate change. As a result, Canada is engaged in climate research that seeks to achieve environmental, economic and health benefits for all Canadians (Environment Canada 2012).

Climate change in the Arctic is considered to be the most severe than any other part of the world, and the indigenous communities/peoples including the Inuit in the circumpolar region are most affected by this. The circumpolar Arctic is home to numerous indigenous peoples whose cultures and activities are shaped by the Arctic environment. As Sheila Watt-Cloutier has pointed out, the circumpolar Arctic is not just about glaciers, the frontier, nor the wilderness, but it is home for the Inuit (Inuit Circumpolar Conference and UNEP/GRID-Arendal 2004: 17; Watt-Cloutier 2007: 14).

The Inuit and other indigenous communities have intermingled and interacted with the environment over many generations through the IQ or indigenous/traditional knowledge (IK/TK). They have built up their way of life by careful observation, learning and skillful adaptations or adjustments with the climate system. They have learnt to harvest country/traditional food, and depend on the environment for their livelihood on (ACIA 2004a).

The next chapter will give an overview of the indigenous peoples and their traditional livelihood in the Arctic region. It will be focused on the Inuit traditional knowledge, particularly their observation of climate change on land, sea, wildlife behaviour and weather patterns in the Arctic region along with scientific studies and measurements. The Chapter will also discuss the negative and positive impacts of climate change and the possibilities of improving infrastructure, development of the area, introducing new industry and its implications and opportunity for the indigenous communities/peoples in the Arctic.

CHAPTER 2

CLIMATE CHANGE AND INDIGENOUS PEOPLES IN THE ARCTIC

Introduction

The United Nations Environment Programme (UNEP) describes "the environmental and climate change in the circumpolar Arctic as the world's barometer of climate change" (UNEP/GRID 2013: 4). A significant change is already occurred in the Arctic environments (ACIA 2004). According to Sheila Watt-Cloutier, "Arctic is the early warning, the health barometer for the planet. Whatever happens in the world occurs here first. To see how healthy the planet is, come here to take its pulse. Science has recently caught up with the changes, Inuit hunters – scientists in their own right – have been observing for decades" (Watt-Cloutier 2007: 14). In fact, the Inuit communities, organisations, and others partners had conducted a series of the community level workshops between 2001 and 2005 in all four regions of Inuit Nunangat in Canada: the Inuvialuit region, Nunatsiavut, Nunavik, and Nunavut. In these workshops, the Inuit clearly stated their observations of climate change in the Arctic region is real because they felt it and experienced the changes in the environment. The Arctic Climate Impact Assessment (ACIA) first report was published in 2004, and it was considered as the most wide-ranging regional assessment of climate change in the world. According to the ACIA assessment report, "climate change in the Arctic is one of the greatest changes in any part of the world... and the indigenous peoples are most affected by the change since the 1980s" (UNEP/GRID 2013: 4).

Traditionally, the indigenous peoples in the Arctic are sustained by hunting, trapping, fishing and reindeer herding with their rich and abundance of the natural resources available from air, land, rivers, and sea for thousands of years. Most of these communities in the Arctic are still sustained primarily on harvesting country/traditional food, by marine and land animals, freshwater and vegetations for their livelihoods. The majority of the indigenous peoples in Canada, Alaska and Greenland like Inuit, First Nations/peoples and Métis practices hunting and trapping wildlife and harvesting fish, and others marines animals. As such, Arctic beluga and minke whales, fin, narwhals, seals, polar bear, and walrus are some of the most significant species of marine mammals, and salmon, arctic char, arctic cod, arctic pike, whitefishes or coregonids and others fish are harvest for food as well as another sources of income in the region. Whereas caribou, moose, fox, reindeer, muskox and polar bear are

some of the substantial land mammals which are significant resources for the livelihoods of the indigenous communities in the Arctic. While the indigenous peoples like Sámi from Scandinavia region of Norway, Finland, and Sweden, or Siberia and the Far East regions in Russia mainly practices reindeer herding and reindeer husbandry. Sámi people sustain through these activities by domesticating this animals, and also through meet production, clothing, and other products from the animals, at the same time, they also practices cash economy through trade and producing indigenous crafts to local as well as global markets (Nuttall 1992).

Because of their direct contact with the close relationship with the environments, the Arctic indigenous peoples feel and experience the impacts of climate change in foremost and most deeply in advanced, compared to the rest of the world. At the same time, climate change has influenced a lot on the indigenous economies as well as global markets in multiple ways to due to the interdependence and intimate relationship between the community and environment. In fact, climate change is one of the significant factors that affecting and influencing the global economy, industries, markets, processes, public policies and technologies. Similarly, it is also a significant impact on local economy, cultural, social and political conditions as well as regional ones. It is important to note that indigenous peoples are not only challenged and threatened by the impacts of climate change but global processes as well in the Arctic. With reference to experience by the indigenous Arctic population, particularly to access country food resources, one of the substantial food security sources of the community, in fact, the resources available in the Arctic are affected progressively more by both states own and privates companies through commercial fisheries, shipping, oil and gas exploitation in the region (Nuttall 2005: 20; Gray 1995).

This chapter highlights that the Arctic is home to various groups of indigenous peoples that have a diverse set of social, cultural, economic, and historical background and the basis of the economy in the region accordingly. The Chapter is focused on the Inuit traditional knowledge for observation of climate change on their local environmental areas: land, sea, and sky. The Inuit observed many significant changes with wildlife behaviour and migrations patterns as well as weather patterns in the Arctic region. The chapter also discusses both the outcomes of negative and positive impacts of climate change where the possibilities of the industrial development, infrastructures, fossil fuels extraction and shipping in the region, and whether it is the implications and the real opportunity for the indigenous communities.

Indigenous Peoples of the Circumpolar

According to the UN Permanent Forum on Indigenous Issues (UNPFII), "there are over 370 million indigenous peoples living in the 70 countries across the world in 2006" (UNPFII 2006). While the Article 33 of the UNDRIP (United Nations Declaration on the Rights of Indigenous Peoples) stresses the significance of "self-identification that indigenous peoples themselves define their own identity as indigenous" (NCIV 2010: 2). In fact, no formal definition of indigenous peoples has been defined by any agency or body of the UNO (United Nations Organisation) (APFNHRI and OHCHR 2013). According to the report of Martinez Cobo's Study[2], "Indigenous peoples, communities, and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system" (NCIV 2010: 1; APFNHRI and OHCHR 2013: 6).

Subsequently, the word "indigenous" has become a common for expressing and describing to these peoples in the recent years across the world, especially after the 1989 Indigenous and Tribal Peoples Convention (ITPC) adopted by the International Labour Organisation (ILO) and the UN declaration of the UNDRIP in 2007 (APFNHRI and OHCHR 2013). In this regard, official or legal term for addressing to indigenous peoples is varied in different part or country in the world, for example, aboriginal or Indian is still using word in either official address or legal term in Canada, Australia, New Zealand as well as in the United States. Whereas the tribal/tribe (adivasi) in India and African countries, and first peoples/nations is one of the common name to address these peoples in the US and Canada. These communities hold a unique beliefs and dialects or languages, and also possess traditional ecological knowledge (TEK) or traditional knowledge, moral value of practices and respect for the environment and sustainable care for the natural resources. Through the collective system

[2] It's the 'Study of the Problem of Discrimination against Indigenous Populations' submitted by José Ricardo MartínezCobo, to the UN Sub-Commission on the Prevention of Discrimination and the Protection of Minorities. In 1971, Martinez Cobo of Ecuador was appointed as the UN Special Rapporteur to conduct a broad study on discrimination against indigenous populations with recommending national and international measures for eliminating such discrimination, and submitted his final report in 1984 (APFNHRI and OHCHR 2013).

their TEK, they have a deep relationship to their environment or ancestral land and use of its resources. This ancestral land has become significance for these communities in their social and cultural identities as their direct or indirect relationship with the physical environment for their survival and livelihoods. In fact, indigenous peoples embrace their own diverse concepts of civilisation and development in the world, based on the environment where they live, their traditional beliefs, needs, priorities, visions, and values. In this context, they preserve and continue to live with their cultural, social, and spiritual way of life with the nature and environment which they are quite distinctive from the prevailing modern/contemporary societies. They inhabit different parts of the world from the Latin Americas to the Arctic, South and Southeast Asia to South Pacific region and from Serbia to African, which meant, these peoples are "the descendants of those who inhabited a country or a geographical region at the time when people of different cultures or ethnic origins arrived. The new arrivals group of population later became dominant society through invasion, colonisation, settlement, occupation or other means" (UNPFII 2006: 2).

While in the context of political participation, indigenous peoples often have neglected by dominant group in the society, due to lack of political awareness, participation and representation among themselves. Moreover, social and economic discriminations are commonly faced by these groups in the country/society mainly due to their economic condition of marginalisation and poverty, limited in accessing to suitable jobs in both public and privates sectors as well as social services. In spite of these indigenous peoples social and cultural differences, a number of these peoples are experiencing the same trouble which connected to the safeguarding of their social, cultural and political rights. In this circumstance, they seek for respect and recognition of their social, cultural and political identities, as well as the rights to protect their ancestral lands, territories and environment or natural resources where they live (UNPFII 2006).

The Arctic is home to over 4 million inhabitants, and about 10 per cent or between 400,000 and 500,000 of the population are indigenous peoples, such as the Aleutians/Aleuts, Alutiit, Athapaskans, Chipewyan, Chukchi, Chuvan; Cree, Dene, Dogrib, Dolgan, Even, Evenk, First Nations (Indian), Gwich'in, Haida, Innu, Inughuit, Inuit, Iñupiat, Inuvialuit, KalaallitKhanti/Khanty, Komi, Koryak, Koyokon, Mansi, Metis, Nanai, Naskapi, Nenets, Nganasan, Nivkhi, Sámi, Sakha, Selkup, Tlingit, Tsimshian , Yakut, Yukagir, Yupiit and others communities spread over the circumpolar Arctic (UNEP/GRID 2005: 14; UNEP

2001; Arctic Info 2014). As such, the Arctic region is a vast area with about 13.4 million square kilometres of land boundary. This extensive area is home to various groups of indigenous peoples that have a diverse set of cultural, social, economy and historical background (Koivurova et al. 2008: 6). The proportion of the indigenous population in the Arctic regions are varied accordingly, for example, the Inuit population comprise about 85 per cent of the Nunavut territory in Canada while the Sámi population cover at 2.5 per cent in the northern Scandinavia and the Kola Peninsula region (UNEP/GRID 2005: 14).

The Arctic region is settled by the population of the eight Arctic countries: Canada, Greenland/Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States/Alaska. The Arctic region is sparsely populated. All of these Arctic countries have indigenous peoples except Iceland (Nordic Council 1993), in fact, Iceland has no official definition of the ethnic group or indigenous people in the country. In Russia, the indigenous peoples live in the circumpolar region, mainly in the northern and the eastern of Russia and Siberia region has about 50,000 people, with a total population of around 244,000 were identified themselves as an ethnic or indigenous community across the Russian Arctic region (Arctic-info 2014).

The Aleutians, Chukchi, Evenks, Dolgan, Inuit, Koryak, Mansi, Khanty, Nanai, Nenets, Sámi, and Selkup are some of the indigenous peoples living in the Arctic region. Most of these communities take the settlement along the coastal areas in the Arctic ocean. Kola Sámi and others Sámi group are mostly settle in the north-western parts of Russia and while Chukchi and Koryak are mainly settled in the north-eastern parts of Russia. Interestingly, these people are a certain group that they maintain well with their social and cultural identity while the demands of modern civilisation and globalisation are very high. Subsequently, indigenous peoples are largely shaken by the impacts of both globalisation and climate change. They live in underprivileged conditions of social and economic, with the demands of an efficient capital, market economy and globalisation process. While the public policy or social services on these small indigenous communities of the Arctic is considerably faced with a complex problems, for example, either to maintain or protect their traditional way of life with the small population in their traditional activities or to encourage the assimilation of small indigenous population in the system of the prevailing modern society (Arctic-info 2014).

The Sámi people of the circumpolar Arctic region, at least around 100,000 of the population are politically represented by four Sámi parliaments in Finland, Norway, Russia and Sweden. Notably, the Parliaments was set up by a council of legislative body between four Sámi representative bodies from these countries, which is known as the Sámi Parliamentary Council in 2000. The Sámi group in Norway are officially recognised as the indigenous people by the Norwegian constitutional amendment. However, about 7,000 Sámi population in Finland are considered as a mere linguistic minority rather than an indigenous people. In Russia, also only some 50,000 indigenous persons are officially recognised as the indigenous peoples against a total of 44 indigenous peoples or approximately 250,000 persons that presently reside in Russia, from a larger groups or population like the Nenets and Evenk to the smaller groups like the Enets and Orok in the country (UNPFII 2008).

The indigenous peoples groups in Canada are namely First Nations, Inuit and Métis. Approximately half of the 42,000 people living in the Northwest Territories (NWT) of Canada are identified as indigenous communities, and more than 85 per cent of the population in the Nunavut territory are the indigenous peoples mostly the Inuit. There are more than 600 First Nations inhabiting in Canada. While about 88,000 of population belong to the indigenous peoples/groups in Alaska, such as Haida, Aleuts, Athabasca, Inuit, Tsimshian and Tlingit, which comprise about 16 per cent of the total population of the state. In addition, around 17,000 of the Sámi people in Sweden is constituting about 0.2 per cent of the total population of the country in 2008 (UNPFII 2008).

Indigenous Peoples Organisations at the International Forums

When the Arctic Environmental Protection Strategy (AEPS) was established at the first ministerial conference in June 1991in Rovaneimi, Finland by the eight Arctic nations, some sections of the indigenous communities/groups of the Arctic were represented by the Indigenous Peoples Secretariat (IPS). The IPS was representing three Permanent Participants of the AEPS: i) the Inuit Circumpolar Conference/Council (ICC) of Canada, Greenland/Denmark, Russia/Chukotka and the United States/Alaska; ii) the Sámi Council of Nordic and Western Russia, and iii) the Association of Indigenous Minorities (AIM) of Siberia, the northern and the Far Eastern parts of the Russia. The AEPS was a non-binding environmental protection agreement among the eight Arctic countries for the assessment,

emergency, preparedness, response, monitoring, protection, and preservation of the circumpolar region (EPPR 2012).

The IPS was established in 1994 under the aegis of the AEPS to assist with building opportunities for the Indigenous Peoples' Organisations (IPO) in the circumpolar region to address their issues, causes, and provide them with essential information and resources. Notably, the AEPS was replaced by the Arctic Council (AC) in 1996, and the six IPO, such as the Inuit Circumpolar Council (ICC), the Gwich'in Council International (GCI), the Aleut International Association (AIA), the Sámi Council (SC) the Arctic Athabaskan Council (AAC), and the Russian Association of Indigenous Peoples of the North (RAIPON) have given Permanent Participants (PP) position in the Council. While both the IPS and PP have reinserted into the Council, intergovernmental framework. The primary role of the IPS is to help contributions from the PP to the cooperation of the eight Arctic nations and to help the PP in functioning, primarily communicational and information work (Arctic Council 2015d).

The primary works of the IPS include: a) ensuring that PP are assigned documents and information related to the activity and function of the AC and its working groups; b) helping PP to address their outlooks and issues to the Council and its working groups; c) collecting and corresponding significance information about the AC and its outcomes to the indigenous peoples in the different parts of the circumpolar region, and d) giving supervision for the IPO to meet with each other, and to take part in the AC working groups. While the IPS does not articulate for the PP of the Council, it makes good conveniences and environments for the IPO to talk for themselves and helps them with essential and substantial information and resources to address their causes and problems in the region (IPS 2015).

The six Arctic Council Permanent Participants (PP) of the Indigenous peoples' organisations (IPO) have full discussion and consultation rights in relation to the Arctic Council decisions and negotiations. While the PP represents a substantial characteristic of the Council, and they build useful contributions to its group activities in their respective fields. At the same time, the PP of the Council is equally open to the Arctic IPO with a common of the indigenous district representing areas: a) at least a single indigenous community inhabitant in more than one Arctic country; b) more than one Arctic indigenous community inhabitant in a single Arctic country (Arctic Council 2015d).

Aleut International Association (AIA): The AIA is Alaska indigenous peoples non-profit organisation that came into existence in 1998 in Alaska, United States. The Association was established by the Aleutian Association under the 1971Alaska Native Settlement Claims Act, and the Association is ruled by a Board of Directors consist of four Aleuts each from Alaska and Russia under the headship of a president (Arctic Council 2015).

The key objective of the Association is to deal with cultural, social and environmental concerns of the comprehensive Aleut people whose livelihoods and protections have been attached to the abundant natural resources of the Bering Sea for the thousands of years. Although the American and Russian Aleuts are divided by the borders and geographical remoteness, but they are unified by the North Pacific and the great Bering Sea. In addition, the Aleut peoples share the resources of the region as well as the environmental problems in the region. The impacts of climate change, trans-boundary contaminants transport in the Arctic, and the consequences of industrial activities, commercial shipping and fisheries in the Arctic ocean, particularly the Bering Sea area are some of the key factors that drive in collaborating in the effort of both the indigenous communities and international forum where AIA is dynamically following partnership with the Arctic Council, inter-governments, scientists, and others organisations in building, development programmes and course of actions that could develop the welfare of the Aleut people and their surroundings or ecosystems in the region. Notably, the AIA was granted as a PP of the Arctic Council in 1998 and also promoted to the Special Consultative Status in 2004 by the United Nations Economic and Social Council (ECOSOC). Subsequently, AIA is a recognised Non-Governmental Organisation (NGO) with the Global Environment Facility (GEF) and the UNFCCC at the international level (Arctic Council 2015).

Arctic Athabaskan Council (AAC): The AAC is an international settlement organisation founded in 2000 to secure the rights and promote the welfare of the Canadian and American Athabaskan people or First Nations administrations in the AC and others global forums. The AAC is an official PP of the AC, and it seeks to promote a better comprehension of the common heritage of Athabaskan people in Canada and the United States. The AAC is represented by at least 32,000 of Athabaskan when it was established in 2000. About 12,000 of the Athabaskan population live in Alaska, compared to almost 10,000 of the Yukon Territory, and approximately 20,000 in the Northwest Territories and northern British Columbia in Canada. The present AAC members constitute at least 15 traditional villages in

Alaska. While the Kaska Tribal Council and the Council of Yukon First Nations, First Nations in northern British Columbia and Dene Nation in the Northwest Territories of Canada spread across 76 communities that represent around 45,000 peoples in the Arctic region. In essence, these people are a comparatively young and growing population, compared to non-indigenous people in the Arctic (Arctic Council 2015a).

In addition, the forms of cultural and political organisation vary, they are depending on the place of habitation of a particular Athabaskan people in the Arctic region. They have organised themselves in agreement with the federal and Alaska governments by providing financial support for the Council operations, through the Indian Reorganisation Act for Athabaskan self-governments, Alaska Native Claims Settlement Act for integrated villages, and others traditional and political entities in Alaska. These Athabaskan have also organised themselves into political bodies in Canada under the federal legislation, including Indian/First Nations bands formed under the Indian Act, while the autonomous body of First Nations as legitimised all the way through confer with the Settlement Agreements, and First Nations comprehensive organisations in Canada (Arctic Council 2015a).

Gwich'in Council International (GCI): The GCI represents about 9,000 Gwich'in people in Canada and the United States. GCI is a non-profit organisation set up by the Gwich'in Tribal Council in Inuvik, Northwest Territories in 1999 to safeguard the Gwich'in communities in Alaska and the north-western parts of Canada. It is also represented as the Permanent Participants of the AC, and take part a significant role in the AC working groups. In essence, it has some priorities concerns connected to climate change, culture, economic, education, social, tradition, and youth development among the Gwich'in communities in the region (Arctic Council 2015b).

Inuit Circumpolar Council (ICC): ICC represents about 160,000 Inuit peoples in the four countries of the circumpolar Arctic: Alaska of the United States, Canada, Chukotka of Russian Federation and Greenland of Denmark. The ICC was set up in 1977 in Barrow, Alaska, to thrive and develop into the most important international indigenous people's organisation. ICC has the priorities areas to value that they have to raise with a cohesive voice on the Inuit social and economic needs to attain sustainable development with respect to the Arctic region. The focus areas include safeguarding of their culture, environments and upholding their social and traditional activities in the all four circumpolar nations. The key

objectives the Council are followed as: i) to enhance unity among Inuit communities in all four Arctic countries; ii) to promote Inuit social, cultural, human and political rights, at the same time, give voice their interests at the international forums and communities; iii) to build up and maintain their long-lasting policies and actions plans that protect and preserve the Arctic ecosystems, particularly to address climate change; and iv) to get permanent and active cooperation in the social, political, environment, and economic development or sustainable development of the communities living across the Arctic regions (Arctic Council 2015c).

In addition, the ICC holds the Special Consultative Status (SCS) at the ECOSOC of the UN since 1983. Notably, ICC is very much committed to the UN agencies/bodies for the safeguarding and development of the indigenous peoples around the world. The ICC consults often with the United Nations on comprehensive issues, especially regarding the environmental and sustainable development in the Arctic regions. The ICC also consults with the UN on various issues concerning indigenous peoples and human rights. It was actively involved in the AEPS and it working groups that later on became the Arctic Council in 1996. ICC is one of the first PP to the Arctic Council structure with strong commitment and focusing the tasks of the Arctic Council, and it has also been actively participated in the Council working groups, and its projects and task forces in the regions. Besides, ICC participates regularly in Arctic Ministerial and Senior Arctic Officials meetings, and it considers the Arctic Council as the leading international forum coping with Arctic issues and policy in the present day (Arctic Council 2015c).

Russian Association of Indigenous Peoples of the North (RAIPON): RAIPON represents at least 41 communities or around 270, 000 of indigenous peoples from Siberia, the northern and the eastern parts of Russian Federation. Although their population is small in number when it compared to the others non-indigenous population in Russia, they are spreading almost 60 per cent of the entire country of Russia from Kamchatka to Murmansk. It was established at the first congregation of the Congress of Indigenous Peoples of the North of Russian Federation in 1990. RAIPON is the indigenous people's umbrella organisation which includes approximately 35 ethnic and regional organisations of the communities in the Russian Federation regions (Arctic Council 2015e).

The main objectives of RAIPON are to safeguard indigenous peoples' rights, protect their human rights, and support their interests in tackling environmental and climate change. In

addition, it aims is to uphold their right to self-governance or self-determination in their social, cultural, economic, educational matters in the regions. At the same time, it has been worked with the Government of Russian Federation and the State Duma relating to legislation of the communities in the country. The head of the governing body of RAIPON is the Congress of all indigenous communities in Siberia, the northern and the Far eastern part of the Russia, whereas the term of the Congress is four years. Notably, Mr. Grigoriy Ledkov is the current (2013-2017) President of RAIPON, at the same time, he is also a deputy of the State Duma of the Russian Federation, who has been elected to the post in March 2013. In addition, Mr. Ledkov is the president of the Duma Working Group for Nationality Issues (DWGNI) who played a significant role in drafting the protection of indigenous peoples' rights to be discussed at the Russian federal legislation. Besides, he is also current chair of the Permanent Delegation of the State Duma (PDSD) to the Nordic Council, a regional inter-parliamentary assembly for collaboration between the Nordic countries: Denmark/Greenland, Finland, Iceland, and Norway (Arctic Council 2015e).

In essence, the RAIPON participates in several international forums such as: i) one of the PP members of the Arctic Council, an intergovernmental organisation of the circumpolar region, ii) holding with the Special Consultative Status (SCS) at the ECOSOC of the UN, iii) holding with the Global Ministerial Environment Forum (GMEF) of the UNEP as an observer, iv) a member of the UNPFII, v) holding with the Expert Mechanism of the UN on indigenous peoples' rights, and vi) the Working Group of the UN on the issue of human rights and transnational corporations including other business enterprises. At the same time, it also represents to the Public Chamber of the Russian Federation as a member of RAIPON's presidium in the federal legislation (Arctic Council 2015e).

Sámi Council (SC): It is a non-profit organisation of the Sámi communities of four countries of the circumpolar region: Finland, Norway, Russia, and Sweden. SC is only some among the oldest indigenous peoples' organisations that working on their social, cultural, economic, political issues and interests in the circumpolar world since its inception in 1956. The Council is led by a president, who is elected for two years term at a time. SC get financial supports and grants from these four countries. The SC participates in international forum and processes at the Arctic Council as a Permanent Participant on the issues such as indigenous peoples, cultural, economic, social, political, human rights, and climate change and environmental issues in the regions (Arctic Council 2015f).

The primary goals of the SC are followed as: i) to promote the Sámi rights and interests in the all four regions of the circumpolar, ii) to unite the spirit of relationship among the Sámi people from all four regions as one family, iii) to reach recognition for the Sámi as a distinctive nation in the legislation of the four countries in Finland, Norway, Sweden, and Russia, and iv) to sustain their unique social and cultural practices and uphold their economic, language and political rights of the Sámi in these four regions through comprehensive dialogue solutions between these all four countries and the Sámi Council and the Sámi parliaments (Arctic Council 2015f).

These indigenous people's organisations have varied broadly in their organisational capacities and the size of the population they represent in the international forums like the Arctic Council and others UN agencies/bodies. The indigenous peoples' participation in Arctic environmental politics had been firmly recognised since 1989. Notably, the Inuit Circumpolar Council (ICC) was ardent to support the design of the Arctic Council, believing that it would enhance awareness of the Arctic environmental issues and needs of indigenous communities in the region. The ICC was hoping that the Arctic Council (AC) would have more focused and paid its full interest on indigenous peoples issues and sustainable development in the region, however, it was disappointed that IPO were granted only the status of PP to the Arctic Council. Although the AC has represented six IPO to champion the indigenous peoples issues, promote their knowledge, provide better contribution in the information, development process, and benefits of resource development but it does not take account of the indigenous communities' perspective on sustainable development in the region (Watt-Coultier et al. 1996; Watt-Coultier 2007).

At the same time, AC has made it clear that it is a forum for states interests, not for the indigenous people's wellbeing or indigenous peoples organisations' needs. In fact, it is "only the state, standing at the intersection of domestic and international politics has sufficient authority, political legitimacy, and territorial control to influence the myriad causal agents of environmental deterioration" (Litfin's 1993: 95). As a result of the environmental problems in the Arctic, it could likely lead to strengthening the authority and legitimacy of the state in new ways. The problems could outcome from weaknesses in the organisational basis of the Arctic Council and over the issues of funding, participation, and the scope of its activities. In fact, admission to the Arctic Council is not based on the political rights of indigenous peoples

and the AC policy is careful to show that permanent participant status does not mean the individual Arctic states are recognising the UNDRIP, the rights of indigenous peoples accorded under international law. Notably, all Arctic Council meetings from 1996 to 2008 ignored the name of indigenous peoples' organisations or representatives of the six Permanent Participant organisations in the Council forum to address their demands including environmental, climate change, cultural, social, economic, human rights and political issues, and also sustainable development among the indigenous communities in the region (AGP 2010).

Traditional Economy and Livelihoods

The major types of traditional economic activities of indigenous peoples in the circumpolar are hunting, fishing, reindeer herding, gathering wild plants and traditional industries. Although they might be practicing different types traditional based economic activities or livelihoods, they all share one universal feature, that is, their total dependency on the ecosystems or environment to sustain their livelihoods and preferred community wellbeing. The indigenous people have significant close relations with the air, ice, land, water, and sea for their traditional livelihoods from time immemorial. In Arctic, wildlife resources like caribou, moose, reindeer, polar bear, arctic cod, arctic char, fish, seal, whale, and others sea mammals play a fundamental role for the Arctic indigenous peoples food and economic life. Subsequently, this subsection discusses three focus areas, such as: i) wildlife hunting or harvesting of country/traditional food meat, ii) reindeer herding and husbandry, and iii) harvesting of fish.

It becomes important to note that, for the Inuit, the food items that collected or harvested from the land, air, sea and rivers are called 'country food', whereas, First Nations/Peoples and others indigenous peoples including the Métis preferred to call it as 'traditional food'. While the majority of the Inuit peoples in Canada and other indigenous peoples across the circumpolar regions live in coastal areas that are particularly significant to these peoples for both fishing and hunting. In fact, caribou, moose and reindeer regularly move and pass through to the coastal areas to their calving grounds and they are available throughout the summer season. Many species including goose, polar bears, shore birds, walrus, seal breed on land, and these animals and birds are available all the time in the sea and coastal areas and some of their lives spend in the drift ice as they find their foods in these regions (ACIA 2004 and 2005).

The contemporary indigenous peoples/communities in the Arctic practices mixed economies. As such, more than half of the indigenous households earnings come from either wage full or part time employment, crafts, fish and meats or others goods productions, and social services or government transfer payments (Wenzel 1991 and 2001; Caulfield 2000; Weinstein 1996; Langdon 1986). These households economic units lay within settlements areas, small towns and villages, which are typified by a mix of formal and informal economies. For example, for formal economies: such as fishing or harvesting of fish, hunting and trapping wildlife and animals for commercial purposes, or activities of forestry, tourism, oil and gas or others mineral extraction; and informal economies: for example, collecting renewable resources from the sky, land, river and sea through hunting, fishing, gathering, herding, and trapping activities, which are generally meant for fulfilling the essential needs of the social, cultural, food and nutritional needs as well as the economic requirements of individuals, families, households, and communities in the society (ACIA 2005: 656).

At the same time, the ability to perform hunting wildlife and fishing activities in the Arctic region is not just possible by the abundant or availability of wildlife or flora and fauna, but it also depend on the possession of money, as the equipment for the contemporary harvesting activities in Arctic regions are really expensive. Most of indigenous communities in northern Canada and Greenland hunt seal, and fishing is commonly practiced in Alaska, northern Canada and Norway, whereas reindeer herding is generally practiced in Scandinavia and Siberia region. In fact, they are progressively more characterised by pluriactivity in which money income is earning through part time or full time employment, seasonal labour, commercial fishing and hunting, crafts production, and taking part in the tourism industry (ACIA 2005: 656).

While the indigenous peoples living in isolated and remote in the Arctic region still need to maintain a strong connection to the environment as they have very limited sources for their livelihoods apart from fishing, hunting, trapping, herding animals, gathering wild fruit and plants, roots, and others renewable resources. These practices have provided the foundation for traditional/country food, meat and fish production. They have the skill to harvest and utilise these resources of flora and fauna, at the same time, these practices are affected by seasonal variation, climate conditions and climate change. Subsequently, climatic variability and weather events have frequently greatly affected the availability and abundance of animals

and fish in the region. Some of the species in the Arctic region are only available seasonally and confined to the small areas (ACIA 2005).

Indigenous people hunt animals and harvest fish for food, clothing, trade and for other purposes. In addition, they have the capacity and flexibility to harvest a variety of animal, birds, fish and plant species in the circumpolar region. In many cases, the indigenous peoples in the Arctic have also shown considerable resilience in the face of severe cultural, social, and economic challenges in the past. While the reindeer animals are very importance for economy and livelihoods of the Scandinavian indigenous communities by herding these animals from the early period of the 900s A.D. In fact, reindeer is strengthening the culture and economy of the indigenous communities living in Fenno-Scandinavia and Siberia regions (ACIA 2005).

Wildlife Hunting: A number of terrestrial species, such as caribou, moose, muskox, and reindeer are extremely significant in local economies in the Arctic region. The caribous are commonly found in Alaska, Canada and Greenland. The hunted animals are utilised in many ways, some for food and others parts for producing clothing, traditional tools and market products. Caribou population in the Arctic are scattering in different parts, but the hunters are also familiar to these animals movement patterns of their seasonal abundance and migratory routes. While moose are commonly found and widespread in the subarctic boreal forest, however, their range is mounting into more northerly Arctic environments. Interesting, muskox, grizzly bear and polar bear, arctic fox, muskrat, ground squirrel and wolf are the common terrestrial animals that valuable importance for the traditional economic to the Arctic indigenous communities. In addition, the Arctic indigenous communities have collected eggs of birds, and they also hunted birds like auks, common eider, kittiwakes, Brunnich's guillemot, king eider, and other sea birds along the coastal areas (ACIA 2005: 653).

At the same time, the rich natural available Arctic resources not only sustain the indigenous people in terms of their nutritional and economic needs, but these resources also provide a substantial basis for their cultural and social practices, identity, spiritual life, and wellbeing of the community. This economy that rely on animals for food and economic, and community well-being can be seen in their practice of hunting, fishing and herding reindeer as traditions, and in regard to food sharing culture and gift giving based on community kinship bind and

other social structure of close relationship in the society. In this type of society, the sharing culture in family and community through hunting, fishing, gathering and herding activities contributes to establishing and defining a sense of social affinity and it is significant for society and cultural identity, as well as for contributing a moral foundation for relationships between community and family/individual or between people and animals as well as environments (Nuttall 1992; ACIA 2005: 654).

Moreover, the sharing and distribution of harvested/hunted meat is fundamental to daily social life and expresses and upholds social relationships among the indigenous community and their social order across the Arctic (Nuttall 1992). Country/traditional food harvesting and its related processing and sharing activities reiterate fundamental values and attitudes towards the ecosystem/environment and animals and provide a moral establishment for continuity between generations in the society (Wenzel 1991; Callaway et al. 1999). Seal hunting very common among the Inuit communities in Canada and Greenland. Notably, there is hardly ever much wasted of harvested animals and fish among the indigenous communities, for example, the fat, meat, and the skin of the seal animals are utilised according to their needs and appropriate uses. While a traditional system and complex communities rules establish the distribution and sharing of the harvested food, such as meat and fish are normally distributed by the hunters to persons beyond the individuals or family, whether those family and individuals are related to their kin or not in the society (Nuttall 1992; Petersen 2003). As a result, hunting or fishing and sharing culture can only be understood with relation to the sense of social connection and relationship that community/persons consider they have the close relationship with each other, relationship with flora and fauna and relationship with the ecosystem or environment (Caulfield 1997; Pars et al. 2001).

Reindeer Herding and Husbandry: While the reindeer husbandry is mainly practiced in 9 countries across the circumpolar Arctic regions: Finland, Norway, Sweden, Russia, Alaska, Canada, Greenland, China, and Mongolia by more than 20 different ethnic groups or indigenous peoples. While a small herd is also sustained in Scotland. Reindeer herders have been practiced and managed vast areas in the Arctic over thousands of years. These vast areas have only recently become important for other industrial interests like oil and natural gas. The reindeer has a number of sub-species of which one of them is Caribou. Reindeer are also categorised into mountain reindeer and forest reindeer. In fact, there are at least 7 different

subspecies of rangifertarandus and most of them called reindeer and some caribou: i) Rangiferta randustarandus, which are commonly known as Eurasian tundra reindeer, ii) Svalbard reindeer, iii) Eurasian forest reindeer, iv) Alaskan caribou, v) Woodland caribou, vi) Barren-ground caribou, and vii) Peary caribou. The mountain reindeer migrate between winter and summer pastures whereas forest reindeer forage in the woodlands throughout the year. Notably, reindeer are the only semi-domesticated animal that naturally belongs to the north circumpolar. There are about 30 reindeer herding communities in the world and approximately 3 to 4 million semi-domesticated reindeer across the circumpolar north. The close connection between humans and animals is possibly best in material form by this relationship as reindeer husbandry represents the almost social, cultural and economic relationship of the indigenous peoples wherever it is found in the region (ICR/WRH 2015c).

The relationship between the indigenous peoples and reindeer animals had started in the present Norway region for the past thousands of years. Initially, the Sámi people had started by hunting them, then gradually developed the uses of these reindeer animals through domestication and herding in the 800s (ICR/WRH 2015a). Notably, between 16th and 18th centuries, Sweden had imperial aspirations and this developed the tax burden on Sámi reindeer herding, which would show to have encouraged a shift in reindeer herding practices in the region. Sámi reindeer herders were nomadic and moved with their reindeer herds between summer and winter for good pastures. In the mountain areas of the Arctic took shape a serious reindeer herding on the daily basis. In this context, the Sámi people whose livelihoods sustained on reindeer herding and worked are called “siiddat” or reindeer herding groups, where reindeer used for milk, transport and meat production. The Siida is an ancient and unique Sámi community system within a certain area but it can also be delineated as a working partnership where the fellows had individual rights to resources through helping each other and one another with the operation of the herds, or at what time hunting and fishing as well. While the Siida could comprise of many families and their herds accordingly (ICR/WRH 2015a).

Subsequently, the first World Reindeer Herders’ Congress (WRHC) took place in 1997 in Nadym of the Yamal-Nenets region in Russia. The meeting was hosted and funded by the Government of Russian Federation jointly with the regional authorities. Participants of the meeting include the representatives from the reindeer husbandry in Finland, Greenland, Sweden, Norway, and Russia. The meeting resulted in the creation of the Association of

World Reindeer Herders (WRH) in the same year. The aim of the WRH is to promote professional, economic, cultural, and social relations between world reindeer herding communities, as well as to share information regarding the reindeer husbandry. At the same time, the formation of the WRH has led the reindeer herding communities to bring reindeer husbandry on the international agenda. Notably, Mr. Knut Vollebæk, the Norwegian Minister of Foreign Affairs, took the initiative to include reindeer husbandry on the programme of the international cooperation at the Arctic Council in 1999, because of that WRH was admitted to the status as the observer in Arctic Council in 2000. Moreover, the International Centre for Reindeer Husbandry (ICR) was founded in 2005 by the Government of Norway in Kautokeino, Norway, as a participation to the special international partnership of the circumpolar Arctic reindeer herding peoples. ICR is an autonomous specialised division with having a separate budget and managing board. ICR get its financial support from the Government of Norway by yearly budget and others financial funding from the Ministry of Reform and Government Administration. The formation of the ICR in Kautokeino is one of Norway's contributions to building up cooperation and partnership in the north circumpolar countries and the Arctic Council (ICR/WRH 2015).

The economic conditions among the reindeer herding communities in Norway are significantly varied, and they have to adapt to a broad variety of changes in the local, national and regional economy. A Siida unit could have at least one or more entrepreneurs in the region, and the income of individual reindeer herding includes the production of meat and others resources such as bones, horns, and skins. Additional sources of reindeer herders income are financial subsidies and compensation. There are some differences between the six regions in Norway but also variations between individual reindeer herders for how much meat production determines of their total revenue, at the same time, the members of the reindeer herders require revenue to survive. In Norway, reindeer husbandry is treated as a for-profit business in terms of taxation, and also for a member of the reindeer herding is considered as a private company. In fact, all income should be taxed for the meat production and herding business unless the income that is come under tax-free, and also the expenses of acquiring revenue is tax-deductible. Meat production in this business has counted more than 50 per cent of the income to reindeer herders in all the regions except Nordland and Troms in Norway. the majority of the reindeer herding families have various incomes sources from the reindeer husbandry, such as food processing, the sale of services or work salary, meat and food industries and additional industries (where the bones, horns, and skins products). The

economic support for the years 2008/2009, they received the amount up to 97 million NOK (approximately 10.1 million Euro) from the Government of Norway for the management and services. The financial support agreement with the government for reindeer husbandry or reindeer herding includes activity supports, district support, special transition assistances, early slaughter supplements and calf slaughter payments, reindeer resources production bonuses, and other payments (ICR/WRH 2015a).

While the practice of reindeer herding and husbandry at the family or individual level in Finland is not considered as a profit business in terms of taxation. Rather, the reindeer herding constituency serves as a cooperative company for the reindeer herders and owners. The constituency gives the information regarding all incomes and costs of the husbandry within the constituency. This is the contrast to Norway and Sweden, where the individual reindeer herders and owners are treated as for-profit businesses in terms of taxation and for the herders in those countries have normally filled tax form as a private entrepreneur. In Finland, there is a state financial support to reindeer husbandry for its management as well as to reindeer owners for subsistence of the reindeer business. If a member of reindeer owner wants to apply for such financial support for the operation of his or hers reindeer husbandry business, he or she should have at least 80 reindeer for minimum and 500 reindeer at a maximum in the Sámi reindeer herding district, and 300 for other districts in the region. The majority of the reindeer owners practice reindeer husbandry as an additional income to agriculture and forestry productions, and reindeer herding/husbandry is one of the most important economic sources and livelihoods for Sámi people in Finland (ICR/WRH 2015b).

In 2000, the annual total revenue from the reindeer husbandry was estimated to be approximately 60 million Euro in Finland. While the major product of reindeer husbandry in Finland is meat. Notably, about 93 000 reindeer were slaughtered and producing approximately 2.1 million kilos of meat in the years 1999 and 2000. A member of reindeer owner can regularly sell live reindeer to a slaughtering house by paying for the slaughtering of the animal and for the waste produced by the slaughtering practice and processing of meat. Apart from meat production, reindeer are also the important resource for both winter and summer tourism, as they are one of the major attractions for foreign tourists in Finland. In the past seven years from 1994 to 2000, about 60 per cent to 80 per cent of the reindeer husbandries incomes were from meat production, around 10 per cent from compensation, and about 10 per cent from aid funds (ICR/WRH 2015b).

Harvesting of Fish: Marine fish are another central sources of country/traditional food and foundation of economic life for most of the indigenous peoples in the circumpolar region. Interestingly, harvested fish like arctic char and arctic cod is not just used for household eating but also used for commercial purposes in the circumpolar region like Greenland. Although its numbers at present are decreased, it remains a fundamental part of the indigenous peoples economy in Norway, Greenland, Iceland, and Canada. In the Bering Sea, a big fishery industry for Alaska pollock or walleye pollock is carried out mostly by commercial companies and industries from other parts of the world, but indigenous peoples are increasingly involving in this fishing industry. A number of flatfish species such as flounder, halibut and Greenland halibut are vital for food and money for the local communities. In Greenland, the Pandalus borealis or shrimp and others northern prawn are the chief sources of export income, in fact, Greenland is the world's biggest supplier of shrimp, whereas the economy of the indigenous communities along the west coast areas are progressively more based on fishing industry for local marine stocks, particularly Greenland halibut, arctic char and arctic cod in the region. In addition, Capelin or Mallotusvillosus and the spawns in huge figures on rocky beaches areas, which is a significant shorelines fish, richly abundant in Greenland and Canada coastal areas, and use for both the communities food and their sledge dog food (ACIA 2005: 652). The total harvest in the Northwest Territories of Canada in 1989 was calculated to be around 232 kilogram or 5000 tonnes per person per year, without commercial fish catches and process ones. However, there is a modest information regarding the harvesting activities of the Métis and Dene communities in Canada, apart from for fur-bearing species trade and commercial fish stocks (AMAP 1998).

The Arctic water bodies are known for the world's top fish abundant and stocks that sustain sea food, commercial fishing and related industries. The huge available, abundant and stocks of the Pacific salmon fish along the coastal or shorelines of Alaska and Canada are well-known for salmon producers in fast-flowing rivers. Salmon is one of the enormously valuable species of fish in the circumpolar regions of the North America and Russia. Another famous and abundant fish of the Arctic species is Atlantic cod. Notably, the world's last and the largest cod fish stocks and availability are currently found in the Barents Sea, because they live in an ecosystem where they are totally reliant on the accessibility and availability of capelin and herring for their food (ACIA 2005; WWF 2008d).

While the Alaska pollock or walleye pollock is another species of white fish or marine fish species belonging to the largest fish stocks between Alaska and Russia in the Bering Sea. All the fish stocks and resources mentioned above are the target for what they are regularly demanding in industrial fishing operations and fisheries in the Arctic countries. Other common species that are fished in the Arctic regions include arctic char, coley, halibut, redfish, haddock, Pacific cod, king crab, and snow crab. At the same time, the temperature in the region is one of the most significant factors determining the extent of large fish accessibility and stocks, birds, both land and mammal animals and plants as their access to food. Most of these species and stocks only flourish under specific temperature conditions in the region. The patterns of the species migrations and substantial changes in the fish stock sizes are often directly linked to changes in sea temperatures (WWF 2008d: 2; ACIA 2005).

Similarly, the practices of hunting, fishing, herding animals and gathering plants mainly depend on climate, season and weather. The Arctic experiences adverse climate change, and this change has not only affected local indigenous peoples and but also ecosystems including fauna and flora. The permafrost is melting and glaciers are receding, and sea ice is disappearing in the Arctic (ACIA 2005; GreenFacts 2013). Subsequently, indigenous peoples have been settled in these rich resource sites for many years. Notably, over 80 per cent of the settlements areas in the Arctic are situated along the coastal and seashores areas. These seashores areas are also significance for fishing as well as tourism industries, and so forth. However, they are being challenged and endangered by increasing threats from climate change, for example, changes in precipitation and weather patterns, thawing permafrost and sea ice. The latter constitutes a significant risk factor for the hunters in the unstable and melting ices in the Arctic. Subsequently, another most important risk is the possible loss of game species and the consequent loss of specific indigenous peoples way of life and livelihoods sources connected with the use of natural resources, in particular, along the coastal lines and seashores. In addition, potential impacts on indigenous communities are increased in competition for commercial activities in terms of economy, social and cultural practices, at the same time, rising prevalent of pollutions and toxins into major food sources in the Arctic region. Besides, the "prevalent of anti-social elements, such as alcohol, drugs and diseases through the social changes that come along with industrialisation and globalisation" also affects the indigenous youth population in the regions significantly (UNEP/GRID 2005: 4).

In addition, climate change and on-going exploitation of rich oil, natural gas and other natural resources by the eighth Arctic countries could negatively affect the harvesting of food by the indigenous Arctic people. In Arctic, climate change has already affected both the terrestrial as well as marine animal population in many ways, such as in the size of the population, reproduction and migration patterns (ACIA 2005; IPCC 2001). As a result, climate change has impacted the traditional economic and livelihood of the indigenous people of the Arctic in both negative and positive ways.

Observations on Climate Change

Climate change is a process in which the condition of the climate undergoes alteration and can be known by changes in the mean or the variables of its elements and properties, that continues for an extended period, normally decades or longer (IPCC 2001 and 2007). According to the IPCC Third Assessment Report (TAR) 2001, "progress in understanding how climate is changing in space and time has been gained through improvements and extensions of numerous datasets and data analyses, broader geographical coverage, the better understanding of uncertainties and a wider variety of measurements" (IPCC 2007: 5). This section of the chapter discusses the observations on climate change: what are the changes that have taken place in the Arctic and have been observed so far? The data and information of the observations on the Arctic climate are from the *Sila Alangotok*: Inuit Observations on Climate Change 2001, the Unikkaaqatigiit: Putting the Human Face on Climate Change 2005 and others Inuit workshops and research reports (through the indigenous ecological knowledge/traditional knowledge) and modern scientific ones, such as the satellites, sensors, the Arctic Climate Impact Assessment (AICA) 2004 and 2005 and the series of the IPCC assessment reports.

It is important to note that the discussion of this section focuses more on the indigenous/traditional ecological knowledge (TEK) than the scientific knowledge-based observation on climate change in the Arctic, particularly the Inuit observation of climate change in their local environment in all four regions of Inuit Nunangat in Canadian Arctic.

The primary centre to observe the outcome of anthropogenic climate change, from rising land surface and ocean temperatures to lessening sea ice cover, is today the Arctic. These changes are being experienced and observed by traditional practices and knowledge of indigenous people/communities, which depend on the land and sea ice for hunting and

movement/travelling. The knowledge systems of the indigenous people are different around the world and vary according to the geographical area and biophysical environment. But there are reliable patterns in the way the knowledge is obtained and in the nature of the substance of the knowledge systems. It is important to note that, Indigenous knowledge systems are completely different from western or modern knowledge systems based on empirical science. In fact, "indigenous knowledge is relatively local in its factual information, whereas science generally must conduct and observe new studies to obtain the same information that is already present in indigenous knowledge systems. Science by and large has a short-term base of information which it can use, while indigenous knowledge can describe on a very long-term basis. Therefore, there is a great advantage and importance to using the two knowledge systems together when its study on climate change" (Emery 2000: 1).

Indigenous knowledge/traditional ecological knowledge (TEK): It is defined as "the knowledge base that obtained by indigenous peoples and local people over several hundreds of years through direct contact with the physical environment. It encompasses a close and comprehensive knowledge of animals, plants, and natural phenomena, the development and use of appropriate technologies for fishing, hunting, trapping, forestry, agriculture, or a holistic view of knowledge, and worldview that parallels the scientific approaches of ecology" (Inglis 1993: vi). Indigenous knowledge utilizes the wisdom, advice and information that has been pass down from generation to generation and that had evolved over centuries of living as a part of the natural environment. It is a valuable fountainhead of information on environment that enables communities to understand their own capabilities, and apply these knowledge and practices to help and protect their way of life and livelihoods (Minerals Management Service Alaska 2003).

In recent years, scientists studying climate change are looking for the multi-generational Inuit who have intimate knowledge of their ecology or environment. According to Igor Krupnik (cultural anthropologist and curator of the Arctic ethnology collections at the National Museum of Natural History, the Smithsonian Institution in Washington, DC, USA), the Inuit can help improve scientists' understanding of the occurrence climate change with their traditional knowledge. The difference between the scientists and Inuit is that have lived in the Arctic environment for thousands of years, thereby developing multi-generational knowledge, traditional ecological knowledge of the classification, language, and nomenclature that they learn from many generations through parents, grandparents and

community elders. On the other hand, the scientists, who study it at a distance, depend upon what they could watch and study in the environment by their own scientific device and appliances. In fact, Inuit people were around the Arctic environment for millennia, and the scientists have began looking into this indigenous knowledge of climate change in the past few decades (Loury 2012). In this context, Krupnik further stated that:

> We know so little and we want so much from these people, from their knowledge. We want it immediately, we want it for our specific goals, we want it for our models, for our predictions, and this is not the way you address other people's knowledge. It's not a common commodity; it's other people's culture. We don't have either a monopoly of knowledge or the best knowledge. So we believe the more we increase this multicultural, multi-knowledge perspective on what's happening with us and the planet, the better it will be for us (Loury 2012).

In fact, there are limitations in climate change data, both in seasonal and historical base information. In order to be able to completely understand the impact of climate change on the Inuit communities, one should avoid solely focusing on scientific data and incorporate traditional Inuit knowledge as well (Riedlinger 1999: 430).

At the same time, the Inuit people who depended on information concerning climate factors with regard to history of climate through the oral transmission of traditional knowledge have had oral account history of the environments and climate-related information over many generations. On the other hand, scientists often work with short-term research results (generally lasting just two to three years); ignoring many of the oral documents of climate factors because they see them as information acquired without a systematic process that is not consistent, reliable or valid. Thus, in the view of the scientists, traditional knowledge and unwritten histories were not scientific. However, in the past three decades, Inuit people and the scientists have cooperated in documenting the systematic process transferring knowledge orally in Inuit communities. Although there might be differences in the level of understanding of the Arctic climate system between the Inuit knowledge and the scientific community, the long-term records of climate factors gathered through observations are valuable sources of information that would guide to a better understanding of climate system and climate change (Sutherland 2003: 1).

In recent years, the indigenous peoples have reported that they have begun to experience the effects of climate change in several parts of the circumpolar Arctic. The Inuit hunters in

Nunavut Territory of Canada have reported the diminishing of sea ice and the appearance of new birds that are not generally found in their region. While Inupiat hunters in Alaska observed that ice cellars in the region have become too warm to store food frozen. At the same time, the Inuit in the Inuvialuit region in the western Canadian Arctic witnessed lightning and thunderstorms, which is a rare happening in the region in the past. In essence, First Nations people like the Athapaskan and Gwich'in in Alaska have experienced and witnessed remarkable change in weather, animal migrations patterns, and vegetation during the past 60 years in the region. Many Alaskan indigenous peoples have already observed and witnessed less snowfall in autumn and early winter, but significant snowfall at the end of winters and early springs in recent years. While the Sámi people in Norway, Sweden, Finland, and Russia have reported that prevailing winds relied on for routing has changed and that snow could not be depended on for travelling over on trails or paths, which in the past have always been considered safe for travel in Scandinavia and Serbia regions (ACIA 2005: 660).

Inuit Observations

The Inuit people who live in the Arctic hold a wealth of traditional knowledge about the ways their environment is fast changing. Inuit traditional knowledge is "partly based on observation, but it is equally based on the realities of lived experience. It is a highly pragmatic and comprehensive system of knowledge of the land, animals, weather patterns, winds, and changes in these elements. This also includes knowledge of how to conduct oneself personally and how to relate to others" (Koutouki and Lyons 2009-2010: 523). In this context, the Inuit communities conducted several community level workshops between 2001 and 2005 in all four regions of the Inuit Nunangat in Canada: the Inuvialuit region, Nunatsiavut, Nunavik and Nunavut. In these workshops, the Inuit clearly stated their observations of climate change that they confirm the changing state of the Arctic climate. They observed a broad range and scope of changes encompassing bio-physical environment, socio-economic and human health. Inuit observations of climate change are not discussed as distinct changes by themselves. Instead, it is observed and reported that there are linkages to changes in the weather and environment to other changes, and in some cases, cause-effect observation (Nickels et al. 2005: 56).

The Inuit observations on climate change that documented in 2001 in the Kitikmeot region of Nunavut was one of the series workshops conducted by the Inuit communities to study the

changing climate and environment in the Arctic. Inuit people have reported a climate change in the 1990s as compared to previous decades in the region resulting in increase in temperature with earlier spring ice thaws and later ice freezing up in autumn, signifying that summer periods are growing while the weather has become weird and unpredictable. This shift and variability have had substantial impact on wildlife like Caribou, particularly on their routes of migration, shifting calving places and inaccessibility of their food sources. Inuit have recently observed that more regular short-term temperature fluctuations, particularly in freeze-melt cycles. As a consequence, an icy layer is form on the top of snows, preventing the Caribou's access to vegetation in the Tundra region (Thorpe et al. 2002; ACIA 2005: 660).

In this circumstance, an overview of some significant changes has been reported by Inuit communities in their local environment in the *Video Sila Alangotok* (Inuit Observations on Climate Change 2001). The changes recorded during the observations made to Sachs Harbour in the Inuvik Region of the Northwest Territories, Canada: i) Changes in variety of birds: The Inuit made observations species of birds which had not been seen in the past; ii) Changes in fish/marine animals: The Inuit peoples observed new species such as herring and salmon, increasing deformed fishes, while the Rock Cod species were decreasing in number; iii) Changes in land animals: The Caribou population was in decline with fewer large males, whereas the polar bears left their dens earlier and moving further away from their natural habitat area. The musk-ox population had increased, however, with higher incidences of deformities than in the past. In addition, the population of wolves had increased, whereas the rabbit population had decreased in the region, and a new type of black/red fox have appeared; iv) Changes in insects: The number and variety of insects have increased, number of mosquitoes have also gone up and longer mosquito seasons were reported; v) Changes in weather patterns: earlier spring, warmer summers, shorter fall, and slower freeze-up and milder winters were observed. At the same time, the community observed increased in rainfall, hail during summers, and occurrence of thunder and lightning. Moreover, fluctuations in the seasons were reported, especially an earlier arrival of spring in the Inuvik Region of the Northwest Territories (Manitoba Education and Youth 2003: 29).

Similarly, some of the changes that the Inuit and others indigenous peoples have observed and reported in their local environment, such as: i) the weather becomes unstable and less predictable by traditional knowledge and methods, ii) changes in snow quality and characteristics, iii) more rains during winters, iv) changes in seasonal weather patterns, v)

dropping water levels in many lakes, vi) unseen species in the past appearing in the Arctic, vii) deteriorating sea ice with changing quality and timing, viii) storm surges in the coastal and shorelines causing increased erosion, and ix) the sun becomes stronger, stinging, sharp in the Arctic, which leading to sunburns and strange skin rashes that have been never experienced before becoming common among the Inuit communities in the Arctic (ACIA 2004: 92).

In order to know more clearly what those changes are really happening in Inuit communities areas, close and deep observations of climate change through serious of workshops[3] were conducted between 2002 and 2005 by Inuit communities in collaboration with the regional Inuit organisations and other partners, living in the four Canadian Arctic regions. In essence, the participants of the workshops from all Inuit communities reported that the weather in the Canadian Arctic is changing, though the types of changes observed were vary amongst communities and region. The weather of the four regions of Inuit in Canada was constantly reported as becoming more unpredictable, and all communities independently highlighted the weather as more unstable than ever before. As a result, prediction of weather in accordance with traditional knowledge and method handed down from generation to generation has become more difficult for the Inuit. Their focus on the common factors or indicators of the environmental and climate change are grouped and categorised as: i) temperature, ii) wind and storms, iii) sky (moon, stars and sun), iv) precipitation (rainfall and snowfall), ice, land, water, and wildlife and vegetation (Nickels et al. 2005: 60).

Temperature: During climate change workshops, the Inuit, most often saw a link to temperature changes with seasons. The participants from across the Arctic reported a seasonal change in average temperatures, such as being warmer or cooler, depending on the where the community was located. For instance, in all the four regions, the average temperatures have been reported to be warmer in the past few decades. However, there was some disagreement regarding the rising of temperatures whether the winter is getting warmer or cooler, but it was on average in Nunavut and Nunatsiavut. Observations of more

[3]These workshops were conducted by the Inuit communities during 2002 to 2005 in different places of the Inuit regions following an International Institute for Sustainable Development (IISD) research initiative in Sachs Harbour, Northwest Territories of Canada in 2001, in partnership with the regional Inuit organisations such as the Inuit Tapiriit Kanatami, the Nasivvik Centre for Inuit Health and the Ajunnginiq Centre at the National Aboriginal Health Organisation, and other partners like Changing Environments at Laval University, focused on environmental or climate change and what it means for communities in the four Inuit regions of the Canadian Arctic (Nickels et al. 2005: 7).

temperature fluctuations, both even within a few hours' time, and day to day were observed to be occurring constantly throughout the Nunavut territory, which may have impacted the observations concerning seasonal unpredictability of temperature in this region. While the autumn season has been observed to be getting longer and warmer on average level in Nunatsiavut, Nunavik, and Nunavut, for the most part of the Nunatsiavut and the western communities of the Inuvialuit region have observed that the summers in these two regions were getting warmer. Whereas the Nunavik and the eastern communities of the Inuvialuit region have observed that the summers are commonly becoming cooler. On review of the communities' observations, patterns of weather changes in extremely warm temperatures fluctuate across the Canadian Arctic (Nickels et al. 2005: 61-62).

Wind and Storms: The Inuit communities in the Arctic Bay in the Qikiqtaaluk Region of Nunavut in the past observe a connection between the phases of the moon and the wind, for example, a half-moon was a sign of the outset of three-day wind period. This traditional belief or methods and relationship are said to stop and no longer valid these days. These changes to weather signs were mentioned commonly by the Inuit communities in Nunatsiavut, Nunavik, and Nunavut, and in more general terms in the Inuvialuit region (Nickels et al. 2005: 61).

While the stronger winds and storms were reported to be taking place in some particular areas, at the same time, prevailing wind directions are changing course in other areas. Inhabitants of the Inuit communities in Nunatsiavut, Nunavik, and Repulse Bay in the Kivalliq region of Nunavut observed that they have experienced changes in the patterns of winds with powerful and strange, for example, more windy days throughout the year in these regions. The Inuit communities in Puvirnituq region of Nunavik have experienced with winds of speeds up to 100 km/h, and residents of Nunatsiavut reported unusual powerful winds and storms powerful enough to break and uproot trees. The patterns of winds were reported as being more unpredictable in the eastern communities of the Inuvialuit region, whereas seasonal shifts in wind have been observed in the western part of the Inuvialuit region, with less wind during winters and more in the summers (Nickels et al. 2005: 61).

In fact, in the summer just ahead of the workshop on climate change which was conducted in Aklavik region in the Inuvik Region, the Inuvialuit region of Inuit Nunangat in the Northwest Territories, an uncommon funnel cloud was being viewed and film taken by the community

residents. Residents of the Aklavik region had never before heard or seen such a funnel cloud happening in the region at any time of year in the past. In many communities across the Canadian Arctic, including Aklavik, Arctic Bay, Holman Island, Kugaaruk, and along the north coastal area of Nunatsiavut have faced a widespread and extensive shift in the course of the prevailing winds. Some Inuit communities were encountering regular thunderstorms, particularly in some parts of eastern Canadian Arctic in different seasons whereas others have reported fewer of these unusual events, especially in some parts of western Canadian Arctic. In general, the changes in the patterns of winds is still being observed and also in the intensity and timing of thunderstorms, for example, thunderstorms are occurring commonly during the spring season, and it also usually happening in the fall in Nunavik. Whereas, thunder and lightning were reported in Nunatsiavut to occur less in summer but these days more often occurring even over the winter period, which meant, this kind of the wind pattern is a very rare event for these communities, and it was never observed in the past in this region (Nickels et al. 2005: 61).

Sky (Moon, Stars and Sun): The Inuit people are living in extreme cold climate for thousands of years but they have witnessed that the sun's heat becoming increasingly intense in the past recent years in Tuktoyaktuk of the Inuvialuit region, in fact, resulting in sunburns for the first time in their history in the Arctic region. Interestingly, a number of other changes in the sun and the sky are being observed as well, particularly in the Inuvialuit region, Nunavik and Nunavut communities. In this circumstance, some of the Inuit locals believed and suggested that rotation or position of the earth has changed or tilting on its axis, or that there is a drop in the number of rotation of our planet. Meanwhile, the communities in both Nunavik and Nunavut have observed a slight shift in the positioning of the moon, stars, and sun in the sky. Accounts of few Inuit natives of Nunavut, hints at the moon moving higher in the sky, and also the residents of both Nunavik and Nunavut have observed the sun travelling higher in the sky and setting in a slightly or somewhat different position on the horizon, the Inuit community in Kugaaruk region of Nunavut have reported a brighter sky and atmosphere, with the sun sets earlier in the evening than it used to be. At the same time, the Inuit residents in other parts of Nunavut and many places in Inuit Nunangat regions have witnessed that the clarity or colour of the Arctic sky is different these days compared to the past many years, for instance, it is often hazier or less clear and the dark blue and cloudy sky appeared and seen (Nickels et al. 2005: 62).

Rainfall and Snowfall: Inuit have observed significant changes in various fundamental elements of the weather like rain and snowfall in their communities' areas. They talked of changes in the quantity and quality of rainfall and snowfall, and the rhythm of precipitation all-round the year. There are significant variations in the quantity of rainfall across the northern Canada that differs in all the four Inuit regions. While some communities have reported that they were getting more rain in the Inuvialuit region, Nunatsiavut and Nunavut, while one community in the Inuvialuit region observed less rain during the past few years. More heavy rainfall has been experienced in Aklavik and Holman Island in the Inuvik Region of the Inuvialuit region, Ivujivik of Nunavik, and Repulse Bay in the Kivalliq Region of Nunavut, and increasing frequency of freezing rains were observed to be taking place just in three community residential areas in the Inuvialuit region. However, these events were not reported in any other part of the region. At the same time, all four regions of Inuit Nunangat have seen decreasing snowfall, whereas residents of Kugaaruk region in Nunavut reported increasing amount of snowfall in previous years. In general, many Inuit communities have experienced that the snow arrives late in the fall and thaws earlier in the spring season in Inuit Nunangat. However, this event was neither witnessed in the Inuvialuit region and nor in Kugaaruk region. In fact, snow is reported to ensue earlier in the fall season even earlier than the time when ice normally forms in the region of this community (Nickels et al. 2005: 62-63).

The Inuit elders, hunters, and community residents alike have observed some changes in the feature, quality, and nature of snow that occurred in their respective regions. For example, the Inuit communities of Nunatsiavut and Nunavut residents have repeatedly saw snow with a top layer of ice that gives rise to a lot of glitter because of freeze-thaw events during winter. They have also begun to observe the appearance drier and grainier snows that change consistently. While snow appears to get drier and less sticky in Nunatsiavut and Nunavik, snow is becoming harder in the region of Repulse Bay of Nunavut and heavier in Inuvik of the Inuvialuit region (Nickels et al. 2005: 63).

Ice: Ice and snow are vital to Inuit culture and tradition as well as the welfare of individuals and the communities at large in the Arctic. In fact, Inuit life is in direct link and wholly dependent to the ice on the land, lakes and sea surrounding their communities' environments from time immemorial. All of the communities that took part in the workshops over the course of four years of the observation of climate change reported changing conditions of

land, lake and sea-ice in their regions. Subsequently, ice is thinner these days than in the past years. At the same time, ice formation takes place latter in the fall, breaking up earlier during the spring season. Until recently, travelling by ice in the first week of June and year around was normally considered to be safe by the community of Repulse Bay in Nunavut, but by 2004, this was not so due to the strange early ice break-up at that time of the year. The timing of freezing and breaking up of ice is also reported to have altered up to a month earlier or a month late and vice versa in some community areas in Nunavut (Nickels et al. 2005: 63).

The communities of Ivujivik and Kangiqsujuaq in Nunavik regions have found that the timing of ice formation because of ice freeze-ups, has shifted from November to December, thereby causing commuting problems for the people. At the same time, the residents of Puvirnituq in Nunavik region expressed their concern about the ice freeze-up that is sometimes not completely made until the first week of January in recent years. In the past, the Inuit residents in Aklavik of the Inuvialuit region have reported that gathered at the edge of the river as a community-gathering type during the height of the spring ice break-up just to watch and witness this remarkable spectacle. However, as the breakup has become less dramatic these days, community members have no longer observed this ritual in the region. Ice formation has been observed to be changing in many ways across the Arctic, although it is has not been consistent in all the community residential areas of Inuvialuit region. In essence, most of the Inuit communities have reported that not only has ice become thinner, it has also been proving increasingly rougher to travel over the ice on the land across the Arctic Canada (Nickels et al. 2005: 63).

Land: The Inuit communities from all four regions of Inuit Nunangat have reported the changes in condition of soil humidity, permafrost stability and the safety of shorelines and coastal areas. The land is getting drier in Nunatsiavut, Nunavik, and Nunavut. The Inuit residents of Aklavik in Nunavik region and Nunavut have reported landslides and mudslides occurring in these areas in recent years, and they also observed some significant events like warmer temperatures, thawing permafrost and heavy rainfall are becoming common phenomena in their regions. Subsequently, the land is said to be sinking/dropping/falling in some areas as a result of thawing of the ground below as well as elevation in these areas when the ground is pushed up from underneath of the earth in Kugaaruk region of Nunavut (Nickels et al. 2005: 63).

The residents from both Aklavik of Nunavik region and Tuktoyaktuk of the Inuvialuit region also observed the ground was to be dropping. In contrast, the community in each of Nunavik and Nunavut region reported that the ground in these regions could be seen growing, expanding and rising in many areas. As a result, the Inuit communities reported the land becoming larger and even new islands being form in the Inuvialuit, Nunavik, and Nunavut regions. In addition, the residents noticed thawing permafrost or that permafrost are becoming thinner and more active in the amount of exposed or more able to be seen permafrost melting in the regions of Aklavik, Kugaaruk, and Tuktoyaktuk. They made links between thawing permafrost and the sinking of the land surface. At the same time, many residents of Aklavik region were mainly concentrating on Shingle Point, a vital area of cultural importance in the Inuvialuit region, which is reported to be sinking as a result of thawing permafrost. While the safety of this area is considered to be decreasing, the residents notice that the said point is growing rapidly at a rate of around four feet per year due to deposition of silt since 1990 (Nickels et al. 2005: 63-64).

The Inuit communities of Kugaaruk and Repulse Bay regions have observed that sinking sea level go hand in hand together with rising of the coastlines, which expose new rocks, shallower beaches and harbours in these areas. Scientists have also observed this event and they describe this phenomenon is known as an "isostatic rebound" (Nickels et al. 2005: 64). In addition, erosion is another major concern of the coastlines' residents in the Inuvialuit region. Consequently, all the communities are concern with the soil loss and land in their coastlines and riverbanks in regions. Due to the erosion on the shorelines, many homes and buildings have been shifted to safer areas. In fact, the communities of Aklavik and Tuktoyaktuk regions are concerned that they might be shifted due to collapsing infrastructure and shrinking municipal land area, while the communities of Nunatsiavut region also share the same anxieties as they have observed substantial erosion in the Webb's Bay area which is situated north of the community of Nain in Nunatsiavut region (Nickels et al. 2005: 64).

Water: The Inuit communities have observed the changes in the quality and quantity of freshwater in all four regions of Inuit Nunangat. They also noticed that the sea level has changed in a number of regions in the Arctic Canada. In Nunavut region, some Inuit communities have observed a sink in sea levels; as a result, the residents in Kugaaruk of Nunavut are reported that their land area has expanded in recent years. In contrast, the Inuit communities of Arctic Bay, Holman Island, and Paulatuk have reported that the sea and tide

levels are observe to be higher than it used to be. On the other hand, spanning Arctic Canada, the level of freshwater was reported to be lower than ever before. The fact is that, the residents of Holman Island have reported that after the level of water rapidly rises initially due to melting of snow in the each year in the Spring, the water level reduces drastically which is visible in some water bodies such as rivers, lakes and ponds that lie in lower level which is less than normal for this area. Most of the Inuit communities in Nunavut have expressed their concern about many bodies of water, such as creeks, shallower rivers, lakes, and ponds in the region have dried up altogether in recent years. At the same time, they have also observed changing sizes of large numbers of sandbars resulting from increased rate of sediment deposits causing additional impacts on the reported sinking water levels in this region. Subsequently, the increasing levels of sedimentation in the sandbars have changed the quality of water in the region. According to the Inuit residents of Holman Island, it has ruined the taste of fresh water. In fact, increased in the land, sea, ocean and the atmospheric temperature, which led to algal growth and increased salinity, were also observed. These changes have been said to have negative effect on the quality of freshwater and the taste of water in the region (Nickels et al. 2005: 65).

Wildlife and Vegetation: The workshops participants from all four regions of Inuit Nunangat have reported that the general condition of vegetation in the Canadian Arctic seems to be poorer these days compared to the past years. Interestingly, the flora species common to the Canadian Arctic are increasing thriving in new places while vegetation species alien to the region have reported appeared in the local areas. In certain localities, the residents observed that plants are growing faster, bigger, and taller and available in abundance than ever before. In essence, to drive home the impact of climate change on vegetation in the Arctic region is that it has negatively affected the growth of berries. The Inuit believe that change in the amount of rainfall, more extreme heat and exposure to sunlight, drier land conditions and increasing erosion to be the key factors which affects the condition and growth of berries across the region. In this circumstance, decreasing of the berry-producing plants was observed in the discussions about vegetation. At the same time, reports of deterioration of the health of other plants also emerged in Nunavik and Nunavut regions. In most cases, the reports from the four Inuit regions dwell on decreasing production of berries as the plants have become less healthy nowadays. They believe that the hot sun causes bake apples and cloudberries to ripen earlier and gets damaged faster, particularly in Nunatsiavut. Other plants in the region has also been affected by the same factors inflicting the berries causing the

numbers, variety and size of the vegetation to expand and increase in the Inuvialuit region (Nickels et al. 2005: 65).

According to the Inuit residents of the Inuvialuit region, the grasses, spruce, and willows, in particular, have become more abundant, and their growth areas has significantly expanded. In these circumstances, changes to lichen and moss were observed but these changes are generally linked to their availability and the health of caribou in the Arctic. For example, the increasing phenomenon of freezing rains has impact the health of caribous and other wildlife as they have less access to lichen and moss in the areas where these events has taken place with regularity. All the participants from different communities to the Inuit observations on climate change between 2002 and 2005 from different four regions of Inuit Nunangat were much concerned about wildlife in the Arctic, bringing forth a significant number of specific observations of changes in the terms of the migrations, behaviour, health, and distribution patterns of the animals. While the changes have been observed with birds, fish or marine animals, and terrestrial wildlife, as well as insects in all four regions, general observations and common trends regarding wildlife to all four regions include: i) an increased in the number of strange events that having negative health among marine and terrestrial wildlife as well as a variety of species of fish; ii) changes in the migration and distribution patterns of both marine and terrestrial wildlife and birds; and iii) the appearance of new species of marine and terrestrial wildlife including birds, fish, and insects. In addition, the movement of certain species of wildlife has observed further north than ever before in the Arctic Canada (Nickels et al. 2005: 66).

These are the common significant indicators of the environmental or climate change that has clearly emerge, though there are some local and regional variations in these observations of climate change from four Inuit regions across the Canadian Arctic. More importantly, the Inuit observations of environmental changes between 2001 and 2005 were not all reported uniformly throughout the Arctic. Differing opinions amongst the four regions of Inuit Nunangat and even in the communities residing in the same region were often reason. In spite of these circumstances, it is clear that the Inuit communities in Canada were observing unprecedented changes in the Arctic environment based on their traditional knowledge with the past and day to day life experiences or recent year's experiences through discussions with the many residents across the Arctic.

Scientific-based Observations

The global climate model/general circulation models (GCMs) are being used to observe and project future climate change in the Arctic. In 2008, the Arctic Climate Research Centre (ACRC) have observed surface air temperature over the Arctic region, and the report of changes and the rising levels of the temperatures in the region were considered as the largest in the world. While the warming rates of the winter temperatures were recorded over 4 degrees Celsius across the Arctic land areas. At the same time, sea ice extent averaged over the Northern Hemisphere, particularly the Arctic region has decreased correspondingly over the past 60 years. In general, the largest change has been observed in the summer months with decreases over 30 per cent, compared to its decreased level observed in winter were more modest (ACRC 2008).

According to the Fourth Assessment Report of the IPCC 2007, the average Northern Hemisphere temperatures during the 1950s were very likely higher than during previous 50 year period in the past 500 years and likely the highest in the last 1500 years. In essence, eleven of the past twelve years between 1995 and 2006 were recorded among the twelve warmest years in the climate history of global surface temperatures since 1850. According to the TAR of the IPCC 2001, the rising rate of the temperatures on earth over the period of the past 100 years linear trend between 1906 and 2005 was 0.74 degree Celsius, which is higher than the corresponding trend of 0.6 degree Celsius from 1901 to 2000. The linear warming trend over the past 50 years from 1956 to 2005 was 0.13 degree Celsius per decade, which is almost two times that for the past 100 years from 1906 to 2005 (IPCC 2007: 5).

In fact, the warming of the planet climate system is clear, as strong evident from observations of increases in global average air, land and seas surfaces and ocean temperatures, prevalent thawing of snow and ice, and increasing global average sea level. At the same time, the satellites data since 1978 indicate that annual average Arctic sea ice amount has reduced by 2.7 per cent per decade, with larger decreases in summer of 7.4 per cent per decade. The temperature raise is prevalent over the world and is larger at higher northern latitudes. As a result, average Arctic temperatures have increased at about two times higher than the global average in the past 100 years (IPCC 2007: 5).

According to the Arctic Climate Impact Assessment (ACIA) 2004, the winter temperatures (between December and February) in Alaska and western Canada have increased at least 3

degree Celsius to 4 degree Celsius in the past 60 years. The ACIA has also the projected temperature change for the Arctic region over the 100 years from the 1990s to the 2090s. The projected annual average temperatures to be risen across the whole Arctic, with increases of about 3 degree Celsius to 5 degree Celsius over the land areas, and whereas for oceans temperatures surface be up to 7 degree Celsius. Winter temperatures are projected to rise extensively more, with increases of 4 degree Celsius to 7 degree Celsius over the land areas and 7 degree Celsius to 10 degree Celsius over the oceans. Some of the strongest warnings are projected for land areas like northern Russia due to or where adjoining to oceans in which sea ice is projected to decline significantly (ACIA 2004: 28).

The ACIA observed that rainfall/precipitation has rose by approximately eight per cent throughout the Arctic during the past 100 years or more, although unreliability in quantifying precipitation in the Arctic region and the inadequacy of data in some parts of the region limits assurance in the outcomes. At the same time, there are regional fluctuations in precipitation across the Arctic, which resulted in regional variations in the changes in rainfall and snowfall as well. Apart from the overall rise, changes in the nature of precipitation have also been seen. Much of the higher precipitation happens to be rain, generally in winter, and to a lesser amount and degree in autumn and spring. The rising winter rains, which fall on top of prevailing snow, make faster snow thaw and, when extreme, could cause flash floods in some regions. The rain-on-snow phenomenon has increased substantially across the Arctic by 50 per cent over the past 60 years in western Russia. In order to determine whether recent changes in Arctic climate are irregular, that is, outside the range of natural variability, it is useful to compare it with recent records of how climate has functioned in the past. Data on past climate comes from the Arctic ice cores and other sources that provides reasonable representations of what climate was happening in the past 50 to 100 years, by examining the record of past climatic conditions found that the amount, degree, speed, and pattern of warming experienced in recent decades are actually irregular (ACIA 2004: 22).

At the same time, the ACIA has projected that climate change will lead to rising evaporation and also move to increase rainfall in the Arctic in near future as well. In the Arctic as a whole, annual total precipitation is predicted to increase by about 20 per cent by 2100, with huge quantity of the precipitation falling as rain. During the summer, rainfall over northern Canada, Alaska and Chukotka regions are projected to go up, whereas rain during the summer in Scandinavia region is projected to go down. During winter, precipitation for all

the Arctic land mass is projected to surge except southern Greenland. In general, the intensification in the Arctic precipitation is presumed to be mainly concentrating in the coastal areas in both the winter and autumn, and the rising levels during these seasons are projected to go beyond 30 per cent in the region (ACIA 2004: 29).

In the Arctic, sea ice significantly has a bearing on climatic factors. It is a crucial index of climate change that influencing land surface reflectivity, humidity, uncertainness of weather, exchanges of heat and moisture on land, sea and surfaces, as well as ocean currents. The sea ice currently covering the Arctic Ocean and adjacent seas is extremely sensitive to temperature fluctuations in the atmosphere both above and below the ocean. In recent decades or in the past 40 years, the yearly average sea ice level has shrunk by approximately eight per cent or almost one million square kilometres, an area bigger than all of Denmark, Norway, and Sweden combined, and the thawing rate is rapidly increasing. In fact, the Arctic sea ice level in summer has sunk more significantly than the annual average, with an average loss of about 15 per cent to 20 per cent of the sea ice coverage in the summer of 2004. There is also important variability of the Arctic sea ice level from year to year, for example, September 2002 had the minimal level of the sea ice cover on record, whereas the sea ice cover was very almost as low in September 2003. In general, the sea ice has become thinner in recent decades, in fact, an extensive average thickness reductions of the Arctic sea ice was observed at 10 per cent to 15 per cent but in some particular areas were observing reductions of the sea ice covering level at up to 40 per cent between the 1960s and late 1990s (ACIA 2004: 24). As a result, the Arctic sea ice has already dwindled significantly over the past 60 years. At the same time, the ACIA further observed that additional decline of the sea ice in the Arctic regions is projected at about 10 per cent to 50 per cent in annual average sea ice coverage level by 2100. Furthermore, the sinking rate of the sea ice level during summer is calculated to be significantly higher than the yearly average decline in the Arctic in the near future (ACIA 2004: 30).

In these circumstances, observations on climate change, whether from scientific study or satellites, sensors, global climate model/general circulation model (GCM) or indigenous/traditional ecological knowledge (TEK) or from the indigenous communities who live in the Arctic reported the same story that the Arctic climate is significantly changing. According to the IPCC 2007 reports, the raising temperature in the Arctic is faster and more

severe than the rest of the world, in fact, the rate of warming at the Arctic is almost two times faster than the global average (IPCC 2007 and 2013).

In essence, there are commonalities between what the Inuit Elders and community members observe concerning climate change and the measurements and predictions by scientists. As a result, the scientists have recognized the value of TEK and are taking into account information collected from native community in their work in the Arctic. Interestingly, there are many climate change research projects and adaptation programmes are incorporation with the TEK and also use it in evaluating process of climate change impacts assessment as well as in the public decision-making processes in Canada to cope with the impending changes (Manitoba Education and Youth 2003).

Issues of Development in the Arctic

The circumpolar Arctic is often elucidated as an unexplored immense storehouse of natural resources such as oil and natural gas, other minerals, and forest, and also the abundance of fish and wildlife. The expectations that climate change will bring huge opportunities for developing these natural resources have kindled considerable interest among governments, companies, the public and the indigenous communities. The seasonal decrease of the Arctic sea ice covering has also led the prospect of large-scale maritime trade via Arctic passage-ways that would result in great savings in time, distance and cost. However, the indigenous peoples have concerns over both proprietorship of resources and effects on customary ways of live. Majority of the non-indigenous populations of the Arctic are going to benefit directly or indirectly, because of their technical advantages for the industrial development resources, and most of the secondary benefits of industries build outside the region. In addition, there are also possible obstructions to new opportunities for resource extraction, fisheries, tourism and sea shipping routes passing through the Arctic ocean (Miere and Mazo 2013).

Many expectations concerning the likelihood of significant increase in oil and gas production, mining, shipping, fishing, and tourism resulting from decline and thinning of sea ice in the Arctic and by the availability of up to date technologies offer wide-ranging opportunities. More commonly, the resulting significant change in the Arctic is opening up geo-political environ that is exceptionally progressive. It important to note that the Arctic region was once dominated by the deep-rooted Soviet Union and the United States discord connected to the Cold War, but the current Arctic is a region of growing attraction to a number of prominent

actors, such as China, the European Union and Japan, apart from the eight Arctic countries. As a result, the Arctic has come to be seen as a governance barometer in the sense that it is a region that generates significant sign of the increasing demand for restructuring governance systems globally. In fact, this is because of climate change and accompanying set of bio-physical processes are manifesting themselves in the Arctic than any other place on the planet. At the same time, the role of the Arctic as a governance barometer is a result of socio-economic and geo-political forces, often connected to the bio-physical alterations, which are beginning to change the face of the Arctic and that many observers view as the birth of a new Arctic (AGP 2010).

Opportunities

The development possibilities for local inhabitants in the circumpolar Arctic would consist of new economic options and employment, and availability of social services, communication and education. Progress in regard to the physical infrastructure of roads, ports, pipelines, power-lines and hydro-power dams have jumped significantly in the past decades in Alaska, northern Scandinavia, north-western Canada, and Russia. However, there are scopes to provide assistance in enhancing the resilience of the Arctic environments and indigenous peoples way of life and their community wellbeing (UNEP/GRID 2005: 4).

Oil and gas, shipping, fisheries and tourism companies are drawn to the Arctic by the incredible economic opportunities unveiled by thawing ice. The Arctic is assessed to contain the world's largest unexplored/unexploited natural gas reserves as well as very few of its largest untapped oil reserves on the planet. If these oil and gas reserves are exploited, it would have implications for the Arctic environment and for the global climate as well. A significant number of these reserves lie in the Arctic's shallow, offshore, and biologically productive shelf seas areas. In this circumstance, the World Wide Fund for Nature (WWF), the civil society, and other organisations are working on the sustainable development issues to ensure that increased development in the Arctic is managed well for the benefit and wellbeing of local communities, flora and fauna and the environment (WWF 2014).

In this context, the Ready Gas Company in collaboration with Inuit Oil and Gas have a little while back sought permission to drill for oil near to the Inuit community area. This type of joint-venture requires permission from both the concerned communities and the federal as well as provincial/territorial governments for southern-based enterprises ahead of moving

onto to explore and extract oil. The extracted oil is sold to the US and other countries where oil is in short supply. In essence, the Ready Gas agreed to train the Inuit community members in maintenance and in operating the drill, at the same time, safeguarding and preserving the environment. In addition, the company agreed to provide employment to employ the community members for the construction of buildings in the area. In order to approve the application of the exploration company, or to determine whether the exploration request should be permitted, it is the federal government duty to hold an open house to give the stakeholders an opportunity to put forward their views and propose results concerning the effects the oil project will have on the community and the environment (Manitoba Education and Youth 2003: 44).

At the same time, an international shipping route in the Arctic is driven recently by an ever increasing global demand for commodities like energy and mining products, and the continuing reduction of Arctic sea ice, mainly during the summer season. While the ship traffic is likely to grow and develop significantly over the next coming decades and the trend will increase the pressure on this comparatively pristine area of the Arctic. For example, two major Arctic routes are increasingly navigable throughout the summertime, such as i) the Northwest Passage in Canadian Arctic would save at least two weeks in travelling time, compared to the Panama Canal; ii) the Northern Sea Route in Russian Arctic region is already in function by commercial ships. Although these shipping routes could not be functioning throughout the year, several companies are already investing billions of dollars in vessels capable of going through the Arctic sea ice routes (WWF 2014b).

Arctic tourism is one of the increased development areas in recent decades. As people can envisage, the beautiful environment of the Arctic attracts many people who wish to experience its fantastic wildlife including Arctic beluga whale or white whale, polar bear and reindeer and caribou, pristine landscapes and unique local cultures. Growing wealth allows ever-greater numbers of tourists to trip isolated and remote areas like the Arctic as well. There is no doubt that tourism activities in the Arctic region over the past 15 years have experienced an unparalleled growth and developed. Although the number of tourists travelling to the circumpolar Arctic is still comparatively small, some areas are witnessing mass tourism development in the unpredictable Arctic environment. In this regard, the Arctic Tourism Associations (ATA) provides tourists with information on alternative travel options within their respective region from: i) Swedish Ecotourism Association, ii) Alaska

Wilderness Recreation and Tourism Association, iii) Westfjords Development Agency, and iv) Wilderness Tourism Association of the Yukon. While the Global Arctic Programme (GAP) views tourism is one of the mechanisms to support the protection of the Arctic environments. Interestingly, the GAP is one of the WWF's programmes focused on the circumpolar region since 1992, and the only circumpolar Environmental NGO that presents at the Arctic Council as an observer. A significant of the Arctic tourism is to allow the visitors and tourists to understand and respect the Arctic environment and cultures of its peoples, and also to provide additional income to local communities and sustain their traditional way of life or livelihoods (WWF 2014a).

Challenges

Climate change impacts have led to growing the commercial and industrial development activities through extracting the natural resources, like oil and natural gas, have also led to opening up of international shipping routes in the Arctic. However, these commercial activities are stressed on the indigenous population in a number of ways. In fact, the industrial expansion is influencing the social, economic, cultural activities and sustenance of the indigenous peoples in the region. Notably, unrestrained pollution of the environment in the Arctic started from the 1980s due to the industrial development establishment in the region. As a result, environmental problems became serious, particularly for the indigenous peoples of the circumpolar, as the natural environment is the foundation of life for them. At the same time, the lack of interest and attention from the government and in policy-making towards addressing the problems of indigenous peoples led to a substantial degradation of their socio-economic and culture development, and their unique relationship with the ecosystem in the circumpolar (Arctic-info 2014).

Due to climate change, many species which are socially, culturally and economically significant are at danger in the Arctic. For example, thawing of the Arctic land ice and sea ice will unavoidably cause sea level rise, at the same time, these effects will impacts on the communities living in the coastal areas. Apart from these events, the Arctic wildlife and vegetations are facing the significant impact from contaminants and pollutants. Although some of the coastal areas are protected, it does not expand from the aquatic areas to the coastal areas where the people and wildlife are relying on. The marine protected areas are under-represented in the Arctic comprising just about 1 per cent in the Arctic. At the same

time, the so-called the protected areas in the Arctic are also facing significant threats and challenges (UNEP/GRID 2005: 4).

The Arctic fisheries are important for food and their economic value for the communities in the Arctic. Moreover, drilling, seashore oil exploration and extraction of natural gas have made threaten the fish and others marine animals which are the foundation of the indigenous economy and their livelihoods in the region. Interestingly, some marine mammals like whales use sound to find mates, food and find the way in the deep water of the ocean and sea. In this regard, seismic noises like the machine produced sound from oil and gas companies to extract for oil in shorelines and offshore, can be disturbing and deafening for these species. In fact, too much or unwanted ocean noise from the extraction of oil and gas, drilling and others activities could cause confusion, injury, and even death to many marine mammals population living in the Arctic ocean and sea areas (WWF 2014).

In addition, oil spills out from pipeline leaks, blowouts, and shipping accidents, pose a great threat to the marine ecosystems in the Arctic. In this regard, the marine ecosystems in particularly are vulnerable and in great danger in this region. While the spill cleanup is unattainable in this prevailing condition and there is no effective tools and method for controlling and cleaning up an oil spill over sea ice and icy water so far. At the same time, the complicated and difficult conditions of the Arctic is its distance from where the ship stationed, which it can take to response the capacity is normally days or weeks to respond to the oil spill even during ice-free seasons. In fact, the Arctic environment is characterised by low temperatures, limited sunlight and short productive season. Consequently, it could take many years or decades to recover from environment disturbance, tundra disruption and oil spills for Arctic regions (WWF 2014).

At the same time, the activities of development in the Arctic is not limited to oil and gas extraction and fishing industries. But the mining company and hydropower expansion, power lines, windmill parks, military exercises have also been developed across the Arctic over the past decades (UNEP/GRID 2005: 30). The Arctic flora and fauna are sensitive to development activities, new building infrastructures and others development projects in the region. Coastal areas are significantly at risk because these areas constitute key breeding places for a number of species. In Scandinavia region, the central calving area of semi-domesticated reindeer possessed by the Sámi reindeer herders and the communities have

faced a lot of problems especially in summer time due to piecemeal development. These areas also hold the Sámi cultural important and historic value, as they represent the summer homes of many Sámi semi-nomadic herders in the region. At the same time, Northern Scandinavia region such as Finland, Norway, Sweden has the utmost development demands anywhere in the Arctic these days. In fact, development of cabin resorts, road construction, maritime industries, mining, hydropower and power wind station, military exercise and bombing ranges in the Arctic threaten the Sámi communities, particularly in accessing to traditional food and their reindeer to traditional grazing places (UNEP/GRID 2005: 25).

Conclusion

Around 10 per cent of the Arctic's population is indigenous peoples. The Arctic environment has vast freshwater and fossil fuels reserves, and abundant of wildlife and fish. Due to climate change, the ACIA and IPCC have projected that the Arctic is going to be almost ice-free place by 2100. The Arctic temperatures are warming at two times and more than the rest of the planet. As a result, the sea ice is melting very fast especially during the summer season. Circumpolar people and wildlife are going to live altered lives by the next few decades. As Arctic sea ice sinks, the region is substantially opening to fisheries, oil and gas, shipping, and tourism development.

According to the UNGA (2009), "over 370 million indigenous peoples from 90 countries around the world are suffering from the worst impacts of climate change, and worried that they must play a crucial role in any decisions made on climate change". The fact that native people are fundamental to the numerous flora and fauna in their environment/area which facilitates enhanced resilience of these ecosystems. Moreover, they interpret and counter the effects of climate change in innovative ways, utilizing their traditional knowledge and other methods to search for solutions that people at large can represent to address climate change in the right way and in the right time (McLean et al. 2009; UNNC 2009). In this regard, Inuit have recently conducted a series of the workshops on observations of climate change in their environment during 2001 to 2005 in their four Arctic regions in Canada by observing the changes in temperatures, weather patterns, particularly in freeze-melt cycles, precipitation conditions, animals behaviours or migration patterns and vegetation growth (Thorpe et al. 2002; ACIA 2005).

The study of climate change observations signified huge scope of Inuit traditional knowledge of the ecology and environment. The indigenous communities were most of the time capable of identifying the problems responsible for environmental changes through observing the prevailing and past weather patterns, sea ice and lake ice, permafrost, erosion and seasonal data information. They observed the climate first by experiencing in their region and recollect the expanse, rate of occurrence, amount, and pattern of changes that took place every preceding year and decade (Nickels et al. 2005: 66).

Climate change has resulted in the Arctic's ice to thaw and new areas to open up for shipping route and exploit the natural resources. The region is also facing exceptional changes and severe threats from increased activities from shipping and oil and gas. Most of the Arctic communities have sustained on fish for their survival for thousands of years. Fisheries also provide a significant income for several coastal communities in the region, and they maintain an essential role in subsistence. Arctic fisheries are one of vital for achieving food security in the region as a number of the world's largest fisheries are found in the region, supply consumers across the world. Although these fish stocks are increasing demands in global markets, they are facing global threaten by increasing sea temperatures and increasing ocean acidification. At the same time, the oil industry is showing a growing interest in the Arctic region which contributing to pressure and increasing the concern about co-existence of these two industries is unattainable in the same region.

Due to the existing unprotected coastal and marine areas in the Arctic, the UNEP has called for specific concern and attention to go forward. In order to achieve this goal possible by cutting down the number and magnitude of various pressures through the expansion of a robust system and regulation of preserved zones, mainly through safeguard of the communities or residential, coastal and marine areas against industrialised and it activities that are mainly southern-based operation. This, in turn, may make possible sustainable development while protecting the fundamental country food sources and healthy ecosystems that very essential and central to the Arctic indigenous peoples livelihood. In addition, "co-management and partnership with indigenous peoples are fundamental to facilitate and allow them to choose their own way of life and influence the future of the resources that they rely upon for their livelihood as well as their community wellbeing" (UNEP/GRID 2005: 4). Climate change is the significant threat and challenges to the Arctic communities, flora and fauna and the physical environment. The next chapter will discuss the consequences of

climate change on the Inuit health, food security, social, cultural, economic and livelihood in Canadian Arctic or in their four regions of Inuit Nunangat.

CHAPTER 3

IMPACT OF CLIMATE CHANGE ON THE CANADIAN INUIT PEOPLES

Introduction

As has been stated by a scholar, "climate change is no theory to the Arctic's inhabitants: it is a stark and dangerous reality. ...What we Inuit are experiencing here these days the rest of the world will experience in the near future and very soon. The Arctic is the world's climate change barometer, and we Inuit are the mercury in that barometer" (Watt-Cloutier 2007: 14; Watt-Cloutier 2005). Inuit communities in the Inuit Nunangat regions, have felt substantial effects of climate change in recent decades, and it has negatively impacted on their food system, livelihoods, and health in a number ways due to rising of surface and ocean temperatures, widespread melting of ice, landslides, and thawing permafrost (UNEP/GRID-Arendal 2009; IPCC 2007).

In fact, climate change in the circumpolar Arctic poses a threat and challenge to the Inuit social determinants of health, community well-being including country food sources and access to food. Climate change is affecting both store-bought food and harvesting of country food by disrupting food shipping or supply line, transportation systems because of changes in sea ice and ice road conditions, damaging roads, airports and pipelines, melting natural ice cellars for food storage, shifting migration of animal population and unpredictable weather conditions in the regions (Watt-Cloutier 2007: 14).

The objective of this chapter is to highlight and examine how climate change influences Inuit housing(by direct and indirect ways), food systems, livelihood and food security, social conditions of Inuit health, and heath care services in the four Inuit Nunangat regions (the homeland of Inuit of Canada): Inuvialuit region (Northwest portion of Northwest Territories and Northern portion of Yukon), Nunatsiavut (Northern coastal Labrador), Nunavik (Northern Quebec) and Nunavut territory. The chapter is organised into three main sections on Inuit health; housing; and food systems and food security with an introduction and conclusion.

The key social determinants of health for Inuit in Canada are determined by eleven factors such as quality of early childhood development, livelihoods, housing, personal safety and security, income distribution, culture and language, education, mental wellness, food security, availability of health services and the environment (Inuit Tapiriit Kanatami 2014a: 7). The existing health indicators that are used in Canada at the national level reflect many major challenges to the health of Inuit, particularly in the four regions of Inuit Nunangat in Canada. According to the Nunavik Inuit Health Survey (NIHS) 2004, IPYIHS 2007-2008 and APS 2006 and 2012, health indicators showed higher rates of Inuit infant mortality, socio-economic distress, unemployment, food insecurity, depression, domestic abuse, suicide, chronic and infectious diseases, low rates of Inuit life expectancy, education, job opportunity, income, and access to quality food and health facilities relative to the total population in Canada (Inuit Tapiriit Kanatami 2014: 9; Statistics Canada 2012a and 2012b). Accordingly, the Inuit have faced many health issues and challenges in social conditions in terms of physical, mental wellbeing, personal safety, food security and health services in these regions.

According to the World Health Organisation (WHO), "all populations will be affected by climate change, but some are more vulnerable than others. People living in small island developing states and other coastal regions, megacities and mountainous and polar regions are particularly vulnerable" (WHO 2015). Environmental changes in Inuit Nunangat is reflected in decrease in the sea ice cover, snow cover, frequent thawing glaciers and permafrost. The Greenland ice sheet melt is affecting wildlife, ecosystems, and the environment throughout the Inuit Nunangat regions (Inuit Tapiriit Kanatami 2014a; NOAA 2013).

The Inuit communities/peoples have survived by harvesting country food through hunting, fishing, trapping and gathering wild food in the Canadian Arctic or Inuit Nunangat from time immemorial. Country food is the most nutrient-dense food source available in the Arctic environment that give the community health, well-being, and cultural identity. In addition to country food, market food or store-bought food become supplementary diets of the Inuit in the Arctic. The store-bought food is shipped by plane and boat or via ice roads in winter in Inuit Nunangat.

According to the Food and Agricultural Organisation of the United Nations (FAO), "climate change is real, and its first impacts are already being felt. It will first affect the people and food systems that are already vulnerable, but over time, the geographic distribution of risk and vulnerability is likely to shift. Certain livelihood groups need immediate support, but everybody is at risk" (FAO 2008: iii). Climate change affects food availability, food production, and food access in complex ways through changes in food growth, food processing, harvesting, transportation or shipping, quality, distribution, trade, incomes and food price fluctuations and crisis.

The FAO 2008 report of the *Climate Change and Food Security: A Framework Document* stated that "food security is the outcome of food system processes all along the food chain. Climate change will affect food security through its impacts on all components of global, national and local food systems" (FAO 2008: xi). Accordingly, food security has become a major concern of the Inuit in the Canadian Arctic or Inuit Nunangat. The Inuit peoples in Canada have experienced food insecurity and lived under the scourge of hunger for many years. The finding from the Canadian Community Health Survey (CCHS) 2004, International Polar Year Inuit Health Survey (IPYIHS) 2007-2008 and Aboriginal Peoples Survey (APS) 2012 indicated that a high level of food insecurity was prevalent among Inuit households living in Inuit Nunangat (ONPP 2007; Rosol et al. 2011; Wallace 2014).

Social Determinants of Health

According to the World Health Organisation (WHO), the social determinants of health (SDH) are "the conditions in which people are born, grow, work, live and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems" (World Health Organisation 2013). In essence, these situations and circumstances are built and shaped by the surrounding environments including air, water and land, and also distribution of income (money), food security, gender equality and power, job security, health care, and land or natural resources at the local, national, and global levels which are themselves determined by policy choices and mandates.

The social determinants of health (SDH) have influenced the peoples' living and working conditions in everyday life. The social determinants of health are significant because they determine people's good health and social conditions. SDH depends on factors such as the

unfair distribution of health care facilities and opportunities, which are responsible for the health inequities, like unaffordable health treatment, inaccessibility, and mandates. This widens the gap of health status between the states/provinces and the country/nation (World Health Organisation 2014a). To further illustrate this point, tremendous differences in income and wealth have negative health outcomes for those who are living below the poverty line or have low income and food insecure households. Hence, the SDH influence health in both positive and negative ways depending on its nature and distribution of income and health care.

The current adverse climate change influences the social and environmental determinants of health by disrupting farming, crop growing, food production, water supply and irrigation, sanitation and safe drinking water, food access, food availability, food security and nutrition, clean air, income and income distribution, health services, and safe housing. According to the World Health Organisation (WHO), climate change is expected to cause roughly 250,000 additional deaths per year, from hunger, poverty and malnutrition. It is believed that some people will die from water-borne diseases related to floodings like diarrhoea and vomiting, cholera, hepatitis A, malaria, and typhoid fever, and others from airborne diseases including respiratory diseases or anthrax (inhalational), tuberculosis, and chickenpox, smallpox, influenza and measles. A sudden rise of temperature and heat will hit a significant population particularly the aged and infants, children and sick people by 2030 and 2050. The direct costs of climate change to health issues is estimated to be between US$ 2 to 4 billion per year by 2030. The regions with poor health infrastructure, particularly the vulnerable and poor regions, or the least developed and developing countries will be most affected, and more assistance will be needed to cope with the impact of climate change (WHO 2014).

Inuit Health

According to the Public Health Agency of Canada (PHAC), there are twelve key factors of the determinants of health in Canada — biology and genetics endowment; culture; education and literacy; employment/working conditions; gender; health services; healthy child development; income and social status; personal health practices and coping skills; physical environments; social environments; and social support networks (PHAC 2011 and 2013; Tait 2008). Based on this understanding, the Inuit communities, organisations, and governments have identified eleven key factors that are articulated as social determinants of Inuit health: 1) quality of early childhood development; 2) culture and language; 3) livelihoods; 4) income

distribution; 5) housing; 6) personal safety and security; 7) education; 8) food security; 9) availability of health services; 10) mental wellness; and 11) the environment (Inuit Tapiriit Kanatami 2014a). Each of these determinants of health factors is significant for the health and well-being of Inuit individuals, families, communities or nations, and they are interrelated to each other. It is important to note that most of these social determinants of Inuit health are discussed briefly below.

Quality of Early Childhood Development: Healthy child development or quality of early childhood development, is used to address all issues relating to maternal, foetal and infant health and overall children's health and wellness. For example, a child that has low weight at birth will have to face many health challenges, issues and problems throughout his/her life, that is not just during childhood, but also while growing up, adulthood, and old age in life (Inuit Tapiriit Kanatami 2014a; PHAC 2011).

There are many challenges to the quality of early childhood development in the Inuit communities. Lack of access to quality health care facilities, educational and social supports centre in Inuit Nunangat or Canadian Arctic led to high rates of infant mortality and prevalence of foetal alcohol spectrum disorder (FASD), due to substance abuse and smoking during pregnancy. Findings from the APS 2006 indicated that approximately 14 per cent of all Inuit women across Inuit Nunangat regions have a problem with heavy drinking during their pregnancy period (Pauktuutit 2010; CPS et al. 2002). At the same time, the prevalence of poverty, food insecurity and poor nutrition, and moreover, overcrowded housing and stressful home environments are other significant factors that lead to negative health status of the Inuit children in Canada (UNICEF Canada 2009; NDHSS 2005; Hodgins 1997).

Early childhood education opportunities for infants and children, sex education and family planning in schools are significant factors that contribute to the healthy child development in the society. In addition, providing training facilities to the elders in child raising activities, infant care, and access to midwifery centres and health services in the community will bring both the short and long-term impact on mental, physical, and social health and well-being of Inuit children in society (Cameron 2011). The positive impacts of these activities and opportunities can support not only coping skills and lifestyle behaviours, but also develop their immunity to illness, improve their employment prospects, income and distribution, and

overall health and well-being of Inuit families, or Inuit communities in Canada (Friendly 2004).

If the mother takes food exposed to Arctic contaminants it can result in critical undesirable health effects for the foetus and the infant as a certain level of the contaminants found in country food sources pass through the placental barrier and affect its development process. The contaminants in the Arctic food system like mercury are extremely harmful for infant development. They can be exposed to it through breast milk leading to impaired cognitive functions and changes in immune system function of the child. Large amount of exposure to mercury for adults is also a potential risk factor for cardiovascular disease among adults (Council of Canadian Academies 2014: 138; Van Oostdam et al. 2009;AMAP 2003a;Després et al. 2005).

Inuit Culture and Language: The Inuit culture and language have changed rapidly over the years due to the legacy of the colonialism which led to establishment of Canada's residential schools system, Inuit community relocation, or Inuit community shipping into the High Arctic during the 1950s and 1960s. These changes have widely impacted Inuit health status including mental health and community well-being. These impacts, threats, and challenges of Inuit culture and language have led to anxiety, depression, substance abuse and even suicide among the Inuit communities in Canada (Inuit Tapiriit Kanatami 2014a; Nelson 2012; Kirmayer et al. 2000).

The Aboriginal Peoples Survey (APS) 2001 showed that a substantial proportion of Canadian Inuit children/youth were victims of the residential school system and were mentally, physically and sexually abused from the 1830s till 1996. The impacts of the residential schools have left untold arduous burdens upon Inuit communities resulting in intergenerational or community trauma, that has in turn, created depression, mental sickness, heavy drinking and smoking, and committing of suicide among youth and adults. Moreover, these impacts of Canada's assimilation policy have led to a rift between Inuit elders and youth, preventing the intergenerational exchange of cultural values, language, parenting skills, and traditional knowledge which are of fundamental importance to healthy relationships and identity formation (Wexler 2006; Kirmayer et al. 2003; O'Donnell and Tait 2003; Aboriginal Healing Foundation 2002; RCAP 1995).

Added to this, the projected and potential impacts of climate change have created a psychological fear and depression among the Inuit communities, as they are likely to lose millennium old Inuit culture and identity due to thawing, or melting of the whole polar ice in the coming decades in this century. The melting ice in the Arctic is a cultural loss as well for the Inuit, because their cultural identity is associated with ice. Inuit houses, known as Igloo, are built in snow, they stored food with ice freezer storage or ice cache, and their food systems are coming from ice-based animals and marine mammals like polar bear, caribou, arctic char, whale, seal, and so on. Due to climate change, the Inuit have stopped building igloo houses, which is an integral part of their culture. The thawing of ice and permafrost affects underground food caches and is resulting in food spoilage of the Inuit communities' food preservation methods and systems (Peace 2012; Nickels et al. 2005).

Moreover, their cultural practices such as hunting and fishing are also being threatened and challenged by the melting of ice in the Arctic. Ultimately, climate change has affected Inuit culture, language, and way of life in a number of ways. The impacts have led to confusion in the community, and that turned into rising domestic violence, sexual abuse, substance abuse and chaos, which are also going to continue to affect many generations of Inuit communities in Canada.

Inuit Livelihoods: Livelihoods are a significant social determinant of Inuit health. Access to job, employment, and economic opportunities in the community, or region is an essential part of the positive health status of the community (RCAP 1995). The concept of livelihoods means securing the necessities of life by engaging a diverse range of activities from a full-time employment to part-time employment such as jobs in both the government and private sectors, or companies. In the context of Inuit communities, it has a wider connotation, including harvesting of country food such as fishing, hunting, and trapping activities of Inuit men and women. At the same time, the Inuit are good in art, artwork, beading, carvings, drawings, embroidery, handicraft, painting, sculptures, and tapestries. For Inuit, this artwork and their products and engaging voluntary services in their communities, also known as 'informal work', become a backbone of Inuit economy to support themselves in Inuit Nunangat. These activities encompass harvesting of country food, artworks, and the voluntary services in the communities and they play a significant role in Inuit livelihoods and boost their health status (Inuit Tapiriit Kanatami 2014a; Elliott and Macaulay 2004).

However, in general, the median incomes of Inuit are less than their counterpart non-indigenous population in Inuit Nunangat due to advanced or technical levels of education requirement. Inuit are often less engaged in higher-paying employment positions in the Inuit regions. Due to the lack of advanced levels of education among Inuit communities, higher-paying employment positions or sectors such as the business, engineering, financial, management, medical and health occupations, and natural and applied sciences and related sectors of occupations are being occupied by the non-indigenous population in Inuit Nunangat (Gionet 2008).

In Inuit regions, the unemployment problem is major and has a significantly negative impact on Inuit health status. According to the Aboriginal Peoples Survey (APS) 2006, approximately 79 per cent of Inuit adults living in Inuit Nunangat were unemployed in 2006 (Little 2006). In 2011, 19.9 per cent of Inuit adults were unemployed which was roughly six times higher than their non-indigenous population counterparts at 3.4 per cent in Inuit Nunangat. While the unemployment rates in Inuvialuit region was recorded at 21.3 per cent, 33.7 per cent were recorded in Nunatsiavut, whereas the unemployment rate for Nunavik was 14.4 per cent, and about 20.5 per cent was recorded in Nunavut. Outside Inuit Nunangat unemployment was recorded at 11.1 per cent in 2011 (Statistics Canada 2011b). In essence, negative health factors, such as feelings of low self-esteem, or lack of self-confidence, drug abuse, listlessness, suicidal tendencies and prevalence of violent activities in the Inuit communities are related to unemployment in Inuit Nunangat (O'Neil 1994).

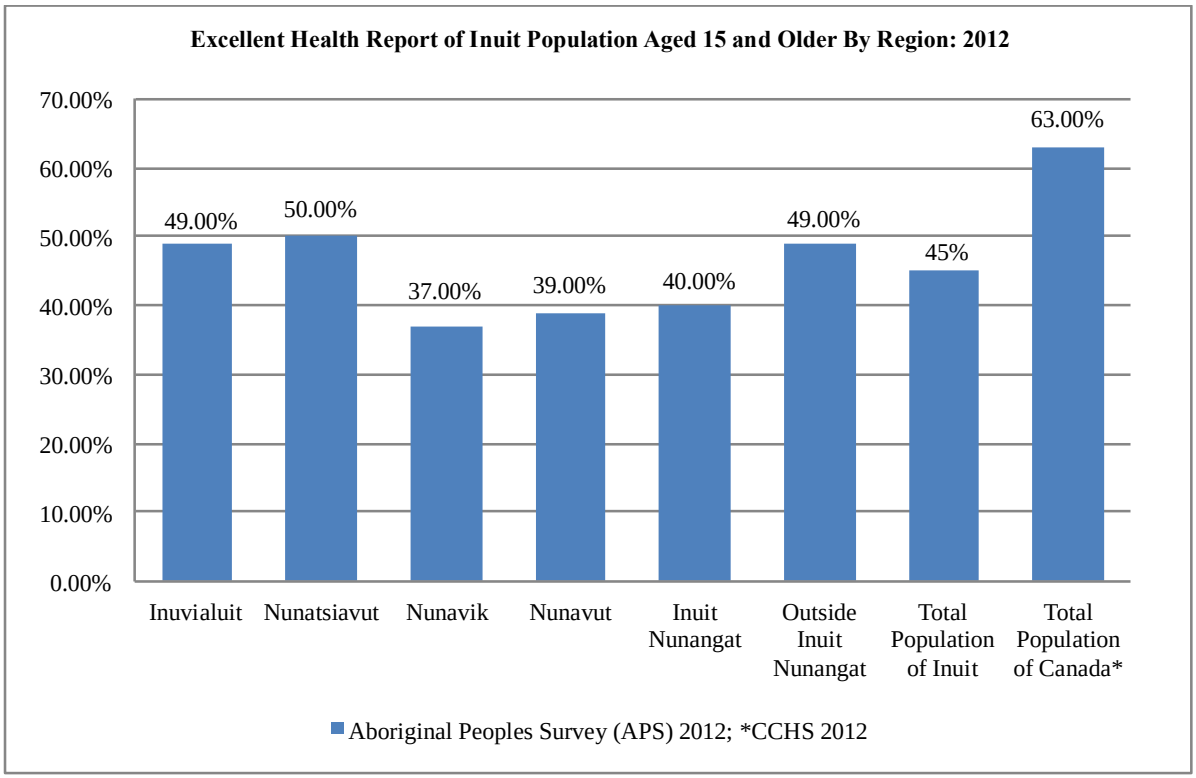
***Income Distribution and Health Status*:** Income distribution is known to be an important socioeconomic determinant of health as it leads "to marginalisation, limiting access to education, employment, good housing and nutritious food" (Inuit Tapiriit Kanatami 2014a). According to the APS 2006 report, overall Inuit achievement in the higher and skilled levels of education is very low. For example, only 36 per cent of Inuit adults possessed a diploma or postsecondary degree in 2005-06 in Canada. It is due to low education and level of skill attainment of the Inuit that led to a wide workforce gap between Inuit adults and the non-indigenous population in both Inuit Nunangat and outside Inuit Nunangat regions in Canada. The employment rate for the non-indigenous population in both the regions was 81.6 per cent, contrasted to 61.2 per cent for the Inuit adults in 2006. The 2006 Canadian Population and Aboriginal Peoples Survey (APS) 2006 reports have found that the median income of Inuit in 2005 was about $16,969, compared to $25,955 for the non-indigenous population,

which was $8,986 less than the median or average income of the non-indigenous adult population in Canada (Statistics Canada 2008).

There is strong evidence that inequity of income distribution exists across Canada. According to the Canada's Second Report on the Health of Canadians 1999, approximately 73 per cent or 7 in 10 of Canadians in the highest income group, compared to 47 per cent or 5 in 10 of Canadians in the lowest income group rate their health as excellent or very good (PHAC 2013; ACPH et al.1999). This implies that access to higher income is linked to better health of the individual, family, and community in the country.

According to a study by Organisation for Economic Co-operation and Development (OECD) in 2008, there was a huge gap in labour earning in Canada between the Canadian top 10 per cent at $103,500, compared to the Canadian bottom 10 per cent at $10,260 (OHCHR 2012). The average median income of Inuit was $20,961, compared with $30,195 for the non-indigenous population in Inuit Nunangat in 2010 (Statistics Canada 2011). According to the Inuit health status report, as shown in Table 3.1, the APS 2012 showed that about 40 per cent, or four in ten of Inuit aged 15 and older rate their health as excellent or very good in Inuit Nunangat. It comes to about 45 per cent for overall Inuit adult population in Canada, compared with 63 per cent or 6 in 10 for the total population of Canada in 2012 (Wallace 2014). Consequently, a higher social and economic condition of living is associated with better health status in the society/country.

Table 3.1: Excellent Health Report of Inuit Population Aged 15 and Older By Region: 2012



Source: Aboriginal Peoples Survey (APS) 2012; *Canadian Community Health Survey (CCHS) 2012 (Wallace 2014).

Inuit Health Conditions

According to the 1996 Report on the Health of Canadians, "good health enables individuals to lead productive and fulfilling lives. For Canada as a whole, a high level of health contributes to increased prosperity and overall social stability" (ACPH 1996:1). This section of the chapter is mainly focused on the Inuit health conditions in Canada. To determine whether the deterioration of the Inuit health in Inuit Nunangat is due to the direct or indirect impact of climate change. The outcomes of the recent Canadian health studies and surveys like the Second Report on the Health of Canadians 1999, Aboriginal Peoples Survey 2001, 2006 and 2012, Nunavik Inuit Health Survey 2004 and International Polar Year Inuit Health Survey 2007-08 showed that the health status of Inuit were the lowest in Canada, in terms of their socio-economic status, lifestyle or living standard, life expectancy, food security and nutrition, educational attainment, employment, and housing. The prevalence of the negative health condition and issues, such as alcohol abuse, smoking, stress, and youth suicide rates are very high in Inuit Nunangat. The section is organised into four sub-sections to assess the

main reasons for the prevalence of chronic diseases, contaminants, suicide, and food insecurity among the Inuit households in Inuit Nunangat.

The concept of health has changed over the past century, that is, from the narrow view of health as the mere absence of diseases to a wider and broadened comprehensive concept by accentuating and focusing on the mental and physical capabilities, as well as social resources along with the absence of diseases in society. According to the World Health Organisation (WHO), "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1948: 100). In this holistic view of health, the socioeconomic condition or status, cultural, physical infrastructure and ecosystem factors are very important. In fact, human health status is the outcome of the intricate interaction of biology and genetics, food and nutrition, employment and income, and socio-economic and environmental factors. Inuit health is very strongly tied to the physical environment of the Arctic. The environmental consequences of climate change in the Arctic have had a huge impact on Inuit health in many ways.

Over 50 per cent or more than half of the Inuit population in Canada is young, with the median age of 23 years in 2011, compared with 41 years of age for non-indigenous Canadian population (Wallace 2014). In fact, Inuit population is the youngest in Canada, which means an average Inuit is under the age of 25. The growing percentage of the Inuit population was 26 per cent between 1996 and 2006, compared to 8 per cent increase among the non-indigenous Canadians population. Thus there are many challenges in the areas of child health or childhood development programme, education, employment, youth health care access, economic, and social development programmes (Knotsch and Kinnon 2011; Statistics Canada 2008).

Findings of the Aboriginal Peoples Survey (APS) 2001, 2006 and 2012, Nunavik Inuit Health Survey (NIHS) 2004, and International Polar Year Inuit Health Survey (IPYIHS) 2007-08 signified that Inuit in Canadian Arctic or Inuit Nunangat have faced various serious health-related challenges, such as high rates of chronic and infectious diseases, youth suicide, and shorter life expectancy along with other problems such as poverty, low education attainment, low income and food insecurity.

Some of these elements are linked to government action in the High Arctic during the 1950s and 1960s which have brought significant changes in Canadian Inuit culture and had a huge impact on their health conditions. The federal government is keen to protect Canadian sovereignty in the Arctic. As a result, the Inuit culture is in transition at the moment because they are actively engaged in protecting and preserving their tradition while adapting to the modern food systems, technologies and other elements of the modern world (Inuit Tapiriit Kanatami 2014: 14). Climate change threatens and challenges human health and well-being in many ways by both directly and indirectly. Some of the impactscome directly from increased extreme weather events, air pollution, stress to mental health, and diseases transmitted by air, food, water, and through some insects such as mosquitoes, housefly, ticks, and mites (Luber et al. 2014: 222).

Chronic Diseases

According to the Chartered Institute of Environmental Health (CIEH), "the potential health effects can be categorised into eight significant group for which the numbers on incidence and cause exist, such as: 1) infectious diseases: food related, water-borne, vector-borne; 2) mortality attributable to heatwaves; 3) mortality attributable to cold periods; 4) malnutrition related to climate effects on food supply; 5) trauma attributable to adverse/extreme weather events; 6) medium and long-term effects of flooding, including mental health as well as infection and impact on other diseases; 7) illness attributable to air pollution; and 8) morbidity associated with ozone depletion: skin cancers, and cataracts" (CIEH 2008: 32). Though climate change endangers human health across the country and the world. the poor and vulnerable communities suffer more than the rich (Portier et al. 2010: iv).

The impact of climate change on human health is complex, varied and multi-dimensional. In general, the impact is diverse depending on the geographical area or region as a function both of the environment and geography, and the susceptibility of the local inhabitants. Climate change challenges and disrupts a large range of physical or natural environment and ecological systems that are an essential part of life support system on Earth. The direct impacts of climate change are caused by weather extremes such as heat waves or heat stress in summer, and extreme cold in winter. The increases in other severe weather events like cyclones, droughts, floods, or increasing temperature affect the hydrological cycle and ecosystems of the planet that influences the food chain cycle, water supply, and disease causative agents and vectors (McMichael 2003: 10). Health impact related to climate change

in the Arctic are likely to vary across communities and regions, with some changes being positive and others adversely affecting the health of individuals and communities (IASC 2010). Consequently, changes in the land, weather and sea which are reported in the Arctic regions affect individual and community health and well-being in a variety of ways (Furgal et al. 2002: 26).

The 2012 Aboriginal Peoples Survey (APS) of Canada defined a "chronic condition as a long-term condition that is expected to last or has already lasted at least six months, and that was diagnosed by a health professional" (Wallace 2014: 8). Periodic poor health of the Inuit was reported by early European observers, explorers, missionaries, traders and whalers, including food shortages, and starvation due to the shortage of wildlife population and animal migration patterns. There was a prevalence of chronic diseases like lung diseases– tuberculosis, asthma or respiratory problems caused by traditional methods of heating homes, and high rates of infant mortality with a shortage of life expectancy. Moreover, the Inuit faced serious complications with their health issues after frequent contact with the Europeans which led to exposure to many new diseases, such as influenza, chicken pox, smallpox, measles, and poliomyelitis which were mostly fatal to Inuit populations as they did not have immunity against these diseases (Bonesteel 2006: 71; Jenness 1964).

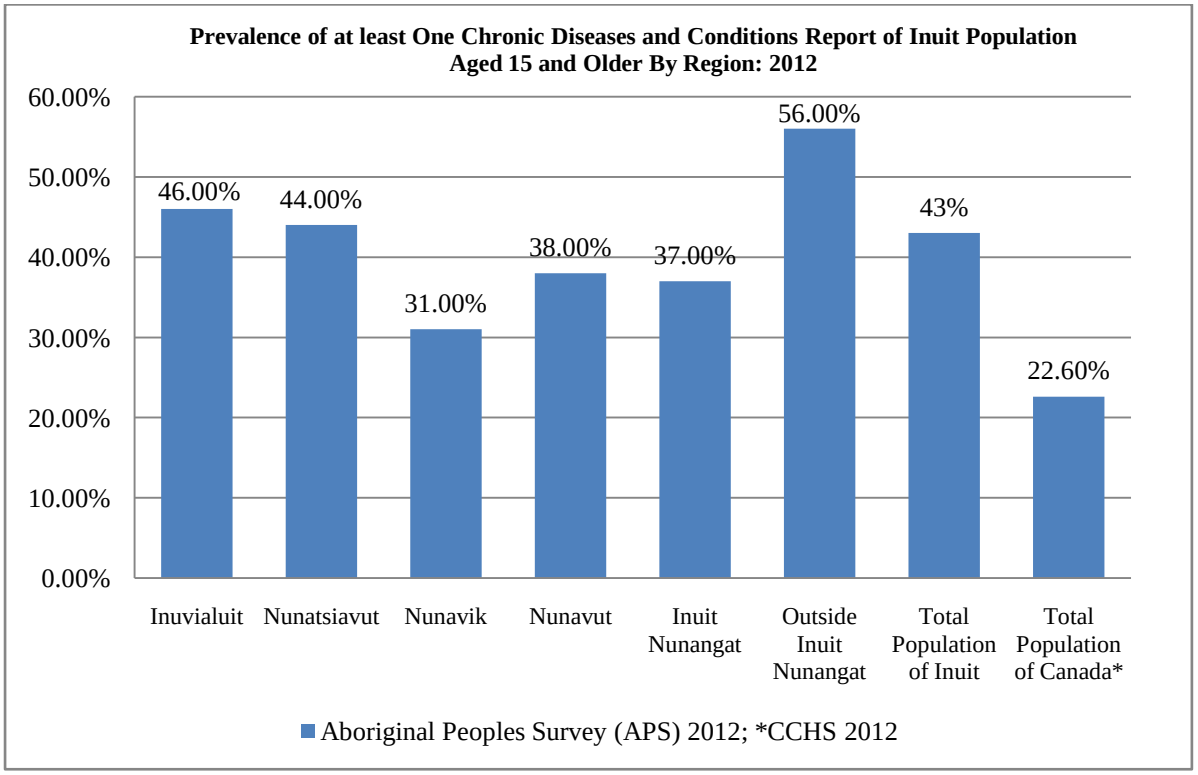
In Inuit regions, the data from the APS 2006 indicated that the most frequently diagnosed chronic conditions among Inuit adults aged 15 and above were arthritis or rheumatism, asthma, diabetes, distress or mood disorder, high blood pressure, obesity, and tuberculosis in 2006. While the Inuit children aged 6 to 14 were diagnosed with some kind of allergies at the rate of 10 per cent, asthma alone was reported at 7 per cent, and 15 per cent ear infections were found among Inuit children in all four regions of Inuit Nunangat (Tait 2008).

According to the 2012 Aboriginal Peoples Survey (APS), about 43 per cent of the overall Inuit adult populations aged 15 and older (comprising 39 per cent of Inuit men and 47 per cent of Inuit women) were diagnosed with at least one chronic condition or disease, compared with 22.60 per cent of the total Canadian adult population in 2012 (Table 3.2). While around 50 per cent of them had just one chronic condition, about 26 per cent of the Inuit had two chronic conditions/diseases, and the 25 per cent had three or more across Canada. About 37 per cent of Inuit adults in Inuit Nunangat were diagnosed with a chronic condition, contrasted with 56 per cent of Inuit adults living outside Inuit Nunangat in 2012

(Wallace 2014). In Inuit regions, the highest percentage of the Inuit adults that were diagnosed with at least one chronic condition was documented at 46 per cent in Inuvialuit region, compared to 31 per cent of the Inuit in Nunavik, which was the lowest rate in Inuit regions.

The 2012 APS signified that about 12 per cent of arthritis or joint inflammation sickness and cardiovascular diseases or high blood pressure conditions were being reported among the Inuit adults in Canada, which was the highest percentage of the Inuit chronic conditions report in 2012. Respiratory illness like asthma was reported at 7 per cent, and mood disorders including the bipolar disorder, depression, and psychological fear among Inuit adults was reported at 7 per cent in overall Canada. Inuit had Type 2 diabetes excluding gestational diabetes, which was reported to be 5 per cent in Canada (Wallace 2014).

Table 3.2: Prevalence of at least One Chronic Diseases and Conditions Report of Inuit Population Aged 15 and Older By Region in 2012



Source: Aboriginal Peoples Survey (APS) 2012; *Canadian Community Health Survey (CCHS) 2012 (Wallace 2014).

Measuring the impact of climate change on health can be due to direct and indirect reasons. For the Inuit in the Arctic, environmental degradation and its consequences have wide effects on their health, food systems and access to food, transportation systems, and housing crisis. Due to the multiple years of thick ice melting in Inuit Nunangat regions, their ice roads are unreliable in everyday life. This meant that the Inuit have to stay more inside their crowded dwellings. Because of air pollution and poor ventilation in these crowded dwellings, many respiratory chronic diseases like asthma spread easily, which lead to more anxiety, depression, mood disorder or mental illness, heart diseases, substance abuse, and family abuse in the Inuit households. Accordingly, climate change affects their shelter, food security, the well-being of the community in a number of ways.

Mental Health

The Inuit Tuttarvingat of the National Aboriginal Health Organisation (NAHO) recognises that mental wellness is the key social determinant of the individual, family, and community health and well-being. For Inuit, mental wellness refers to "physical, emotional, mental and spiritual wellness, as well as strong cultural identity" (NAHO 2013). Accordingly, the Inuit in Canada considered mental wellness as their top priority on health issues. In the holistic views of health for Inuit, mental wellness is not only mental health, but also encompasses prevention and treatment of alcohol addiction, drugs or substance abuse, suicide prevention, reduction of family abuse or violence, and community well-being (NDHSS 2005).

According to the 2004 Nunavik Inuit Health Survey (NIHS), at least 13 per cent of the Inuit adults in Nunavik had experienced a severe level of depression, distress and psychological stress in 2004 (Anctil 2008). The sickness of anxiety, depression and substance abuse are the chief factors of mental illness among the Canadian Inuit population. Thus the suicide rates among the Inuit adult population in general and the Inuit youth, in particular, were very high at 11 times the national average of Canada, and was the highest suicide rate among the youth in the world in 2006 (Gionet 2008; Statistics Canada 2008).

Youth suicide is a significant concern for the Inuit communities in Inuit Nunangat and across Canada since the suicide rates for Inuit youth has a remarkable record in the world. In Nunavut alone, the Inuit youth suicide cases between 1989 and 1993 were 79 in every 100,000 of the population. Moreover, the rates for Inuit youth suicide had increased to 119.7 cases in 100,000 for the years between 1999 to 2003 in Nunavut (Hicks 2007). The horrible

problems of suicide cases among the Inuit communities in Canada are still experienced on a regular basis (Nelson 2012).

According to the Nunavut Department of Health and Social Services (NDHSS), there are many factors for committing suicide among the Inuit communities in Canada, particularly in Inuit Nunangat regions, such as the housing problems, lack of social supports, unemployment, low income, alcohol abuse or substance abuse, loss of culture, poverty, single parenting and other social factors that impact a person's mental wellness (Inuit Tapiriit Kanatami 2014a; Cameron 2011). In addition, the 'community trauma' carried on by the legacy of colonialism, the Canadian residential schools system, the hundreds of Inuit sledge dogs slaughtered by the Royal Canadian Mounted Police (RCMP) between the 1950s and 1970s that were used as a traditional means of transportation, the Inuit communities sending into the High Arctic in the 1950s and 1960s, and the pressures to adjust their culture to other non-native culture remains the primary reasons for building both family and community support to deal with mental health illness and well-being of the community (SPSWG 2010; NDHSS 2005).

Climate change and the global warming are also considered the driving forces of mental health and illness among Inuit communities, both in Inuit Nunangat and outside Inuit Nunangat regions in Canada. The environmental changes and its consequences like food contamination, thawing of the Arctic glaciers and the permafrost, land erosion and landslides, are direct and indirect effects of climate change in the Arctic. The consequents of these changes have already affected the Inuit health, livelihood, access to food both country food and store-bought food items, and way of life in many ways. The changes have affected on their culture, traditional roles, spirits, and challenges their subsistence activities, such as fishing, hunting and trapping for the harvesting of country food, which is an important part of the Inuit social, cultural, spiritual, emotional, mental well-being of the communities (Inuit Tapiriit Kanatami 2014a; Kirmayer et al. 2000).

Health Care and Services

Accessibility, affordability, and availability of health care and services are considered to be significant factors of Inuit health and wellness in Inuit Nunangat. While providing appropriate health care and services to the Inuit communities, and increasing affordable health care, access to quality health services, and enhancing health care facilities with

culturally suitable environments in Inuit Nunangat regions are essential factors for the positive impact on the health status and wellness of Inuit communities in Canada (CPHO 2008).

Inuit communities have faced critical problems in accessing health care facilities and services across Canada. While Inuit communities living in Inuit Nunangat regions have very limited access to quality health care and services as most of the communities live in isolated and remote areas, and are generally examined by the nurse practitioners at available nursing health centres in the regions (NAHO 2007). Most of the medical practitioners, doctors, nurses, and other medical technicians or specialist staff are not willing to work in Inuit Nunangat regions due to the geographical, the climatic and other factors.

According to the Aboriginal Peoples Survey (APS) 2006, about 56 per cent or over half of the Inuit adult population in Canada had managed to consult with a medical specialist or doctor for medical problems in 2005, in contrast to 79 per cent of non-indigenous Canadian adult population (Statistics Canada 2008). Nearly half or 49 per cent of Inuit adults aged 15 and older settling in Inuit Nunangat had consulted with a family doctor or a specialist for the medical in 2005, compared to 73 per cent or two-third of the Inuit adults living outside Inuit Nunangat in Canada (Statistics Canada 2008). While the Inuit Oral Health Survey (IOHS) 2008-2009 found that only half or 50 per cent of the Inuit population had consulted a dental care practitioner or dental specialist doctor in 2008, compared with 75 per cent or two-third of the overall non-indigenous Canadians population (Health Canada et al. 2011).

Inuit patients often have to leave their families or communities and travel to southern Canadian cities for medical care due to lack of hospitals, health care centres or services, or lack of up-to-date medical equipment and facilities, shortage of medical doctors, specialists, dental practitioners, obstetricians and gynaecologists in Inuit Nunangat (Inuit Tapiriit Kanatami 2010). Apart from these challenges in the region, majority of the Inuit patients frequently face cultural and language problems when they visit medical centres and hospitals in southern cities like Calgary, Churchill, Edmonton, Happy Valley-Goose Bay, Montreal, Ottawa, Toronto, Winnipeg, and Yellowknife (Inuit Tapiriit Kanatami 2014a; Archibald and Grey 2006). In fact, Inuit have to spend more money on health while they earn less than the rest of the Canadian population. As a result, there are significant gaps or health disparities

between the Inuit population and the rest of the non-indigenous Canadian population in Canada (Inuit Tapiriit Kanatami 2014a).

According to the Aboriginal Health Human Resources Initiative (AHHRI), there remains a significant lack of progress in relation to human resources on health issues in Inuit Nunangat. Only a few Inuit are being trained for health work in their communities. The numbers of Inuit health-care workers fall far short of those required. There are only a few Inuit physicians, perhaps a handful of registered nurses and licensed practical nurses. In 2010, there was a proportion of one registered nurse for every 135 non-indigenous Canadian population, compared to 45,000 Inuit population in Inuit Nunangat, which meant that there should be more than 300 Inuit nurses just to meet the existing needs of Inuit communities in the four regions of Inuit Nunangat (Inuit Tapiriit Kanatami 2014).

Inuit communities in the Arctic are at increased health risk and more susceptible to climate change because of poverty and inequality, poor accessibility to associated health services compared with the average Canadian. In general, Inuit communities depend on resources that come from land, sea, ice and the environment, which make up their livelihood, particularly fishing, hunting, and trapping which are parts of Inuit culture and diet, and reflective of underlying social, cultural, and economic factors. The mental health issue is now another concern among Inuit hunters in response to an increasing inability to hunt with changing ice conditions reflecting not only the decreased ability to provide food for the family, but also a loss of cultural identity and livelihood practices (Ford et al. 2014).

Inuit Housing

According to the Inuit Tuttarvingat of the National Aboriginal Health Organisation (NAHO), the prevalence of Inuit homelessness, housing deficiencies, and inferior housing quality are significant factors that determine Inuit health in all four regions of Inuit Nunangat as well as outside Inuit Nunangat regions in Canada (Inuit Tuttarvingat 2008). The 2008 Chief Public Health Officer's (CPHO) report on the State of Public Health in Canada stated that housing is considered a key factor of the social determinant of Inuit health due to a strong connection between adequate housing and positive health status outcomes (CPHO 2008).

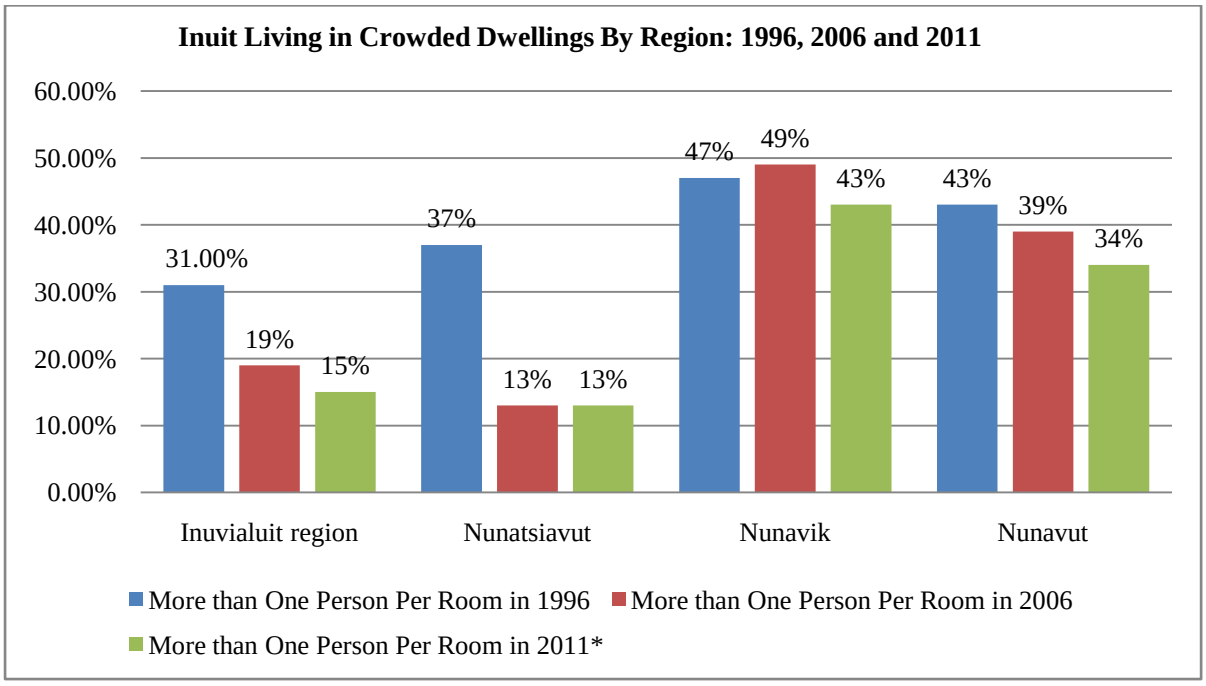
The Canada Mortgage and Housing Corporation (CMHC) defines housing as "Residential accommodation and facilities, common areas and services used directly with the residential

accommodation. Housing does not include commercial or institutional premises, social or recreational services, and services or facilities related to mental or physical health care, education, corrections, food services, social support or public recreation" (Inuit Tuttarvingat 2008: 5).

In addition to the prevalence of Inuit homelessness, shortages of housing availability and suitability, poor quality housing and ventilation, the sky-high rental costs, the high cost of home construction and repair in Inuit Nunangat regions are some of the factors that lead to negative Inuit health in Canada. These complex housing issues and problems have directly and indirectly affected the health of Inuit individuals, families, and communities in many ways. Poor quality and insufficient housing of Inuit families and communities has led to overcrowded dwellings, poor hygiene, sanitation, and ventilation in the house. Because of these conditions , the prevalence of infectious diseases such as respiratory diseases or tuberculosis spread easily among infants and other members of the family. Moreover, lack of privacy in the crowded households led to depression, psychosocial stresses, substance abuse, spousal abuse, and violence. At the same time, the housing crisis faced by the Inuit in Canada have been linked with low attainment levels of education in schools, colleges, and universities (Inuit Tuttarvingat 2008). According to the Statistics Canada (2008), the housing crisis reached disastrous proportions in 2006. This meant that 10 times more indigenous lived in normal housing space than non-indigenous Canadian population. Over 33 per cent or more than one-third of all Inuit household members lived in crowded conditions (Knotsch and Kinnon 2011).

The findings from the 1996 and 2006 Population of Canada Census, Aboriginal Peoples Survey (APS) 2006, and National Household Survey (NHS) 2011 show that the highest rates of Inuit household members living in crowded conditions were reported in Nunavik region at 47 per cent in 1996 and 49 per cent in 2006, while 43 per cent was reported in 2011 in Nunavik (Table 3.3). In Nunavut, the Inuit living in crowded dwellings was found at 43 per cent in 1996, 39 per cent in 2006, and 34 per cent in 2011. In Inuvialuit region, about 31 per cent of Inuit households inhabited crowded homes in 1996, 19 per cent in 2006, and 15 per cent in 2011 (Statistics Canada 2011a).

Table 3.3: Inuit Living in Crowded Dwellings By Region: 1996, 2006 and 2011

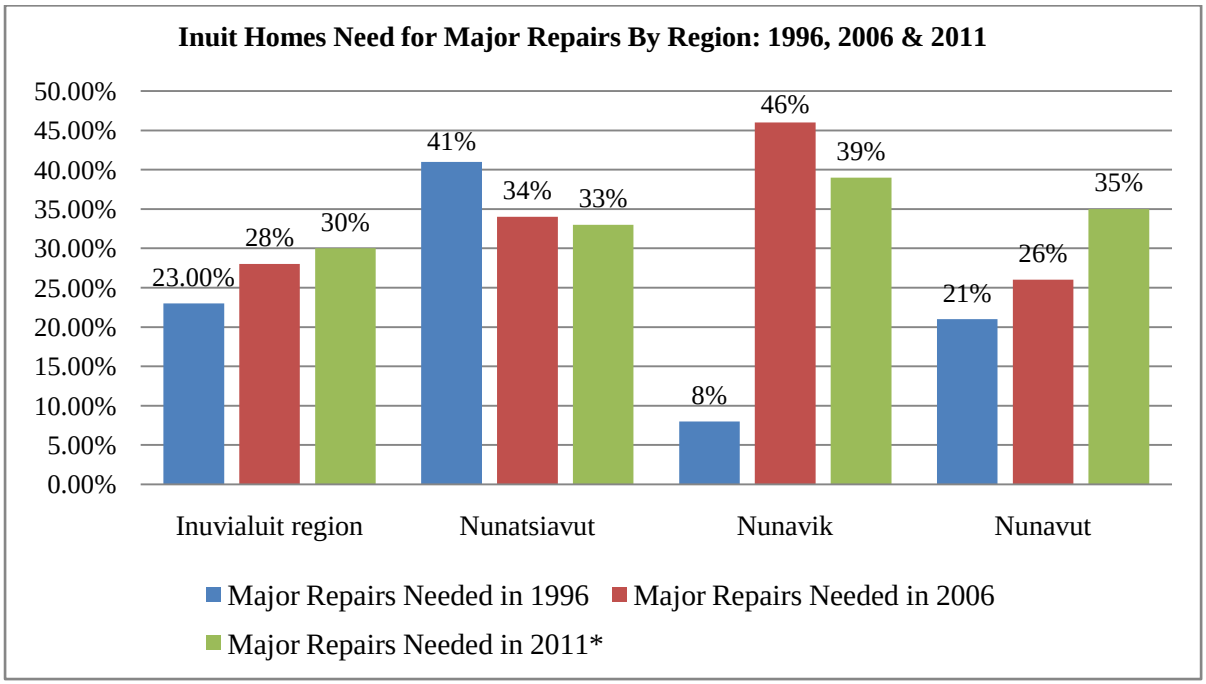


Source: The 1996 and 2006 Census of Population (Statistics Canada 2008); Aboriginal Peoples Survey (APS) 2006; Nunavik in Figures 2015 (Duhaime et al. 2015). *National Household Survey 2011 (Wallace 2014).

While approximately 37 per cent of Inuit households lived in crowded conditions in Nunatsiavut in 1996, about 13 per cent in 2006 and 2011, which is the lowest rates among the four regions of Inuit Nunangat (Statistics Canada 2011a).

In addition to the Inuit overcrowding housing crisis across Canada, the data from the Statistics Canada 2011 indicated that almost 30 per cent of the total Inuit housing in Inuit Nunangat required major repairs such as electrical work and plumbing, as shown in Table 3.4, contrasted to nearly 7 per cent for the non-indigenous Canadian population in the regions in 2011 (Statistics Canada 2011a).

Table 3.4: Inuit Homes Need for Major Repairs By Region: 1996, 2006 & 2011



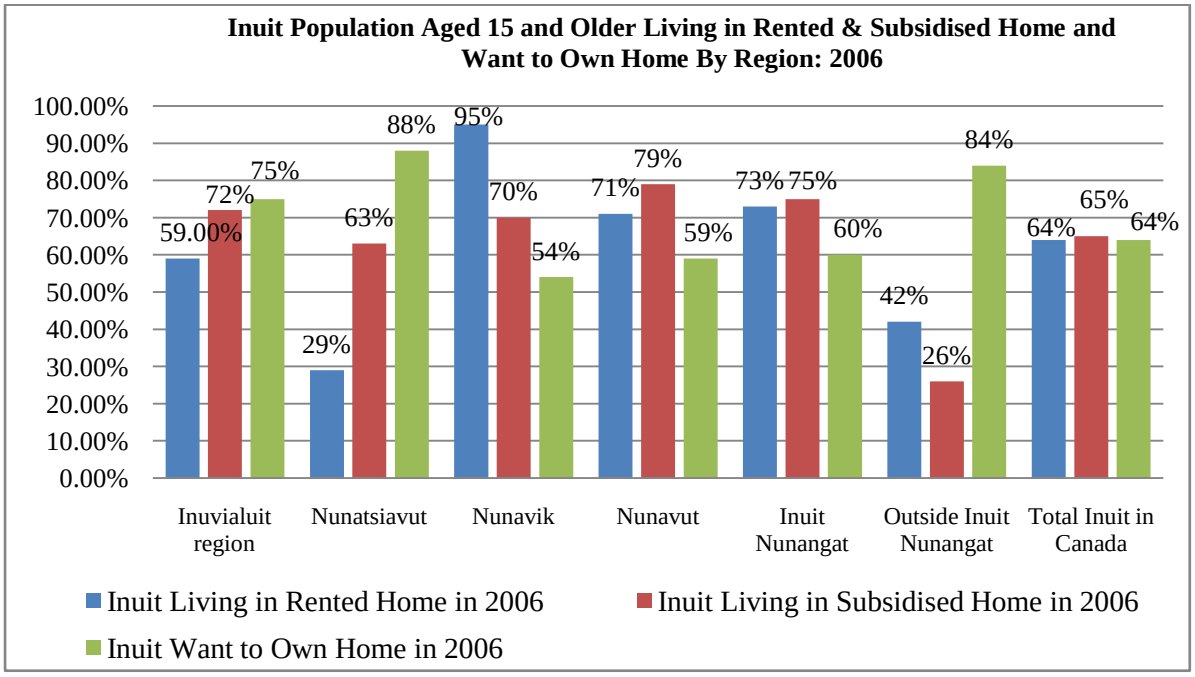
Source: The 1996 and 2006 Census of Population (Statistics Canada 2008); Aboriginal Peoples Survey (APS) 2006; Nunavik in Figures 2015 (Duhaime et al. 2015). *National Household Survey 2011 (Wallace 2014).

The data from the International Polar Year Inuit Health Survey (IPYIHS) 2007-2008 also found that at least one in five Inuit households in three regions such as the Inuvialuit region, Nunatsiavut, and Nunavut have provided temporary shelter to homeless communities members or visitors (Minich et al. 2011).

According to the Inuit Tuttarvingat of the National Aboriginal Health Organisation (NAHO), there is no real data about the number of homeless in Inuit Nunangat or northern Canada. In fact, there is inadequate data about the migratory patterns of the homeless in Inuit Nunangat. The migration of the population into Iqaluit, the capital of Nunavut, is the main cause of many homelessness-related problems in the regions (Inuit Tuttarvingat 2008).

The majority of the Inuit adult population lived in rented homes, or in government subsidised homes across Canada, both in Inuit Nunangat and outside Inuit Nunangat regions in 2006 (Table 3.5). (Inuit Knowledge Centre 2016; Statistics Canada 2008).

Table 3.5: Inuit Population Aged 15 and Older Living in Rented & Subsidised Home and Want to Own Home By Region: 2006



Source: Aboriginal Peoples Survey (APS) 2006 (Inuit Knowledge Centre 2016).

Moreover, over two-third or 75 per cent of Inuit adult population lived in subsidised homes in Inuit Nunangat in 2006, as shown in Table 3.5. Subsidised housing is provided by federal, provincial, and municipal or local governments so that it is affordable for low to moderate income individuals and families, in order that they don't spend a disproportionate share of their income. In this context, the Canada Mortgage and Housing Corporation (CMHC) defines 'affordable housing' as housing that costs no more than 30 per cent of your income. People who spend more than 50 per cent of their income on housing are at high risk of homelessness" (Inuit Tuttarvingat 2008: 5).

Accordingly, in 2006, nearly 70 per cent of the Inuit total households wanted to own housing in Canada. While the highest rates of the Inuit households that demand to own a home was at 88 per cent in Nunatsiavut, compared to 54 per cent in Nunavik, the lowest rates of Inuit desire to own a home was in Inuit Nunangat (Table 3.5).

Geographical and climatic factors are considered to be the major reason for the Inuit housing crisis. Due to climate change, the thawing of permafrost and sea-ice, business, manufacturing, and transportation has become more difficult in Inuit Nunangat. The construction season in the Arctic or Inuit regions is very short. At the same time, shipping goods for construction sites are also problematic in the region (Peace 2012; Inuit Tuttarvingat 2008). Since there is very limited road connection between the mainland of Canada and the Inuit communities settlement areas in the Arctic, delivery by ship is the main way of delivering goods, particularly large and heavy ones. This sort of shipment is not possible in poor weather and during winter season, and is extremely costly. The transportation of goods and building materials are being affected by the thawing of ice and permafrost.

Unpredictable of weather and climate patterns and the prevalence of the melting ice and permafrost have influenced the schedule of building construction in the Arctic. The costs of fuel for heating, or use of oil and diesel for electricity generation, and the insulation charge are very high because of cold climate which has a direct impact on the affordability of housing in Inuit Nunangat (Knotsch and Kinnon 2011).

According to the National Oceanic and Atmospheric Association (NOAA), the average loss of the Arctic sea ice was reported at the rate of minus 14 per cent per decade in 2013 (NOAA 2013). Most of the Inuit communities are living in coastlines, shorelines, and river bank areas in Inuit Nunangat. Due to the frequent melting of sea ice and permafrost particularly in the vulnerable areas such as gullies and shorelines, houses are being destroyed. The melting and freezing of the permafrost in the regions are not only destroying roads but also other infrastructure used for transporting goods, constructing building raw materials, and transport systems in the communities. In fact, ice roads are a major transport system during the winter season in Inuit Nunangat. However, melting ice is making ice roads unreliable and insecure, which affects the shipping of building materials and goods where the ice roads are used in the region (Peace 2012).

According to George Wenzel (2015), “due to the frost cracks, landslides, and permafrost, the construction sites of the buildings need to dig about 20 feet deeper or more for the safety of the pillars of the buildings, particularly in the Baffin Island, Clyde River, and Pangnirtung areas in Nunavut”. When the sea ice melts, sea-level of water increases and creates more

erosion in the area. The erosion rates in the Baffin Island region of Nunavut was very high in the 2000s. Because of less sea ice on the shorelines in summer, the frequent winds, storms, and floods have destroyed houses, housing infrastructures, and properties of the Inuit communities on the shorelines and river banks in Nunavut. Roads along rivers, river banks, gullies, and shorelines are often cracked, damaged, washed out and destroyed, particularly in the Clyde River and Duvall River. For example, the Pangnirtung bridges were severely damaged and destroyed in June 2008 in Nunavut (Wenzel 2015; Peace 2012).

Thus, climate change affects Inuit housing and its development infrastructure across Inuit Nunangat regions and Canada, which is considered as a significant factor affecting Inuit health including the mental wellness, and well-being of the communities.

Inuit Food Systems and Food Security

This section of the chapter examines the impact of climate change, directly or indirectly, on the Inuit food systems, livelihoods, and food security in Inuit Nunangat or Canadian Arctic. It attempts to determine whether the impacts of climate are the main reasons for the prevalence of food insecurity among Inuit households in Inuit Nunangat. In order to understand Inuit food systems, food security and food insecurity prevalence in the region, it is important to know what food systems and security is.

Food System: According to the Global Environmental Change and Food Systems (GECAFS), "Food systems encompass, first, activities related to production, processing, distribution, preparation and consumption of food; and second, the outcomes of these activities contributing to food security (food availability, food access, and food use with elements related to nutritional value, social value and food safety). The outcomes also contribute to environmental and other securities (income). Interactions between and within ecology and human environments influence both the activities and the outcomes" (FAO 2008: 4). Food systems include the growing, production, harvesting, importing, processing, marketing, transport, consumption and distribution of food. It is influenced by governance, health, social, economic or community economic development, agriculture, and natural environment.

Inuit food systems are traditionally sustained by harvesting local food or country food through hunting, fishing, trapping and gathering wild food from the natural environment. In addition, Inuit peoples access market food or store-bought food through imports or markets at

the local stores. In Inuit regions, climate change has significantly impacted Inuit harvesting of country food and access to store-bought food. The details on food security issues and the challenges in the regions will be discussed in the following sub-sections.

Food Security*:* According to the 2009 Declaration of the World Food Summit in Rome, food security exists in a region or country "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life" (FAO, IFAD and WFP 2013:16-17). In essence, the Food and Agricultural Organisation of the United Nations (FAO) affirms that food security is based on these four dimensions: food availability, food access, food utilisation and food stability.

Food Availability: Food availability is the physical presence of food in the area through domestic production, agriculture, trade or imports, food aid and food stocks in sufficient quantity of quality food in all parts of the country, territory or region (WFP 2009). Thus, it is determined by food production in the local area; secondly, on trade or food brought into the area through market mechanisms; thirdly, on food stocks stored by traders or that stored in government reserves; and fourthly, food transport supplied by the government and aid agencies (FAO, IFAD and WFP 2013).

Food Access: According to the World Food Programme (WFP) (2009), food access is the ability of households or individuals to acquire an adequate quantity of quality food regularly through a combination of purchases, barter, trade, borrowings, food aid and gifts. Food access is determined by physical access to food through the availability and quality of infrastructure including roads, railways, ports and other installations that facilitate the functioning of markets. Secondly, through agriculture, livestock, forests, fisheries and aquaculture. Thirdly, people's ability to purchase food at markets which are influenced by the income of the households. Fourthly, through trade, barter or exchange of things for food. And fifthly, acquiring food through gifts from friends, relatives, community, government and aid agencies (FAO, IFAD and WFP 2013).

Food Utilisation: It is the use by households or individuals of the food to which they have access, and their ability to absorb and metabolise nutrients that affect the efficiency of food conversion by the body (WFP 2009). Food Utilisation is firstly influenced by how food is

processed, stored and prepared with care including cooking fuel used and sanitation. Secondly, feeding and sharing of food within the household particularly for individuals with special nutritional needs such as babies, young children, the elderly, sick people and pregnant and lactating women (FAO, IFAD and WFP 2013).

Food Stability: According to the FAO (2009), food stability is the assurance of food to households or individuals which is determined by the stability of three dimensions of food security: food availability, food access and food utilisation in the households or individuals to food even in the face of natural calamities, climatic changes, price fluctuations, economic and political crisis (FAO, IFAD and WFP 2013).

While the agricultural product is an essential part of food availability and of achieving food security in a region, however, agriculture is absent in Inuit Nunangat. In general, livestock, poultry farming, and market gardening are not very common practices in Inuit regions due to the harsh climatic conditions and the geography of the Arctic. Traditionally, the Inuit have sustained themselves on country food to survive, and these food items are harvested from the land, sea and rivers.

Challenges to Country Food

Country Food is locally available and produced food that is linked to the traditional, cultural identity, and gives a nutritious boost to the diet of the Inuit in the Arctic. Country food is what the land, rivers and sea provide in terms of (i) meat of the arctic fox, arctic hare, bearded seal and ringed seal, beluga and bowhead whale, caribou, duck, goose, moose, muskox, muskrat, polar bear; (ii) fish such as arctic cod, arctic char, herring, inconnu, lake trout, whitefish; (iii) fruits such as blueberries, cranberries, crowberries, currants, (iv) plants and roots; and (v) birds eggs. According to Kuhnlein and Receveur (1996), country food refers to "all food within a particular culture available from local natural resources and culturally accepted. It also includes the socio-cultural meanings, acquisition, processing techniques, use, composition, and nutritional consequences for the people using the food". In Inuit regions, fishing, hunting, trapping, and gathering of wild food or products are what the community needs and values. This comprises not just their nutritious diet, but is also their livelihood, a part of their economic, social, spiritual, and cultural identity.

Climate change in the circumpolar has had a significant negative impact on country food harvesting activities due to diminishing of Arctic ice conditions, changing and unpredictable weather patterns, changing animal migration or movement routes, which are the major limitations on the Inuit country food harvesters in Inuit Nunangat regions (Watt-Cloutier 2004a). In fact, unstable sea ice could make ice-edge in the Arctic more difficult and dangerous for hunting and trapping activities. The rising temperature and precipitation rate changes could affect migration patterns of terrestrial animals such as caribou and moose and alter breeding and moulting areas for birds in the region. Herring, salmon, seals whales, walrus, and various other species of waterfowl are expected to experience shifts in range and numbering the Arctic (ACIA 2004 and 2005). At the same time, the Inuit are concerned about the contamination and environmental pollution of the Arctic through the food chain systems. This has raised a number of apprehensions relating to the consumption of country food among health care experts and the Inuit communities and organisations in the regions (Boult 2004: 8).

Many mammals and other wildlife in the Arctic like polar bears, seabirds, seals, and walruses depend on the sea's life productivity and on the existence of sea ice, both of which are dependent on the climatic conditions and environment. Changes and increases in sea surface temperatures (SST) or ocean currents could have a significant outcome on the Arctic marine life, particularly fish stocks, which are the main source of food as well as the core on which the economy is based for the Inuit communities in the region. The Inuit communities are really concerned and worried that there will be a significant loss of country food which is the important part of their social and cultural way of life for future generations. In fact, the increasing temperatures in the summer season in the Arctic has already affected country food, particularly making the storage of meats more challenging and difficult. Not only is meat spoiled rapidly, fish are also dying and spoiling faster due to the heat waves and increase in water temperatures. The multiple impacts on country food access, availability, preparation, and storage have caused the Inuit communities to initiate community freezer programmes (Nickels et al. 2005: 79).

The Nutritious, Social and Cultural Values of Country Food: Each culture has its own food system according to sources of food available. For example, the Inuit have different habits of food intake linked to climatic conditions in the region which they have practiced from time immemorial. The traditional Inuit diet is nutritious and healthy for the community. Foods

such as fresh, raw or frozen meat, fermented fish are common. Some of their traditional dishes include caribou stew flavoured with berries, and berries mixed with animal fats (Flynn 2006).

According to the 2006 Aboriginal Peoples Survey (APS) half of the meat and fish consumed in Inuit Nunangat by about 65 per cent of Inuit was country food. In the region, the highest consumption of country food was reported in Nunatsiavut at 79 per cent while about 66 per cent of the food consumption was reported in both Nunavut and the Inuvialuit region, and 59 per cent in Nunavik. According to the APS report, many Inuit children aged 6 to 14 ate country food on a regular basis in Inuit Nunangat. For example, five in ten children or about 49 per cent of Inuit children ate country food at least thrice in a week in 2006 (Tait 2008). According to the Inuvialuit Regional Corporation (IRC), "consumption of country food is significant to Inuit identity, way of life, and the culmination of a series of cooperative activities – harvesting, processing, distributing and preparing – that require behaving in ways that give emphasis to Inuit values of cooperation, sharing and generosity" (Statistics Canada 2013).

Food sharing is an integral part of the Inuit culture and it is customary to share hunted meat or fish with their family and neighbours. When the hunters bring meat or fish it is distributed to the elders, widows and people providing them with hunting facilities, in that order and then to other households in need of food. The sharingof country food was widespread across Inuit Nunangat in the Arctic. According to the APS 2006, eight in ten or about 80 per cent of Inuit adults in each of the four regions have reported living in households that shared country food with others during the previous year (Tait 2008).

The Inuit diet has many benefits over westernfood or market food that is available at the stores. The Inuit diet comprises fresh or raw meat and fish that keeps them warmer and stronger in the extremely cold climate because it contains high level of fat intake or approximately 50 per cent of calories which provides valuable energy. This diet acquires a high-quality level of protein, about 30-35 per cent of the food intake calories, and approximately 15-20 per cent of the calories are from carbohydrates in the form of glycogen (Krogh and Krogh 1915; Ho et al. 1972).

Moreover, country food provides invaluable health benefits because it contains high levels of antioxidants, omega-3 fatty acids, monounsaturated fatty acids, protein and other micronutrients (Egeland et al. 2009; Dyerberg and Bang 1978). Similarly, a study on Inuit diets has found that nutritious levels of vitamin A, D, E and B6, riboflavin, iron, zinc, copper, magnesium, manganese, phosphorus, potassium and selenium are contained in Inuit diets (ITK and ICC-Canada 2012; Kuhnlein and Receveur 2004).

According to the Makivik Corporation (MC), for Inuit, consumption of country food is not only culturally important to the community but also healthy, rich in essential nutrients and low in sugars and unhealthy fats (Statistics Canada 2013). It contains approximately, 15-20 per cent of all animal protein consumed from aquatic animals, which are highly nutritious and serve as a valuable supplement to diets lacking essential vitamins and minerals (FAO, IFAD and WFP 2013). In addition, these diets obtained by fishing, hunting and trapping are healthier, more nutritious, and less costly than the store-bought food.

However, presence of contaminants in sources of country food is of direct concern for the Inuit communities in the Arctic, for whom the harvest and consumption of country food are fundamental to their economic livelihoods, social and cultural identity (Donaldson et al. 2010). According to the AMAP 2011 report, the effects of climate change and the pollutants in the Arctic are linked to climate change (AMAP 2011). Indigenous communities/peoples in the circumpolar Arctic and scientists have observed the presence of contaminants in the Arctic food chain system that have threatened the well-being of the community for the past 30 years and more. A wide range of substances, such as persistent organic pollutants (POPs) ororganchlorines like chlordane, dichlorodiphenyltrichloroethane (DDT), linedan, polychlorinated biphenyl (PCBs), toxaphene, heavy metals like lead and mercury, and radionuclides have been found in surprisingly towering levels in the Arctic ecosystem (Lockhart et al. 1992; Muir et al. 1992). The environmental contaminants in the Arctic are substances inadvertently or intentionally brought into the environment that have the potential to harm the human population, wildlife, and vegetation, or the ecosystems in the region.

Harvesting of Country Food: In Inuit Nunangat, each season of the year has a significance for the Inuit communities for accessing or harvesting nutritious sources of local or country food. When the spring comes, arctic fox, musk-ox, and muskrat are trapped for their fur or pelts and meat. These furs produce warm clothes. Roots and plants are also gathered during

the spring season. During the winter, hunting and trapping of animals like polar bear, arctic fox and hare, and fishing are major sources of country food. Summer is a good time for whaling in the Yukon coast particularly for the beluga whale. Bird eggs are available in the month of June (ACIA 2005; Nuttall 1998).

The caribou and moose are hunted, during summer and autumn/fall. Autumn is hunting season for caribou, ducks, geese, and moose. Besides, it is a good time to dry harvested fish, meat, and to collect the arctic berries such as blueberries, cranberries, crowberries, currants, and also plants and roots in the autumn. Good sources of country food like birds, fish, whale, and other sea mammals such as walrus are harvested throughout the year (ACIA 2005).

Inuit are often required to travel long distances to trap, hunt and fish. According to George Wenzel, "the Inuit hunters normally travel at least 200 miles to 300 miles to hunt animals like caribou and moose in Nunavut region" (Wenzel 2015).

Besides going very long distances to harvest country food, the high cost of hunting and trapping equipment has affected access to healthy food in Inuit Nunangat. In order to go for a normal three day hunting trip in the Canadian Arctic, the hunters require, about $15,000 to $23,500 in Iqaluit, Nunavut (Weber 2014) as shown in Table 3.6. The cost of hunting and fishing equipment is another significant problem of access to country food in Inuit Nunangat (Campbell et al. 2014).

According to the Inuit Tapirisat Kanatami (2007), 42 per cent of Inuit hunters complained about the cost of fishing and hunting in the Arctic as hunters required modern equipment due to changes in animal migratory patterns because of the changing weather patterns. They need to go faraway from home to hunt. Moreover, gas and food prices in Inuit Nunangat are very costly (Statistics Canada 2013). Ammunition, food and gas costs at least $150 to $200 a day in a hunting trip (TGM 2012; Boult 2004) and about half of Inuit adults in the region earned less than $20,000 a year (Statistics Canada 2013).

Table 3.6: Cost of the Basic Equipment for Country Food Harvesting Trip in Iqaluit, Nunavut in 2014

Particular/Item	**Minimum Amount**	**Maximum Amount**
	$	
Ammunitions (2 boxes of 20 shells)	100	150
Boat	12,000	16,000
Camping Stove	200	300
Clothing	800	1,000
Fishing Equipment	1,000	2,000
Food ($35-$50 per day)	105 (3 day supply)	150 (3 day supply)
Gas/Fuel	200 (3 day supply)	300 (3 day supply)
GPS (Global Positioning System)	500	600
Inuit komitak (Snowmobile-Sledge)	1,000	3,000
Rifle	500	1,500
Sleeping Bag	400	500
Snowmobile	9,000	15,000
Tent	1,200	1,400
Total	**18,005**	**41,900**
All Seasons (3 day per week)	**39,056**	**73,100**

Source: Cost of Iqaluit Hunting Trip (Weber 2014). Note: The Data was/were adjusted, compiled, and illustrated accordingly.

Inuit peoples have thus started facing challenges in accessing nutritious country food essential for the community's health. Despite these challenges, the 2006Aboriginal Peoples

Survey (APS) found that about 68 per cent Inuit adults were actively involved in harvesting of the country food in 2005 (Tait 2008).

However, many scholars believe that it is climate change that is impacting wildlife in the Arctic which in turn is affecting traditional practices and food security of the Inuit communities. Unpredictable weather patterns and early melting of sea ice result in inability to hunt at certain times of the year in the region (Pearce et al. 2009; Furgal 2008; Furgal and Prowse 2008; IPCC 2007; Nickels et al. 2005). Moreover, strange weather patterns like the higher winds speed make travel conditions dangerous. The thickness of ice has reduced and the duration of the ice-free season has extended with warmer winter temperatures (Ford et al. 2006; Nickels et al. 2005). Hunters have adapted themselves to harvesting country food, and find themselves hunting from a boat instead of a dog sled team (Gearheard et al. 2006; Council of Canadian Academies 2014: 136).

***Trade and Wildlife*:** Trade and barter system of exchanging goods for food have been a part of Inuit livelihood and economy especially since contact with European explorers, fur traders, and whalers in the Arctic. Arctic fox fur trade was one of the most important sources of Inuit income during those days and its , collapse after World War II was a major setback (Rennie 2015). Even recently, in spite of a written exemption for Inuit hunters, Inuit have suffered as the European Union along with other 34 countries declared a ban on trade in seal products since 2009 (Inuit Tapiriit Kanatami 2014a).

Similarly, the United States proposal to ban cross-border trade in polar bears and their parts was defeated at the meeting in Bangkokin 2013. In response, Audla (then chair of the Inuit Tapiriit Kanatami) stated: "We don't have cows or pigs or chicken; what we have are the polar bears, the seal, and the walrus. This is how we make our living; this is how we put food on the table. Less than 1 per cent of the global polar bear population was traded. What's traded is not in any way detrimental to the polar bear population. We harvest for subsistence, we are never driven by the market" (McGrath 2013).

In defence of Inuit culture and way of life, Leona Aglukkaq (then Minister of Health, Government of Canada) argued that "the food security issue is not about access to food in the Arctic. It is about fighting environmentalists trying to put a stop to our way of life and

livelihood" (Gunn 2012). Indeed, climate change is the biggest threat to both the polar bear population and Inuit communities in the Arctic.

Moreover, climate change has affected wildlife migration patterns and animal movements in the Arctic. According to Gunn et al. (2009), the population of caribou and moose have decreased by about one-third since the early 1990s while the birds have shifted their breeding and moulting areas. Notably, there was widespread starvation in the Kivalliq region of Nunavut in the late 1940s and early 1950sdue to caribou migration patterns (Rennie 2015).

The Inuit are now worried about country food for future generations as food resources are dependent on the weather, and environment. In this context, Sheila Watt-Cloutier (environmental activist and former chair of the Inuit Circumpolar Council) stated that "due to climate change, the weather is increasingly unpredictable. The look and feel of the land are different, and the sea-ice is changing. The Inuit hunters are having difficulty navigating and travelling safely. The hunters now have even lost their hunting experience and skills"(UNEP/GRID-Arendal and Inuit Circumpolar Conference 2004).This is due to the melting of the thick sea ice in summer that is dangerous for transportation, fishing and hunting. Due to global warming and increases in summer temperatures, stored meat spoils faster and fish are observed to be dying and spoiling quicker in nets (Nickels et al. 2005).
Even water which was used directly from rivers, streams and ponds now needs to be treated. (Gardiner 2007). Rapid snowmelt and heavy rainfall in the summertime can also causediarrhoea and vomiting as was seen in the Rigolet area under the Nunatsiavut region (Than 2012).

Store-bought Food

In addition to country food, store-bought food or market food is another food source in Inuit Nunangat. Store-bought food refers to food that generally not harvested from the environment locally. The consumption of this food started with the arrival of European explorers, Christian missionaries, traders, and whalers in the Arctic. By mid-1900s or 1905, Inuit started consumption of western/modern or store-bought food (Flynn 2006). The modern Inuit depend on a combination of country food and store-bought food that is shipped from southern Canada by plane and sea barge or ship and sold at the local stores. Store-bought food items vary from canned food, fresh vegetables, dairy products, fruits, frozen food, and packaged food items. This food is becoming popular among the younger generations.

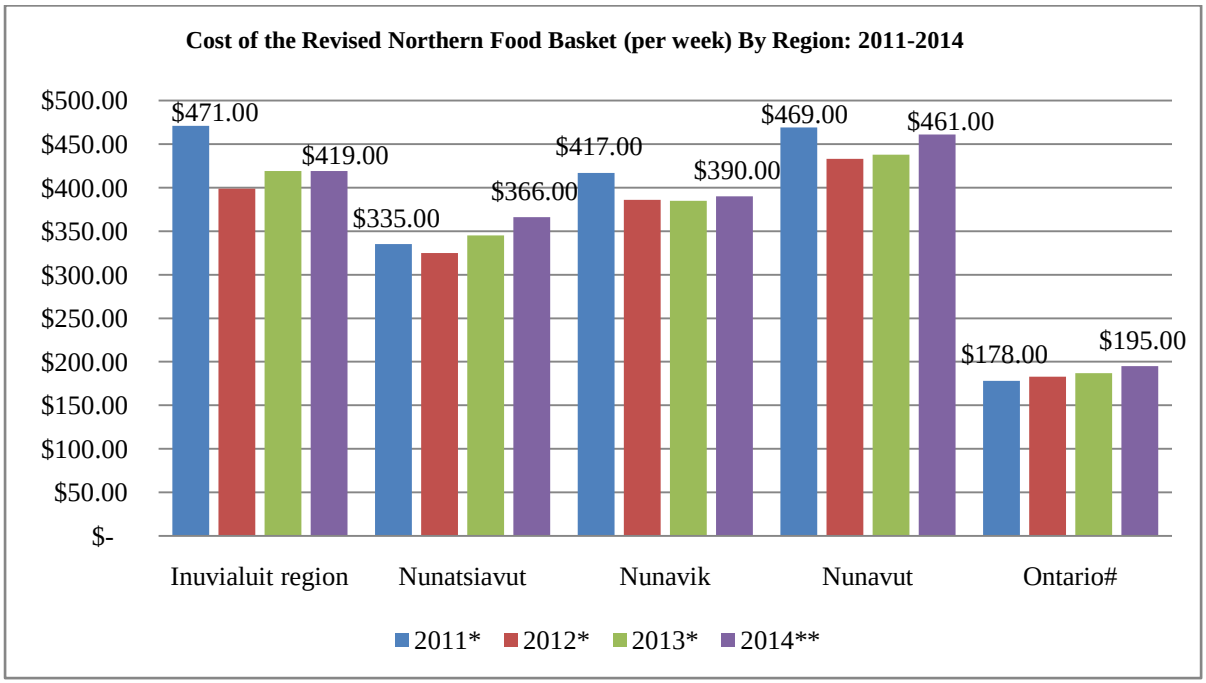
Shipping and Price of Store-bought Food: Store-bought food items are transported by airlift and sealift services since there are no rail routes and no roadways. Sealift service is also not available in the long winter season or bad weather in the Arctic. The food mail flight service works twice a week and brings bread and perishables like milk, fresh fruits and vegetables, tea, coffee, flour and so forth(ITK and ICC-Canada 2012; Giannetta 2009; Lawn and Harvey 2003).

However, the availability of store-bought food in Inuit Nunangat is very limited because of the sparse railways and roadways connections and geographical and climatic factors. Besides, the Inuit population are scattered across a vast landmass of the Arctic, and are significantly small and isolated from the major power station and transportation hubs.

The transportation and shipping of store-bought food items from southern Canada is a major challenge in Inuit Nunangat. Due to the high cost of food transport and shipping, the cost of food price in the Inuit regions are higher than any southern regions of Canada. In 2006, the average cost of a basket of nutritious food which contains 67 standard food items and weighs about 52 kilograms to provide healthy diet for a family of four in a week was recorded at $325 to $500 in Inuit Nunangat (Table 3.7), whereas the same basket of food cost $155 to $200 in Ontario or southern Canada (Wallace 2014; AANDC 2010; Government of Canada 2015; Duhaime et al. 2015; Halton Health Statistics 2015).

According to the 2013 Nunavut Food Price Survey (NFPS), on average, prices of basic food items were over 140 per cent higher in Nunavut than the rest of Canadian April 2013 (Campbell et al. 2014). In 2014, the food prices across Nunavut were still sky-high, despite drop by four per cent from the 2013 food price rate as reported by the NFPS2014. For example, one kilogramme of chicken was selling for $16 in Iqaluit, Nunavut compared to $7 for the rest of Canada.

Table 3.7: Cost of the Revised Northern Food Basket (per week) By Region: 2011-2014



Source:*Revised Northern Food Basket 2011 to 2013 (Duhaime et al. 2015). **Revised Northern Food Basket in 2013-2014 (Government of Canada 2015). #2015 Household Food Security & Cost of a Nutritious Food Basket Indicator Report (Halton Health Statistics 2015).

A four-litre bottle of milk was selling for $10.39 with a sign printed on the package that it would be $20.91 without the subsidy of the Nutrition North Canada (NNC)[4] programme (Rennie 2014).

However, within a few years fits functioning various issues appeared in the management of the NNC programme that replaced the Food Mail Program (FMP)[5]in April 2011. First, food continues to be extremely expensive in northern Canada. According to the 2014 auditor general's report, the NNC does not subsidise items necessary to pursue country food-harvesting equipment, fishing nets, boat motor parts, ammunition and gas. Nor does it

[4]The NNC is the federal government of Canada food subsidy programme that provides directly to northern retailers, food suppliers and distributors and northern food processors through contribution agreements to help lower the price of nutritious food items. The subsidy rates of the programme have varied by the community: some communities are eligible for a partial subsidy and others are eligible for a full subsidy (OAGC 2014). The NNC subsidises food items are perishable food including country food that is commercially processed in the Canadian Arctic or northern Canada (AANDC 2013).

[5]FMP was the Canadian federal government programme initiated during the late 1960s that covers part of the shipping costs incurred when transport nutritious, perishable food and other essential items to isolated northern communities that are not accessible year-round by road, rail or marine service. The programme was managed by Indian and Northern Affairs Canada (INAC), administered by Canada Post Corporation (CPC), and advice on the nutritional aspects of the programme is provided by Health Canada (HC) (AANDC 2010).

support the purchase of other basic necessities like toilet paper, diapers, hygiene products and medical devices. Second, some of the fully subsidised food is not traditionally eaten by the northern communities thus imposing food choices on the communities. Third, there are serious doubts that consumers actually benefit from the programme as many northern communities are ineligible for the NCC subsidy (Kassi and Sheedy 2015).

In essence, shipping $200 worth of groceries in southern Canada cost $500 to $600 a week or $26,000 to $31,200 per year for a family of four in Nunavut(TGM 2012). The average Inuit family in the Nunangat has to spend about $2,000 per month or $24,000 in a year on food alone while compared to their fellows Canadian sat $800 per month or $9,600 in a year.

Climate change has influenced shipping or transportation of store-bought food in complex ways. The thawing permafrost and ice affects the integrity of buildings, roadways, ice roads, and other significant infrastructures such as airport runways, water systems, sewer systems, and construction sites in the circumpolar Arctic. These changes in break-up and freeze-up of the Arctic water bodies affect the consistency of winter roads and the capability to transport necessary items and goods for communities and industry in the regions. Building and construction sites, the infrastructure facility, shipping, transportation and water treatment, supply, and distribution systems are vulnerable and disruptive. Unpredictable weather events such as harsh storms and extreme precipitation levels may lead to adverse floods that are a menace to infrastructure, shipping, and transportation and increase maintenance costs, food prices and even quality of food in the local stores or markets in the region (Governments of the Northwest Territories, Nunavut and Yukon 2011: 15).

Store-bought Food and Nutritional Value: In Inuit Nunangat, food use, processing and preparing of healthy food for the family is a key factor of food utilisation as the cost of food in the northern Canada is dramatically higher than the rest of Canada. In addition, most of the store-bought food items such as fruits and vegetables are unfamiliar to the Inuit. Besides, some of the food items are already spoiled and of very low quality at the time of arrival in the local stores (Campbell et al. 2014).

Many households that rely on weekly food supply do not have access to fresh and good quality food. The store-bought food items are categorised into two groups-vegetables, fruit, milk and grain products that known as healthy food and canned food that contains high

sodium, fat and sugar that is unhealthy (Council of Canadian Academies 2014). Most of the Inuit feel that store-bought food is inferior in nutritive value than country food, and an overall dependence on store-bought food will lead to problems in human health. In general, store-bought food consumed by Inuit are of poor nutritional value (ITK and ICC-Canada 2012; Lawn and Harvey 2004; Kuhnlein and Receveur 1996).

Health Canada has reported that consistent consumption of this nutrient-poor store-bought food has not only brought chronic diseases in the communities but a number of obesity cases are also being observed (ITK and ICC-Canada, 2012; Health Canada 2001). Many suffer from anaemia and obesity, which affects about one in three Inuit in Nunavut. More than half of Nunavut children aged three to five are overweight, which is 10 times higher than elsewhere in Canada. Consumption of country food has dropped and obesity has increased to 24 per cent, up from 19 per cent in 1991. According to the report from the 2004 Qanuippitaa Health Survey in Nunavik, the Inuit lack vitamin D, iron and calcium, because they consumed a diet loaded with trans-fats, sugar, salt and contaminants. The report suggested that some of these problems could be resolved if Inuit consumed more country food that comes from caribou, birds, mussels, seal, walrus meats, and fish like arctic charand trout, Salvelinusalpines, and salmon (George 2010).

Prevalence of Food Insecurity

Canada has a good reputation for producing quality, safe and healthy food. Canada recognises that food security is key to survival and sustainable development (Government of Canada 2009). Yet, food insecurity and hunger they are main problems in the Canadian households. According to the Food and Agriculture Organisation of the United Nations (FAO), "food insecurity is a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life" (FAO, IFAD and WFP 2013).

According to the International Polar Year Inuit Health Survey (IPYIHS) 2007-2008, seven out of ten Inuit population lived with food insecurity in Canada, particularly in Nunavut which has the highest documented food insecurity prevalent for any indigenous population living in Canada (Rosol et al. 2011). While the preliminary household data from the Canadian Community Health Survey (CCHS) 2011 indicates that about 8.2 per cent households were

not food secure (Tarasuk et al. 2015; OHCHR 2012). In essence, the Inuit population who lived in Inuit Nunangat are one of the most hungry people in Canada and the world.

Food Insecurity in Inuit Nunangat: The Inuit Nunangat has the largest food insecurity prevalent in Canada. According to the 2003 Study in Kugaaruk report, five out of six Inuit households experienced food insecurity in Kugaaruk, Nunavut (Ajunnginiq Centre 2004). About 75.8 per cent of Inuit children had skipped meals and 90.4 per cent went hungry while 60.1 per cent did not eat for a whole day (Egeland et al. 2010).

According to the International Polar Year Inuit Health Survey (IPYIHS) 2007-2008, 56.5 per cent Inuit children (aged 6 to 14) faced food insecurity in Nunavut, 32.7 per cent in Inuvialuit region, 49.7 per cent in Nunavikand 25.8 per cent in Nunatsiavut region (Rosol et al. 2011; Pirkle et al. 2014). In addition, the IPYIHS 2007-2008 indicated that about 88.6 per cent adults in the household had skipped meals, 76.9 per cent gone hungry and 58.2 per cent not eaten for a whole day (Rosol et al. 2011).

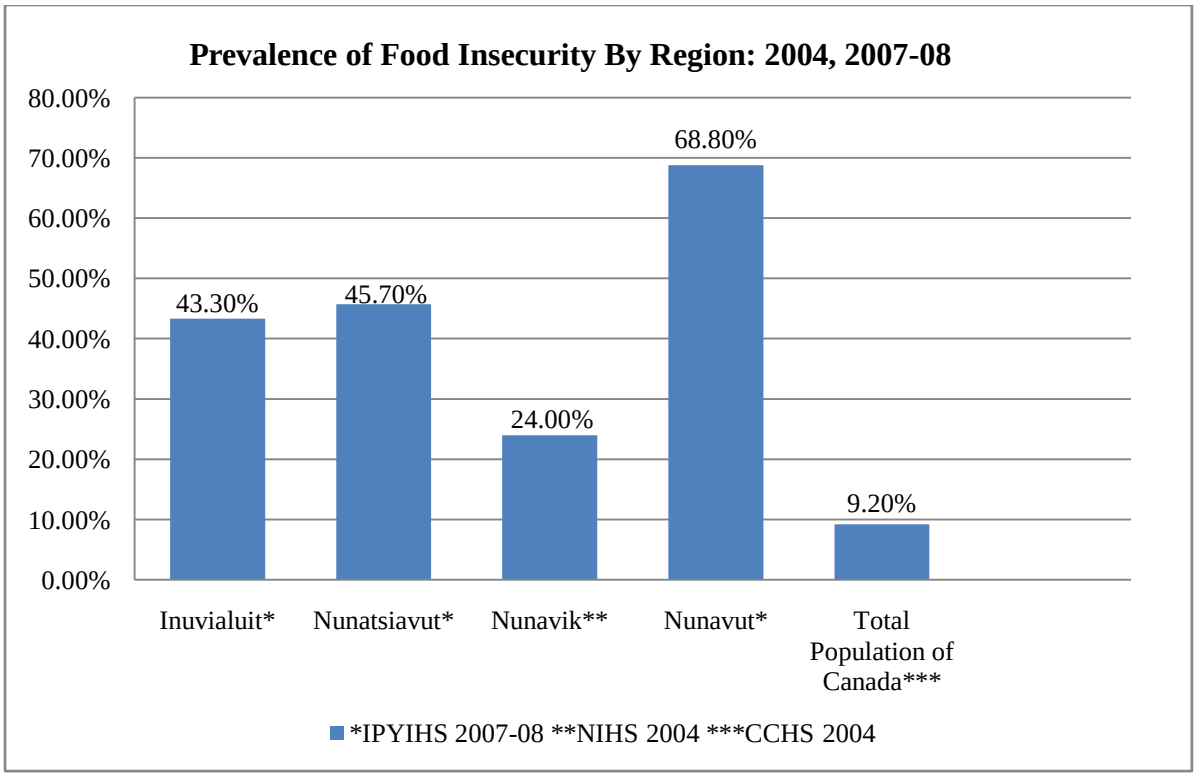
The disparity of food insecurity prevalent in Inuit households was reported by the IPYIHS (2007-08) in the three regions of Inuit Nunangat: about 68.8 per cent in Nunavut, which is over six times higher than the Canadian national average of 9.2 per cent; 43.3 per cent in the Inuvialuit region; and 45.7 per cent in the Nunatsiavut region (ONPP 2007; Rosol et al. 2011). The Nunavik Inuit Health Survey 2004 food insecurity in Nunavik region at about 24 per cent (Anctil 2008; George 2010) which is less than other regions but still higher than the national average (Table 3.8a).

While the 2012 Aboriginal Peoples Survey (APS) showed that Inuit food insecurity in two Inuit Nunangat regions (Inuvialuit and Nunavut)have decreased by over 10 per cent from the previous report, it has significantly increased by 31 per cent in Nunavik region. According to the APS 2012, about 53 per cent of Inuit households in Inuit Nunangat experienced food insecurity (Table 3.8b). In 2011, the lowest prevalence of food insecurity was reported at 32 per cent in the Inuvialuit region compared to 45 per cent in Nunatsiavut, 55 per cent in Nunavik and 56 per cent in Nunavut (Wallace 2014).

Income Influences Food Security: The individual's or household ability to access quality food is influenced by the income of the individuals or households (FAO, IFAD and WFP

2013). According to the 2006 Census report, the Inuit median income was lower than that of the non-indigenous population in Inuit Nunangat.

Table 3.8a: Prevalence of Food Insecurity By Region: 2004, 2007-08

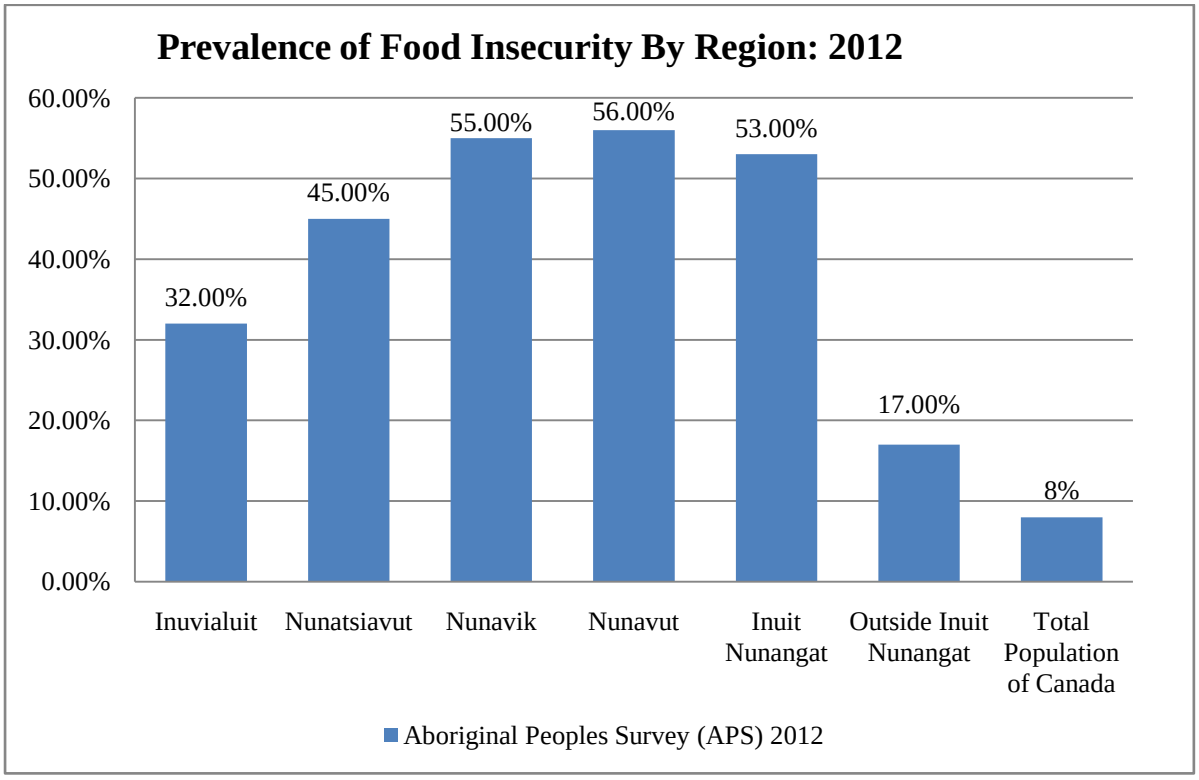


Source: *International Polar Year Inuit Health Survey (IPYIHS) 2007-2008 (Rosol et al. 2011). **Nunavik Inuit Health Survey (NIHS) 2004 (Anctil 2008). ***Canadian Community Health Survey (CCHS) 2004 (ONPP 2007).

In 2005, individual median income for non-indigenous was $60,047 whereas $16,669 was the Inuit median income, which was $43,378 less than that of their counterpart. In Inuit regions, the average Inuit median income was $16,576 in Nunatsiavut; $16,944 in the Inuvialuit;$18,994 in Nunavik and $15,939 in Nunavut (Statistics Canada 2008).

According to the 2011 National Household Survey, the median household income for Inuit inside Inuit Nunangat was $74,021 which is higher than the median household income for the total population of Canada at $74,777 (Table 3.9).However, the households in Inuit Nunangat are larger than that outside Inuit Nunangat or the rest of Canada. In essence, the median household size in Inuit Nunangat is 5 people while 3 people for the total population of Canada.

Table 3.8b: Prevalence of Food Insecurity By Region in 2012



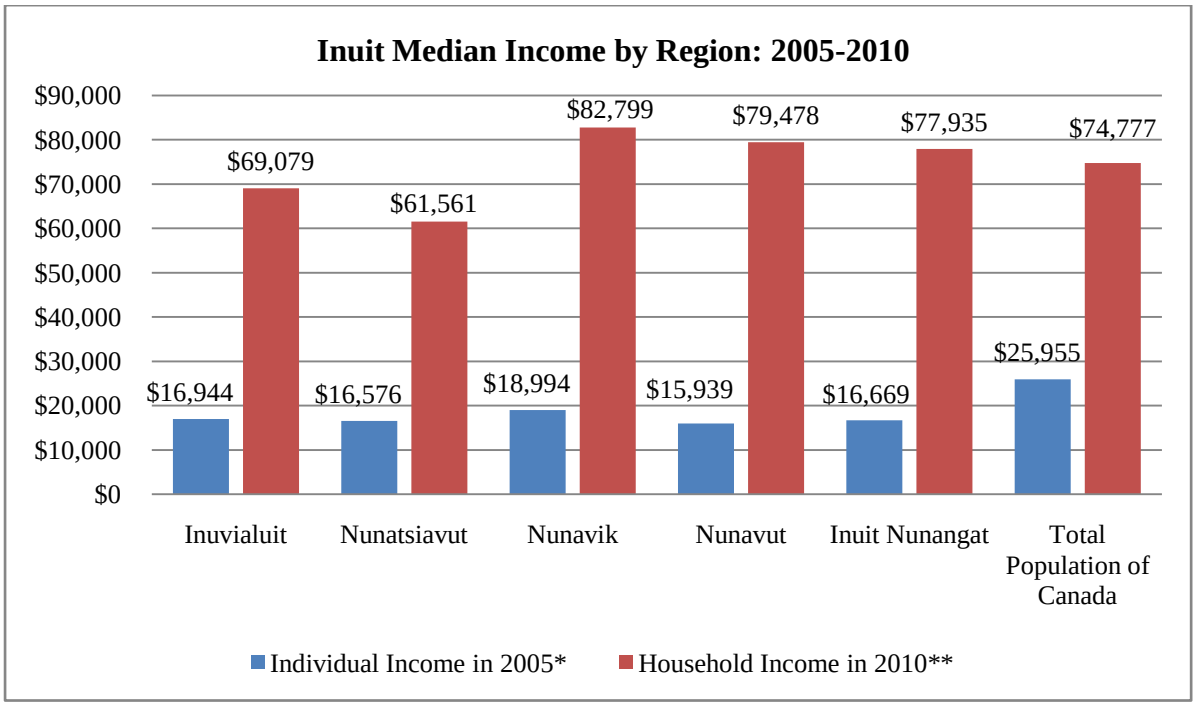
Source: Aboriginal Peoples Survey (APS) 2012 (Wallace 2014).

In addition, the cost of living in the Inuit Nunangat is generally higher than that of southern Canada. There is actually less income per person than outside Inuit Nunangat or the rest of Canada (Wallace 2014; Rogan 2003). The average Inuit median income in Nunavut was just around $16,549 in 2011 (Statistics Canada 2008).

Unemployment Influences Food Security: The high rate of Inuit unemployment is a significant contributory factor for food insecurity prevalence in Inuit Nunangat. According to Statistics Canada, the 2006 unemployment rate for Inuit adults of both sexes in the working-age group was almost four times higher than for their non-indigenous counterparts at 20.4 per cent against 5.2 per cent (Table 3.10). According to the IPYIHS 2007-08, about 87 per cent of food insecure households in Nunavut resulted from "not having enough money" to buy healthy food (Campbell et al. 2014; Rosol 2009). The Inuit unemployment rates in Nunavut were 19.2 per cent and 18.8 per cent in Nunavik. Unemployment rates for the Inuit adults

were much higher in Nunatsiavut at 34.8 per cent and 24.5 per cent in the Inuvialuit region. (Statistics Canada 2008a).

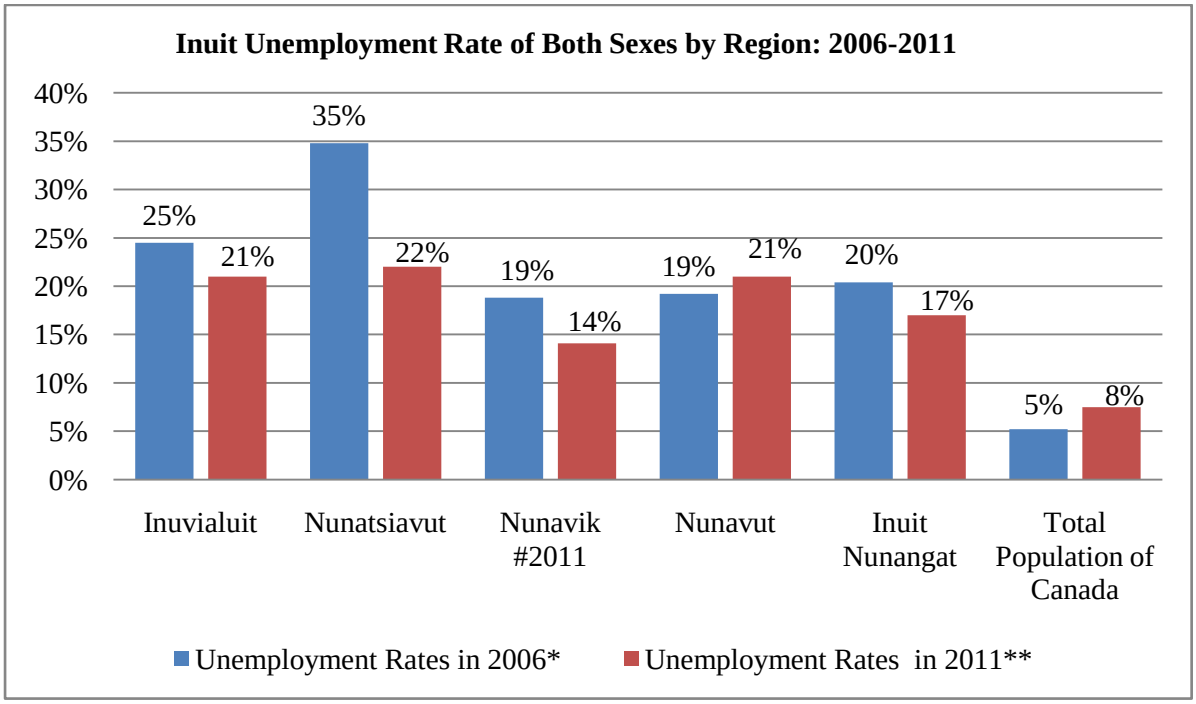
Table 3.9: Inuit Median Income by region: 2005-2010



Source: *2006 Census of Population (Statistics Canada 2008). **National Household Survey 2011 (Wallace 2014).

The 2011 National Household Survey (NHS) indicated that the average Inuit unemployment rate in two Inuit Nunangat regions decreased by about 2.5 per cent; over 10 per cent in Nunatsiavut, but increased by 1.8 per cent in Nunavut region. In 2010, Inuit accounted for 78 per cent of Nunavut's working-age population, yet on average made up only 64 per cent of employed people in the territory. On a national scale, the average total income for Canadian families of two or more people is $69,850, compared to $62,680 in Nunavut, a difference of more than $7,000. Yet the average household expenditure for food in Nunavut, as already mentioned above, is more than three times the average household expenditure for Canada as a whole (Nunavut Tunngavik Incorporated 2013; Statistics Canada 2011). All these indicate an additional dependence on store-bought food and a move away from traditional life-styles not out of choice but more out of necessity due to changing circumstances.

Table 3.10: Inuit Unemployment Rate of Both Sexes By Region: 2006-2011



Source: *2006 Census of Population (Statistics Canada 2008). **National Household Survey 2011 (AANDC 2013). #Nunavik in Figures 2015 (Duhaime et al. 2015).

Climate change influences food systems and thus affects food security. According to the Food and Agricultural Organisation of the United Nations (FAO), "climate change affects all four dimensions of food security: food availability, food accessibility, food utilisation and food stability. It has impacted human health, livelihood assets, food production and distribution channels or food transportation and supply, and is also affecting purchasing power and market flows" (FAO 2008: iii). The prevalence of food insecurity in Inuit Nunangat is a serious challenge to Inuit population and health.

Conclusion

There is no doubt that the Inuit Nunangat has witnessed immeasurable changes in its culture and lifestyle ever since European colonisation which has impacted on their food habits, housing and health. However, the discussion in the current chapter focused on what the reasons have been for these changes. Can they simply be attributed to cultural colonisation and modernisation, or global warming and climate change? What are the changes and how has the Canadian government responded?

The continuing climate change in the Arctic or Inuit Nunangat has led to increasing challenges for its peoples. Rising water levels and frequent occurrence of erosion and floods, lead to transportation and infrastructural damages increasing food insecurity (Inuit Tapiriit Kanatami 2007).

Change in the environmental conditions in the Arctic affect the habitation and sustainability of species for country food in northern Canada in terms of quantity and quality. The presence of contaminants such as mercury, lead, and polychlorinated biphenyls, in marine life have radically increased in the Arctic (Laird et al. 2013a; Van Oostdam et al. 2005). The levels of exposure to these contaminants among the inhabitants in Nunavik and Nunavut have surpassed the Canadian and global safety advisories and guidelines. The Inuit communities who eat marine mammals have blood mercury levels which are 3 to 10 times higher than the population that consumes store-bought food in the same region (AMAP 2003a and 2009a; Tian et al. 2011; Van Oostdam et al. 2005; Chan et. al. 1995; Kuhnlein et al. 1995).According to the Nunavut Inuit Children's Health Survey (NICHS) 2008-09, almost 25 per cent of Inuit children aged 3 to 5 had hair mercury concentration levels equal to or higher than the World Health Organisation (WHO) reference level of 2 μg/g (Tian et al. 2011; Council of Canadian Academies 2014: 138-9).

Apart from this, Inuit hunters have to travel extra miles to harvest country food, they have also to adjust and adopt alternate routes due to animal migration(NOAA 2013).This adaptation and adjustment to the demographic and environmental changes have major impact on food security and thus health care issues in Inuit communities. Rising household expenditures to access store-bought food adds to the increasing menace and cost of accessing country food (Nickels et al. 2005).

According to the Governments of the Northwest Territories, Nunavut and Yukon, the prioritisation of other important concerns in each territory, such as health care, housing and food security issues make responding to climate change per se a less important priority. In fact, some of their major challenges are limited financial power and an extensive scope of responsibility that make it hard to plan long-standing strategic investments in the Arctic.

Human power or the limited workforce numbers in the Arctic, limits service delivery to the small but widely dispersed population in the Arctic. The risk analysis and identification of the

impact of climate change and capacity to build solutions are limited and restricted by inadequate financial and human resources in the regions. Logistical challenges comprise a lack of roadways to various communities in the Arctic, and a limited time window for sealift services, expensive air travel, an extreme climate and weak telecommunications networks system in the regions (Governments of the Northwest Territories, Nunavut and Yukon 2011: 18).

The three territorial governments in northern Canada face various challenges in responding effectively to climate change. Their common challenges provide an opportunity for them to work together to focus on adaptation and mitigation policies. It is particularly significant for each territorial government to continue working with the indigenous communities/peoples to enhance awareness of climate change impacts, and identify hazards, dangers to develop effective solutions to climate change in the Arctic (Governments of the Northwest Territories, Nunavut and Yukon 2011: 18). The next chapter will discuss these policies and programmes taken by the Canadian government.

CHAPTER 4

CANADIAN POLICY INITIATIVES TOWARDS CLIMATE CHANGE

Introduction

Adaptation and mitigation are the two types of policy responses that are usually applied to climate change. These are mechanisms to deal with climate change at the local, regional, national and global levels. Adaptation refers to activities or programmes meant to deal with the fallouts of climate change on human beings and the environment (Schipper 2006; Warren and Egginton2008: 30).The implication thus is that climate change is unavoidable and that we have accepted it. Mitigation, on the other hand, refers to human intervention to remove the source or enhance the diminution in the concentrations of greenhouse gases (GHG) in the atmosphere (Intergovernmental Panel on Climate Change 2001a). The objective of mitigation is to prevent climate change and thus its focus is on the causes such changes, like GHG emissions by the anthropogenic forces (Warren and Egginton2008: 30; Schipper 2006).

According to the European Commission's Directorate-General for Climate Action (DG CLIMA), "adaptation is anticipating the adverse effects of climate change and taking suitable action to minimise or prevent the damage they can cause, or taking advantage of opportunities that may arise. It has indicated that a well-planned and early adaptation action saves lives and money subsequently" (European Commission Climate Action 2016). Adaptation to the negative impacts of climate change is significant in dealing with the effects of climate change which are already experienced in the region with plans to reduce and adapt to the future impacts. Moreover, the United Nations Framework Convention on Climate Change (UNFCCC) had stressed that successful adaptation to climate change is not only based on the action taken by governments of one or two nations but also on the active and persistent strategies, commitment and participation of all stakeholders including civil society and its organisations, various communities and their organisations, private and public sectors, local, national, regional, multilateral, intergovernmental and international organisations (UNFCCC 2014).

Adaptation is one of the options under taken by governments at all levels in Canada—from municipal to provincial, territorial and federal—to combat climate change impacts. This chapter discusses the policy initiatives taken by the Canadian federal, provincial and

territorial governments and the Inuit community organisations that address climate change impacts, particularly in the four regions of Inuit Nunangat: Inuvialuit region, Nunatsiavut, Nunavik and Nunavut. This chapter also provides the development programmes of the adaptation policy in Canada, which have implications for the socio-economic, health, food, culture and traditional way of life of the Inuit communities in Canada. It also describes key federal government policies, strategies, and frameworks related to mitigation policy of climate change within the domestic as well as the international level.

The Government of Canada has recognised that climate change is taking place due to the increasing level of emissions of GHG across the world (OAGC 2014). Canada has experienced the impacts of climate change in all regions of the country. It needs to allocate funds to reduce emissions of GHG such as: i) carbon dioxide (CO2), ii) nitrous oxide (N2O), iii) methane (CH4), iv) hydrofluorocarbons (HFCs), v) nitrogen trifluoride (NF3), vi) sulphur hexafluoride (SF6), and vii) perfluorocarbons (PFCs),which are slowly increasing in the atmosphere due to the human-made activities. Climate change has severely impacted Canada's economy, food security, human health, infrastructure and natural environment. Reports of the Auditor General of Canada (2014) have indicated that the impact of changing climate and its environmental consequences is already evident in Canada.

Since the signing of the 1992 UN Conference on Environment and Development (UNCED), also known as the Earth Summit, under the UNFCCC in Rio de Janeiro, Brazil, the Government of Canada has made national and international commitments to address the issue of climate change by minimizing the emission of GHG. While the Conservative government in Canada had officially announced withdrawal from the Kyoto Protocol commitments in December 2011, Canada intended to reduce GHG emissions by 17 per cent below 2005 levels by 2020.Canada is also a signatory or party to the UNFCCC and the Copenhagen Accord of 2009 (Office of the Auditor General of Canada 2014). Moreover, Government of Canada is committed to attaining its national and international obligations to bring down greenhouse gas emission by 30 per cent below 2005 levels by 2030 as the Intended Nationally Determined Contributions (INDCs) or Canada's contribution to the 2015 United Nations Climate Change Conference (COP 21) held in Paris.

In essence, adaptation and mitigation are co-dependent, even though distinct. The greater the level of climate change, the more substantial requirement for wide-ranging adaptation, which

is more challenging and expensive. Moreover, there are some programmes and actions that would be considered both adaptive and mitigative like planting trees in urban areas. That has both positive consequences of decreasing greenhouse gas concentrations in the atmosphere (mitigation) and decreasing temperatures, which cools the immediate environment(adaptation) (Mendelsohn 2006; Warren and Egginton2008: 30; Lemmen et al. 2008).

Canada's Adaptation Policy

Adaptation to climate change means acclimatising and therefore reducing potential damage, destruction, and harmful effects of this change. The Intergovernmental Panel on Climate Change (IPCC) has affirmed the linkages between climate change, adaptation and sustainable development. The IPCC has clearly identified that "the adaptive capacity to deal with climate risks is closely related to sustainable development and equity. The augmentation of adaptive capacity is fundamental to sustainable development" (Smit et al. 2001: 899). In fact, adaptation is a key concept for all concerned with promoting the community development and sustainable development in the region (Bruce and Haites 2008: 418).

Since Canada's 5th National Communication 2010 report on commitments under the UNFCCC to tackle the challenges of climate change, an understanding on impacts of climate change was reached. Adaptation is increasingly accepted and acknowledged as a wider response to climate change. Adaptation can be used to handle the risks of climate change and also benefit development. Moreover, the adaptation process has improved; more shareholders are involved in discussions, with adaptation research, increasing and programmes being implemented in Canada (Government of Canada and Environment Canada 2014). In order to be effective, adaptation to climate change needs the collaboration and partnerships at different levels of government, civil society organisations, non-governmental organisations (NGOs), public and private companies/sectors, and other shareholders in the country to assess vulnerabilities and ensure that the community or nation economies, and ecosystems are resilient to future changes. Adaptation to climate change includes developing ways to protect the individuals, families, and communities by preventing and reducing their vulnerability from climate change impacts (UCAR 2011). While the rising prevalence of Inuit food insecurity, poverty, and hunger, housing crisis, environments or food contaminants, low status of Inuit health and social conditions, the degradation of the Arctic environments, and living cost in Inuit Nunangat are highlighted consistently by the Aboriginal Peoples Survey

(APS) 2001, 2006 and 2012, International Polar Year Inuit Health Survey (IPYIHS) 2007-08 and Canadian Community Health Survey (CCHS) 2011 and research reports including Canadian Council of Academies 2014.

In response to the impacts of climate change on the social determinants of Inuit health in Inuit Nunangat or the Canadian Arctic, the following section discusses socioeconomic issues focusing on food and health. The section also highlights policy initiatives taken by the Canadian (federal, provincial and territorial) governments and Inuit communities in the region in support of Inuit subsistence and traditional livelihood. Examples of such programmes are the Food Mail Programme (FMP), the Nutrition North Canada (NNC), the Harvester Support Programmes (HSP) in Inuvialuit region, etc.

Food Security Programmes

Food security has become a primary concern in northern Canada, particularly in Inuit Nunangat due to numerous complex factors including climate change. According to Terry Audla (former chair of Inuit Tapiriit Kanatami), in order to attain and achieve food security levels among the Inuit communities, Inuit are collaborating with Inuit Nunangat regions and other partners through the Inuit Food Security Working Group (IFSWG), which is currently developing a National Inuit Food Security Strategy (NIFSS) to lay the framework for effective and sustainable solutions to food security at the local, regional and national levels (Inuit Tapiriit Kanatami 2014b).

The partnership and combined work by all levels of governmental and nongovernmental agencies, Inuit community organisations and other stakeholders have resulted in improving food access, food affordability and food availability, as well as reducing the barriers for future generations to eat nutritious country food in this region. Inuit Tuttarvingat of the National Aboriginal Health Organisation (NAHO) has prepared community food security activities and programme outlines through combined traditional knowledge based and the scientific studies to resolve the communities' food problem in the near future (Carry and Carfagnini 2012: 3-4).

***Federal Government Initiatives*:** Food security and nutrition are significant issues in the Canadian Arctic communities, particularly among the Inuit communities living in isolated and remote areas like Inuit Nunangat. Food security is determined by food access, food

availability, food used/utilisation, and food stability in terms of adequate quality, availability and accessibility at all times. Food security can be measured at the family or household, individual, community, national, and regional as well as global levels (Tarasuk 2001; FAO 2009; FAO, IFAD and WFP 2013 and 2015).

Social determinants of health conditions in the northern communities of Canada are very poor. There has been growing prevalence of high levels food insecurity and hunger, sky-high cost of food prices, high rates of unemployment, low income, and poverty among the Inuit and other indigenous communities across the Canadian Arctic. The prevalence of diet-related diseases such as diabetes and obesity, and high-levels of nutritional deficiencies like iron and vitamin D is rampant. To this list could be added the lack of affordable food security programme and strategy in the Canadian Arctic region or across Canada (INAC 2009).

Canada has recognised that access to nutritious or healthy food at affordable prices is key to resolve food insecurity prevalent among the Inuit communities. The cost of living, food prices and transportation costs in the Canadian Arctic and Inuit Nunangat regions are at least two to three times higher than the rest of Canada. In response, the Government of Canada initially created the Northern Air Stage Programme (NASP) after the Second World War. Later, the Food Mail Programme (FMP) came into existence in the late 1960s (Burnett et al. 2015: 144). Transportation costs incurred when shipping nutritious, perishable food and other essential commodities to isolated and remote northern Canadian communities which are inaccessible year-round by road, rail and ship services in Canada are partly covered by the FMP. Subsequently, the Food Mail Programme (FMP) also began providing a facility to meet the social, physical, mental or psychological needs for the well-being of the communities living in northern Canada including Inuit Nunangat (INAC 2009).

This subsidy programme was to make it feasible for retailers in these communities and shareholders to sell fresh food and nutritious perishable food stuff at lower prices (INAC 2002; 1). The objectives of the FMP are: i) to make nutritious but perishable food-stuff more affordable to these isolated and remote communities; ii) to increase access to non-perishable foods including other indispensable items; and iii) to promote healthy eating and a nutritious diet (INAC 2009: iv).

Initially, the FMP was run by Canada Post/Canada Post Corporation (CPC) to cover part of the cost of shipping and transporting eligible items. From 1991, the Department of Indian and Northern Affairs Canada (INAC) managed the Food Mail Programme (Burnett et al. 2015: 144). While the Health Canada (HC) provided advice and guidance on nutrition, Canada Post was providing the Food Mail service by contracting with flight suppliers or air carriers. There are three major categories of items on the Food Mail Programme that are provided to these northern communities: i) nutritious perishable food like bread, cheese, eggs, fresh vegetables, fruit and frozen fruit and food, milk, fish and meat; ii) non-perishable food such as baking supplies and flours, canned food, cereal, pasta, coffee and tea; and iii) the basic essential non-food items such as household supplies, clothing, and personal care products. Fresh and nutritious affordable food items from southern Canada are a significant source of supplementary diet that complements country/traditional food. With the FMP subsidy programme, the lesser-cost nutritious food shipped by Food Mail has resulted in a healthy diet that is essential for the communities in the regions (INAC 2002).

The FMP covered about 140 communities (a population of over 100,000) in northern Canada including Nunavut, Inuvialuit region, the Northwest Territories, Yukon, Nunatsiavut, Labrador, Nunavik, Quebec, Alberta, Manitoba, Ontario and Saskatchewan that are eligible to get the FMP. Communities that live in the isolated and remote areas only for a short period of time are not eligible for this food programme. Members of eligible communities and individuals including retailers who receive the FMP provided by their suppliers in southern Canada have a Food Mail account with Canada Post. The communities and individuals benefit from the food programme by shopping at the local stores that use the FMP in the region (INAC 2009).

Over the years, because of population growth and increasing fuel prices, expenditures increased, and the programme often exceeded its budget. In 2006, the Government directed the Department of the Aboriginal Affairs and Northern Development Canada to review the FMP and develop options to improve its efficiency, while maintaining financial sustainability and predictability (Office of the Auditor General of Canada 2014). In fact, due to high costs of food in the northern Canada and Inuit regions, the programme was considered not as effective as expected by the FMP, which led to a series of reviews and studies. In 2011, Nutrition North Canada (NNC) was created to replace the FMP with a more effective food

subsidy programme (AANDC 2013). Thus, the NNC was launched on the 1st of April 2011, replacing the former Food Mail Programme (FMP).

The NNC is the Government of Canada's subsidy programme aimed at providing northern communities with improved and wider access to perishable nutritious food transfer payment based on a market-driven model. The NNC subsidises food items that are also perishable, including country food which is commercially prepared and processed like packaged foods, meats, cans or bags in the Canadian Arctic (AANDC 2013). Notably, the NNC has a fixed budget of approximately $60 million in a year. Of this allocated amount of $60 million, about $53.9 million is to be paid annually to the subsidy component in the programme. The NNC subsidy programme is provided directly to the northern distributors, retailers, food suppliers and northern food processors through contribution agreements to lower the cost of nutritious and health food items. In this context, the retailers and food suppliers make their own supply-chain arrangements and run the business while the Department of the Aboriginal Affairs and Northern Development Canada (AANDC) expects to keep transportation, shipping and handling costs low. The rates of the NNC subsidy vary by the community in the programme criteria. Some communities are eligible for a partial subsidy and others are eligible for a full subsidy in the NNC programme (OAGC 2014).

The AANDC maintains the subsidy list of food items and the list of eligible northern Canadian communities. The Department is responsible for selecting the lists of eligible communities that can receive the benefit of the subsidy programme among the communities in the Canadian Arctic. The objectives of the NNC are comparatively similar to the FMP: a) to make nutritious food more accessible and more affordable to the isolated and remote communities and residents in the Canadian Arctic; b) to support and sustain the consumption of country food diet among the indigenous communities which is important for the social, cultural, spiritual well-being; and c) to provide healthy food choices and nutrition education on development of food preparation, process, skills which are targeted and provided by Health Canada (AANDC 2013).

The perishable food items can be refrigerated, frozen and is fit for consumption within a year. A larger subsidy level applies to the most nutritious perishable food items, such as bread, fresh vegetables, frozen vegetables, fresh fruit, eggs, milk, and meat. A lower subsidy level of the programme applies to other food stuff like crackers, ice cream, flour, and combination or

mixture food items such as lasagne and pizza (INAC 2009). Country food meats or fish like caribou, muskox, arctic char and others fish are eligible for a subsidy under the programme. The country food items must either be commercially prepared and processed in the Canadian Arctic under the country food specific subsidy rate and shipped by air to eligible communities in the northern Canada, or shipped by air from southern Canada by the registered suppliers or retailers for the same subsidy as other meats to eligible communities in the region. At present, there are three country food preparation and processing facilities in Nunavut that meet the programme's requirements under the country food specific criterion, such as: i) Kivalliq Arctic Foods Limited in Rankin Inlet, ii) Pangnirtung Fisheries Limited in Pangnirtung, and iii) Kitikmeot Foods in Cambridge Bay (AANDC 2013).

While the Nutrition North Canada (NNC) programme seems to be working well, there are some serious issues in its management. According to Canada's Auditor General Report 2014, the NNC does not subsidise the important items that are essential for pursuing country food harvesting-equipment for fishing and hunting which include boat parts or automobile motor parts, gas, fishing nets, rifle and ammunitions. Nor does it provide the subsidies on other basic necessities like hygiene products, diapers, toilet paper, and medical devices. Some of the fully subsidised food items are not commonly consumed by the indigenous communities/peoples which implies that food choices are being imposed among the communities in the region. Moreover, there are serious doubts whether consumers actually benefit from the programme as many northern communities are ineligible for the Nutrition North Canada subsidy (Kassi and Sheedy 2015).

Olivier De Schutter, the UN Special Rapporteur on the Right to Food who submitted a report in May 2012 to the UN Human Rights Council (UNHRC) claimed that neither NNC nor the FMP could address the primary issues that were responsible for the high costs of food items in the communities living in the Canadian Arctic. The high cost of energy for equipment maintenance, building construction, electricity generation, heating and refrigeration are major issues for these communities. The cost of food remains higher in the Canadian Arctic region than elsewhere in Canada for justifiable factors but more needs to be done to improve the effectiveness of the NNC programme in the region. The Special Rapporteur is concerned about the design and implementation of the NNC programme without establishing accountability and transparency procedures that provide the communities in the Canadian

Arctic with an opportunity to apply their right to food and life in the country (OHCHR 2012: 18; Office of the Auditor General of Canada 2014).

The NNC has circulated the rate of the subsidy items per kilogramme for each eligible community but does not demand of the dealers or retailers to inform the Department of the AANDC. In fact, the NNC programme extends subsidies to retailers and suppliers who operate within the programme and to food suppliers in southern Canada. The subsidies are aimed at providing consumers or communities lower market prices for eligible items. However, in the absence of satisfactory monitoring, it is ambiguous whether the subsidy programme is achieving its expected outcome. As such, the federal Government of Canada has no way of authenticating if the subsidy programme is being distributed, despite the requirement imposed on subsidy beneficiaries to prove that they have fulfilled the obligation at the time of submitting subsidy claim, and the compliance reviews conducted by independent auditors like the Auditor General of Canada. Some of the issues were also raised regarding the eligibility criteria on which communities fall within the scope of the programme and which items are subsidised. Under the NNC programme, at least 31 isolated and remote communities in the Canadian Arctic that were eligible under the FMP, purportedly became ineligible despite the fact that they had not relied on the programme in the preceding years. As a result, the Government of Nunavut is currently taking steps by formulating a monitoring programme that should become a viable solution in addressing the issue in near future, and would involve the Nunavummiut/Inuit in the region (AANDC 2013; OAGC 2014).

Community/Regional Initiatives: The harvesting of country food is the cultural, economic and social foundation of the Inuit traditional livelihood as well as the community wellness, and it represents a key component of the contemporary mixed subsistence and wage-based economy of the Inuit communities in Nunavut. As a result, the Harvester Support Programmes (HSP) are framed with the objective of supporting traditional harvesting practices, production and consumption of country food. The Government of the Northwest Territories operates a number of programmes for the support of harvesters within the territory. These programmes date back to 1985 when the initial programme guidelines and budgets were established (Aarluk Consulting Incorporated 2008: 30). The existing harvesters support programmes in the four regions of Inuit Nunangat encompassing the Community Harvester Assistance Programme (CHAP), the Inuvialuit Harvesters Assistance Programme

(IHAP) in the Northwest Territory and Take a Kid Trapping and Harvesting (TKTH) in Inuvialuit region (northern portion of Yukon and northwest portion of Northwest Territories); the Inuit Hunting, Fishing and Trapping Support Programme (IHFTSP) and Nunavik's Hunter Support Programme (NHS) in Nunavik (Northern Quebec); Going Off, Growing Strong (GOGS) or Aullak, Sangilivallianginnatuk in Nunatsiavut(northern coastal Labrador); and the Nunavut Harvester Support Programme (NHSP) in Nunavut (Gombay 2005; Council of Canadian Academies 2014: 175).

The Nunavut Harvester Support Programme (NHSP) was launched in 1993 by the Tunngavik Federation of Nunavut and the Government of the Northwest Territories to provide monetary help to eligible beneficiaries of the Nunavut Land Claims Agreement (NLCA) lacking in equipments for fishing, hunting, trapping and supplies for harvesting. The two partners chipped in US$15 million each toward the fund, amounting to a total ofUS$30 million. The money was invested by the Nunavut Hunters Income Support Trust (NHIST), which enabled the programme to be continuously funded while Nunavut Tunngavik Incorporated (NTI), the Government of Nunavut and the Government of Canada call the shots on whether to invest in the prolonging the programme. In addition to this programme, the Nunavut Economic Development Strategy (NEDS) was introduced in 2003, to revise the harvester support policies of the Government of Nunavut and NTI so that they are complementary and better reflect Nunavut's mixed economy (Aarluk Consulting Incorporated 2008: 4). Subsequently, the Government of Nunavut has launched the Nunavut Food Security Strategy (NFSS) that focuses on 6 key programmes, such as country food, local food production, store-bought food, community initiatives life skills and training programmes and policy and legislation on food security. In fact, the Government of Nunavut has called for action on food insecurity through the Tamapta mandate through a collaborative action plan with a strong and critical focus on partnerships, by various joint ventures of the government departments, along with non-governmental organisations, private sector and Inuit organisations with the aim to achieve food security in the region (Government of Nunavut and Nunavut Tunngavik Incorporated 2014: 3; Inuit Tapiriit Kanatami 2014b).

For the survival of country food harvesting practices, the Northwest Territory government introduced Take a Kid Trapping and Harvesting Programme (TKTHP) in 2002. The programme is designed for youth of all ages with the intention that traditional practices, skills and knowledge such as hunting, fishing, trapping and outdoor survival skills should be pass

down to the next and future generations. The Government of Northwest Territory provides funds to schools in the Northwest Territory by organizing on-the-hand skills training, for at least two weeks. Apart from hunting, fishing and food gathering, the groups are often taught preparation of country foods, tracking, repairing of both modern and traditional harvesting equipment, respect for the environment, and key lessons on preparedness for land excursions and tourism (Council of Canadian Academies 2014: 181; Carry 2012). In 2009-2010, the programme extended support to 39 projects which involved 1,726 participants, at an overall cost of US$305,000, or about US$177 for an individual in the TKTH programme (Government of the Northwest Territories 2011). When the programme was inaugurated/instituted in 2002, there were 386 youth participants. As of 2011, the numbers have climbed to 2,274 youths from 49 schools in the region (Carry 2012; Council of Canadian Academies 2014: 181).

Similarly, Going Off, Growing Strong (GOGS) or Aullak, Sangilivallianginnatuk programme was launched by the Government of Nunatsiavut in Nain to assist and build the resilience of the Inuit youth with skills and knowledge in the face of widespread environmental, social, and cultural change in the region. The first group of 10 youth, aged 14 to 21, started the programme in March 2012 and completed the programme in August 2013 becoming Junior Harvesters in Nunatsiavut. The activities of the programme consist of fishing, hunting, trapping, respect, cultural traditions and travelling. It is a multi-sectoral partnership led by the Nain Inuit Community Government and the Nunatsiavut Government's Department of Lands and Natural Resources based at the Nain Research Centre, in partnership with community members, local health authorities, schools, government departments and university (Council of Canadian Academies 2014: 181; Nunatsiavut Government/Nain Research Centre 2015).

At the same time, many food security networks and organisations in Canada at local, municipal, provincial, territorial, and national levels are involved at working to achieve food security in the country. For instance, the Centre for Indigenous Peoples' Nutrition and Environment (CINE), a multi-disciplinary resource centre for community-based research and education with regard to traditional food systems was created in 1992 at the McGill University in Montreal to address the indigenous peoples' concerns about their food, food use, and environment (Council of Canadian Academies 2014: 165). By using the social networking site and media, "Feeding My Family" in the Facebook Group was created in 2012 to bring awareness about the high price of food and its impact on food insecurity in Nunavut

and other parts of northern Canada. This group utilise traditional knowledge combined with practical advice on how to prepare market food, foster community-based solutions to address food insecurity by establishing food banks, promoting closer cooperation and collaboration with local and territorial governments (Council of Canadian Academies 2014: 164).

Growing Food in the Canadian Arctic: Climate change in the Arctic has brought a lot of transformations in the region. Growing Forward (GF) is one of the options in northern Canada. Producing locally grown food, especially vegetables and fruit will expand local economies. GF provides the communities with healthy, nutritious and locally produced food choices that have an important effect on the cost of food and living in the Arctic. GF is a national agricultural framework programme to manage federal and provincial/territorial agriculture policy in the country. The federal, provincial/territorial governments in Canada provided US$1.3 billion to farming and gardening families over a period of five years from 2009 to 2013 in northern Canada. In July 2009, the federal government of Canada signed an agreement with the Northwest Territories that would provide US$3.2 million for farming in the region (AG Canada 2009).

The GF programme, particularly growing vegetables and fruit across northern Canada including the Inuit settlement areas is one of the food security initiative programmes in the region. Farming, gardening and growing vegetables practices are not common among the Inuit communities in the Arctic. Growing food is not traditionally a part of Inuit culture and it is not yet prevalent among the Inuit communities in the region. In fact, this programme will not affect and replace country food, but it is supplementing the Inuit diet in the Arctic. In general, the Inuit communities depend mainly on weekly store-bought food shipments or food transported by air to deliver fresh food items, such as vegetables and fruit from southern Canada. Locally grown foods are fresh, healthy, and a lot more affordable than similar store-bought food stuff in the stores. Both indoors gardening that under greenhouse protection building and outdoors gardening in the summertime are viewed as an alternative choice to store-bought food and vegetables (Carry and Carfagnini 2012: 3-4). This programme is another solution to the impact of bad weather that causes delayed deliveries, and the concern that inappropriate food handling has reduced the freshness and quality of the store-bought food items in the region.

Subsequently, Growing Forward 2 (GF2) programme was launched by the Government of the Northwest Territories in partnership with the Government of Canada in 2013. GF2 is also has a five-year policy framework for Canada's agri-food and agricultural sector from the year 2013 to 2018. GF2 is a $3 billion worth investment by the Canadian federal, provincial and territorial (FPT) governments and the institution for agricultural programmes and services in the country. The GF2 programme will focus on improvement of economic and market development to ensure Canadian food producers have the apparatus and resources they require to innovate and take advantage of the emerging market opportunities in the region. In the Northwest Territory region, GF2 is focusing on a small scale food programme, promoting commercial greenhouses development through market farm, gardens and commercial harvesting in rural and urban areas; and also enhancement of traditional harvesting programmes, including Take a Kid Trapping and Harvesting Programme (TKTHP) and Going Off, Growing Strong (GOGS). GF2 will enhance the agricultural products and agri-foods awareness in northern Canada (Council of Canadian Academies 2014: 171-72; Government of the Northwest Territories and the Government of Canada 2011).

Similarly, Inuvik Community Garden (ICG) is a community greenhouse garden and non-profit organisation formed by the Community Garden Society of Inuvik in November 1998inthe Northwest Territories of Canada. The main objective of the ICG is to utilise the space to allow for the production of a variety of fresh vegetables, flowers and organic produce for the community in the region where fresh vegetables or economical foods produce are often unavailable. Spinach, chard and lettuce, tomatoes, carrots, peas, herbs, strawberries, watermelons and squash are among the common crops growing in this garden. ICG represents the most northerly indoors garden or greenhouse garden that actively functions in North America. In fact, it is one of the numerous models in operation in northern Canada. In essence, the ICG is operational only from May to October in a year, and the ICG does not receive regular funding. However, the Community Garden Society of Inuvik has received funding from the Government of Canada, Government of the Northwest Territories, Aurora College, community sponsors and local businesses for the maintenance of the gardens (Council of Canadian Academies 2014: 179; Public Health Agency of Canada 2009).

Health Security Programmes

Data from the 2004 Nunavik Inuit Health Survey (NIHS), the International Polar Year Adult Inuit Health Survey (IPYAIHS)2007-2008, the International Polar Year Nunavut Inuit Child

Health Survey (IPYICHS) 2007-2008 and other publications focusing on Inuit and indigenous peoples' health show that Inuit health indicators in Canada remain low compared to the national average health status (Cameron 2011). These surveys only show that more effective decisions need to be taken and implemented to improve Inuit health in Canada. Inuit today work together to create better ways to build social support systems for managing issues that are presently impacting their health and personal safety. Infrastructural support such as housing, health care centres and other social service centres are being developed. Health and social services are actively engaging with Inuit families and youth to integrate Inuit-specific traditions and knowledge in the developing health care, social, cultural programmes, and spreading awareness in the communities about programmes and services in the region that they can avail themselves(ITK and ICC 2007).

The Tukisigiarvik Centre in Iqaluit is one of the culturally, socially and economically appropriate community support centre run by the Iqaluit Community Tukisigiarvik Society that offers a number of programmes and services to Iqalummiut or Inuit individuals and families of the community in Iqaluit, Nunavut. These include i) assistance with accessing education and training; ii) elder advisors and counsellors; iii) hunter guides that take individuals on hunting trips to teach hunting skills; iv) country food when available; v) cultural skill development programming; vi) help with resume writing and employment searches; vii) counselling and healing; and viii) other social services (George 2004; PovNet 2015).

The Tukisigiarvik Centre offers a variety of practical support and assistance to help the Inuit find solutions to their problems be it personal family issues, education, food, health, healing or access the resources they need, such as, employment by referring the persons to employment centres, government departments, and other agencies. The centre has Inuit elder-advisors and experts, who teach traditional skill development and advice on Inuit Qaujimajatunqangit (IQ) belief, customs, values, and practices (PovNet 2015).

The Tukisigiarvik Centre has laundry facilities and sewing machines. The Centre also has a kitchen and encourages customers to make light meals when food is available especially country food. It benefits the members in a number of ways: a) it offers services close to home; b) it provides shelter for homeless persons; c) it provides opportunities for local employment opportunities to the elderly and the youth; d) it provides services including

parenting and relationship skills, coping skills, traditional skill development, such as Inuit ulu knife making, cleaning seal skins and country food preparation; e) it provides health care like anger management and personal hygiene; and f) it also reduces the medical expenditure for the community, especially by providing expensive transport to southern Canada for medical consultation on small health issues (George 2004).

The government provides several financial aid at the regional level such as the Social Assistance and Employment Insurance. However, most of the financial help from the federal government of Canada is in adequate as they are not adjusted to the high cost of living in the Arctic. The federal government should shape financial assistance programmes to the sole requirements of the Inuit communities residing in Canadian Arctic. To deal with substance abuse among the Inuit youth, counselling, adopting approaches to reduce harm and related strategies are seen as an essential part of treatment and problem solution. These strategies comprise a wide range of responses, from using safer substance to self-restraint or abstinence (NAHO 2007). In order to tackle substance abuse in Inuit Communities, Pauktuutit (2011) had listed a National Strategy to Prevent Abuse: i) initiate abuse prevention programmes in Inuit communities as a priority issue; ii) raise awareness and reduce tolerance of abuse; iii) invest in training programmes and capacity development in Inuit regions; iv) uphold vanguard workers and community services; v) deliver services that heal Inuit; and vi) enhance programmes that rely on Inuit health strengths and prevention of abuse (Inuit Tapiriit Kanatami 2014a).

The ability and ease at accessing health care services and facilities in Inuit Nunangat is an essential determinant of social health of Inuit. In spite of Canada's national health care system that seeks to protect the health of all the citizens, a number of Canadian people living, particularly, in the Canadian Arctic have not been able to access essential healthcare. Access to health services is very limited in four regions of Inuit Nunangat. As a result, Canadian Inuit faces critical obstacles and challenges – related to physical access and the nature, appropriateness and quality – while trying to access health care facilities and services. Apart from regional centres, vast majority of Inuit communities do not have access to hospitals (NCCAH 2011; Health Canada 2011).

In order to reduce the challenges that the Inuit experience while trying to access health care and services in Inuit Nunangat, effective action needs to be taken by both the federal and

provincial/territorial governments in Canada. In addition, related social determinants of health need to be handled since they commonly predispose Inuit patients to insufficient and poor access to health care services in the regions. The Inuit communities in Canada are concerned about their health as the impact of rising level of adverse climate change is highest in the Arctic where health care and services are very limited. They have expressed the need for a holistic approach to Inuit health. They believe that until Inuit housing problems are solved, post-secondary education opportunities are made available and a support system for the rising number of young Inuit reaching working age is given in the four regions of Inuit Nunangat, the situation is unlikely to change in the near future (Archibald and Grey 2006; Inuit Tapiriit Kanatami 2014a).

Consequently, efforts are being made to enhance the overall health care system for Inuit. Inuit are demanding for a transformation in the development of health care and services in northern Canada through laws that gives autonomy in structure, development and delivery system of services (ITK and ICC 2007). Most of the current provincial/territorial governments and other agencies that provide health care and services to Inuit communities through a number of delivery systems are done in an ad hoc manner. The Inuit-specific health care and treatment programmes and services can be further enhanced by integrating Inuit traditional healing and modern medical approaches (NDHSS 2005; Archibald and Grey 2006).

Initiatives to reform human health resources in Inuit communities is stress in the Inuit Health Human Resources Framework and Action Plan (IHHRFAP) 2011-2021, which aims: i) to support the recruitment and maintenance of quality health-care resources, ii) to increase the number of Inuit health professionals, and iii) to improve culturally appropriate, safe and relevant health services in Inuit communities in Inuit Nunangat (ITK 2010). The Nunavut Arctic College (NAC) in Iqaluit offers nursing programme in collaboration with Dalhousie University in Halifax, Nova Scotia which focuses on Inuit nursing graduates. Because of these efforts, Inuit midwives and staff are now more common in birthing/nursing centres in many Inuit communities. Notably, the Inuulitsivik Health Centre in Puvirnituq in Nunavik region began a maternity programme in 1986 that introduced perinatal care to the communities of the Kivalliq region of Nunavut which has provided the women a choice to give birth nearer home. In addition, the Nunavik Regional Board of Health and Social Services (NRBHSS) has also reported that the NRBHSS currently provides nursing health

care centres including perinatal services in Inuit communities in Nunavik (Inuit Tapiriit Kanatami 2014a).

Mental wellness is a significant determinant of health for Inuit. Mental well-being includes a broad range of components such as preventing suicide, violence reduction, mental illness, prevention and treatment of drug addictions and substance abuse, and safety. For Inuit, a healthy mental state refers to "emotional, mental, physical as well as spiritual wellness and strong cultural identity" (NAHO 2013). Consequently, this determinant of health is closely linked to the other determinants of health such as livelihood, access to health care, safety, education, language, and culture. For enhancement of Inuit mental wellness, some steps are being undertaken at the national, regional and community level to address key determinants that has a bearing on the mental health in Inuit communities. The Nunavut Suicide Prevention Strategy (NSPS) 2010 is one of the government policies created to address the factors impacting mental wellness. There are many initiatives and projects that have been started in support of suicide prevention across Inuit Nunangat (Cameron 2011). In response to addiction, the Nunatsiavut Department of Health and Social Development conducted 12-week Inuit Intergenerational Trauma and Addictions Healing Programme 2012 that represents a thriving community-based programme to support mental wellness in the region(Inuit Tapiriit Kanatami 2014a).

Similarly, the Alianat Inuit Mental Wellness Action Plan (AIMWAP) was brought out by the Inuit Tapiriit Kanatami in 2007 as an Inuit strategic goal planned to focus action in Inuit Nunangat. The strategic goals of the AIMWAP are as follows: i) to ensure a building of culturally appropriate mental wellness programmes and support system such as cultural/traditional and clinical approaches; ii) to recognise the community as the preeminent resource in the treatment of mental illnesses and allocate funds for community capacity building; iii) to enhance resources at the community level for mental wellness building; iv) to ensure that Inuit-specific data, information, knowledge, research, and training are available and accessible; and v) to enable implementation and operation of the AIMWAP's goals through close collaboration with all stakeholders at all levels across Inuit Nunangat. In fact, most of the programmes and research conducted on Inuit health so far have focused on limited area and on a few specific indicators of health status without taking a holistic point of view of the social determinants of health as they are particularly linked to Inuit health. Future health initiatives should concentrate on issues such as acculturation, food security, and

livelihood as well as culturally specific health problems. This change in focus areas would promote a more holistic view of Inuit health in Canada (Inuit Tapiriit Kanatami 2014a).

Initiatives have been taken to introduce programmes that address contaminants in the Arctic, such as the Walrus-Testing Programme (WTP) that is being conducted at the Nunavik Research Centre. Traditionally, marine mammals like the walrus have been harvested for country food in northern Canada coastal areas, including in the majority of the Inuit communities in Nunavik region (Larrat et al. 2012). In general, walrus meat is commonly eaten raw or fermented and cooked in Inuit communities (Proulx et al. 2002).However, the consumption of raw or uncooked walrus meat may lead to exposure to a zoonotic parasite, which is dangerous for health (Larrat et al. 2012). Notably, during the 1980s and 1990s, the epidemic of the potentially lethal trichinellosis due to consumption of trichinella-infected walrus meat brought Inuit communities in Nunavik to introduce a programme which tests walrus meat for zoonotic parasite which infect and cause disease in humans and other related hazard (Proulx et al. 2002; Council of Canadian Academies 2014).

The Nunavik Trichinellosis Prevention Programme (NTPP) is a regional and community-based screening/testing programme to prevent disease which started in 1992 in Salluit of Nunavik region. The NTPP was gradually extended to many walrus-harvesting areas and communities in 1996 across Inuit Nunangat (Larrat et al. 2012). Inuit hunters are participating in the programme on a voluntary basis and, with the help of local Hunters and Trappers Associations (HTA), are shipping blood samples to the Nunavik Research Centre (NRC) in Kuujjuaq of Nunavik region, Quebec (Government of Nunavut 2011; Larrat et al. 2012). As soon as the sample is received at the NRC, the results are normally processed and corresponded within 24 hours (Larrat et al. 2012).

Two more new food testing laboratories in northern Canada: One in Nain of Nunatsiavut region and another in Yellowknife, Northwest Territories have been made and equipped with basic testing facilities (Owens et al. 2012). Larrat et al. (2012) have stated that the Nunavik Trichinellosis Prevention Programme could be used as "a model for a successful health-related prevention programme in the Arctic." In fact, the NTPP has been able to discover the nature of the disease and its cause. Premise on the non-detection of recent cases of trichinellosis from walrus meat, the NTPP's success has been acknowledged. The positive implications of the NTPP are demonstrated by the walrus harvest with a professional method

to analyse results, inter-sectoral corporation and involvement of local communities (Larrat et al. 2012; Council of Canadian Academies 2014: 142).

Socioeconomic Security Programmes

The Government of Canada has devotedly partnered with territorial governments, Inuit communities and leaders, and partnerships in the circumpolar Arctic to ensure that the northern Canadian communities achieve its full social and economic developments as an effervescent region within a strong and sovereign Canada. In this context, the Government of Canada launched Canada's Northern Strategy (CNS) in 2007, to meet the socioeconomic challenges and opportunities of a changing Arctic for the communities in the region. Canada is strongly committed to ensuring a prosperous Arctic region that will facilitate building the future of the nation.

Therefore, Canada has provided significant funding to improve social and economic developments in the Canadian Arctic since 2007. The Government of Canada allocates an unconditional grant to the territorial governments through Territorial Formula Financing (TFF) that empowers territorial governments to finance developmental programmes and services, such as health-care centres, hospitals, schools, social services and other infrastructures in the regions. Notably, the three territorial governments in Canada such as Nunavut, the Northwest Territories, and Yukon have received $2.9 billion for the year 2011-2012. In order to employ the resource potential in the Canadian Arctic region without compromising environmental safety and protections, the Government of Canada launched an Action Plan to improve northern Canada regulatory management and development in 2010. The main objectives of Canada's Action Plan in the Arctic are to make the regulatory process more efficient by: i) removing barriers to private investment; ii) enhancing environmental stewardship; and iii) investing in programmes to support economic growth and provide opportunities for the communities in the regions. As such, economic development can be undertaken and opportunities created while at the same time preserving the social, cultural and environmental richness of the Arctic (AANDC 2011: 3).

Northern Canada has plentiful and diverse natural resources. From clean air and water to the conservation of the species at risk, and to protecting the health of Canadians from climate change to environmental hazards, preserving the environment is essential to the Canadian socio-economic well-being (Environment Canada 2013 and 2014). The Government of

Canada has prioritised the Arctic region, moving it up higher on the agenda than it had been in many decades. Canada has a clear vision for the Arctic as a viable and prosperous region within sovereign Canada. By pushing ahead with northern Canada's Strategy and Action Plan commitments to ensure outcomes are benefiting the northern communities as well as all the Canadians. Consequently, the Government of Canada is achieving significant progress in all four priority areas such as: a) exercising Canadian Arctic sovereignty; b) protecting the environmental heritage; c) promoting socio-economic development; and d) improving and delegating governance for achieving sustainable developments in the region (AANDC 2011: 17).

The Government of Canada is committed to working with all three territorial governments, northern communities and other the shareholders in northern Canada to advance practical, efficient, innovative, and good governance structures through self-government and land claim agreements. Indigenous communities are helping develop northern Canada policies and strategies to address their substantial challenges. Decentralisation of land and resource management is essential to building the future of the Canadian Arctic region. Yukon became the first territorial government in Canada to assume land and resource management responsibilities after decision-making was given directly to Yukon communities in April 2003. Subsequently, the tripartite the Government of Canada, Nunavut Tunngavik Incorporated and Government of Nunavut-signed a protocol for future talks toward the devolution of land and resource management agreement in 2008. The Government of Canada and Government of Northwest Territories also have started an Agreement-in-Principle for the devolution of land and resource management duties and liabilities to the Northwest Territories government. The first negotiation to a final agreement, began in 2001. In fact, the Government of Canada is enthusiastic to renew and rebuild its relations with the indigenous communities across Canada. Notably, in August of 2010, the Government of Canada officially apologised to Inuit families, who relocated to the High Arctic in the 1950s and 1960s, by paying tribute to their courage, adaptability and perseverance in the face of difficulty, hardship and suffering, and recognising their contribution to a strong Canadian presence in the Arctic (AANDC 2011: 9-10).

In all Inuit inhabited areas in Canada, the most pressing social and economic challenges are acute shortages of proper housing, poor quality of accommodation and limited infrastructure. A key problem of poor quality housing significantly effects Inuit socio-economic

development and health because cold, dampness and mould causes respiratory diseases especially among children (Bouchard 2013). This issue is particularly important since about 40 per cent of Inuit children under the age of 15 live in over-crowded dwelling, compared to national average of 7 per cent, which is approximately six times higher than the proportion of all children in Canada (Tait 2008). In response to the housing crisis in Inuit Nunangat regions, the Government of Canada announced in the federal budget funding of US$100 million over a period of two years of 2013-2014 to construct roughly 250 housing units in Nunavut (AANDC 2013). While this is a step in the right direction, a key complexity in introducing social housing programmes in Canada is that Inuit from the Canadian federal government's Aboriginal/Indigenous housing programmes are excluded. Even though Inuit communities are often grouped under together with First Nations, there is frequent failure in providing funds and delivering programmes which they rightfully deserve with the bulk of funding being channelled to on-reserve First Nations. As such, between 1993 and 2004, the federal government invested US$3.8 billion in First Nations housing, approximately 2600 new houses were constructed per year, and 3300 were renovated. However, no Inuit houses were renovated or built in Nunavut during this period (Inuit Tapiriit Kanatami 2004b and 2014a).

Subsequently, the Makivik Corporation in Nunavik effectively fought for the Inuit social housing imbalance by filing a dispute case against Government of Canada, with regard to its failure to act in accordance with sections 2.12 and 29.0.2 of the James Bay Northern Quebec Agreement (JBNQA) in 1975. These sections of the JBNQA state that federal and provincial government programmes and financial support shall apply to the Inuit of Quebec on the same basis as other First Nations and Inuit communities in Canada (Inuit Tapiriit Kanatami 2004). As a result, the Canadian federal government ultimately took responsibility for providing on-going programme for social housing to Inuit communities in Nunavik region in July 1999, and under a new agreement, each of the Governments of Canada and Quebec have given assurance of $10 million per annum for the expenditure and maintenance of building Inuit houses from 2000 to 2005 (Inuit Tapiriit Kanatami 2004).

This productive outcome has induced other Inuit Nunangat regions to ask the Government of Canada to commit fund for Inuit social housing schemes in their regions across northern Canada (NTI 2006). The Government of Nunavut and the Nunavut Tunngavik Incorporated (NTI) proposed a Ten Year Inuit Housing Action Plan (TYIHAP) 2006-2016, a proposal to

the then Department of Indian and Northern Affairs Canada (INAC) or (the present Indigenous Affairs and Northern Development Canada) in August 2004. The total projected financial support requirements for the TYIHAP 2006-16 are estimated at approximately $1.9 billion. The TYIHAP estimated the number of Inuit housing units that are in urgent need of renovation and re-construction in Nunavut, and the number of new housing units required per year in the coming decade and the housing plan's average yearly cost. It also delineates the socio-economic accruements preventing a long-term housing strategy in Nunavut region. A well-coordinated housing programme could achieve the outcomes mention below: i) provide training facilities for local communities in terms of trades such as carpentry, plumbing, and electrical; ii) creating full-time employment for about 1500 people in the region; iii) increase spending by the local community; iv) capacity-building and providing the communities with a sense of empowerment and self-reliance; and v) mitigate health and social problems related to over-crowding among Inuit communities in Nunavut (Inuit Tapiriit Kanatami 2004b; Nunavut Tunngavik Incorporated and Government of Nunavut 2004).

In the Nunavut Tunngavik Incorporated yearly report of 2006 on the State of Inuit Culture and Society, the Nunavut Tunngavik Incorporated recommended several other measures to rectify Inuit housing problems: i) the municipal, provincial/territorial, and federal governments should clearly define their respective roles in relation to housing; ii) health authorities should work together with housing authorities to explore Inuit-appropriate building plans; and iii) the federal government should develop and implement a multi-year initiative for social housing that identifies immediate and long-term funds, and iv) to incorporate transport cost and challenges in logistics into its budget (Inuit Tapiriit Kanatami 2014a).

At the regional level, tangible actions have been taken for raising employment opportunities by utilising the Inuit Impact and Benefit Agreement (IIBA) for key developmental projects in Inuit Land Claims (ILC) areas. In this context, the relationship between IIBA or the developer and community are considered an important measure for Inuit to attain self-government, broaden their horizons such as in earning revenue, expanding training, job prospects and opportunities, and reduce adverse impacts on Inuit and its development projects in the regions. The IIBA has been agreed upon for many mining projects in Inuit Nunangat regions, which included the Voisey's Bay Nickel Mine (VBNC) in the Nunatsiavut region, Labrador and the Jericho Diamond Mine (JDM) in the Kitikmeot region of Nunavut

to ensure that Inuit are involve in the management of the projects in the regions. According to the Department of INAC, it was calculated that jobs ranging between 40 and 116 could be provided during various phases of the Jericho project in 2005, and they were mostly to be filled by Inuit (Indian and Northern Affairs Canada 2005). As of December 2005, the Voisey's Bay project had recruited 419 persons, of which 211 were from the Inuit or Innu of First Nations communities (VBNC 2005).

At the community level, the solid measures have been taken by offering career counselling, vocational training, and other employment programmes continuum; however, more support is required in Inuit communities. Moreover, to maintain long-term sustainable job opportunities in communities, growth and diversification of the private sector is essential as well (Inuit Tapiriit Kanatami 2004). Subsequently, the Inuit Tapiriit Kanatami harped on the significance of maximising the capital wealth/resources of Inuit regions in the following areas to improving: i) physical capital such as buildings and infrastructure, ii) human capital including education, training, social conditions, iii) natural capital like mineral resources, and iv) organisational capital such as strengthening the corroboration between local and regional Inuit organisations (Inuit Tapiriit Kanatami 2004).

Similarly, the steps taken to solve Inuit education and employment would likely have a beneficial outcome on earnings and its distribution in Inuit regions. In 2007, the Inuit Tapiriit Kanatami highlights an action plan and outlined a common set of objectives for both Inuit and the Government of Canada. The plan presented the following priorities to redress the employment and income deficits: a) to increase the number of educated and trained Inuit filling jobs across a broad range of skilled and occupational groups; b) to increase the number of Inuit in apprenticeship programmes; c) to maximise Inuit involvement in training opportunities; and d) the Government of Canada should allocate funding to recruit and retain qualified Inuit in productive employment within Inuit regions and other parts of Canada (ITK and ICC 2007). In order to fix the problem of high living expenditure in northern Canada and other Inuit-specific determinants impacting the sufficiency of their incomes, the Nunavut Employees Union (NEU) suggests that incomes, salaries, and social aids be calibrated to take into consideration factors like high food costs, household size, commodities, utilities and travel, and whether the housing is private or subsidised in the region (Rogan 2003).

Canada's Global Commitments

Climate change is one of the fore most crucial challenges facing humankind as it has implications on food, health, economy, trade, agriculture, and transportation. In general, least-developed and developing countries, particularly the poverty-stricken and most vulnerable communities, are hardest struck by climate change. The majority of these countries have limited capability to prevent and deal with its consequences. In this circumstance, Canada is doing its part to adapt to climate change impacts and to assure a sustainable future for all, by supporting the transition of least developed and developing countries to green in order to minimise ecological scarcities and environmental hazards, and aims at sustainable development without degrading the environment. As a result, the Government of Canada is committed to assisting climate change action plan in developing countries around the world, by delivering $2.65 billion between 2015 and 2020 (Environment Canada 2015).

The Canada Climate Change Development Fund (CCCDF) was launched in 2000 to aid developing nations at the policy and programming level in the management and minimisation of climate change effects. The aims of the CCCDF were reducing the rise of GHG emissions in the developing countries, particularly China, India, Indonesia and Brazil. The CCCDF encouraged activities in developing countries that dealt with the causes and effects of climate change. In addition, it contributes to poverty reduction and sustainable development. In fact, the CCCDF was a six-year plan (2000-2005) that delivered $110 million for addressing climate change initiative programmes managed by the Canadian International Development Agency (CIDA). The CCCDF had four themes, particularly to minimize the vulnerability of the deleterious impacts of climate change to developing countries. As the programme progressed, more emphasis was accorded to adaptation programme and monetary assistance to global adaptation funds including the Red Crescent Societies (RCS) and International Federation of Red Cross (IFRC). Subsequently, some of the CCCDF projects were undertaken in different parts of the world, such as the Caribbean, Indonesia, Nigeria and south-western Pacific region. At the same time, Canada's International Development Research Centre (IDRC) is working in partnership with the United Kingdom Department for International Development (UKDID), by delivering $65 million for climate change adaptation programmes through research and capacity building in Africa (Bruce and Haites 2008).

Canada has long been contributor to the scientific establishment for studies with regard to better climate change management and projections of the impact for a more desirable adaptation and mitigation solutions in the international arena. The climate change negotiations within the UNFCCC includes consideration for coordination and integrated approaches to scientific research, studies and systematic observations for both climate change adaptation and mitigation mechanisms. The UNFCCC's Nairobi work programme is one of the programmes that were undertaken by the UNFCCC on impacts, vulnerability and adaptation to climate change. This was a vital undertaking by the UNFCCC, initiated to support nations to make informed choices and assessments on pragmatic adaptation activities (UNFCCC 2007). Canada lent a hand to various significant international initiatives and programmes on global environment and climate change, for example, the International Human Dimensions Programme (IHDP), the International Geosphere-Biosphere Programme (IGBP), Integrated Research on Disaster Risk (IRDR),and the World Climate Research Programme (WCRP) to name a few (Bruce and Haites 2008: 418).

Canada is committed to working with an intergovernmental organisation like the Inter-American Institute for Global Change Research (IAI) that has the backing of 19 nations in the western hemisphere. The main objective of the IAI is to create the scope for understanding the incorporated impacts of current and future global climate change on regional and continental environments, human population, and to support cooperative research and enlightened action programmes, encompassing all levels in the region. In addition, the primary focus of the IAI on the science programme is to promote and endorse research beyond the scope of national programmes by boosting/supporting comparative and focused studies based on scientific issues that are significant to the region as a whole, particularly climate change adaptation (Fenech et al. 2005).

The global change System for Analysis, Research and Training(START) is a non-profit and non-governmental organisation that strives to bring about and promote regional networks of collaborating scientists and institutions in developing countries. The University of Western Ontario, Canada is actively working with START and the key strategic partners of the International Global Environmental Change (IGEC) research programmes of the International Social Science Council (ISSC) and the International Council for Science (ICSU) or ISSC-ISCU group, such as the IHDP, IGBP, IRDR and WCRP. These promote regional and

international framework for capacity building efforts and include societal decision-making in aspects of environmental and climate change. The START networks conduct research on regional attributes resulting from change in the environment in order to: i) analyse effects and susceptibility to such changes; ii)provide information to policy-makers; iii)increase the scientific capacity of developing nations to overcome the complex processes of environmental change and degradation through a number of training and work development programmes in the region; and iv) support research programmes and the infrastructure on environmental change within developing regions. In addition, Canada has contributed immensely in the international evaluations of climate change impacts and adaptation management measures through the Arctic Climate Impact Assessment (ACIA) and the Intergovernmental Panel on Climate Change (IPCC). In response to global health impacts of climate change, Health Canada (HC) has enthusiastically collaborated with UN bodies such as the World Health Organisation (WHO), the World Meteorological Organisation (WMO) and the UN Environment Programme (UNEP) (Kovats et al. 2003; Bruce and Haites 2008: 418-419).

Partnerships in the Circumpolar Arctic

Canada plays a significant leadership role in the Arctic issues at the domestic as well as international levels; whether it is in the Arctic Council or its six working groups as well as four action plans. Notably, Canada was the first to chair the Arctic Council from 1996 to 1998 and again in 2013 to 2015. Canada's Arctic foreign policy was launched in August 2010 that addresses a number of issues on the global dimensions of the Northern Canadian Strategy by providing the international platform from which Canada raised its national interests to the global community (Government of Canada 2011).

Human history in the Arctic has been known as a progression of adaptations, or a process of transition accumulating cultural mechanisms, and is designed to deal with the features of the environment (Krupnik 1993). Chapin III et al. (2006: 200) suggest that building a balanced understanding of the Arctic climate change and environmental resilience, vulnerability, and adaptation is important because it: a) identifies externalities such as hidden costs and benefits that contribute to Arctic change; b) minimises the pressures for change; c) identifies the Arctic changes most probable to alter human health and well-being within and outside the Arctic; d) explores opportunities for valuable ecological and social change; and e) identifies institutions to implement policies at appropriate scales and at all levels.

Thousands of various chemicals and contaminants are being constantly dumped into the environment; determining which ones are harmful and monitoring them is a herculean task. The advent of the new Persistent Organic Pollutants (POPs) makes it increasingly difficult to sustain and control the climate system and the threat of contamination in the Arctic. Contamination is one of the challenges to the indigenous communities in the region. Developing advance techniques and mechanisms to dependably measure the new POPs or chemicals and determining the chemicals require to be scanned for health and food safety is essential. In view of the long-range transmission of POPs, safeguarding human population and the environment from POPs has to be a universal endeavour and responsibility (Council of Canadian Academies 2014: 140).

In March 2008, the International Expert Meeting on Responses to Climate Change (IEMRCC)[6] was held in Helsinki, and a number of specific activities were identified to facilitate and meet Parties obligations in relation to biodiversity, climate change and indigenous as well as other local communities in the Arctic. In this context, there is an urgent necessity for capacity-building and the collection of appropriate knowledge on the linkages between biodiversity, climate change and indigenous communities in the Arctic. The circumpolar Arctic is spread over 8 countries: Canada, Denmark, Iceland, Norway, Finland, Sweden, Russia, and the US, and the issue of climate change, biodiversity and indigenous communities are regulated by several international agreements, including the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). A concerted and cooperative step that addresses climate change impacts on indigenous population, food, health, society, culture and livelihoods in the Arctic is a pressing requirement. In addition, the rights of indigenous peoples should be recognised, their values accepted and their preservation made a primary concern in the Arctic region. Climate change impacts management and adaptation projects should be developed at the earliest (Government of Finland 2009: 6).

[6]IEMRCC for Indigenous and Local Communities and the Impact on their Traditional Knowledge related to Biological Diversity in the Arctic region, was held in Helsinki, convened by the Government of Finland from 25-28 March 2008 which provided an avenue to explore how these two pools of knowledge can be complementary and equally valued. The report of the meeting was presented as an information document to the ninth meeting of the Conference of the Parties to the CBD in May 2008 (Government of Finland 2009).

There are three international agreements that handles the question on pollutants in the Arctic: i) the UN Economic Commission for Europe's Convention on Long-Range Trans-boundary Air Pollution (CLRTAP) 1979 that has been effective from 16 March 1983; ii) the Stockholm Convention on Persistent Organic Pollutants (POPs) 2001 have been effective from May 2004; and iii) the UN Environment Programme's Minamata Convention on Mercury (MCM)from 2013. These international agreements reflect the Arctic scientific, environmental, socio-economic and political anxieties raised by the indigenous communities. In fact, the Inuit leaders were represented at the annual Stockholm Convention meetings through the Inuit Circumpolar Council (ICC), and the collective and individual efforts of the eight Arctic nations, including Canada. Through the leadership of Sheila Watt-Cloutier, then chair of ICC and the Canadian Arctic Indigenous Peoples Against POPs (CAIPAP), the human dimension of POPs was put on the negotiating table as a strong moral reminder of the human cost of the Arctic environmental contaminants (Downie and Fenge 2003).

In June 1991, the Arctic Environmental Protection Strategy (AEPS) came into existence at the first ministerial conference in Rovaneimi, Finland. The AEPS was a non-binding environmental protection agreement among the eight Arctic nations, such as: Canada, Greenland/Denmark, Iceland, Norway, Finland, Sweden, Russia, and the US. Some of the native inhabitants of the Arctic were represented by the Indigenous Peoples Secretariat with three AEPS Permanent Participants: the Inuit Circumpolar Conference (Canada, Greenland/Denmark, Russia and U.S.), the SAAMI Council (Nordic and Western Russia), and the Association of Indigenous Minorities of the Far East of the Russian Federation, the North, and Siberia (EPPR 2012).

The reasons for the momentum of the AEPS was mainly three-fold: i) reports of the Soviet Union dumping radioactive and other harmful materials into the Arctic Ocean; ii) the willingness of the Russian government to scrutinize the problems to seek bilateral and multilateral level support to clean-up or remove and manage current and future problems; and iii) scientific findings of bizarrely high levels of persistent organic pollutants (POP) and heavy-metals in the Arctic that affect indigenous peoples in terms of their food sources, health and community well-being which possibly came from air, precipitation, ice and water circulation, and probably ice transport systems from industrial countries in the northern hemisphere. To deal with these problems, five programmes of the AEPS were initiated: a) the Arctic Monitoring and Assessment Programme (AMAP); b) the Conservation of Arctic Flora

and Fauna programme (CAFF); c) the Protection of the Arctic Marine Environment working group (PAME); d) the Emergency Prevention, Preparedness and Response working group (EPPR); and e) the Sustainable Development and Utilisation (SDU) (EPPR 2012).

The Arctic Environmental Protection Strategy (AEPS) was replaced by the Arctic Council in 1996. The Arctic Council is a consensus intergovernmental platform established by the eight Arctic nations to address various issues encountered by the circumpolar nations and the indigenous people/communities of the Arctic (EPPR 2012). Some of the major objectives of the Council are: i) to provide a mechanism for co-coordinating their activities in the region; and ii) to monitor and coordinate the programmes instituted under the AEPS. The Arctic Council established guiding principles to implement the AEPS, and it works through six working groups and four action plans. The Arctic Council working groups are as follows: i) the Arctic Monitoring and Assessment Programme (AMAP); ii) the Emergency Prevention, Preparedness and Response (EPPR); iii) the Arctic Contaminants Action Programme (ACAP); iv) the Conservation of Arctic Flora and Fauna (CAFF); v) Protection of the Arctic Marine Environment (PAME); and vi) the Sustainable Development Working Group (SDWG). The Arctic Council Programmes and Action Plans are: a) Arctic Biodiversity Assessment (ABA); b) the Circumpolar Biodiversity Monitoring Programme (CBMP); c) the Arctic Climate Impact Assessment (ACIA); and d) the Arctic Human Development Report (AHDI)(EPPR2012; AGP 2010).

Over the issue of oxidification in the circumpolar region, Arctic Council needs to take immediate actions: i) research on the existing loadings and potential effects of acid deposition; ii) consideration to be given to expanding deposition monitoring programmes; iii) defining critical loads and setting and meeting target loads for sensitive ecosystems; and iv) reducing emissions of sulphur and nitrogen by the use of up to date technology, including value and integrate traditional knowledge of indigenous communities (Sands 2003: 729).

The Arctic Council has adopted its Action Plans to address six serious environmental matters. Due to incessant organic contaminants, the eight Arctic countries agree: a) toshoulder the responsibility of cooperative monitoring and research; b) to consider the possibility of generating national inventories on production, usage and emissions; c) to develop proposals for international action under the 1979 Geneva Convention on Long-range Trans-boundary

Air Pollution[7](LRTAP), the 1974 Paris Convention[8] and the 1974 Helsinki Convention[9]; d) to lessen or check the use of chlordane, Dichloro Diphenyl Trichloroethane (DDT), toxaphene and Polychlorinated Biphenyls (PCBs); e) to initiate a programme whereby priorities and timetables for eliminating emissions would be spelt out; and f) to prevent oil pollution. In addition, the Arctic nations consented: i) to cooperate in monitoring; ii) to consider putting in place a reporting system on discharges and spills; iii) to take measures as soon as possible to adhere to the strictest relevant international standards within the conventions regarding discharges notwithstanding their origin; and iv) to take up collaborative steps to bolster recognition of the peculiarly sensitive nature of ice-covered parts of the Arctic Ocean (AGP 2010).

The Arctic Council has established the Arctic Monitoring and Assessment Programme (AMAP): i) to determine levels of anthropogenic pollutants and evaluate their impacts; ii) to take precautionary steps with regard to marine pollution in the Arctic, which includes application of the principles envisaged in the 1982 United Nations Convention on the Law of the Sea[10] (UNCLOS), by taking steps immediately, adhering to the firmest relevant international standards as prescribed by the conventions to which they are parties, and by working cooperatively in order to develop binding rules and regulations to enhance safeguards arising from accidental pollution; and iii) to take up steps aimed at improving emergency prevention, preparedness and response (EPPR). While measuring the implementation of the protection of Arctic flora and fauna (PAFF), it was seen that the 1973 Polar Bears Agreement (PBA) is the only agreement exclusively implemented for the Arctic

[7]LRTAP is implemented by the European Monitoring and Evaluation Programme (EMEP), directed by the United Nations Economic Commission for Europe (UNECE). The convention opened for signature on 13 November 1979 in Geneva and was effective from 16 March 1983. The Convention, which currently has 51 Parties, identifies the Executive Secretary of the United Nations Economic Commission for Europe (UNECE) as its secretariat (UNECE 2013).

[8]The 1974 Paris Convention was the convention for the Prevention of Marine Pollution (PMP) from Land-Based Sources and was adopted to address marine pollution by discharges of pollutants from land-based sources, watercourses or pipelines. The Paris Convention was replaced by the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), and was adopted in Paris, France in September 1992 and has been effective from March 1998 (American Society of International Law 2013).

[9] On 24 March 1974 the Baltic Sea States signed the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the 1974 Helsinki Convention (HELCOM). It was the first regional agreement ever to cover all sources of pollution, whether from land, sea or air. In 1992, a new Convention on the Protection of the Marine Environment of the Baltic Sea Area was signed by all the countries bordering on the Baltic Sea and by the European Economic Community (Ostojski 2013).

[10] The Law of the Sea Treaty, also known as the Third United Nations Convention on the Law of the Sea (UNCLOS III) was adopted in 1982. Its purpose is to establish a comprehensive set of rules governing the oceans and to replace previous UN Conventions on the Law of the Sea, one in 1958 (UNCLOS I) and another in 1960 (UNCLOS II).The Convention was opened for signature to all regions of the world, all legal and political systems and the continuum of socioeconomic development on 10 December 1982 in Montego Bay, Jamaica.

region. The Agreement on the Conservation of Polar Bears (CPB) is a multilateral treaty signed on 15 November 1973 in Oslo by the five nations: Canada, Denmark/Greenland, Norway/Svalbard, Russian Federation/Soviet Union and the US with the largest polar bear populations in the circumpolar region. This treaty was signed because of increasing hunting of polar bears during the 1960s and 1970s, resulting in critical survival pressure for the polar bears (Sands 2003: 729).

In essence, the PBA agreement forbids random, unsupervised sports or hunting of polar bears and proscribes hunting of polar bears from icebreakers and aircraft or helicopters which have proved most dangerous to the polar bear population in the region. In addition, the agreement of the PBA holds member nations accountable and responsible for taking necessary and suitable action to safeguard the environment which the polar bears inhabit. It gives particular importance to areas where polar bears build dens and carry out their feeding, and where they migrate. At the same time, the Parties are also supposed to oversee polar bear populations according to appropriate conservation techniques and procedures based on the best available scientific data, information and technology. The important aspects of the arrangement include the development of the Polar Bear Specialist Group (PBSG) under the aegis of the International Union for Conservation of Nature (IUCN) and the accumulation of sub-national fundamentals to the arrangement like the Inupiat-Inuvialuit Polar Bear Management Agreement (IIPBM) 1988 in the Southern Beaufort Sea (Sands 2003: 729; AGP 2010).

The Arctic nations agreed on the framework as referred to below for taking prompt collective measures on emergency prevention, preparedness and response (EPPR) in the Arctic. They will take steps to consider existing bilateral and multilateral agreements and understanding in order to gauge the capability of the geographical coverage of the circumpolar region by cooperative agreements (EPPR 2012). The Arctic nations will also take steps to organise a gathering of experts to determine and give suggestions on the obligatory system of cooperation, which could encompass factors like: i) ways to respond to pollution by accidents from any origin; ii) coordination and management of preventive policies, measures, and strategies; iii) setting up an early announcement and warning system in the event of accidental or potential future risk of pollution; iv) evaluation of the hazards cause by accidental pollution and of the terrible outcomes. In cases such an event takes place, to enable the parties to take necessary preventive, prepared and responsive measures; v) to include research and studies on outcomes of accidental pollution concomitantly with the monitoring

activities of AMAP; vi) partnership in conducting of research with an aim to develop methods and technologies to prevent accidental pollution in the Arctic; vii) collaborative development on a system for exchange of information on research and new findings concerning methods and technologies on ways to respond in the Arctic; viii) exchange of information on legislative, governmental and administrative measures as well as policies; ix) provisions for information sharing with the public and their involvement; and x) promote and strengthen regional bilateral and multilateral cooperation and partnership in the Arctic concerning prevention, preparedness and response by establishing a suitable emergency/contingency plans, training programmes, as well as other significant measures to smoothen transfer of aid and resources to the parties, specifically joint assistance for effective emergency response in the event of accidental pollution, or the potential threat of such incident in the future (EPPR 2012).

Apart from these common programmes, cooperation and agreements, the eight Arctic nations agree: a) to share, exchange information and experts for adaptation and management of adverse climate change; b) to institute more effective laws, regulations and practices for the protection of the flora, fauna, their diversity and habitat; and c) to recommend strategies for improvement in conservation of the ecosystems in the Arctic (Sands 2003: 729; AGP 2010).

In the Ilulissat Declaration 2008, Canada along with other four Arctic Ocean coastal nations, such as Denmark/Greenland, Norway, Russia, and the US declared their obligation to the prevailing legal framework meant for managing and regulating the Arctic Ocean. Canada provided significant information to the Arctic Marine Shipping Assessment (AMSA) 2009about potential future shipping activities as well as their potential impacts. Canada played a preponderant role in developing an assessment of mercury contaminants in the Arctic. The evaluation provides important facts on how mercury continues to be a risk to the human population and wildlife in the Arctic. In 2010, Canada's Minister of Foreign Affairs along with seven other Foreign Ministers of the Arctic Ocean coastal nations had a discourse on shared interests and responsibilities for regulating areas of the Arctic Ocean. The dialogue focused on the Arctic continental shelf and potential community safety challenges leading to the formation of the Arctic Regional Hydrographic Commission (ARHC). The ARHC will enhance their awareness of the characteristics of the Arctic Ocean and its coastal areas and give substantial knowledge for safe navigation in the polar region. In 2011, Canada along with other seven Arctic nations signed an Agreement of Cooperation on Aeronautical and

Maritime Search and Rescue (ACAMSR) in the Arctic. The first ever legally binding agreement brought forth by the Arctic Council, and it highlights the capability of the Council to solve rising Arctic issues (Government of Canada 2011).

Canada's Mitigation Policy

Mitigation is an effort to tackle climate change by lowering GHG emission like carbon dioxide, methane, and nitrogen dioxide. This will give human beings and the flora, fauna and ecosystems on which they depend more time to adapt. The reduction of emissions of GHGs at the global, regional, national and local levels will also lead to substantial decrease in the air, land, and water pollution and thus benefit human health and food systems. In fact, adverse climate change has already occurred in Canadian Arctic regions, compelling signatories to the UNFCCC to act straightaway through mitigation mechanisms to minimise human intervention in the climate change (Ford 2009b).

Generally, there are two strategies when it comes to grappling with climate change. First, adaptation to climate change as has been previously discussed and second, mitigation of climate change. According to the International Panel on Climate Change (IPCC 2007), "mitigation is an act of anthropogenic intervention to reduce the sources or enhance the reductions of greenhouse gases." Mitigation of climate change is activity and engagement that is taken to eradicate emissions of greenhouse gases (GHG) permanently, or to minimise the long-term threat and hazards of climate change to human population, property and well-being (Global Greenhouse Warming 2015).

A global mitigation process of the reduction of GHG emission facilitates adaptation by obstructing the rate of climate change. Canada and other developed nations have committed to the UNFCCC and its Kyoto Protocol to reduce GHG emissions as well as to facilitate: a) developing countries that are especially vulnerable to the detrimental outcomes of climate change; and b) the transfer of environment-friendly technologies and knowledge to developing countries. With the atmospheric concentrations of GHG unabatedly rising due to growing global emissions, best adaptation and mitigation efforts are the need of the hour in many countries in the world. Some key obligations to empower the vulnerable to tackle the changing climate, and for climate adaptation management and mitigation in the long term, have been identified as follows: i) enhancing capacity in climate science and technology, including assessment, monitoring, use of remote sensing and building up the science

structure; ii) improving assessments of vulnerability, impacts, adaptation and mitigation options; iii) making greater use of lessons learned from coping with climate variability; and iv) empowering peoples, particularly the young population, through information programmes (Zubair 2004).

Article 12 of the Kyoto Protocol established the Clean Development Mechanism (CDM) to help developing countries, especially susceptible to the adverse outcomes of climate change in achieving the outlays of adaptation and mitigation. The share of CDM has been placed at two per cent of the Certified Emission Reductions (CERs) issued for most of CDM projects. CERs are a type of carbon creditor emissions unit notified by the CDM Executive Board for emission decrease achieved by CDM projects and confirmed by the Designated Operational Entity (DOE) under the convention of the Kyoto Protocol.

Canada is among the nations that agreed to reduce its GHG emissions when it approved the UNFCCC in 1992. When the Kyoto Protocol was ratified in 2002, by 193 nations as signatories, Canada pledged to reduce emissions to a benchmark of 6 per cent below its 1990 level by 2008 and 2012, during the Kyoto Protocol obligation period. In order to address the Kyoto Protocol Implementation Act (KPIA) in Canada, the mitigation of climate change plans were developed by Environment Canada. However, they were not in compliance with the KPIA because necessary information was missing in the exchange between the federal government and the department in charge of climate change, Environment Canada. In order to meet these obligations or subsequent commitments, such as Canada's 2008 Federal Sustainable Development Strategy Act (FSDSA), the 2009 Copenhagen Accord and Climate Change Adaptation Programme (CCAP) of its first three years (2008-2011) in Canada, it is essential to establish a wide-ranging plan and an effective governance structure to implement it. Environment Canada has made some improvements in the comprehensiveness, transparency and liability of the information contained in the climate change management strategy and policy since 2007. However, the measures contained in the plans are insufficient to achieve the Kyoto Protocol commitments for reductions in GHG emissions (OAGC 2011).

Canada has not been on track to meet its Kyoto Protocol GHGs emissions target. The 2010 National Inventory data showed that Canada's GHG emissions in 2008 were above 31 per cent higher than the Kyoto Protocol commitments target. Even if all the measures in the first Canadian annual climate change plan of 2007 had been implemented as planned and their

expected GHG reductions had been achieved, the reductions would not be sufficient to meet Canada's Kyoto Protocol commitments target. Expected GHG emissions reductions set out in the climate change management plans and policies have dropped by 90 per cent since 2007. Although the Government of Canada had been allocated over $9 billion to implement the measures in the 2010 climate change plans, it did not, establish a governance structure that set out comprehensible roles, accountability and responsibilities, and value reassurance systems for reporting on GHG reduction accomplishment nor instruments for evaluating the climate change plans in Canada (OAGC 2011).

Domestic Level

Canada has pronounced greenhouse gases (GHG) as toxic substances in accordance with the Canadian Environmental Protection Act (CEPA) 1999, thereby establishing the regulatory framework for the control of such substances (Office of the Auditor General of Canada 2014). In response to deal with climate change, the Government of Canada has prepared domestic and global/international commitments to reduce GHGs emissions since 1992. In 2000, the Government of Canada launched the Canada Action Plan 2000 on climate change to drop GHG emissions by 65 million tonnes per annum from 2008 to 2012. In 2002, the federal government introduced the climate change action plan, Climate Change: Achieving Canada's Commitments Together, making a commitment to reduce 240 million tonnes of Canada's GHG emissions from its projected below the 2010 level by 2020. In 2005, the federal government launched climate change action plan called Project Green, Moving Forward on Climate Change: A Plan for Honouring Canada's Kyoto Protocol Commitments, that commits to reducing GHG emissions by 270 million tonnes per annum from 2008 to 2012 (OAGC 2012 and 2014).

In 2007, the concerned department of climate change, Environment Canada introduced Canada's first climate change action plan, as mandated by the Kyoto Protocol Implementation Act (KPIA), which specified that Canada's goal is to reduce GHGs emissions to the benchmark of 6 per cent below its 1990 level over the period between 2008 and 2012. Moreover, the Canada's first action plan on climate change also adds an assurance to drop Canada's overall GHGs emissions by 60 per cent to 70 per cent by 2050. These commitments and targets were reaffirmed in the climate change action plans between 2008 and 2009. The KPIA officially was adapted in June 2007 in Canada . Environment Canada introduced its 2010 climate change plan, as required under the KPIA, which signified that

Canada's target is to sink GHG emissions to the average of 6 per cent below its 1990 emission level from 2008 to 2012. The plan also reaffirmed Canada's target under the 2009 Copenhagen Accord. In its 2010-2013 and 2013-2016 Federal Sustainable Development Strategy (FSDS) plan, the Government of Canada has prepared to sink Canada's GHG emissions by 17 per cent below its 2005 level by 2020 (OAGC 2014; Environment Canada 2014).

In Canada, the federal government shares jurisdiction over environmental and climate change issues with the provinces and territories. As such, it becomes necessary for governments at all level to cooperate and synchronise their action plans on climate change to attain their national target at both national and international levels. Environment Canada is the leading department on climate change and environmental issues within the federal government. In 2012, Environment Canada discussed each regulation of the emissions projects under development with the provinces and territories governments as part of its sector-by-sector plans. Committees of expert with representatives of each government concerned were formed to intercommunicate, report and coordinate programme strategies, and to pinpoint gaps in the enhancement of regulations. In addition, the Natural Resources Canada is accountable for estimating emissions from Canada's forests and control energy productivity and efficiency under the Energy Efficiency Act (EEA) in Canada. Transport Canada governs the emissions from ship transportation in accordance with the 2001 Canada Shipping Act (CSA) which guides Canada's international commitments to minimise GHG emissions from marine and aviation transport sectors. Regarding the issue of financing, the Department of Finance Canada and the Canadian International Development Agency or Foreign Affairs, Trade and Development Canada regulate the costs and maintenance (OAGC 2014).

Reduction of Greenhouse gas (GHG) emissions depend on several evolving economic and energy variables that are subject to substantial unpredictability. On the one hand, future developments in demographics, technologies, and resource-extraction will change the future emissions trail. Under the scenario where oil prices are 27 per cent higher in 2020, and Canada's annual average growth in Gross Domestic Product (GDP) between 2010 and 2020 is presumed to be at 2.9 per cent, compared with the speculation of 2.1 per cent and emissions of GHGs could reach 773 megatons (Mt). On the other hand, under a plan with slower GDP growth, the speculation of the average growth in the GDP between 2010 and 2020 is estimated at 1.9 per cent and with lower world oil prices, and emissions of GHGs could be

lowered by 686 Mt. Environment Canada (EC) applies the Energy, Environment and Economy model for Canada (E3MC), which is internationally recognised and combines external data from consistent and regular sources. The E3MC modelling estimates are subject to various interdepartmental reviews of the federal, provincial and territorial governments. However, the E3MC modelling work is basically filled with uncertainty and projections are subject to alteration with reviews and updates on substantial energy data (Environment Canada 2014).

International Level

Canada's international commitments to climate change started in 1992 with the Earth Summit in Rio de Janeiro. In 1997, the Kyoto Protocol was adopted under the UNFCCC and Canada signed the Protocol in 1998 and formally endorsed it in 2002. The Kyoto Protocol legitimately came into effect in 2005, and Canada promised to reduce GHG emissions to 6 per cent below its 1990 emission level over the 2008 and 2012 period. At the meeting of G8 Summit in 2009, the Group of Eight (G8) leaders, including Canada established a long-term goal to cut down the total GHGs release by 50 per cent by 2050, however, its baseline year was not mentioned. In 2010, Canada promised to sink GHGs release by 17 per cent from 2005 level by 2020 under the Copenhagen Accord, 2009. In 2011, the Minister of the Environment pronounced that Canada would legitimately withdraw from the Kyoto Protocol.

Notably, Canada became the first nation to withdraw from the Kyoto Protocol. Instead of cooperation with other nations to settle a more effective and take action of the Protocol, Canada has chosen to withdraw the Protocol from reducing GHG emission target of 17 per cent on the basis of 2005 level by 2020. In fact, recent estimates show Canada's GHG emissions are more than 30 per cent above that target. For example, between 1990 and 2012, Canada's GHG emissions increased by 16.64 per cent and 21.38 per cent respectively (Davidson and Shah 2015: 7). In this circumstance, Stephen Harpers Conservative government defended that "Kyoto Protocol for Canada, is in the past" (Curry and McCarthy 2011). According to Peter Kent, then Minister of the Environment, "The Kyoto protocol does not cover the world's largest two emitters, the United States and China, and therefore cannot work." The Canadian government argued that that Kyoto is not the right step to go forward to a global solution to climate change. If Canada implement and go ahead with Kyoto, Kent further stated that "to meet the targets under Kyoto for 2012 would be the equivalent of either removing every car, truck, ATV, tractor, ambulance, police car and vehicle of every kind

from Canadian roads or closing down the entire farming and agriculture sector and cutting heat to every home, office, hospital, factory and building in Canada, but withdrawing the Protocol allows us to continue to create jobs and growth in Canada." It is cleared that Harpers government was unwilling to affect Canada's economy by reducing GHG emissions from its economic sectors including the oil sands sector that the world's third-largest oil reserves after Saudi Arabia and Venezuela, but this sector is Canada's fastest growing source of GHG in the country.

However, when the Sixth National Communication and First Biennial Report came in 2014, Canada reaffirmed the obligations to reduce GHG emissions under the Copenhagen Accord 2009. In addition, as a signatory nation to the 2015 United Nations Climate Change Conference (COP 21) in Paris, the Government of Canada has promised to attain its national and international obligations to drop GHGs release by 30 per cent below 2005 level by 2030 under the Intended Nationally Determined Contributions (INDCs) of the Paris Agreement 2015.

Table 4.1 highlights the 2005 and 2012 Canada's GHG emissions for the major seven different economic sectors and projected 2020 GHGs emissions in megatons (Mt) with and without federal and provincial measures. For each economic sector, Table 4.1 shows the estimated Canada's GHG emissions for 2005 in Mt with percentage and number measures, the baseline year for the 2009 Copenhagen Accord target. It highlights to 2012 estimates of the national GHG emissions. It also gives a projection of Canada's GHG emissions for 2020 with the inclusion of all the declared (with measures). It also shows Canada's projected GHG emissions (without measures) with none of the existing and announced federal and provincial measures are taken into account in Canada.

Table 4.1: Canada's Estimated and Projected Emissions for the Seven Economic Sectors

Canada's Greenhouse gas (GHG) emissions in megaton (Mt)					
Economic sector	2005 emissions		2012 emissions	2020 projected emissions with reduction measures**	2020 projected emissions without reduction measures
	Mt	%	Mt	Mt	Mt
Transportation	168	22	165	176	199
Oil and Gas	159	21	173	200	203
Electricity	121	17	86	82	128
Buildings	84	11	80	95	98
EITE* Industries	89	11	78	90	91
Agriculture	68	10	69	69	69
Waste and Others	47	8	47	50	52

Source: Canada's National Inventory Report and Sixth National Communication on Climate Change and First Biennial Report to the UNFCCC (Office of the Auditor General of Canada 2014).

*Emission Intensive Trade Exposed Industries (such as: cement, chemicals and fertilizers, iron and steel)

** Both from the Federal and Provincial

The transportation sector is a significant source of GHGs in Canada. This sector alone has produced 22 per cent or 168 megatons (Mt) of the Canada's GHG emission in 2005 (Table 4.1). According to the Environment Canada (2014), the average vehicle on Canada's roads accounts for approximately 5.6 tonnes of GHGs a year. In general, Canada produces an estimated 699 megatons (Mt) of GHGs emission in 2012, with about 165 megatons from the transport sector. Reducing the GHG emissions by 1 megaton (Mt) would be equivalent to removing about 180,000 vehicles from the roads in the region. Some development programmes have been initiated on most transport regulations for heavy-duty vehicles that came into effect in 2014. Environment Canada expects this similar regulatory action to

continue in the country. Transport Canada is also addressing emissions from railways through measures taken voluntarily rather than by regulating them. Transport Canada is dealing with emissions from other means of conveyance through voluntary measures like Canadian aviation action plan. In addition, the Transport Canada is engaging in international negotiations to tackle emissions from aviation and shipping through its membership and partisanship in the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) respectively (Environment Canada 2014; OAGC 2014).

According to Environment Canada (2014), the oil and gas sector is the second largest producer of Canada's GHG emissions-about 21 per cent or 159 megatons (Mt) was produced in 2005 and 173 Mt in 2012 (Table 4.1). This oil and gas sector is projected to reduce about 200 Mt GHG emissions by 2020, which is an increase of about 12 Mt from 2005 to 2012, and about 27 Mt between 2012 and 2020, which is the largest rising rate of the emissions among the seven economic sectors. The electricity sector is a producer of the third largest GHG emissions in Canada of 17 per cent or 121 Mt in 2005 and 84 Mt in 2012. The estimated GHG emissions in this sector will be 82 Mt by 2020.About 35 Mt and 39 Mt of emissions have been cut down effectively over the period 2005 to 2012 and 2012 to 2020 respectively in this sector (Table 4.1). While both the buildings/constructions and EITEI (Emission Intensive Trade Exposed Industries) sectors contributed to about 11 per cent of Canada's GHG emissions in 2005 and 2012,the agricultural sector produced GHG emissions of about 10 per cent or 68 Mt in 2005 and 69 Mt in 2012. As shown in Table 4.1, the Waste and Others sectors produced the national GHGs emissions of8 per cent or 47 Mt over the period from 2005 to 2012 (OAGC 2014; Environment Canada 2014).

Table 4.2: Canada's 2020 Projected Emission Reductions with Reduction Measures from either Federal or Provincial Actions

Economic sector	Emission reductions by 2020 due to Federal actions in megaton (Mt)	Emission reductions by 2020 due to Provincial actions in megaton (Mt)
Transportation	18	5
Oil and Gas	0	3
Electricity	9	37
Buildings	0	3
EITE* Industries	1	0
Agriculture	0	0
Waste and Others	0	2
Total**	36	62

Source: Canada's National Inventory Report and Sixth National Communication on Climate Change and First Biennial Report to the UNFCCC (Office of the Auditor General of Canada 2014).

*Emission Intensive Trade Exposed Industries (such as: cement, chemicals and fertilizers, iron and steel)

** Total emission reductions include cross-cutting measures, which are estimated by 8 Mt at the federal level and 13 Mt at the provincial level. Cross-cutting measures are measures that affect more than one sector, such as the federal eco-efficiency programmes or British Columbia's carbon tax (Office of the Auditor General of Canada 2014).

Table 4.2 shows 2020 Canada's projected GHG emission reduction in megatons (Mt) with reduction regulations estimated from federal and provincial actions for the seven major economic sectors in Canada. The Office of the Auditor General of Canada is worried that Canada will not achieve its 2020 GHG emission reduction target. Canada's mitigation of climate change plans have been ineffective and the actions that have been taken so far are also moving at a snail's pace, inefficiently managed and uncoordinated. While the sector-by-sector regulatory approach has made some progress, the existing measures put into practice are expected to bridge the gap in GHG emissions by 7 percent by 2020, and the actual outcomes of these measures have not yet been deliberated. The Government of Canada also needs substantial plans and approaches to coordinate actions with the provincial and territorial governments to meet the national target. In fact, the Government of Canada does

not yet have effective plans for how it will work for the better reduction of the national GHG emissions required beyond 2020 (OAGC 2014; Environment Canada 2014).

The Government of Canada has yet to act sector-by-sector for regulating GHG emissions other than in transport and power generation. Some regulatory appraisals are being taken into consideration by the federal government but they may not affect Canada's GHG emissions by 2020 because of several factors, such as limited expected reductions, long lead times required to build capital investments, and to change technologies. According to Environment Canada, the sector-specific federal government regulations of existing plans would help decrease emissions by nearly 18 Mt by 2020. These steps are calculated to attain 7 per cent decrease or 612 Mt in the gap between Canada's Copenhagen Accord 2009 target and the planned GHGs emissions level without strategy measures by 862 Mt. by 2020. The Government of Canada envisages that other cross-cutting rules, such as the efficient energy regulations by Natural Resources Canada, are balancing the existing sectorial approach and will also reduce the emissions. The Government of Canada expects further reductions from existing and intended regulations after 2020, but not sufficient to overturn the increasing tendency in Canada's overall emissions (OAGC 2014).

Environment Canada is dedicated to transparent and accountable processes when climate change plans are implemented at all levels of the governments in Canada. As such, Environment Canada will continue to publish updated reports on emission trends. Environment Canada will also continue to publish the National Inventory Reports and National Communications under the UNFCCC and will regulate any new measurement, information, verification and ratification mechanisms established under the Copenhagen Accord 2009, the Cancun Agreements 2010, the Durban Platform 2011 through the decisions reached at the Paris Agreement 2015.

The Government of Canada is committed to the UNFCCC Intended Nationally Determined Contribution (INDC) of the Paris Agreement 2015. As a result, Canada plans to attain an economy-wide 100 per cent of Canada's GHG inventory goal to minimise its GHGs release by 30 per cent of the 2005 baseline by 2030. The INDC lists seven GHGs, such as: a) carbon dioxide (CO2), b) methane (CH4), c) nitrous oxide (N2O), d) sulphur hexafluoride (SF6), e) perfluorocarbons (PFCs), f) hydrofluorocarbons (HFCs), and g) nitrogen trifluoride (NF3). In this context, the Common Reporting Framework in the Reporting Instructions (CRFRI) of the

IPCC outlines how GHGs release are reported among the IPCC sectors, including the Agriculture, Energy, Land Use, Land-Use Change and Forestry (LULUCF) and the Transportations sectors (Government of Canada 2015).

The Government of Canada has taken regulatory measures in action plans sector-wise as mentioned below: a) gradually setting up transport sector regulations with more strict GHG emission norms for heavy-duty automobiles for 2014 to 2018 as model years and for light trucks and passenger vehicles for 2011 to 2025; b) banning of electricity generating units using coal which would be guided by electricity sector regulations. The sector regulations will guide the end of existing coal-fired electricity units which do not have facilities to capture carbon capture and store it; and c) renewable fuel rules demands that gasoline should comprise of an average of 5 per cent renewable fuel content while diesel contains an average of 2 per cent renewable fuel content (Government of Canada 2015). The Government of Canada is also putting in place measures to deal with the transport sector's GHG emissions from marine, rail and aviation sub-sectors. Subsequently, the Government of Canada is in the process of discussing additional regulatory measures that: i) will apply more rigorous standards in the transport sector for heavy-duty automobiles of the 2018 and subsequent models; ii) will gradually reduce HFC emission, which will minimise the GHG emissions that are anticipated to soar significantly in the next 10 to 20 years; iii) will decrease GHG emissions from natural gas-fired electricity, and also from chemicals and nitrogen fertilizers; and iv) will minimise methane emissions from oil and gas sector in the country. Notably, Canada is the first country in the world to introduced carbon capture and storage plan in the power-sector in Saskatchewan (Government of Canada 2015).

In order to achieve Canada's international target of 30 per cent reduction in GHG emissions by 2030 under the UNFCCC's Intended Nationally Determined Contribution (INDC) of the Paris Agreement 2015, Canada will have to cut its emissions down by 208 Mt from 2016. At the same time, the Government of Canada has committed to providing $2.65 billion over the next 5 years to assist developing countries to combat climate change starting from 2016 (Government of Canada 2015; Mas and Cullen 2016).

Conclusion

Climate change is a reality in Canada, particularly in the Arctic region. Canada needs to take comprehensive and action-oriented measures when dealing with climate change issues and making plans to adapt and mitigate to a changing environment and climate. The Government of Canada understands that future success depends on collective support, collaboration, and incorporation of all levels of government efforts relative to the major concerns and interests of the indigenous communities/peoples in northern Canada. The Government of Canada along with the three territorial governments in Canada have committed to working intimately with their national, provincial, territorial, local, indigenous communities and international partners to share knowledge and practices on climate change adaptation in order to enhance collaborative activities. In order to serve the people in northern Canada and ensure their well-being, the three territorial governments of Nunavut, Yukon and Northwest Territories are committed to lead in the adaptation of climate change plans in the Canadian Arctic (Governments of the Northwest Territories, Nunavut and Yukon 2011).Climate change is a collective responsibility that needs commitment and endeavour at every level of governments in Canada. In fact, the Canadian provinces and territories have the constitutional and jurisdictional authorities over the fields of energy, natural resources, and many sectors related to the environment.

In order to manage the high cost of food items in northern Canada, the federal government created the Food Mail Programme (FMP) which was operated by Canada Post in the late 1960s which pays for a portion of the transportation expenses incurred ship nutritious but perishable food and other items to far-flung and remote communities in northern Canada which are inaccessible throughout the year by road, rail and ship services (INAC 2009). However, the FMP was not able to address the food price escalation in the region, resulting in a decision to do away with it and a more focused food subsidy programme called Nutrition North Canada (NNC) took its place in April 2011. Similarly, the NNC programme has also failed to meet its objective which is to make nutritious food accessible and more reasonably priced for inhabitants of isolated and remote communities in Canadian Arctic region. The Fall Report of the Auditor General of Canada 2014on the NNC found that the subsidy programme has failed due to lack of accountability, transparency and community consultation (INAC 2009; OHCHR 2012; OAGC 2014). In fact, Canada has failed to address food security and health security issues in the Canadian Arctic region or in Inuit Nunangat.

The Inuit communities will benefit if focus is paid on preventing diseases, provision of health support activities, disease screening, advice on healthy living and counselling on mental health in Inuit Nunangat if the availability of health care services increases in these regions (CPHO 2008). The Inuit Tapiriit Kanatami and Inuit Circumpolar Council have launched recently a programme called the Inuit Action Plan 2011-2021, stressing the need for long-term funding based on demand, instead of the per capita allocations based on operating costs and remoteness. The Government of Canada must recognise the distinctive circumstances of Inuit like the high costs of transporting medical supplies, shortages of medical staff, the complications that comes with maintaining medical practitioners from the south and training new Inuit health staff in Inuit Nunangat (ITK and ICC 2007; Inuit Tapiriit Kanatami 2014a).

Mitigation of climate change needs collective actions of all countries of the world to reduce overall GHG emissions. Canada will work with other developed countries and international partners to move forward to address climate change. Canada's plan is a resilient and comprehensive world-wide commitment that will put in place a long-term construction for collaborative action (Environment Canada 2013).

Despite the fact that the Government of Canada was officially withdrawing from the Kyoto Protocol in December 2011 (Curry and McCarthy 2011; Kennedy 2011), Canada seems to be officially committed to reducing GHG emissions as a signatory to the UNFCCC as well as under the 2009 Copenhagen Accord (OAGC 2012). As a result, it appears that Canada is obligated to achieve its national and international undertakings to decrease GHG emissions to 17 per cent below its 2005 levels by 2020.Canada's has an international target of 30 per cent decrease in GHG emissions by 2030 under the INDC of the Paris Agreement 2015 (Government of Canada). At the same time, the Government of Canada has also committed to assisting developing countries to tackle climate change by investing $2.65 billion over the next 5 years (Mas and Cullen 2016; Government of Canada 2015).

CHAPTER 5

CONCLUSION

The study is based on two objectives – to find out the consequences of climate change on the Inuit in Canada and Canada's approach to adverse climate change. Climate change is a global issue and recognised to be one of the most serious challenges to mankind in contemporary times. It is a global phenomenon that will adversely affect and impact humanity directly (food, air and water) and indirectly by making regions, species and ecosystems around the world vulnerable. The effects of climate change vary from rising of the sea level, submergence of low-lying islands and coastal lands to melting ice and glaciers and thawing permafrost that occurs in the Arctic, due to rising global temperatures. These changes are a threat to indigenous peoples, particularly the Inuit population and have become a major cause for concern in the region as they challenge not only the Inuit way of life but also their cultural identity, society and economy.

To understand the impact that climate change is having on the Inuit in Canada, it is important to recognise the unique geographical, cultural and historical environment in which Inuit live. The Inuit are circumpolar peoples, inhabiting regions in Alaska, Canada, Greenland and Russia, united by a common culture and language. There are approximately 53 Inuit communities living in Canada spread across the northern part of the country where four Inuit regions in Canada encompass more than 40 per cent of the entire landmass of the country: Nunatsiavut, Nunavik, Nunavut, and the Inuvialuit region. Such a small population spread across such a large region makes the Canadian Arctic a remote and sparsely populated area.

The UNEP and the UNFCCC, have described the Arctic as the world's climate change indicator and barometer. The uncertain weather prediction in the Arctic such as prevalence of rainfall, floods, coastal or shoreline erosion and landslides are making life unpredictable and tough for the communities. Decreasing rate of snowfall, unavailability and poor quality of freshwater in the circumpolar region has already impacted the health of Inuit communities, wildlife, and environment or biodiversity. Besides, increase in the sea/ocean and surface temperatures and the warmer weather in summertime in the region has led to thinner sea ice that result in shoreline erosion and landslides. At the same time, new species of flora and

fauna are found in the region, and changes in animal migration patterns, movements, and wildlife behaviour are also being observed (Prosser 2011; Peace 2012).

Climate change is referred to as a long-term significant change in climate over a period of time. The cause(s) of climate change could be due to the natural or solar variability, or as a consequence of human activity, especially as a result of the industrial revolution in the world, or both. Climate, in many aspects, is influenced by various human-made factors such as industrialisation, infrastructure and developmental work, urbanisation, and population. Consequently, air, noise and water pollution levels continue to increase, leading to rising distress and stress on the environment.

According to Bast (2010: 30), the anthropogenic theories of climate change assert that human emissions of greenhouse gases, primarily carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) are causing a catastrophic rise in global temperatures. The mechanism whereby this happens is called the enhanced greenhouse effect. Nearly all the experts agreed that it is "very likely that anthropogenic greenhouse gases have been responsible for most of the unequivocal warming of the earth's average global temperature in the second half of the twentieth century" (Anderegg et al. 2010: 2-3; Rice 2010). In contrast to the anthropogenic theory of climate change, is the theory of solar variability, which argues that global temperature changes were controlled by long-term quasi-periodic variations in the parameters of the Earth's orbit or the obliquity, precession and eccentricity of the solar system (Pillans et al. 1998: 5). It also argues that the orbital forces and axial variations in the solar system influence climate change on earth in long-term natural cycles defined as, 'ice ages' and 'warm periods' or 'glacial' and 'interglacial' epochs. According to it, this is a result of the cyclical glaciations of the past hundred years to million years because of the variations in the earth's orbit and rotational motion.

On the other hand, the Inuit understanding and their interpretations of observed climate change are more often wider or varied than the two scientific interpretations and explanations of climate change in many ways. The Inuit manifestation of Sila suggests that the Western emissions of the GHGs are reflective of ecologically or environmentally unsustainable cultural thought patterns. This implies that the sentience of Sila is reacting to GHG emissions that have largely originated through Western culture and action (Leduc 2007: 247). About 80 per cent of the growing carbon dioxide (CO2) emissions released into the atmosphere has

been mainly produced by developed and industrial countries (Earthtrends 2005; Leduc 2007: 247). Thus, climate change in the Arctic is a human issue, a family issue, a community issue and an issue of cultural survival. For the Inuit, climate change is likely to disrupt or even destroy their hunting and food sharing culture as reduced sea ice causes the animals on which they depend to decline, become less accessible, and possibly even extinct (Watt-Clouter 2005).

In order to survive these changes in the Arctic environment, adaptation to climate change is one of the core mechanisms meaning thereby taking "actions that reduce the negative impact of climate change, while taking advantage of potential new opportunities. It involves adjusting policies and actions because of observed or expected changes in climate. Adaptation can be reactive, occurring in response to climate impacts, or anticipatory, occurring before impacts of climate change are observed" (Richardson 2010: 2). In these conditions, the outcome of the anticipatory adaptations would be more effective and cost saving than the reactive adaptation process. Adaptation is one of the options undertaken by governments at all levels in Canada – from municipal to provincial, territorial and federal – to combat climate change impacts. However, Canada's policy initiatives towards the Inuit through the Department of AANDC/INAC on food security issues, social and health care services or other social determinants of Inuit health are unclear, and the actions of current and past Canadian governments on climate change have never signalled any sense of the urgency with regard to climate change.

Access to nutritious food is extremely difficult in the region due to the high cost of food and limited harvesting of country/traditional food. For harvesting of country food, Inuit have experienced a number of different climatic forces that threaten to restrict harvesting activities. Moreover, the social, economic and demographic change due to globalisation or resource development, resource management, trade barriers and animal-rights campaigns have all affected Inuit livelihood and cultural activities (Nuttall, 1998; Wenzel 1991).

At the same time, the high rates of unemployment and low income among the Inuit communities are significant factors of food insecurity prevalence in Inuit regions. According to the Nunavut Inuit Health Survey 2007-2008 report, Inuit adult unemployment and low income, and the high cost of food were the core contributing factors to food insecurity in the Inuit Nunangat regions (Nunavut Tunngavik Incorporated, 2013; Egeland, 2011). Moreover,

most of the store-bought food items are not a healthy diet for the Inuit, nor are these items available in times of poor weather conditions in Inuit Nunangat. The melting of ice and permafrost in the Arctic create more difficult conditions for food access, transport and infrastructure. Moreover, climate change is influencing animals migration patterns, human access to wildlife, food preparation methods and food storage (Nuttall, 2007). As a result, food security is a major issue in Inuit Nunangat.

Climate change not only affects hunting activities, it has also affected social relationships and mental health of Inuit communities (ACIA 2005). Food and Agricultural Organisation of the United Nations (FAO) has stated that "climate change affects all four dimensions of food security: food availability, food accessibility, food utilisation and food stability. It has an impact on human health, livelihood assets, food production and distribution channels or food transportation and supply, and is also affecting purchasing power and market flows" (FAO 2008).

In order to manage the high cost of food in northern Canada, the federal government created the Food Mail Programme (FMP) which was operated by Canada Post in the late 1960s which covers part of the transportation costs incurred when shipping nutritious, perishable food and other essential items to isolated northern communities which are not accessible year-round by road, rail and ship services. However, the FMP could not address the high food prices in the region that resulted in a decision to replace the programme with a more focused food subsidy programme called Nutrition North Canada (NNC) in April 2011. Similarly, the NNC programme has also failed to address the objective of the programme which is to make nutritious food more accessible and more affordable to residents of isolated and remote communities in northern Canada. The 2014 Fall Report of the Auditor General on the NNC revealed that the subsidy programme has failed due to the lack of accountability, transparency, community consultation and assessment of the eligibility of communities. In a nutshell, Canada has failed to address food security in the country. Even when food security is attainable in Canada, the biggest challenge is distribution, which is not providing the affordability of food to the individuals and communities in need.

Despite the fact that Canada ranks high in areas such as life expectancy, standards of living and quality of life, and is a member of Group of Eight (G-8) nations sending food aid to developing countries around the world, food insecurity remains a critical problem in northern

Canada and Inuit have not been freed from their struggle to meet basic food needs. At the same time, Canada has been a long time champion of the international human rights issues in terms of the protection of civil, political, economic and social rights including the right to food. However, Canada has failed to give legal protection of economic and social rights particularly the right to food domestically. According to the United Nations Special Rapporteur on the Right to Food, Canada has considerably exceeded its minimum food aid commitments under the Food Aid Convention in the past few years (OHCHR 2012). Canada faced a probe by the United Nations human rights expert, Olivier de Schutter, the UN Special Rapporteur on Food Security and the Right to Food in May 2012. During his visit, Schutter said, "this is a country which is rich but that fails to adapt the levels of social assistance benefits and its minimum wage to the rising costs of basic necessities, particularly food, health care services and housing in the northern Canada" (Gunn 2012).

Therefore, over 4 million Canadians have been living in poverty, hunger and food insecurity, including the majority population of Inuit in Canada. According to the IPYIHS 2007-2008, seven out of ten Inuit population lived with food insecurity in Canada, particularly in Nunavut and other parts of Inuit Nunangat which has the highest documented food insecurity prevalence for any indigenous population living in Canada and a developed country (Rosol et al. 2011). Besides, the preliminary household data from the Canadian Community Health Survey (CCHS) 2011 shows that about 8.2 per cent or 4.3 million individuals/Canadians were lived under food insecurity (Tarasuk et al. 2015; OHCHR 2012).

The other core mechanism to survive climate change is mitigation. Canada was one of those countries, which led the world in discussing plans for reducing GHG emissions. However, there has always been a gap in planning, projection and implementation. Many examples can be taken – Action Plan, Green Plan, Project Green. Mulroney had plans in 1990; Chrétien's Liberal government had plans in 1995, 2000 and 2002; and the Martin Liberal government had a plan in 2005. Even the Harper Conservative government had a plan of offering a target for reducing emissions that contribute to climate change by 17 per cent on the level of 2005 by 2020 before his government officially withdrew from the Kyoto Protocol in December 2011. The current Trudeau Liberal government is also not different from the previous governments in plans to tackle climate change by reducing Canada's total GHG emission in the country. The Trudeau government has promised to reduce GHG emission by 30 per cent by 2030 under the INDC of the Paris Agreement 2015. In addition, the Government of

Canada has committed to supporting developing countries to deal with climate change by granting $2.65 billion for a period of 5 years from 2016.

Initially, the Martin government developed a plan to achieve its Kyoto targets, which included mandatory emissions cuts for large factories and power plants. The Government of Canada initiated a voluntary agreement with auto manufacturers to develop fuel efficiency of vehicles in Canada and climate funds to maintain GHG emissions. In addition, a partnership and corporation fund has been established to help provinces and municipalities in making investments in infrastructure projects to reduce GHG emissions.

Unfortunately, the Harper government has reversed Canada's stand on climate change at both domestic and international fronts. The government declared that it would not even try to reach its Kyoto targets, and it dropped funding for Canada's climate change plan and stopped most of Canada's climate change programmes. Notably, the government of Canada became the first nation to withdraw from the Kyoto Protocol. Instead of cooperating with other nations, Canada chose to withdraw from the Protocol where they had promised to reduce GHG emission target by 17 per cent from 2005 levels by 2020.

In fact, recent estimates show Canada's GHG emissions are more than 30 per cent above that target. Between 1990 and 2012, Canada's GHG emissions increased by 16.64 per cent and 21.38 per cent respectively (Davidson and Shah 2015: 7). "The Harper government was more concerned about protecting polluters than people", according to Greenpeace Canada's Mike Hudema. Most reporters and news items were critical of Canada's stand. A columnist from Canada's Globe and Mail, John Ibbitson stated: "Canada gave its word to the world and Canada broke its word. No one should feel anything other than ashamed" (Carrington and Vaughan 2011).

In addition, the absence of any effective climate regulations at the federal or provincial level to address Canada's fastest growing source of GHG pollution, combined with policy failures across the board in terms of regulations on air, water, wildlife, climate science, renewable energy and energy efficiency have pushed Canada into a corner from which it will be impossible to escape unless they prove they are going to take the global climate crisis seriously. Therefore, it has been widely felt even in Canada that it should immediately take a comprehensive action to elevate its poor climate record and address the massive GHG

emissions from its agriculture, construction/buildings, electricity/power, oil and gas, EITE industries, transportation and tar sands industry to achieve both domestic and international commitments in dealing with climate change.

The Inuit also have the right to adequate food, housing and health care services as part of the right to life, liberty and security guaranteed to all Canadians in the Section 7 of the Canadian Charter of Rights and Freedoms of the Canadian Constitution. Inuit continue to live partly with their traditional way of life by hunting, fishing and trapping, and partly meet their requirements by shipping store-bought food. Thus, there is need to improve the capacity of country food harvesting programmes through enhancement of subsidy for hunters to ensure they have the essential equipment required to hunt, fish and harvest country food. The prevalence of food insecurity in the Inuit Nunangat is a complex issue that requires a collaboration between the federal and territorial governments as well as the community organisations to achieve food security in the regions. Notably, the 2009 World Summit on Food Security in Rome reaffirmed that "food security is a national responsibility and that any plans of addressing food security challenges must be nationally articulated, designed, owned and led, and built on consultation with all key stakeholders" (FAO 2009).

Based on this understanding, Canadian federal government is responsible for policy formulation and implementation of national health security, food security and social development programmes in Canada especially in light of the Inuit perspectives on climate change which believes that climate change in the Arctic is a family and community issue, which in turn is related to cultural survival. A viable conclusion seems to be that climate change be it anthropogenic or natural, has to be dealt with by the government as there is already a lot of interface between government development policies and Inuit cultural practices. The Canadian government has a responsibility towards sustainability and protection of indigenous cultural and economic practices.

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