Northwest Territories GREENHOUSE GAS STRATEGY

March 2001

Northwest Territories
Resources, Wildlife and Economic Development

Minister's Message

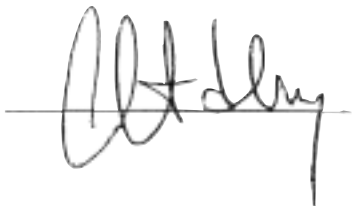
Global climate change is considered one of the most serious environmental, economic and political challenges of this century. The impact of climate change on people with traditional lifestyles in the North is a vital concern of the Government of the Northwest Territories. Northern regions are already seeing the effects of a changing climate.

Climate change is caused by the buildup of greenhouse gases in the Earth's atmosphere. Carbon dioxide, the most significant greenhouse gas released by human activities, is the main contributor to climate change. It is produced through the burning of fossil fuels. This strategy is designed to start identifying and coordinating northern actions to control greenhouse gas emissions.

Although the Department of Resources, Wildlife and Economic Development had the privilege of coordinating the development of the *NWT Greenhouse Gas Strategy*, this is not a Government of the Northwest Territories strategy for action. It is a strategy for action by all sectors in the Northwest Territories.

More than 40 federal and territorial agencies, Aboriginal organizations, industry and environmental groups participated in the development of the strategy. I would like to thank those participants, whose significant commitment of time and effort has guided the development of this strategy. I would also like to acknowledge the support of our major funding partner, the Government of Canada through the Climate Change Action Fund.

I invite all northerners to review the strategy and to provide comments and feedback on the actions being proposed to begin controlling the emission of greenhouse gases in the Northwest Territories. I also encourage all northerners to take personal action to reduce greenhouse gas emissions.



Joseph L. Handley
Minister
Resources, Wildlife and Economic Development

1.0 INTRODUCTION

1.1 The Need for a Strategy

Naturally occurring greenhouse gases help the earth's atmosphere trap the sun's heat. This blanketing or "greenhouse" effect keeps the earth warm and sustains life. Human activities, especially the burning of fossil fuels, are causing higher levels of greenhouse gases. The rising levels of greenhouse gases mean more heat stays in the earth's atmosphere, causing changes in climate around the world.

Global climate change is considered one of the most serious environmental, economic and political challenges of this century. Forecasts show that continued warming of the earth's temperature could trigger a wide range of changes in our climate. These changes could have consequences for our environment, our health, our economy and our children's future. There is general agreement among experts that average global temperatures could rise by 1 to 3.5 degrees Celsius over the next century.

The impact of climate change on people with traditional lifestyles in the North is a vital concern. Northern regions are already seeing the effects of climate change. For example, many Northern communities have already seen changes in rain & snowfall that is making it harder for animals to find food and threatens their habitats.

The overall effects of climate change will likely be more obvious in the North than in other parts of the country. The temperature increases that are already taking place in the North serve as an early warning for the rest of Canada.

The potential impact of climate change on the North's natural environment has compelled the Government of the Northwest Territories to support global and local actions to reduce emissions of the greenhouse gases.

One of the actions the Government is undertaking is coordinating the development of the NWT Greenhouse Gas strategy with the participation of a broad range of stakeholders. A Steering Committee of senior government and non-government representatives was established to guide the strategy process. A Working Committee was also created. The Working Committee is made up of representatives from government, industry, aboriginal and environmental organizations.

The purpose of the NWT Greenhouse Gas Strategy is:

1) to identify and coordinate northern actions to begin to control greenhouse gas emissions, and

2) to assist in developing and contributing a northern perspective as part of Canada's national Climate Change implementation strategy.

Although the Department of Resources of Wildlife and Economic Development is coordinating the *NWT Greenhouse Gas Strategy* this is not a Government of the Northwest Territories strategy for action but a strategy for action in the NWT. Reducing greenhouse gases in the NWT will require major changes in the way we produce and use energy at home, at work, and on the road.

Climate change action offers other environmental, health, economic, and social benefits. Many actions to reduce GHG emissions also cut emissions of air pollutants that affect local air quality and public health. Energy efficiency and renewable energy can help consumers manage energy costs in the face of rising fuel prices. In addition, climate change action provides opportunities for economic development, technology advancement, and job creation that may be missed unless the Northwest Territories acts promptly and decisively to address climate change.

These changes will not be easy and will require all northerners to take action to control greenhouse gas emissions. Many of these changes make sense anyway because they will reduce the cost we now pay for energy.

(See Appendix 1 for Background Information and Appendix 5 for the GNWT's Official Statement on Climate Change)

1.2 Impact of Climate Change on the NWT

Scientists have learned a great deal in recent years about the complex systems that control the global climate. Many changes have taken place through the earth's climate history, including the ice ages. There are still significant gaps in our knowledge. We don't know as much as we could about the causes, impacts, amount and timing of climate change. We need to find this information out through better scientific understanding of what is happening to the climate. Even with the gaps in knowledge, there is enough scientific evidence about climate change to warrant taking early action. Many traditional knowledge holders are seeing changes in the Northern environment that are consistent with what scientists are saying.

Not all regions of the world will be affected equally by climate change. Some regions will have increased temperatures while other areas will become cooler. Or, different regions may become wetter or drier as changing weather patterns change the annual precipitation levels. Just like other geographic regions in Canada, the Northwest Territories will experience unique changes in its natural environment as the climate changes. However, since many areas of the north are expected to experience greater than average warming, the impacts of climate change in the NWT will be significant.

Should the northern climate warm up as much as predicted, every major human activity in the Arctic will be affected. Some of these changes may bring economic advantages, but there will also be new problems that will offset some of the benefits.

Some of the environmental impacts of warmer temperatures may include:

- Higher sea levels and flooding of coastal communities.
- Changes in permafrost
- Increased forest fires/insect infestations due to drier conditions
- Significant disruptions for Arctic wildlife and vegetation

Economic impacts may be felt in the areas of:

- Transportation
- Hunting, fishing and trapping
- Building construction
- Tourism
- Oil and gas production

(See Appendix 2 for more information about Potential Climate Change in the NWT.)

2.0 NWT GREENHOUSE GAS STRATEGY

2.1 Goals and Objectives

The goal of the *NWT Greenhouse Gas Strategy* is to control greenhouse gas emissions in ways that:

1) Reduce negative impacts on health and the environment

2) Minimize negative impacts on the economy

3) Support Canada in meeting its obligations under the Kyoto Protocol

The objectives of the NWT Greenhouse Gas Strategy are:

- To increase awareness in the NWT of the issue of global climate change and the need to control greenhouse gas emissions;
- To engage all northerners including government, non-government, industry, and the general public, to take action to control greenhouse gas emissions;
- To identify and implement achievable and practical actions that can be undertaken immediately, as well as longer-term actions which will result in future, sustained reductions in greenhouse gas emissions in the NWT, taking into consideration the economic, environmental and social costs and benefits;
- To identify economic opportunities that may arise from the use of cleaner, more efficient equipment and technology.
- To identify potential sources of funding that may be utilized to implement the actions identified.

2.2 Principles

The Strategy reflects the following principles:

LEADERSHIP

The Government of the NWT must demonstrate leadership by diligently and responsibly taking action to control emissions of greenhouse gases in the NWT.

INCLUSION OF STAKEHOLDERS

Residents, communities, industry and other affected groups must be provided with a meaningful opportunity to participate in the development of legislation, policy, strategies and other initiatives that will directly affect them.

COMPREHENSIVE APPROACH

The responsibility for meeting the goal and objectives of the Strategy must be shared by all sectors of society including governments, the private sector and the general public.

PHASED APPROACH

The strategy should identify least-net-cost (economic, environmental, and social costs and benefits) measures first and adopt a long term, responsible approach to achieving sustained greenhouse gas emission reductions.

BALANCED APPROACH

Controlling emissions must be done in ways that carefully considers sectoral and regional economies. All sectors and regions should do their part but no region or sector should be asked to bear an unreasonable share of the burden of mitigative actions if such actions would prevent economic growth.

EFFECTIVENESS

Action should advance the environmental, economic and social goals of residents of the NWT, ensuring that the NWT's response to control greenhouse gas emissions is supportive of the overall priorities of the NWT.

ECONOMIC BALANCE

The strategy must recognize that there may be financial costs in achieving the goal of reducing greenhouse gas emissions but these costs must be balanced by the resulting environmental and social benefits.

PRECAUTIONARY APPROACH

Given the significant risk that potential climate change poses for human and environmental health, a "weight of evidence" or precautionary approach must be used to justify preventative actions rather than wait for full scientific certainty.

3.0 ACTION PLAN

The Greenhouse Gas strategy will support measures that are cost-effective; deliver important additional benefits; and lay the groundwork and build momentum for progressive action. There will be several phases to the strategy to allow for response to changes. This phase of the strategy begins to reduce NWT emissions now in order to lead to reduced costs later.

The current focus of the *NWT Greenhouse Gas Strategy* is to "mitigate" or reduce greenhouse gas emissions. The NWT Greenhouse Gas Strategy provides a framework for a coordinated response to climate change by governments, industry and individual northerners. Actions already taken to reduce energy costs have resulted in reducing greenhouse gases in the NWT.

The actions identified through this strategy have been organized along the lines of five broad themes. The themes are:

1) ENHANCING AWARENESS AND UNDERSTANDING
Inform, educate and build awareness of climate change including the science, impacts and adaptation, develop support that climate change is a priority issue, and encourage and motivate northerners to take personal and corporate action to reduce greenhouse gas emissions.

2) DEMONSTRATING LEADERSHIP BY PUTTING THE GOVERNMENT'S HOUSE IN ORDER
The Government of the Northwest Territories needs to "walk the talk" with respect to climate change by taking action to reduce emissions in its own operations. Exhibiting leadership in this fashion will send a signal to northerners that climate change is an important issue and needs to be addressed.

3) ENCOURAGING ACTION
The main focus is to facilitate actions to reduce greenhouse gas emissions across sectors, which will build on existing voluntary approaches and pave the way for more significant reductions.

4) PROMOTING TECHNOLOGY DEVELOPMENT AND INNOVATION
Enhance the availability of advanced technologies to help reduce GHG emissions efficiently.

5) INVESTING IN KNOWLEDGE AND BUILDING THE FOUNDATION
Equip decision-makers with the necessary knowledge, capacity and experience to make informed future decisions and lay the foundation for future action.

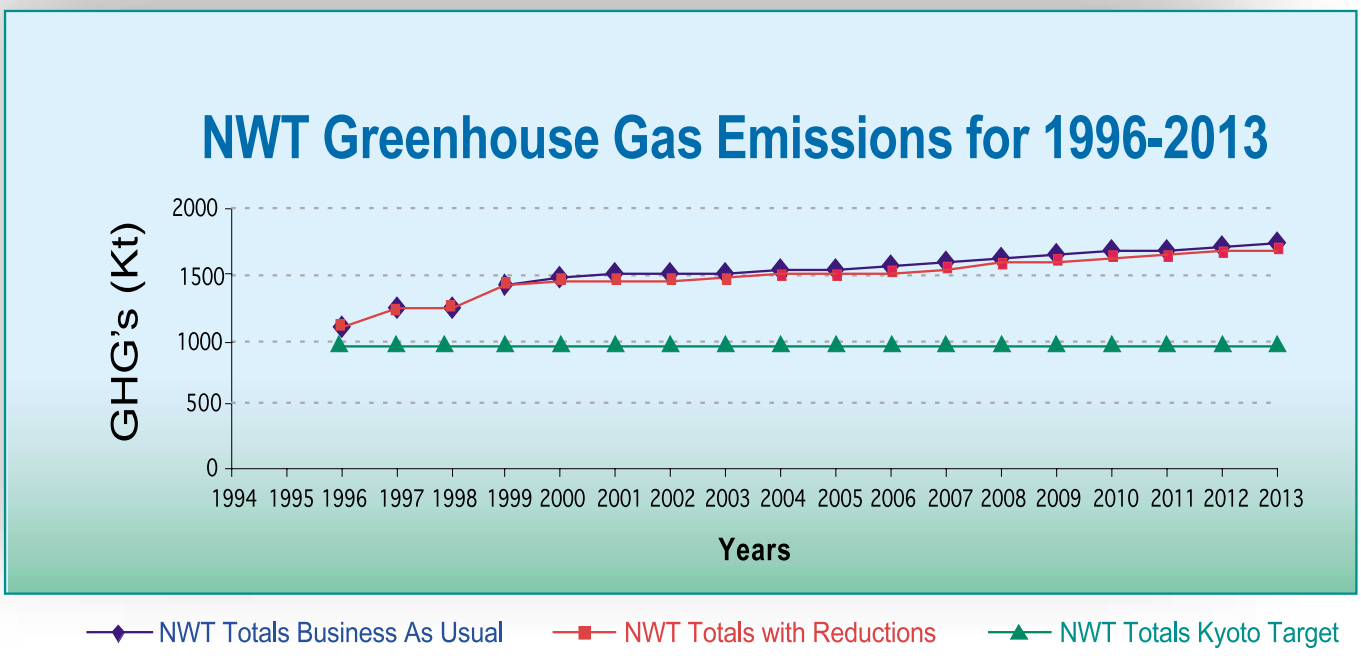
The following table lists both existing and new measures that are to be implemented as part of this Strategy.
(Detailed explanation of the measures are found in Appendix 3.)

Theme & Measure	Business Plan Cycle	
THEME #1: Enhance Public Awareness And Understanding	**Existing**	**Future**
1. Design and develop energy management workshops	No	2001
2. Incorporate climate change information in school curriculum	Yes	2001
3. Establish a NWT public education & outreach Hub	No	2000
4. Promote changes in driver patterns	No	2001
THEME #2: Government Leading By Example	**Existing**	**Future**
1. Increase energy efficiency of government operations	No	2000-2004
2. Develop a Purchasing Policy to require purchase of low emission products	No	2001
3. Continue or expand existing energy management initiatives		
• Public Awareness Campaign	Yes	Yes
• Energy Conservation Capital Program	Yes	Yes
• Inuvik Natural Gas Conversion Assistance Program	Yes	Yes
• Promote use of the Good Building Practice guidebook	Yes	Yes
• NWT Housing Corporation Energy Management Program	Yes	Yes
• Northwest Territories Power Corporation VCR Action Plan	Yes	Yes
• Continue support of Arctic Energy Alliance	Yes	Yes
• Vehicle fleet inspection and preventative maintenance program	Yes	Yes
• Develop new district heating systems	Yes	Yes
THEME #3: Encourage Action Across And Between Sectors	**Existing**	**Future**
1. Adopt energy efficiency codes for new construction	No	2003
2. Move to full-cost pricing and rationalize utility subsidy programs	No	2003
3. Provide financing for energy efficiency retrofit projects in non-government and private sectors	No	2002
4. Support communities efforts to reduce GHG emissions	No	2001
5. Promote participation in the Voluntary Challenge & Registry (VCR) program	Yes	Yes
6. Environmental tax shifting	No	2004+
7. Integrate greenhouse gas emission considerations into the design and implementation of all new projects	Yes	Yes
THEME #4: Promoting Technology Development & Innovation	**Existing**	**Future**
1. Establish a renewable energy technology conversion assistance program	No	2001
2. Set up a Northern Research Centre to test new technologies	No	2003
3. Develop hydro-electric resources	No	2004+
4. Convert Mackenzie Valley communities to natural gas	No	2004+
THEME #5: Investing in Knowledge / Building the Foundation	**Existing**	**Future**
1. Build knowledge of science aspects of climate change, including northern impacts and adaptation issues	No	2001
2. Monitor NWT GHG emissions	No	2002

4.0 IMPACT OF ACTION PLAN ON EMISSIONS FORECAST

If the action plan is carried out there will be a reduction of approximately 47 kilotonnes (kt) of carbon dioxide ($CO_{2)}$ on an annual basis. Further reductions will result from actions taken after 2004. The chart below illustrates the impact of the 47 kt reduction initiatives on the "Business as Usual" forecast of greenhouse gas emissions in the Northwest Territories.

The Business as Usual forecast considers a normal growth in energy needs, the continuation of current energy management measures, and includes the energy requirements for advanced mineral development projects such as the Ekati and Diavik mines. The forecast does not include the major oil and gas developments anticipated in the Liard and Mackenzie Valleys, which would increase emissions significantly.



5.0 CHALLENGES

5.1 Northern Emissions

Northern carbon dioxide (CO_2) emissions are approximately 30 tonnes per person compared to the national average of 21 tonnes per person. Carbon dioxide is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned. Emissions for each northerner are so high partly because cold climate conditions create large demands for space heating and other energy consuming devices. The long distances between communities have also made the NWT dependent on transportation and the use of refined petroleum products.

Our CO_2 emissions are increasing at a rate greater than the national average. Population growth in the NWT is higher than the national average while the level of economic development in the past has been lower than in the rest of Canada. Energy intensive mineral developments are already underway and without more development, the NWT would not be able to work towards its goal of supporting the economic needs of its citizens

Mining developments and other "remote" facilities in most communities provide electrical power by burning fossil fuels like oil. There is considerably more potential for hydro development but the cost of power lines to distant markets and concerns over environmental impacts are major limitations.

New technologies such as fuel cells look promising but the time frame for their commercial use is too uncertain at this time.

(For more information on the NWT Emissions Forecast see Appendix 4)

5.2 Energy Efficiency

Many existing activities, operation of buildings and mines, are already reasonably energy efficient because of the high cost of energy in the North. The challenges are to identify other areas where energy efficiency and conservation will help us reduce emissions and to seek opportunities for dependable low carbon, alternative energy sources for new and existing developments.

5.3 Public Awareness

Increasing the level of interest in climate change among the general population in the NWT may be difficult when there are other significant issues to be addressed including constitutional development, Aboriginal rights and self-government, health care, education, among others. Implementing the strategy will have to compete with those issues for time and resources. Lack of public interest may require greater leadership on the part of government.

5.4 GNWT Subsidies

The GNWT provides a large number of subsidies to a significant portion of the population for some, or all, of their utility consumption. Some of the programs include the Water/Sewer Subsidy Program, Territorial Power Support Program, and the fuel price structure. Such subsidies often do not encourage the wise use of energy.

5.5 Impact on the Arctic

Current projections are that the greatest warming in Canada will occur in high northern latitudes in winter, although these areas will not experience as much additional warming in summer. A potential doubling of carbon dioxide emissions in the atmosphere over the next century may cause winter temperatures over the mainland of the Canadian Arctic to rise by five to seven degrees Celsius. A climate model run by the Canadian Centre for Climate Modeling and Analysis predicts the increase could be as much as 10 degrees Celsius over central Hudson Bay and the Arctic Ocean, northwest of the Arctic Islands. At the same time, some other areas of the Arctic will experience cooling.

5.6 Economic Growth and Reduction of Greenhouse Gases

Economic activity in the NWT is increasing. A lot of economic growth is linked to resource based activities. Unfortunately these activities are energy intensive and result in high emissions of greenhouse gases. The challenge will be to allow increased economic activity reducing or controlling the emission of greenhouse gases.

6.0 FUTURE STEPS

The NWT Greenhouse Gas Strategy is a "living document" that can be revised in future years, as more information becomes available. Changes in both the national and international context, and also in the knowledge base (science, analysis of impacts, and technological advances) will require that the plan be updated. Objectives and actions must continually be refined as new knowledge comes to light and as new technologies and practices are developed.

Although the current focus of the NWT Greenhouse Gas strategy is reducing emissions there is another approach to climate change called adaptation. This involves taking action to minimize the negative effects of climate change. An example might be adapting the way buildings are constructed so that they are stable on melting permafrost.

Any effective approach to climate change must incorporate both approaches. The NWT Greenhouse Gas Strategy is focusing on reducing greenhouse gases as well as looking at what adaptive measures can be taken.

Even if all emissions were eliminated in the NWT, the climate in the north will continue to change due to the emissions produced in other areas of the world. Some form of adaptation will be required eventually, no matter what reduction efforts are made in the NWT.

The NWT Greenhouse Gas Strategy also reflects the National Implementation Strategy on Climate Change with three year rolling business plans being updated annually. There is flexibility to change the NWT action plan, as other options such as new affordable technologies become available.

Achieving buy-in and action by all sectors of the NWT economy will be critical. The appropriate mechanism to oversee implementation of the Strategy is an independent advisory panel, made up of a cross-section of interested stakeholders. The panel will be asked to review the NWT's progress against this strategy and to advise the Minister of Resources, Wildlife and Economic Development on priorities for the year 2004 and beyond. The strategy will be updated in three years by January 2004.

7.0 LIST OF APPENDICES

Appendix 1 - *Background*

Appendix 2 - *Potential Climate Change Impacts in the NWT*

Appendix 3 - *Detailed Explanation of Measures*

Appendix 4 - *NWT Emissions Forecast*

Appendix 5 - *GNWT Official Statement on Climate Change*

BACKGROUND

Greenhouse Gases

Some greenhouse gases occur naturally in the atmosphere, while others result from human activities. Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Naturally occurring gases trap some of the sun's heat and prevent it from escaping into space - like a windshield in a parked car. This creates a natural "greenhouse" that keeps the earth's surface about 30 degrees Celsius warmer than it otherwise would be. However, certain human activities add to the levels of most of these naturally occurring gases. This overloads the earth's atmosphere and it can't get rid of the excess heat.

Greenhouse gases have different global warming potentials. Global warming potential refers to how long a gas will remain in the atmosphere before it is chemically destroyed and to how much warming effect that gas will have. Carbon dioxide, the most significant greenhouse gas released by human activities, is the main contributor to climate change. It is produced primarily through the burning of fossil fuels (oil, natural gas and coal).

National and International Efforts

Current national and international efforts to mitigate or reduce the levels of global emissions won't stop climate change. Climate change will create situations that require new creative approaches and solutions. We need to try and understand what the impact of climate change will be on our environment, our economy and our society so that adaptation strategies can be developed and implemented.

Many countries including Canada are looking at different ways to reduce their emissions of greenhouse gases into the atmosphere. Reducing our current levels of emissions as quickly as possible can slow the rate at which the global climate is changing. This will allow us more time in order to better understand the science of climate change, predict future impacts and devise adaptation strategies.

International Agreements

In June 1992, 154 countries signed the United Nations Framework Convention on Climate Change. The convention or agreement said that the countries agreed to keep the amount of greenhouse gases in the atmosphere at levels that would not interfere with the climate system.

The third meeting of the Framework Convention on Climate Change was held in December 1997, in Kyoto, Japan. At this meeting, Canada joined some 160 nations and agreed to take action on climate change. Known as the Kyoto Protocol, this agreement identifies emissions targets for most of the world's developed countries.

Canada's commitment under the Kyoto Protocol is to reduce its greenhouse gas emissions to six percent below 1990 levels by the period between 2008 and 2012. This will require a 25 per cent drop in Canada's emissions from "business as usual" projections. A decision on ratification of the Kyoto Protocol is expected in the next few years.

Canada's Response to the Kyoto Protocol – The National Implementation Strategy

In 1998, government and stakeholders began to look at the impact, the cost and the benefits of Canada following the Kyoto Protocol. This helped Canada do three things:

1) Prepare Canada for the continuing international negotiations on how to implement the Kyoto Protocol.

2) Identify immediate action that can be taken to reduce emissions

3) Begin identifying and developing longer-term plans that will result in reductions in emissions.

In October 2000, federal, provincial and territorial Energy and Environment Ministers reviewed and approved two key elements in Canada's national approach to climate change: the National Implementation Strategy and a 3-year business plan.

The National Implementation Strategy provides a coordinated, phased approach to responding to the risks of climate change. It focuses on reducing Canada's emissions, better understanding the science of climate change, and adapting to a changing climate. Federal, provincial and territorial governments agreed that climate change poses significant environmental, economic, health and social risks to Canada, but that there are still considerable gaps in our understanding about the causes and effects of climate change.

The first 3-year business plan outlines actions to be taken by federal, provincial and territorial governments, individually and collectively, to address climate change. Action-based business plans will be monitored, reviewed and updated to reflect new understandings and opportunities, and presented to joint meetings of ministers on an annual basis.

The first business plan is not intended to reach the Kyoto target. It outlines how governments will reduce Canada's emissions growth now in order to lead to reduced costs later.

The business plan is based upon these key considerations:

- ***Shared responsibility and partnership***
  All jurisdictions will work cooperatively to develop, implement, evaluate and report on business plans and share responsibility for the ongoing success of the business plans.

- ***Respect for jurisdictional decision-making***
  Each jurisdiction decides how they will contribute to the common themes, objectives and performance indicators in the national business plan. Contributions include those made individually, collectively or in partnership with other jurisdictions or sectors of the economy.

NWT Greenhouse Gas Emissions Forecast

In the NWT greenhouse gas emissions caused by humans are mostly a result of burning fuel for transportation, heating buildings, and the generation of electricity.

The Department of Resources, Wildlife and Economic Development (RWED) recently did an inventory of greenhouse gas emissions in the NWT. They also developed a forecast for emissions to 2013. The forecast was based on a business-as-usual scenario.

A business-as-usual scenario looks at normal growth in energy needs, the continuation of current energy management measures, and includes the energy requirements for advanced mineral development projects such as the Ekati and Diavik mines. **This forecast did not include the major oil and gas developments anticipated in the Liard and Mackenzie Valleys, which would increase emissions significantly.**

It is important to note that the emissions forecast is based on the best available data at the time of study. The study looked at the energy use in the NWT. As the quality of the data available on energy use improves, the NWT emissions forecast will need to be updated. The following Table illustrates the current and forecast emissions in the NWT:

Source	1996 Inventory	2013 Forecast
Fuel combustion for power generation and heating	674 kt	1209 kt
Mobile fuel combustion (transportation)	366 kt	505 kt
Industrial processes such as those in the upstream oil and gas industry	46 kt	26 kt
Miscellaneous	4 kt	6 kt
Total	**1090 kt**	**1746 kt**

Under the Kyoto Protocol, Canada agreed to reduce its national emissions by six percent below 1990 levels by 2013. It is not known how Canada will meet the terms of the Kyoto agreement. It is not expected that every individual province and territory will have to meet the target.

In practical terms the NWT's emissions are only 0.2% of Canada's national emissions. The NWT has not established a numerical target but has set a goal to reduce greenhouse gas emissions and support Canada in meeting its obligations under the Kyoto Protocol.

If the NWT were to meet the Kyoto target, it would have to reduce emissions to 942 kilotonnes by 2013. If the NWT reaches an annual emissions level of 1746 kt in the year 2013, as expected under the forecast, emissions will be 85% (804 kt) above the level needed to meet Canada's Kyoto commitments.

To get a sense of the significance of the gap between the Kyoto target and the NWT forecast for 2013, it is important to look at the levels of emissions generated in the communities in the NWT. According to the *NWT Greenhouse Gas Emissions Work Program Final Report November 1999* estimated emissions resulting from fuel use in the communities is approximately 572 kt, with Yellowknife alone at 250 kt. Even if every community in the NWT were shut down, it still would not be able to meet the Kyoto target.

(Additional information on the NWT Emissions Forecast is provided in Appendix 4.)

Oil and Gas Development

The further development and production of natural gas reserves in the NWT will increase emissions considerably (estimated to be 154 kt). But, at the same time this, will help the entire North American situation. Natural gas burns much cleaner than other fuels. More available natural gas would provide the opportunity to replace higher emitting forms of energy such as coal or oil. The reductions in emissions outside the NWT would be 200-500 kt depending on how much natural gas is used instead of oil or coal.

This raises the issue of how energy exports are treated in national inventories. All emissions are allocated to the country (and in Canada's case province or territory) where the emissions are produced. However, no credit is received for the emission reductions created outside of a country's borders. This issue is being reviewed at both the national and international level.

The development of natural gas reserves in the NWT will increase emissions. But it also will result in natural gas being available for power generation and space heating that might partly offset some of the increases in emissions caused by the production.

POTENTIAL CLIMATE CHANGE IMPACTS IN THE NWT

Every major human activity in the Arctic will likely be affected by climate change. Many of these changes may bring economic advantages, but there would also be new problems that will offset some of the benefits. The balance of positive and negative effects will vary considerably from one economic sector to another.

Petroleum companies have developed a wide variety of methods for both onshore and offshore drilling in the Arctic, but costs are still higher than in the south. Oil companies can generally expect a warmer climate to improve environmental conditions for exploration and development, but not necessarily at reduced cost. While a warmer climate, with longer open-water seasons and fewer ice problems, should make many offshore activities easier and less expensive, other factors will keep costs high. Sea level rise and increased wave action will challenge offshore rigs while onshore operations will need to tackle thawing permafrost and increased flooding and erosion along the coasts.

In addition to adapting to changing climatic conditions, the northern transportation sector may have to deal with increased demand for service as a result of expanding economic activity. The northward expansion of agricultural, forestry and mining activities, will force air, marine, rail, road and related transportation options to expand.

Air transportation, which is often the only link to the outside world for many northern communities, may be the least affected by a warmer climate. Floatplanes would benefit from a longer ice-free season, but the season for winter ice strips would also become correspondingly shorter. More frequent storms may cause planes to be grounded more often and increase the need for better navigation aids.

Ocean shipping, which supplies coastal communities and moves commodities including oil, may benefit considerably from longer open water seasons, fewer ice problems, deeper harbours and channels, and easier transit through the Northwest Passage. Some additional costs and problems may arise as a result of higher waves, intense storms, the possible flooding of coastal facilities, and the need for additional navigational aids and better search and rescue capability.

Freshwater navigation may be made more difficult by lower water levels, but a longer season could increase barge traffic. On the Mackenzie River, for example, the season for barge traffic could increase by as much as 40 per cent, according to model predictions.

Roads, which are important to many communities in the southern Arctic, may become more expensive to maintain, at least in the short term, as the permafrost over which they are built becomes unstable. In addition, the season for ice roads, which provide an efficient way of moving goods in winter, would become shorter and more uncertain.

Longer, warmer summers may be a benefit to recreation and tourism in the Arctic. However, increased precipitation, accompanied by higher winds and poorer visibility, could limit activities in some areas. The effects on wildlife could also limit activities such as sport hunting, particularly in the Mackenzie Basin where climate change is expected to put the Bathurst caribou herd under greater stress.

Building and construction in the Arctic involve a number of special problems. While permafrost is the main concern, wind, snow and ice conditions are also important considerations. A warmer climate may reduce heating and insulation needs as well as provide a longer season for summer construction. Shorter winters, however, may make it more difficult to undertake major construction activities that require frozen ground for the movement of heavy equipment. The thawing of permafrost and related landscape changes could seriously affect the stability of pipelines, pile foundations, bridges, dikes, erosion protection structures and the walls of open pit mines.

Many aboriginal communities in the North continue to rely on hunting and fishing as a source of food. Subsistence living relies on both the distribution of wildlife and related resources, and the use of traditional knowledge, to ensure its success. Climate change could alter such things as the kind and distribution of animals and wildlife in an area, challenging reliance on traditional knowledge as a basis for adapting. A decline in food source could affect the health of many northerners, especially if they are forced to adopt a more urban lifestyle and increase their consumption of commercially prepared foods.

Due to poor soils and rough terrain, most of Arctic Canada is unsuitable for agriculture even with a more favourable climate. The central and upper Mackenzie Valley areas do, however, have agricultural potential that could be realized with longer and warmer growing seasons.

Timber can be harvested commercially in the southern part of the Mackenzie Basin. Although the growth rate of hardwood trees may increase in a warmer climate, softwood trees may die at a higher rate. Taking into account an expected increase in forest fires and insect infestations, the average age of trees would decline and yields from all stands of commercial timber - both hardwood and softwood – may fall by 50 per cent.

A warmer climate is expected to make both ocean and fresh-water aquatic life more productive. As a result, fish populations may generally increase and larger numbers of most species may be caught without endangering the future of the resource. The northward migration of some southern species could also increase the diversity of fish that may be harvested.

As more open water and longer ice-free seasons make the Arctic more accessible, Canada's claim to sovereignty over all waters within the Arctic Archipelago may be challenged. The region may become harder to defend as extreme weather conditions pose less of a hazard to an invader.

Easier access to the Arctic may also create a need for more surveillance and better search and rescue capabilities. Overall, Canadian military activities in the Arctic are expected to increase as a result of climate change.

DETAILED EXPLANATION OF MEASURES

THEME #1: *Enhance Awareness and Understanding*

Climate change is one of the most important environmental, economic and political challenges of this century. Public awareness and education are important so Northerners can understand what climate change means for them.

Public awareness and education are also important in building public support for broader policies and actions and to motivate northerners to take action to reduce greenhouse gas emissions.

MEASURES

1. Develop and Deliver Energy Management Workshops

The Arctic Energy Alliance is developing two energy management workshops. The first is a non-technical workshop explaining energy management to decision-makers. The second more technical workshop outlines specific energy management strategies and is intended for facilities operators and maintenance staff. The delivery of the workshops may be more appropriately handled by Aurora College.

It is recommended that ***additional*** energy management workshops be developed and delivered to specific government and non-government target audiences. This will help motivate organizations and individuals to take action and provide practical suggestions on how they can reduce their fossil fuel consumption.

Potential workshop participants include facilities operators and maintenance staff in PW&S, school and health boards, local Housing Authorities, the business sector and municipal government employees etc.

2. Continue or Expand Energy Management and Climate Change Information in School Curricula

The NWT Department of Education, Culture and Employment already includes Energy Management and Climate Change information in school curricula.

The Department should be encouraged to ***continue*** with and ***expand*** this initiative.

3. Establish a NWT Public Education and Outreach Hub

Federal, Provincial and Territorial Ministers of Energy and the Environment, agreed that it is important to establishing a network of national-regional hubs for coordinating public education activities.

The Arctic Energy Alliance is prepared to accept the responsibility of being the NWT's Public Education and Outreach (PEO) Hub. The Alliance is the logical choice for a Hub in the NWT since it is the most qualified organization in the NWT to distribute information and raise awareness on climate change. The NWT Hub would be responsible for three primary tasks:

- Co-ordination, Liaison and Monitoring on NWT Climate Change PEO Activities
- Building Delivery Capacity for PEO Initiatives
- Raise Awareness of Climate Change Through Delivery of Specific PEO Activities

This ***new*** initiative should form part of the NWT Strategy. It will raise awareness about the importance of taking action to limit the impact of climate change.

4. Promote Change in Driver Patterns

Transportation is important to the Northwest Territories economy. It is a significant source of greenhouse gas emissions. Transportation directly affects individual NWT business, residents and involves all levels of government. There will also be a need to changes in behavior, infrastructure, and technology to reduce emissions over the next ten years.

Decisions about transportation are made each day by carriers, drivers, shippers, consumers and the general public. The Northwest Territories is committed to encouraging northerners to make energy efficient transportation choices. Both individual and commercial drivers should be encouraged to minimize their use of vehicles by:

- Not running their vehicles for long periods of time when not in use
- Using public transit
- Walking and using bicycles

As part of a public awareness campaign ***New*** information about the energy efficiency of various forms of transportation should be provided to the general public.

THEME #2: *Government Leading by Example*

Northerners are looking for leadership in the reduction of greenhouse gases. The GNWT needs to send a signal to the rest of the NWT that climate change is important and needs to be addressed.

For example, the GNWT could increase the energy efficiency of government-owned buildings and share information with communities and the private sector. By reducing emissions within their own operations the GNWT can build credibility and encourage other sectors of the economy to reduce their emissions. The GNWT could also provide a leadership role by developing innovative ways to reduce greenhouse gases.

MEASURES

1. Increase Energy Efficiency of Government Operations through the Implementation of *New* Initiatives Designed to Reduce the Consumption of Energy in GNWT Funded Assets.

A task team was established to recommend potential cost savings to government through the reduction in consumption of energy and utility services. This was part of the Government of the Northwest Territories business planning process for 2000/01 and 2001/02.

The Government of the Northwest Territories has approved implementation of a package of 13 ***new*** energy efficiency initiatives identified in the final report of the Energy Utilities Subsidies Task Team including:

- Utilities Management Committee
- Utilities Management Database
- Baseline Consumption Analysis
- Surplus Retention Policy
- Targeted Retrofits
- True Cost Analysis
- Employee / Tenant Awareness Program
- Employee Recognition Program
- Review of Building Codes and Standards
- Deployment of Renewable Energy Systems
- Building Operator Training Program
- Utility Reduction Program for Leased Buildings
- Utility Reduction Loan Fund

These will be phased in over a three-year period.

2. Develop a Purchasing Policy to Require Purchase of Low Emission Products

The GNWT's current *Guide for Procurement of Environmentally Responsible Products and Services* should be updated to ensure that only low emission products are purchased.

3. Continue with and Expand Existing Energy Management Initiatives

Energy management is an ongoing process. It helps individuals and organizations reduce and/or control their energy consumption and costs. It involves meeting the demands while using energy more efficiently and/or appropriately. Using energy more efficiently may be as simple as changing operating and maintenance procedures. In other cases, it may involve replacing inefficient energy-consuming systems and equipment with more efficient systems and equipment. Using energy more appropriately typically involves eliminating waste by using energy only when and where it is needed. For example, turning lights off when they are not being used is an excellent way to save energy. It may also involve using a more appropriate source of energy such as using oil or propane or natural gas instead of electricity for space and water heating.

Public Awareness Campaign

The Arctic Energy Alliance delivers a Public Awareness Program on behalf of the Government of the Northwest Territories. The Public Awareness Program provides information about the wise use of energy to the public. The Public Awareness Program provides energy reduction information in pamphlets, fact sheets, television and radio announcements, displays and presentation.

.....The budget for 2000/2001 is $100,000.

National material should be used as much as possible, with modifications to suit NWT considerations such as culture and languages. New products should be developed as required.

The ***existing*** program should continue to be supported by the GNWT. ***Additional*** funding for specific public awareness projects should be sought through other sources such as the Climate Change Action Fund.

Continue with or
Expand Energy Conservation Capital Program
The Energy Conservation Capital Program (now the Energy Conservation Program - ECP), developed in the mid - 1980's, provides grants to territorial and community funded departments, non-profit organizations, boards and agencies. The grants support projects which reduce the use of electrical and heat energy, and water.

ECP has been used to correct or upgrade existing lighting, heating, ventilation, water and electrical systems. The data from 1990 to 1998 shows an accumulated reduction of 5,651 tonnes of CO_2 based on ECCP expenditures of $3,289k.

.....The budget for 2000/2001 is $364,000.

Inuvik Natural Gas Conversion Assistance Program
The Inuvik Natural Gas Conversion Assistance Program is an ***existing*** grant program. It provides financial assistance to residential homeowners in Inuvik to subsidize conversions from oil heat to natural gas. The local gas supplier matches the amount of the grant. The major objective of the program is to assist in the rapid conversion of residential homeowners to a local, cleaner energy source for heating. It has been in place since 1999.

.....The budget for 2000/2001 is $400,000.

Promote Use of the Good Buildings Practice
The Department of Public Works and Services has prepared building design guidelines (*Good Buildings Practice for Northern Facilities*) to help ensure that Government of the Northwest Territories facilities are designed and constructed to minimize life-cycle costs. Utility costs are a major component of owning and operating costs of a facility. There is considerable emphasis on energy efficiency in the guidelines. The guidelines are updated on a regular basis. The guidelines, supported by a rigorous design review process, help to ensure that NWT funded buildings are designed to conserve energy.

.....This initiative has been in place since 1990.

NWT Housing Corporation Energy
Management Program
The Northwest Territories Housing Corporation (NWTHC) is responsible for approximately 2,018 public housing units in 22 communities across the Northwest Territories. The housing units are managed through an agreement between the NWTHC and a local housing organization (LHO) in each community.

Utility costs for the NWTHC's public housing inventory are approximately $11 million per year. Since 1997 the NWTHC has tried to reduce its utility costs by replacing electric hot-water heaters and inefficient refrigerators. New refrigerators and hot-water heaters were bought if the cost could be made up with energy cost savings over a two-year period.

The NWTHC has ***begun*** development of an energy management program that could be adopted and implemented at the community level. The idea is to give the LHOs the responsibility for delivery of energy management. To do this, the LHOs will require technical and financial support. The energy management program would include:

1) Completion of a baseline energy consumption study.

2) Development of a retrofit schedule for the replacement of energy inefficient appliances.

3) Development and delivery of energy efficiency workshops for LHO management and maintenance staff.

4) Development and delivery of an energy efficiency awareness program for housing tenants.

5) Development of an on-going energy consumption monitoring program.

6) Development of an appropriate incentive program for LHOs.

The Northwest Territories Power Corporation Voluntary and Challenge Registry (VCR) Action Plan
Initiatives identified in the latest NWTPC plan include:

I. Wind Energy Conversions
II. Residual Heating Systems
III. Efficient Diesel Engines
IV. Programmable Logic Controllers
V. Natural Gas Generating Facilities
VI. Energy Efficient Street Lighting
VII. Transmission and Distribution Lines
VIII. Energy Efficient Initiatives
IX. Continued Involvement i Arctic Energy Alliance
X. Continued Involvement in the Voluntary Challenge and Registry Program

NWTPC should continue with implementation and expand their plan to reduce greenhouse gas emissions as outlined in their Action Plan.

Continue Support of the Arctic Energy Alliance
The ***Arctic Energy Alliance*** is a not-for-profit organization established in 1997 to help reduce the financial costs and environmental impacts of energy and utility services in the NWT. They receive financial support from the GNWT. The Alliance has six staff people. The Alliance's four main areas of activity are:

- To assist in the development of appropriate public policy
- To deliver energy management services to government and non-government clients
- To promote and facilitate the increased deployment of renewable energy technologies suitable for use in the north, and
- To develop and deliver public education and outreach activities related to climate change and energy management.

In order to increase the Alliance's scope and effectiveness with respect to its climate change PEO activities and energy management services, it is recommended that steps be taken to increase the Alliance's deliver capacity.

Vehicle Fleet Inspection and Preventative Maintenance
Properly maintained vehicles use less fuel and therefore emit fewer greenhouse gases.

Government agencies should ***reconfirm*** adoption of policies to have regular maintenance checks on their fleet vehicles. A vehicle maintenance campaign that encourages employees to check the pressure of their tires on a regular basis, remove unnecessary racks, undergo regular oil changes and tune-ups, etc, should be part of this.

The Federal Government has established the FleetWise program, which is a planning program for fleet managers. The GNWT should review this program for applicability to its fleet of vehicles.

Development of Residual Heat Energy and District Heating Systems
District Energy, also known as District heating and cooling, is the technology for providing heating (and possibly other forms of energy) from a central plant to multiple users. The most common district energy technology originally used piped steam to distribute the energy, but nowadays, lower pressure hot water in flexible plastic piping can be used effectively to distribute heating and cooling energy.

District energy can:

- save money for the users
- conserve resources
- reduce pollution
- open up many options for flexible and sustainable energy solutions in the future

Most communities in the NWT receive electrical energy generated by diesel generating plants located within municipal boundaries. The production of electrical energy from diesel fuel is an inefficient process, as only about 40% of the thermal energy contained in the diesel fuel is converted into electrical energy. The remaining energy in the diesel fuel is lost as heat.

To recover the heat rejected from the engine, heat recovery exchangers are inserted in the cooling system. These exchangers allow the engine to heat up a stream of water or glycol, which can then be pumped through a piping system to service the heating requirements of nearby buildings. Residual heat recovery has the potential to significantly increase the energy efficiency of the diesel-electric generating process by capturing thermal energy that is usually lost as a by-product of generating electricity.

The Northwest Territories Power Corporation (NWTPC) has several projects that exploit the residual heat from the diesel-electric generation process to provide space heating in their own and other public facilities. GHG emission reductions are directly linked to the volumes of fuel displaced.

Additional residual heating systems at more diesel-electric generating stations is an opportunity for additional reduction of greenhouse gas emissions in the NWT.

It is believed that ***additional*** residual heating systems could be installed in the NWT on a cost-effective basis. Installation of residual heat recovery systems into additional communities should form part of the NWT Strategy.

THEME #3: *Encourage Action Both Across and Between Sectors*

Encouraging action means to facilitate immediate actions to reduce greenhouse gas emissions across and within all key sectors of the economy. This could be done by providing incentives to appropriate technological choices and behavioral change, and by removing barriers, and supporting voluntary action.

MEASURES

1. Adopt Energy Efficiency Building Codes for New Construction

The Model National Energy Code of Canada for Buildings and the Model National Energy Code of Canada for Houses were developed in 1997. Both codes set minimum standards for energy efficiency in buildings and housing. It has been suggested that the GNWT adopt the Model Energy Codes as a companion to the National Building Code. The GNWT has developed several iterations of Design Standards and Guidelines for New Public Buildings which address energy efficiency. However, compliance with these standards is not mandatory in GNWT funded projects.

The effects of implementing the Model Energy Codes must be evaluated to ensure adoption will actually lead to improvements in building energy efficiencies (as compared to GNWT Better Building practices) and be able to be implemented by northern contractors and building trades. Such a review (***new action)*** is considered necessary before adoption of this measure.

2. Move To Full-Cost Pricing and Rationalize Utility Subsidy Programs

The Government of the Northwest Territories currently provides subsidies to reduce consumer energy costs. The Petroleum Products Division (PPD) of the Department of Public Works and Services sets prices for petroleum products in many communities. The Territorial Power Support Program (TPSP) was established so that power rates paid by residents throughout the NWT would be equivalent to the rate paid in Yellowknife

Both the PPD and TPSP subsidies are blanket programs with no eligibility restrictions. The Northwest Territories Housing Corporation provides subsidized housing units to residents of the NWT. Additionally, the GNWT further cross-subsidizes fuel and water costs by generally paying higher government rates, which permits residential and commercial consumers to pay lower rates.

From an environmental perspective, knowledge of the true economic costs, subsidies and cross-subsidies may motivate consumers to reduce their use of the various utilities. Based on experience in other jurisdictions, it is likely to result in heightened interest in energy management and conservation strategies.

The GNWT should rationalize the territorial energy subsidies and implement measures to reduce energy consumption accordingly. This is a ***new*** initiative.

3. Provide Financing for Energy Efficiency Retrofit Projects to the Private Sector

A ***new*** energy retrofit loan fund program is proposed to encourage the public to be more energy efficient. This measure will be aimed at retrofitting existing residential, commercial and municipal facilities in the NWT to increase energy efficiency and/or change to energy sources that are more appropriate for the end use. (A similar internal GNWT grant program currently exists and is successful in reducing consumption and emissions.)

The measure would provide repayable loans at attractive rates to finance energy management initiatives that contribute to a reduction in greenhouse gas emissions. Priority for loans would be given to those projects with the highest potential emission reductions within reasonable pay back periods. Without a financing mechanism such as this many potential emission reduction retrofits may not be implemented.

Initial seed funding would be required until the fund could become self-sustaining from repayment of loans. Similar programs have been suggested at the national level and the NWT should take advantage of funds, if they are made available through the national process.

4. Support Communities to Reduce GHG Emissions

Municipalities have direct control over their own operations GHG emissions and considerable influence over emissions in the community. In the Northwest Territories all communities will feel the impact of climate change and require the means to address it. Municipalities can be enthusiastic partners in climate change efforts, particularly when these efforts deliver local environmental, social and economic benefits.

Fort Smith, Fort Simpson, and Yellowknife are now members of the Federation of Canadian Municipalities' P*artners for Climate Protection Program*. The GNWT should support their efforts and encourage other municipalities to join the program.

There is a need to work with the NWT Association of Municipalities to promote greater awareness leading to action aimed at reducing greenhouse gas emissions. The first step could be to have a workshop involving the communities, NWTAM, Municipal and Community Affairs, and the Arctic Energy Alliance. The workshop could explore what is the best approach to support communities to enable them to take action. Some possible areas to be considered include- a Community Energy Planning initiative, provide a dedicated resource (a Community Energy Advisor) within the Arctic Energy Alliance to assist communities, develop a generic implementation plan that each individual community can tailor to its own needs, identify the level of financial assistance that communities require, etc.

Involving municipalities in the strategy to control greenhouse gas emissions is critical to the success of the strategy. Many challenges will arise because each municipality is unique in terms of its greenhouse gas emitting activities.

5. Promote Participation under the Voluntary and Challenge Registry (VCR)

An explanation of VCR is included under the measure **Update the GNWT VCR Plan.** All major public and private sector organizations should be encouraged to register and participate with VCR and set targets for reducing their greenhouse gas emissions. This ***new*** initiative should form part of the NWT Strategy.

6. Environmental Tax Shifting

More and more governments around the world are pursuing a new policy called environmental tax shifting. Environmental tax shifting is a process that levies environmental taxes and recycles the revenue as rebates to those who pay taxes, or as reductions in existing taxes and charges.

Such taxes reflect to a certain degree, the damages caused by the production and consumption of goods and services, and offer incentives to decrease production and/or consumption of the goods and services to which they are applied.

> *This **new** initiative should form part of the NWT Strategy in a future phase.*

7. Integrate Greenhouse Gas Emission Considerations into the Design and Implementation of All New Projects

The current low level of economic activity means that greenhouse gas emissions from the NWT do not form a significant part of the national total. This limits our ability and flexibility to manage further economic development without increasing emissions.

Energy intensive mineral developments are already underway. Without more development the NWT would not be able to work towards its goal of supporting the economic needs of its citizens. One diamond mine can result in emissions that equal 10% of our 1996 total.

During the environmental review process for all ***new*** projects, project proponents will be encouraged to ensure that greenhouse gas emissions are minimized through the use of renewable energy, co-generation, and maximum energy efficiency.

The industry is strongly encouraged to ensure that these same practices are continued in the north as well.

Any measures implemented by the industry in other parts of Canada to reduce greenhouse gas emissions are strongly encouraged. Industry will be consulted with on opportunities to reduce flared and vented volumes prior to establishing a Code of Practice to minimize the release of air pollutants including greenhouse gases.

THEME #4: *Promoting Technology Development and Innovation*

Promoting technology development and innovation makes advanced technologies that help reduce GHG emissions efficiently more available.

MEASURES

1. Establish a Renewable Energy Technology Conversion Assistance Program

The Department of Resources, Wildlife and Economic Development (RWED) is currently analyzing the feasibility of implementing a Renewable Energy Technologies Conversion Assistance Program. A program would become part of the NWT Strategy and would offer incentives to organizations that are planning to convert to renewable energy sources. Renewable energy technologies that could be included in the Program include the following:

- ***Solar thermal*** technologies convert solar energy into thermal energy for water and air heating. Applications include solar water heating systems as well as solar walls for large-scale space heating.
- ***Photovoltaic (PV)*** technologies convert the sun's energy into electricity.
- ***Passive solar*** uses building design techniques to capture and store the sun's energy for temperature regulation in residential and commercial buildings.
- ***Wind Energy*** technologies convert the wind's energy into electricity. Wind turbines are used to capture the energy of the wind and convert it into electricity.

2. Set up a Northern Research Centre to Test New Technologies (Expand the Aurora Research Institute)

The Report of the NWT Economic Strategy Panel included the following commentary and recommendation:

"We are spending huge amounts of money on housing, energy, communications technology, transportation, waste collection and disposal, water purification systems and so forth, many of which have been specifically adapted to our northern environment. All of these have a direct impact on our economy. In some cases, our failure to address these issues properly is having adverse impacts on our environment. Research and development efforts are scattered and poorly funded. The Panel recommends:

The Aurora Research Institute (ARI) be expanded, and be funded appropriately, to ensure a strong research and development initiative in the Northwest Territories.

The Institute should:

- Be a clearinghouse for information relevant to northern circumstances and opportunities;
- Have the capability to undertake pilot projects to test new technologies;
- Access existing federal and other research and development funding;
- Investigate alternative energy options, especially in the use of hydro energy; and
- Work with northern manufacturers in development and testing of new products."

The Greenhouse Gas Strategy supports the above recommendation. It is important to note that the Arctic Energy Alliance is being recommended to act as the clearinghouse for Public Education and Outreach activities on Climate Change. It is expected that the Aurora Research Institute will be a participant in the PEO Hub so that the Alliance and ARI aren't duplicating efforts related to climate change. In the case of demonstration projects for renewable energy technologies, the Alliance and other players such as the NWT Power Corporation, could partner with ARI on demo projects, but it is expected that ARI would take the lead role.

3. Develop Hydro-Electric Resources

This initiative involves expanding the use of hydro-electrical power. It could involve the construction of additional large-scale hydro-electrical developments or smaller scale micro-turbines. There is also surplus hydroelectric power from the Talston system south of the lake. It could also involve connecting the hydro systems on the north and south sides of Great Slave Lake. Preliminary estimates place the cost of tying the two systems together at $66.7 million, in 1999 dollars. The diesel emissions displaced as a result of this measure are estimated at 25.4 kt CO2 per year equivalent. This initiative requires further study but it should be considered in ***future*** iterations of the NWT Strategy.

4. Convert Mackenzie Valley Communities to Natural Gas

Natural Gas developments are anticipated in the Mackenzie Valley. When these operations are in place, it may be possible to convert a substantial amount of the NWT's electricity generation, space heating, and commercial/industrial operations to natural gas. This would result in significantly reduced greenhouse gas emissions.

Recommendation 51 from the Report of the Economic Strategy Panel stated:
"The Government of the Northwest Territories work with the federal and aboriginal governments in development of a Non-Renewable Resource Development Strategy. Overall, the strategy should address the need to attract and retain investment, manage development and maximize benefits."

A long term plan to develop natural gas in the Northwest Territories and to convert a substantial amount of the NWT's electricity generation, space heating, and commercial/industrial operations to natural gas should be prepared in a ***future*** iteration of the Greenhouse Gas Strategy.

The two strategies, Non-Renewable Resource Development and Greenhouse Gas Strategy, can complement each other in the development of local resources for the benefit of the residents. The development of NWT natural gas reserves is a great opportunity to replace imported oil with a local and cleaner fuel as well as providing economic and clean air benefits.

THEME #5: *Investing In Knowledge/ Building the Foundation*

Investing in knowledge and building the foundation is meant to equip decision-makers with the necessary knowledge, capacity and experience to make informed future decisions and lay the foundation for future action.

MEASURES

1. Build Knowledge of Science Aspects of Climate Change, including Impacts and Adaptation Issues

It is essential to better understand how climate change will affect the North's transportation system, building structures, traditional land use, wildlife, etc. A stakeholder task group should be established as soon as possible to examine the development of adaptation strategies.

2. Monitor NWT Greenhouse Gas Emissions

The Government of the NWT needs to monitor greenhouse gas emissions to be able to measure progress against this strategy and to identify areas for additional greenhouse gas reduction measures. The information will be available to policy makers as well as the general public and will provide baseline data for future decision-making.

NWT EMISSIONS FORECAST

Gross Total for 1996 – 2004

SOURCE	1996 All Gases ($ktCO_2$)	1997 All Gases ($ktCO_2$)	1998 All Gases ($ktCO_2$)	1999 All Gases ($ktCO_2$)	2000 All Gases ($ktCO_2$)	2001 All Gases ($ktCO_2$)	2002 All Gases ($ktCO_2$)	2003 All Gases ($ktCO_2$)	2004 All Gases ($ktCO_2$)
Industrial Processes									
Natural Gas Distribution									
Upstream Oil and Gas	46	43	42	38	50	46	43	40	38
Cement/Lime Production									
Other Non-Energy Use									
Coal Mining									
Chemical Production									
Subtotal	**46**	**43**	**42**	**38**	**50**	**46**	**43**	**40**	**38**
Fuel Combustion - *Stationary*									
Power Generation	144	147	149	165	168	170	173	176	179
Industrial	16	134	134	288	288	288	288	288	288
Commercial	248	254	260	266	272	278	278	285	291
Residential	114	116	119	122	125	127	130	133	136
Agriculture									
Public Administration	85	87	89	91	93	95	97	99	102
Steam Generation									
Producer Consumption	17	16	15	13	23	21	20	19	18
Other									
Fuelwood (residential)	48	48	48	48	48	48	48	48	48
Fuelwood (industrial)	1	1	1	1	1	1	1	1	1
Spent Pulping Liquors									
Subtotal	**674**	**803**	**816**	**995**	**1018**	**1030**	**1037**	**1051**	**1065**
Fuel Combustion - *Mobile*									
Automobiles	67	69	70	72	73	75	77	79	80
Light Duty Gasoline Trucks									
Heavy Duty Gasoline Trucks	4	4	4	5	5	5	5	5	5
Motorcycles									
Off-Road Gasoline	0	0	0	0	0	0	0	0	0
Light Duty Diesel Automobiles	5	5	5	6	6	6	6	6	6
Light Duty Diesel Trucks									
Heavy Duty Diesel Vehicles	10	10	10	10	11	11	11	11	12
Off-Road Diesel									
Air	222	228	233	238	244	249	255	261	267
Rail	1	1	1	1	1	1	1	1	1
Marine	57	58	59	61	62	63	65	66	68
Other									
Subtotal	**366**	**375**	**383**	**392**	**401**	**411**	**420**	**430**	**439**
Incineration									
Municipal Solid Waste	3	3	4	4	4	4	4	4	4
Subtotal	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Agriculture									
Livestock/Manure									
Fertilizer Use									
Soils(Net Source)									
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Miscellaneous									
Prescribed Burning									
Wastewater/Compost									
Landfills									
Aneasthetics/Propellants	1	1	1	1	1	1	1	1	1
Subtotal	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
NWT Totals	**1090**	**1224**	**1246**	**1429**	**1473**	**1491**	**1505**	**1525**	**1547**

NWT EMISSIONS FORECAST

Gross Total for 2005 - 2013

SOURCE	2005 All Gases ($ktCO_2$)	2006 All Gases ($ktCO_2$)	2007 All Gases ($ktCO_2$)	2008 All Gases ($ktCO_2$)	2009 All Gases ($ktCO_2$)	2010 All Gases ($ktCO_2$)	2011 All Gases ($ktCO_2$)	2012 All Gases ($ktCO_2$)	2013 All Gases ($ktCO_2$)
Industrial Processes									
Natural Gas Distribution									
Upstream Oil and Gas	40	38	35	33	31	30	28	27	26
Cement/Lime Production									
Other Non-Energy Use									
Coal Mining									
Chemical Production									
Subtotal	**40**	**38**	**35**	**33**	**31**	**30**	**28**	**37**	**26**
Fuel Combustion - *Stationary*									
Power Generation	183	185	189	192	195	199	202	206	209
Industrial	288	288	288	311	311	311	311	311	311
Commercial	285	291	298	305	312	319	326	334	342
Residential	140	136	140	143	146	149	153	156	160
Agriculture									
Public Administration	99	102	104	106	109	111	118	120	123
Steam Generation									
Producer Consumption	19	18	17	17	16	16	15	15	14
Other									
Fuelwood (residential)	48	48	48	48	48	48	48	48	48
Fuelwood (industrial)	1	1	1	1	1	1	1	1	1
Spent Pulping Liquors									
Subtotal	**1063**	**1071**	**1085**	**1124**	**1139**	**11155**	**1175**	**1192**	**1209**
Fuel Combustion - *Mobile*									
Automobiles	79	80	82	84	86	88	86	88	90
Light Duty Gasoline Trucks									
Heavy Duty Gasoline Trucks	5	5	5	5	5	6	6	6	6
Motorcycles									
Off-Road Gasoline	0	0	0	0	0	0	0	0	0
Light Duty Diesel Automobiles	6	6	6	6	7	7	7	7	7
Light Duty Diesel Trucks									
Heavy Duty Diesel Vehicles	11	12	12	12	13	13	13	13	14
Off-Road Diesel									
Air	261	167	273	279	286	292	299	306	306
Rail	1	1	1	1	1	2	2	2	2
Marine	66	68	69	71	73	74	76	78	79
Other									
Subtotal	**430**	**439**	**450**	**460**	**471**	**481**	**488**	**500**	**505**
Incineration									
Municipal Solid Waste	4	4	4	4	5	5	5	5	5
Subtotal	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**
Agriculture									
Livestock/Manure									
Fertilizer Use									
Soils(Net Source)									
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Miscellaneous									
Prescribed Burning									
Wastewater/Compost									
Landfills									
Aneasthetics/Propellants	1	1	1	1	1	1	1	1	1
Subtotal	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
NWT Totals	**1538**	**1553**	**1575**	**1622**	**1647**	**1672**	**1698**	**1725**	**1746**

Footnote: This forecast does not include the major oil and gas developments anticipated in the Liard and Mackenzie Valleys, which would increase emission significantly.

GOVERNMENT OF THE NWT – OFFICIAL STATEMENT ON CLIMATE CHANGE

The potential disruption of the North's natural environment has compelled the Government of the Northwest Territories to support global and local actions to reduce emissions of the greenhouse gases believed to cause enhanced climate change. In October 1998 the GNWT adopted the following official position on climate change:

Climate change is a serious concern that could in future significantly disrupt the global environment, affecting the ability of northerners to lead healthy and productive lives. This potential disruption of our environment compels the Government of the Northwest Territories (GNWT) to support global and local actions to reduce emissions of the greenhouse gases believed to cause enhanced climate change. These global actions include the Kyoto Protocol negotiated under the United Nations Framework Convention on Climate Change.

The GNWT recognizes that it has a responsibility to contribute to this initiative in order to support Canada's position as a leader among nations in protecting the global environment. The government is committed to working with the federal and provincial governments to develop an equitable approach to Canada's international commitment to reduce national emissions to six percent below 1990 levels by the year 2013.

Actions in the Northwest Territories to control northern greenhouse gas emissions will be developed in cooperation with a broad range of stakeholders. These actions will be implemented in a manner that reduces the negative impacts on our health and environment, minimizes negative impacts to our economy, and takes advantage of the economic opportunities that will result from the use of more efficient equipment and materials.