





Building a Path for Northern Science

Government of the Northwest Territories' Science Agenda

Northwest Territories

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November 2009

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Ministers' Message

As a culturally, socially and environmentally diverse area, the Northwest Territories (NWT) attracts high levels of scientific interest and activity every year. It continues to be an important locale for research by federal, territorial, international, academic and industry-based researchers.

The Government of the Northwest Territories (GNWT) recognizes scientific knowledge and understanding is essential when planning policies and actions to address the dynamic changes in the territory. The Science Agenda includes a science strategy, science priorities and steps to promote, support and encourage scientific research related to the GNWT's priorities. It also outlines the science needs and commitments for science promotion, integration and use within decision-making processes in the NWT.

The vision of the 16th Legislative Assembly is to see strong individuals, families and communities sharing the benefits and responsibilities of a unified, environmentally sustainable and prosperous NWT. Scientific research is a cornerstone of realizing this vision.

The GNWT has identified the following five strategic initiatives: Building Our Future, Managing this Land, Maximizing Opportunities, Reducing the Cost of Living, and Refocusing Government. These initiatives and their corresponding actions are addressed by the scientific priorities and sub-priorities contained in the Science Agenda.

The GNWT continues to develop and design programs and services, using scientific investigation, to meet the needs of the residents of the NWT people. Continued collaboration with other governments, Aboriginal organizations, communities, academic institutions, industry, and organizations and agencies must be promoted and directed by the GNWT to ensure these scientific sub-priorities are achieved, while meeting the needs of NWT residents.

The NWT Water Stewardship Strategy is being developed through the Managing this Land strategic initiative. This Strategy will highlight the GNWT's commitment to science and the importance of science integration in policy development. This comprehensive approach to managing and protecting the NWT's water resources is one example of policy development responding to an ever changing situation and using science to direct its future course.

Although NWT scientific needs will evolve as the territory grows and changes, the importance of reliable, timely and accessible information will remain essential to ensure wise and effective decision-making processes.

Message from the Ministers

The Science Agenda was developed through a collaborative interdepartmental effort to ensure it reflects the needs and priority areas of the GNWT and NWT residents. We thank and acknowledge the contributions from the departments of Aboriginal Affairs and Intergovernmental Relations (DAAIR), Education, Culture and Employment (ECE), Environment and Natural Resources (ENR), Health and Social Services (HSS), Industry, Tourism and Investment (ITI), Public Works and Services (PWS), Executive, and Transportation.

We look forward to the growing focus on northern science and want the NWT to continue to be a focus for scientific innovative and exciting discovery.

J. Michael Miltenberger
Minister
Environment and Natural Resources

Jackson Lafferty
Minister
Education, Culture and Employment

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Section 1: Science Strategy

Public policy must be informed by reliable, timely and accessible knowledge that reflects the historical and current human and environmental conditions in the NWT.

The NWT is experiencing a period of dynamic changes and challenges. Resource development, climate change, economic change, new technologies, health risks and social change require the GNWT to adapt its programs and services. The GNWT needs sound and reliable evidence-based information, derived from scientific investigations and research, to make informed policy decisions. Government plays a key role in the development and management of science. It is a central element in ensuring sustainable resource development, health and wellness, education, industrial diversification, cultural retention and economic development of the NWT.

This Science Agenda establishes a strategic framework for science and identifies science priorities, which will guide future research and science integration for the GNWT. This will be a useful tool in directing science practitioners working in the NWT to investigations that will yield information relevant and valuable to NWT residents. It will also refocus science initiatives across the GNWT and influence science funding in the NWT.

For the purpose of this document, the GNWT definition of science includes *research, baseline studies, effects monitoring, traditional knowledge studies and community-based monitoring in a range of fields, including social sciences, physical and natural sciences, archaeology, engineering and health sciences.* This broad definition incorporates many different methodologies and research approaches used to collect valuable information on the physical, biological and human environments of the NWT.

The Science Agenda recognizes that the GNWT:

- requires sound, reliable, evidence-based information to make decisions;
- needs to inform science practitioners and agencies supporting science about its institutional and informational needs;
- directs and supports research by the its departments, boards, agencies and outside institutions;
- often engages as a partner, participant or reviewer of community, federal, territorial and international science initiatives;
- faces major social, political and environmental changes, which require scientific information to address; and
- has committed to providing science-based information in a series of binding agreements and strategies made at the territorial, national and international levels, and has legislation that requires science-based information to implement (see Appendix).

Science Strategy

The GNWT's vision for its Science Agenda is: The Government of the Northwest Territories will be an active leader, practitioner, partner and promoter of scientific research, regulation and integration throughout the territory to inform relevant, timely and effective policy, planning and legislation for its constituents.

The GNWT has identified the need to:

- establish a systematic and long-term approach to science and science capacity;
- establish science priorities for the GNWT and undertake regular reviews of these priorities;
- ensure science is integrated into GNWT strategic and business planning;
- enhance standardization of baseline data collection and storage, information management and data sharing across departments;
- encourage, and legislate, appropriate research approaches and methodologies;
- contribute to pan-northern and circumpolar science strategies and policy development;
- promote community engagement in science;
- promote science education in NWT schools;
- build science capacity within the GNWT and the NWT;
- address infrastructure and logistics constraints on science activities;
- continue to recognize the importance of science to the ongoing operation of GNWT programs and services; and
- promote the use of science as a tool for decision-making in the NWT.

These strategic actions should ensure the continued visibility of science in policy and legislation development, and program design and delivery.

Section 2: Identifying Priorities

In the past, research undertaken in the NWT has primarily been driven by the scientific curiosity of southern research institutions and the interests of southern-based academics. This has resulted in some high quality investigations, but it has also meant many areas of importance to NWT residents were overlooked or under-represented in the research. Research results were often inadequately reported back to the north and, in general, inadequately integrated into policy development at many levels of government.

To address its vision for science, the GNWT must identify priorities for science. Specifically, the GNWT needs to identify areas where information is required for improved regulation, policy development, planning, and program design and implementation.

This Science Agenda defines and prioritizes GNWT research needs. It will influence the priorities of NWT-focused scientists during the next 20 years.

Science in the GNWT

The GNWT has four main roles in relation to science. These are:

1. *Practitioner* – Most GNWT departments employ science practitioners who design studies, conduct data collection, analyse and report information, and collaborate with other agencies and their scientists to address various questions related to their mandates. This science is often conducted for management purposes, but also includes pure research, all of which can help inform decision-making, guide legislation and policy development, and to promote science.
2. *Consumer* – The GNWT recognizes it needs sound, reliable, evidence-based information to develop sound policies and legislation. Science must inform GNWT policy and legislation development to allow decisions to be made based on the best information of their potential environmental and social impacts. The GNWT collects a wide range of information through reports, scientific literature and journals, surveys, raw data, real-time remotely-sensed information and research.
3. *Educator* – The GNWT is responsible for the social and natural science education of its residents. This includes the general education of the public and formal education programming for kindergarten to grade 12 and college and adult education courses as well as encouraging interest in scientific query. Education is the key to building capacity so that northerners can function as science practitioners and high level scientists.

4. *Regulator* – The GNWT administers four research licensing processes to register and regulate research across the NWT. Regulations ensure research is not environmentally, culturally or socially harming to the people, wildlife and lands of the NWT. Under the NWT *Wildlife Act*, ENR is responsible for reviewing and permitting all work related directly to wildlife and wildlife habitat. Under the Forest *Management Act*, ENR reviews and issues Forest Research Licences. The Prince of Wales Northern Heritage Centre (PWNHC), through the *NWT Archaeological Sites Regulations*, issues permits for archaeological investigations. Under the NWT *Scientists Act*, the Aurora Research Institute (ARI) reviews and approves all other forms of research in the NWT. This includes investigations into biology, contaminants, engineering, health, physical sciences, social sciences and traditional knowledge.

Identifying GNWT Science Priorities

Background for Establishing the GNWT Priorities

In 2000, a joint task force report released by the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC) concluded that northern research had reached a state of crisis in Canada. The report also concluded the country would not be able to meet "basic national obligations to monitor, manage and safeguard the northern environment or respond to emerging social issues in the north."

In 2004, the three research funding councils (NSERC, SSHRC and the Canadian Institutes of Health Research) held a meeting for researchers and northern residents in Whitehorse. Participants were asked to identify potential actions to improve northern research and collaboration between researchers, research users and research funders. This meeting resulted in an extensive list of recommendations, which required action from all groups and agencies involved in northern research. It also included a recommendation to create individual territorial research strategies.

The 2007 report, *The GNWT Science Interest Project*, examined the status of science activities and research/information needs across all GNWT departments. It concluded for science to effectively inform policy and legislation development, the GNWT needed to create a common science agenda to reflect the needs of all the departments. This recommendation was further supported and expanded in the 2008 report, *Beyond Opportunity to Action: Towards a Northwest Territories Scientific Research Agenda*. The 2008 report clearly outlined the need for a GNWT science direction and ways to pursue it.

The results of these initiatives pointed to the need for a GNWT science agenda. This led to the creation of the Deputy Minister's Subcommittee on Science Activities. The subcommittee was tasked with:

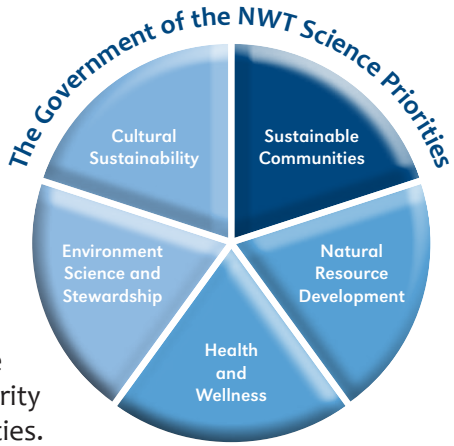
- identifying and implementing appropriate approaches to establishing a GNWT science strategy;
- enhancing GNWT science activities;
- creating a northern research agenda; and
- promoting the northern research agenda at territorial, national and international levels.

Establishing the GNWT Science Strategy and Priorities

The GNWT Science Strategy and Science Priorities are based on feedback from GNWT departments engaged with science and information gathering.

Information was submitted through surveys, consultation and working group meetings. The voices of researchers and community members were integrated through documents, past surveys and GNWT employee feedback, best practices and lessons learned from other jurisdictions. Further guidance and input was provided by the Deputy Ministers' Subcommittee on Science Activities.

Section 3: Science Priorities



The GNWT has identified the following five core priority areas for research:

- cultural sustainability;
- environmental science and stewardship;
- health and wellness;
- natural resource management; and
- sustainable communities.

These priorities are the broad areas where the GNWT believes research needs to be focused in order to improve the quality of life of NWT residents and maintain the integrity of NWT cultures, ecosystems, environment and communities.

Sub-priorities have also been identified to further focus the scope of each priority to specific aspects within the broad theme. These centre on socio-economic, environmental, health and cultural indicators and questions that will provide a more in-depth and focused understanding of the territory.

Three overarching themes emerged, which influence all types of research to varying degrees. These cross-cutting themes are important to identify as they underlie and unify scientific activities and paradigms in the five core priority areas for research. The themes are characterized by great complexity, play a role in the physical, biological and sociological worlds, and promote collaboration and integration across the priority areas or departmental mandates. The prevalence of these themes also drives the direction of research and creates the paradigms within which research unfolds. The cross-cutting themes are:

- technology integration and use;
- traditional knowledge integration and use; and
- climate change.

Current and future research in the NWT should address one or more of the five core priorities and employ these three overarching themes.

Cultural Sustainability

Cultural sustainability recognizes that:

- The NWT is comprised of many diverse and vibrant cultures with long and extensive histories.
- The NWT has 11 official languages, nine of which are Aboriginal.[1]
- Globalization forces are altering traditional cultural ways of life and changing the way traditional methods and knowledge are maintained.
- The primary responsibility for the preservation and promotion of traditional knowledge, lifestyle and customs lies with Aboriginal people.
- Traditional knowledge, lifestyle and customs are best preserved through continued use and practical application.
- The primary focus of cultural sustainability research should be the Aboriginal community.
- Research related to culture and traditional knowledge must recognize the knowledge holder as the proprietor of the information.

Research related to cultural sustainability must examine and document the history and culture of various regions and societies of the NWT. This must be done in a culturally sensitive fashion. Research in this field must also highlight the associated legal, cultural and linguistic issues arising from globalization and related changes to cultural practices. Community involvement is vital for successful research either through partnerships or initiating and executing studies. Research in this field will help produce a more in-depth understanding of various pressures and responses being felt by NWT Aboriginal governments, organizations and peoples. It will also highlight the vast breadth of traditional knowledge held within the NWT. Traditionally held knowledge and customs have often been transmitted from generation to generation and, as such, have associated methods of communication. Traditional, cultural and historical knowledge should always be treated with deference and by the stipulations of the knowledge holder.

[1] Official languages as denoted by the *Official Languages of the Northwest Territories* (R.S.N.W.T. 1988, c.56(Supp.),s.4; S.N.W.T. 2003,c.23,s.5) are Chipewyan, Cree, English, French, Gwich'in, Inuinnaqtun, Inuktitut, Inuvialuktun, North Slavey, South Slavey and Tlicho.

Strategic Goal:
The goal of research into cultural sustainability is to study the past and current cultural practices, traditions and traditional knowledge to better understand and support these practices and traditions in the future. Research in the NWT should investigate ways to support cultural and linguistic preservation, review and implement traditional knowledge integration paradigms, and provide practical steps to ensure the continued livelihood of all Aboriginal people in the NWT.

Sub-priorities

Sub-priorities identified under culturally sustainability include:

1. Anthropological and archaeological studies of traditional landscapes, economies and communities.
2. Mechanisms for effective incorporation of traditional knowledge that empowers traditional knowledge as a unique form of information.
3. Traditional language grammar, use and context.
4. Understanding changing traditional knowledge, customs and practices (both current and historical) and the pressures causing such change and the consequences of these changes.
5. Cultural impact mitigation and adaptation techniques and strategies.
6. Determining industrial impacts on culture and assessments related to socio-economic and cultural impacts and opportunities.
7. Effective community-driven and community-based research and methodologies in cultural and traditional knowledge topics.

Environmental Science and Stewardship

Environmental science and stewardship recognizes that:

- The NWT is a vast and geographically diverse territory with an array of environmental characteristics of local, national and global significance.
- The northern environment is sensitive to change from both local and global drivers such as climate and contaminant regimes.
- Baseline information is needed to understand the state of biodiversity and ecosystems throughout the different regions of the NWT.
- NWT-specific, quantifiable environmental indicators are required to detect ecosystem stress and change.
- Increased geophysical, vegetative, climate and hydrological understanding is required to comprehend environmental processes territory-wide.
- Understanding the relationships between components of the northern environment is required as all components in the northern environment are interconnected.

Research efforts into environmental science and stewardship must investigate both the biological and physical environments and their inherent connections. The collection of baseline data on the environmental processes and ecosystems of the NWT allows for a more complete understanding of the NWT, leading to more informed environmental decision-making. High quality, science-based evidence is needed for effective environmental regulation and management, land use planning and water resource management. There is a continuing need for environmental baseline data to support environmental impact assessments and strategic environmental assessments. Once in place, the potential and actual cumulative impacts of development activities, climate change and ecosystem stress can be better measured and analyzed. Research also helps produce the basic knowledge, predictive modelling and impact assessment expertise needed to enable effective management of the northern environment and its resources.

Strategic Goal:
The goal of research concerning environmental science and stewardship is to expand our basic environmental knowledge and expertise with a view to supporting economic, social and cultural progress as effectively as possible, while maintaining sustainable and resilient ecosystems. Research will help to quantify and assign environmental stresses, predict their impacts, and develop mitigation and adaptation strategies to protect the environment, maintain biodiversity and promote healthy air, water, land, plants and wildlife for future generations.

Sub-priorities

Sub-priorities identified under environmental science and stewardship include:

1. Regional baseline monitoring and research to establish comprehensive understanding of biophysical processes, biodiversity and baseline geodata.
2. Ecological relationships, population trends, thresholds of landscape change, population and habitat resilience, and biodiversity categorization and preservation.
3. Surface and groundwater hydrology across the NWT, including surface water quantity and quality.
4. Monitoring changes in permafrost regimes, identifying sensitive terrain, and the environmental and geotechnical implications.
5. Cumulative effects of multiple stressors on terrestrial and aquatic ecosystems.
6. Impacts from up-stream sources and regional assessments strategies.
7. Atmospheric transport of pollutants and changing air quality.
8. Baseline monitoring and observation techniques that have a reduced environmental impact, including remote sensing technology and community-based approaches.
9. Paleo-environmental studies that assess temporal change in climate and aquatic and terrestrial ecosystems.

Health and Wellness

Health and wellness recognize that:

- The NWT struggles with higher rates of communicable disease such as sexually transmitted infections, Hepatitis C and tuberculosis.
- Cancer, cardiovascular diseases and injuries are major contributors to mortality.
- The prevalence of significant risk factors such as smoking, physical inactivity and obesity contribute to chronic conditions.
- Mental health issues and substance abuse are underlying concerns that contribute to overall poor health.[2]
- NWT communities consistently identify issues related to health, wellness and sustainable communities as their top research priorities.[3]
- Baseline information in certain areas of health and wellness needs to be increased to better understand and analyze the health of the NWT population.
- Proper health education tools and culturally-relevant implementation mechanisms can greatly improve research in health and wellness.

Research initiatives in the NWT must take a comprehensive approach in considering the well-being, health conditions, morbidity and mortality of residents. Research must also focus on the determinants of health such as social and economic influences, the physical environment, personal health attitudes and practices, healthy childhood development and preventative health services. Research should also consider primary, secondary and tertiary prevention measures for a complete approach to altering the adverse consequences of all health-related events in the NWT.

Health care implementation and delivery require methodologies and initiatives that address the wide spread health care system in the NWT.

Health and wellness research projects must engage communities and empower the creation of health decision paradigms. Research can provide a better understanding of the health risks and issues facing the NWT in light of social, economic and environmental change.

[2] *The NWT Health Status Report, 2005*
[3] *NWT Research Agenda 2001*

Strategic Goal:
The goal of research relating to health and wellness is to ensure continuing vitality into the near and long-term future of NWT residents by better understanding health and wellness trends, health care service and management systems. Research in this field should support culturally-relevant health care delivery paradigms in remote settings and aim to understand health decision processes within that context.

Sub-priorities

Sub-priorities identified under health and wellness include:

1. Regional baseline surveys to establish a comprehensive understanding of health care knowledge, behaviours and health care outcomes as well as perceived needs.
2. Culturally and regionally sensitive health care delivery paradigms.
3. Pressures and impacts of health and wellness changes in NWT residents.
4. Mitigation and adaption strategies which address major NWT health concerns.
5. Disease vector paths specifically identifying issues unique to the north.
6. Evaluations of the effects of certain lifestyles on family structures, government resources and the health status of individuals and families.
7. NWT residents' decision-making paradigms and the development of regionally specific and culturally sensitive health promotion techniques.
8. Evaluation of current health programming effectiveness.
9. Effective community-driven and community-based research and methodologies in health and wellness related topics.

Natural Resource Management

Natural resource management recognizes that:

- The NWT contains a wealth of renewable and non-renewable natural resources. These include minerals, energy (oil, gas, biomass and hydro), timber, traditional food stocks (fish and wildlife) and endemic genetic resources.
- Potential and actual cumulative impacts development activities, harvesting, climate change and ecosystem stress can be better measured and analyzed.
- Natural resource development is of great economic importance to the NWT.
- Renewable resources must be conserved and sustained for future generations.
- Natural resources are integral to the cultures of the NWT.

Sound environmental management in the NWT necessitates monitoring of baseline environmental conditions so that impacts of climate change can be detected and the effects of natural and anthropogenic disturbance may be distinguished. In resource rich areas, the footprint of anthropogenic disturbances is anticipated to grow as exploration and development intensifies. The additive or "cumulative" impacts of these changes will also influence the structure and function of northern ecosystems, which will have important implications for protected areas management, local wildlife harvest plans and the planning, assessment and management of northern development. In areas of the NWT where susceptibility to ecosystem change and development potential overlap, implementation of a robust environmental monitoring and research system that can link multiple sources of northern environmental knowledge becomes a critical tool for resilient ecosystem planning and responsible management of resource development.

Research efforts must focus on providing information to improve the sustainable use, extraction and development of renewable and non-renewable natural resources within the NWT. Research assists in producing basic knowledge and methodological expertise to manage natural resources. Focus on baseline environmental data and cumulative effects monitoring are important as special attention must be paid to monitoring and assessing the changing state of the environment. In research and management, natural resources should always be treated within the framework of the larger ecosystem.

Strategic Goal:
The goal of research concerning the natural resources of the NWT is to expand our basic knowledge and expertise with a view to conserve renewable resources, support economic and industrial progress as effectively as possible, and create opportunities for the development of new resources and technologies, while minimizing environmental impacts.

Sub-priorities

Sub-priorities identified under natural resource management include:

1. Location, extent and value of natural resource potential in the NWT (hydro, oil and gas, minerals, biomass, timber, traditional food stock and genetic resources).
2. Exploration and diversification of the resource commodity base, in light of foreseeable changes to current extraction patterns.
3. Effective development, implementation and use of unconventional energy sources, including unconventional gas, geothermal energy, biomass, solar and wind power.
4. Identification and assessment of opportunities and impacts created by industrial development, including socio-economic, health, environmental and cultural aspects.
5. Remediation techniques of industrial projects/development.
6. Clear and effective environmental impact assessment criteria, which account for cumulative effects.
7. Impact identification, assessment and monitoring of past, existing and future industrial development on abiotic and biotic indicators.
8. Best management practices for industrial activities to minimize environmental impacts.

Sustainable Communities

Sustainable communities recognize that:

- The sustainability, viability and wellness of NWT communities is the primary goal of the GNWT.
- NWT community members consistently identify issues related to sustainable communities and health as their top research priorities.[4]
- Changing environmental regimes and factors threaten the viability of current infrastructure in the NWT.
- The NWT has a complex governance regime, with diverse levels of interaction and partnership with agencies at the Aboriginal, community and federal government levels.

Research concerning sustainable communities must be conducted on two relatively distinct aspects: the social environment and the civil infrastructure. As with all research, these are not necessarily mutually exclusive. For ease of explanation in this document, a division has been drawn.

The social environment of the NWT is characterized by a sparse, culturally diverse population, with complex Aboriginal, territorial and federal government relations. Increasing attention must be focused on the dynamics of northern regional governance structures and the strategies and scenarios of regional development to create functional, versatile and viable communities which are healthy for all population groups. Questions of governance and interactions between various levels of government, including Aboriginal, territorial and federal agencies, must be further understood in the face of increasing social pressures and devolution. Research must produce information on how changes to the regional structure can be made in an environmentally, economically, culturally and socially acceptable manner.

The NWT is characterized by isolated communities, long distances and a severe climate. Smoothly functioning transportation systems, reliable delivery of materials and power, and ease of communication within and between communities are of prime importance for everyday living, business and industrial activity. Advanced infrastructure and communications are needed to ensure communities function in parallel with larger centres in the country. Many GNWT departments identified that research related to sustainable communities must focus on alternative and unconventional energy sources to reduce the economic burden of power generation in the NWT. Information related to infrastructure longevity or evolving best practices under the rapidly changing permafrost regimes is also often identified as a major research question.

[4] *NWT Research Agenda 2001*

Strategic Goal:
The goal of research on the social environment is to study, understand and develop governance structures that best promote the health, safety and sustainability of communities in the NWT. Research should investigate ways to support social and economic development, social stability, the culture and livelihood of all NWT residents, and the management of environmental and health issues in order to retain the vitality of the NWT.

The goal of research on the civil infrastructure is to improve the conditions for the continuing success of NWT communities in such a way that the urban structure can function, both logistically and technically, and ensuring the reliability of materials, energy supplies and communications.

Sub-priorities

Sub-priorities identified under social environment include:

1. Analysis of current information on socio-economic indicators related to community longevity, sustainability and prosperity.
2. Model devolution and resource sharing models and implementation strategies.
3. Self-governance implementation models and the relationship to territorial responsibilities.
4. Strategies for transitioning programs, service mandates and responsibilities from the GNWT to Aboriginal and community governments.
5. Evolving commercial and business strategies and implementation in a northern context.
6. Evolving land use and recreation strategies and implementation in a northern context.
7. Food security issues related to the high cost of living, northern agriculture, food production and dissemination.
8. Governance coordination and cooperation strategies and paradigms related to economic, social and environmental issues.

Sub-priorities identified under civil infrastructure include:

9. Renewable energy plans for various technologies, and techniques based on use of local resources.
10. Atmospheric and local contaminant-loading, it's cumulative socio-economic, environmental and health impacts as well as regionally specific mitigation and remediation strategies.
11. Changing permafrost regimes in relationship to transportation and building infrastructure stability.

12. Current northern waste water treatment systems and community sewage lagoons.
13. Northern solid waste management systems.
14. Building and infrastructure deployment methods to increase efficiency, lower costs and reduce waste in materials and processes.
15. Monitor technical performance of building designs to evaluate engineering designs in a northern context.
16. Regionally specific infrastructure, including cold climate innovations and higher performing, higher durability community buildings and dwellings.
17. Water and river regime changes (annual levels, break-up periods, ice stability) as they relate to transportation infrastructure.
18. Advancing northern-based building construction technology and building manufacturing.
19. Maximum efficiency and integrity of NWT infrastructure design standards.
20. Infrastructure planning processes, including regionally specific variations.

Section 4: Cross-cutting Themes

When examining science activities in the NWT, it becomes clear that there are three major themes which frequently cross-cut all five core priority areas.

Technology, the first theme, is constantly changing the face of research. As technology progresses and is adapted to the northern context, the capacity and techniques researchers use can change. Technology is altering our ability to do science and driving many of the changes and impacts to the environment researchers study. These changes bring forth a new round of questions for discovery.

The second important theme is traditional knowledge. The NWT is rich in culture and traditional knowledge about its lands, people and wildlife. Traditional knowledge is distinct from other forms of understandings as it has a generational component which gives it an important temporal dimension. The culturally sensitive use of traditional knowledge is an essential aspect of most research in the north. Its use is important in understanding most aspects of human and environmental sustainability and health in the NWT, and in empowering northerners as stewards of the land.

Climate change, the final theme, is one of the most pressing issues of our time because northern environments are expected to undergo dramatic change. The effects of climate change are altering the NWT human and natural landscapes. It is a pervasive and multi-disciplinary research theme. It must be acknowledged and addressed in many research disciplines to fully understand the nature of the situation in the NWT.

Theme 1: Technology Integration and Use

Technologies are crucial components in monitoring natural landscapes, the urban environment and assessing baseline health and socio-economic data.

In the context of the NWT, making progress in the other theme areas will depend in part on whether researchers have access to the observation, data analysis and communications technologies required to develop research platforms and conduct information exchange. An example is access to earth observation data through remote sensing. When addressing the vast landscape and sparse population of the NWT, baseline data needs to be collected with minimum impact and cost over large areas. Earth observations through remote sensing address these needs and should be fully integrated in future research, where applicable.

Technology is constantly advancing. The pace at which technology is changing and becoming specific for the northern use can be seen almost every day. Technology, as shown in the past, will change the methodologies and research designs of projects over time. Advancements in technologies will be used prominently for observation and monitoring, which is an indispensable core activity for building our knowledge base, understanding the environment, exercising stewardship and managing resource development.

Technology has a clear role in addressing the NWT's research priorities. Its use must be examined as part of every research project from its design, implementation and data dissemination to ensure environmental, social and cultural sensitivity. The GNWT needs to provide clear support for innovative ideas backed by new and upcoming technologies that specifically address science priorities within departments, Aboriginal organizations and communities.

Data and information sharing across and between departments and other agencies has been identified by many as an area for improvement. Data and information management and sharing is essential to effective integration of science into policy. Efforts must be made to create clear data collection, management and sharing protocols for the NWT, and to ensure the GNWT has the capacity to maintain these protocols. This will allow for the standardization of the collection, storage and dissemination of observational data. Efforts must also be made to ensure this data is freely accessible and understood by GNWT employees as well as visiting researchers and other users for it to be correctly interpreted, analyzed and incorporated into the decision-making process.

Theme 2: Traditional Knowledge Incorporation and Use

The GNWT recognizes Aboriginal traditional knowledge as a valid and essential source of information concerning the natural environment and its resources, the use of natural resources and the relationship of people to the land and to each other. Traditional knowledge is defined as: "...knowledge and values, which have been acquired through experience, observation, from the land or from spiritual teachings, and handed down from one generation to another."[5]

Traditional knowledge, while expressly identified in the Cultural Sustainability priority, is also a cross-cutting theme as it has implications for all forms of northern research. Effective, respectful and appropriate incorporation of traditional knowledge into research initiatives strengthens the observations and outcomes.

Traditional knowledge embodies:

- A combination of specific factual information, derived from a form of empirical process which includes observation, experiential testing, information sharing and discussion, and consensus building.
- An understanding and interpretation of inter-relationships, patterns and systems (derived from the same process).
- An expansive set of cultural beliefs, values and practices which drive how that knowledge is applied.

Researchers can seek out forms of information and knowledge most useful or relevant to the particular tasks at hand by consulting with Aboriginal or community governments and traditional knowledge holders.

[5] GNWT *Traditional Knowledge Policy* 53.03

Traditional knowledge is inherently multi-disciplinary as it links human and non-human systems, where people are considered part of the environment. Research methodologies of all types in the NWT must account for this added knowledge framework and consider it in their design, delivery and dissemination of results. Further innovation is required to develop methodologies incorporating both traditional knowledge and conventional science.

Theme 3: Climate Change

The north is experiencing rapid and extensive changes often linked to climate change. This phenomenon has far reaching effects. These effects are altering northern ecosystems and all aspects of life in the NWT, from the man made to the natural and physical environment and from the health of the residents to NWT's governance and socio-economic future.

Climate change is an inherently complex issue which requires a multi-disciplinary approach to mitigation and adaptation. Understanding how the natural world is affecting the human world and vice versa is essential in research on this global issue. There is a need for empirical and experimental investigations on the behaviour and interactions of natural systems and the development of models for global and regional climatic systems as well as regional interpretation of these systems. Scientific and sociological monitoring of the effects of climate change paired with socioeconomic analysis is also required. Regionalized modelling is important to plan for adaptation coordination.

Climate change is a cross-cutting theme because of the sheer expanse of its relevance to the changing north. Climate change is not contained in one specific research priority or another. It is applicable within all priorities. Climate change must be considered when engaging in research. It is a major driver within all priorities. An enhanced understanding of the changing natural environment, the role of climate change in these changes, and the challenges and opportunities these changes will present for the NWT is essential.

Section 5: Keys to Success

Successful implementation of the vision and strategy laid out in the Science Agenda depends on taking directed and concrete steps to promote, support and encourage scientific research related to the GNWT's priorities.

Implementation efforts will be systematic and long term. A culture of scientific data collection, sharing, analysis and use must be fostered in all GNWT departments. Focus must also turn outwards to community, academic, federal and international stages to promote and foster science and the GNWT's needs.

Internal GNWT and external actions are required in the multi-level nature of this approach. Internal actions must be completed within departments to promote science internally in the GNWT. These actions will attempt to:

- promote GNWT science priorities;
- enhance the role and visibility of science in the GNWT;
- increase access to information and data for decision-making; and
- review and clarify research requirements of the GNWT.

External actions involve GNWT employees actively reaching out to different levels of governments, academic institutions, community and Aboriginal organizations, and private industry. These actions will attempt to:

- promote and initiate collaboration with external governments and agencies to increase the calibre of research done in the north and to direct science in the northern interest; and
- develop northern science capacity.

The steps outlined below are based on a five-year timeline. Coordination of these steps and the creation of a detailed five-year GNWT-wide implementation plan for specific actions are essential.

Internal GNWT Actions

Goal	Action	Description
To promote GNWT science priorities	*Promote GNWT science priorities*	• Educate and disseminate GNWT science priorities within all departments. • Integrate science priorities into regular GNWT strategic and business planning.
To enhance the role and visibility of science in the GNWT	*Promote science actively*	• Develop five-year implementation plan, with community input, to prioritize research needs. This plan should identify knowledge gaps and specific research activities the GNWT will undertake.
		• Develop and staff a senior government position dedicated to science promotion, integration and oversight at all levels of government. • Maintain the Deputy Minister's Sub-committee on Science Activities and the interdepartmental science working group.
	Build science capacity	• Evaluate and address the research capacity needs of GNWT departments and science practitioners. • Evaluate and address access to resources, access to equipment and infrastructure, research stations and centres of excellence, capacity to implement a wide range of projects, and training needs. • Support northern researchers' efforts to engage in and direct scientific research in the northern interest, and to analyse and summarize data at scales relevant to northerners. • Promote and support a wide range of science education initiatives.
	Develop and implement best practice design	• Develop and publish best practices for traditional knowledge incorporation into research. • Develop and publish best practices and standards for community consultation protocols, in conjunction with community input. • Develop, monitor and enhance best management practice documents for key environmental impacts.
	Evaluate the role of ARI to improve integration into GNWT pursuits	• Expand research partnerships with other GNWT departments and agencies. • Review and revise, where necessary, ARI's governance structure to support the Science Agenda. • Increase the visibility of ARI.

Goal	Action	Description
To increase access to information and data for decision-making	*Share information*	• Improve information sharing protocols for science in the GNWT. • Establish and clarify mechanisms and processes for data and information from external researchers to be reported back and made available to the GNWT and NWT residents. • Develop a GNWT file-sharing protocol to ensure government-wide access to databases and information and to better promote currently accessible data. • Better promote current database systems in the GNWT.
	Integrate emerging technologies	• Evaluate changing and emerging technology trends. • Engage with projects that offer technological innovation for the collection of data in the NWT.
	Standardize baseline data collection and dissemination	• Develop and publish collection and reporting methodologies to ensure standardization of information. • Develop a set of baseline environmental, socio-economic and health indicators.
To review and clarify research requirements of the GNWT	*Review legislation*	• Analyze the regulatory licensing and permitting processes across the NWT and clarify inter-relationships and overlaps amongst each. • Undertake community consultation to review and amend the NWT Scientists Act and licensing procedure to ensure the mandate and processes are clear, while addressing community needs. • Review wildlife research permitting to ensure mandate and processes are clear and address community needs as part of the process to update the NWT Wildlife Act. • Review forestry research permitting to ensure processes are clear and address community needs. • Ensure the proposed new Forests Act recognizes the importance of science and adaptive management. • Develop and implement legislation related to paleontological discoveries to ensure they are properly protected.
	Improve human ethic review procedures	• Develop clear GNWT human ethical guidelines for social, health and traditional knowledge research. • Establish traditional knowledge-specific ethical guidelines in conjunction with Aboriginal governments and organizations. • Develop a process to which non-affiliated, academic, industrial and government researchers can undergo appropriate ethics review. • Examine the possibility of establishing an NWT Ethics Review Board with Social Science and Humanities Research Council (SSHRC) accreditation.

External Actions

Goal	Action	Description
To promote and initiate collaboration with external governments and agencies to increase the calibre of research done in the north and to direct science in the northern interest	*Lead an initiative to develop a pan-northern science policy*	• Work with the governments of the Yukon and Nunavut to promote and develop a pan-northern science vision and strategy to ensure appropriate and relevant research is conducted to address northerners' concerns.
	Develop an NWT-wide research strategy	• Work with NWT community groups, Aboriginal governments and organizations, ENGOs and federal agencies to develop a comprehensive NWT policy, using this Science Agenda as a starting point.
	Collaborate with Canadian academic institutions	• Foster links between government departments, government science practitioners and Canadian research institutions.
	Work with Canadian funding agencies to promote the GNWT research priorities and interests	• Engage research funding agencies and educate them on research needed in the NWT. • Promote infrastructure development to support GNWT priority-based science activities.
	Work with Canadian academic institutions' human ethics boards	• Educate southern research ethics boards on northern concerns.
To develop northern science capacity	*Develop best practice design and implementation*	• Develop and/or support community driven research strategies to promote community involvement in research.
	Build science education	• Develop programs linking scientists and their research to NWT communities and the education system to promote community engagement, science education and capacity building.

Section 6: The Future

Priorities, and especially sub-priorities, may change over time and require review and realignment with emerging realities. A process to report annually on science activities and to conduct a five-year review of this Science Agenda must be established for the effective implementation.

Cross-cutting themes driving research will continue to change, as will the focus and the needs of the GNWT. While it is possible to foresee certain socio-economic, health and environmental changes, it is impossible to plan for everything.

Research should continue to address the current and predominant needs of the people of the NWT. A mandated review of the Science Agenda will ensure the needs are being addressed and the priorities remain current. This way the GNWT can ensure the Science Agenda remains relevant into the future.

Appendix: Basis for the Science Agenda

The GNWT has committed to providing science-based information as part of a series of legislative tools, agreements, accords and high level strategies. Examples of these commitments are listed below, with references to each of the Science Agenda's core priorities. Some commitments are relevant to more than one priority.

Cultural Sustainability

Commitments
GNWT Traditional Knowledge Policy 53.03
GNWT Traditional Knowledge Implementation Framework
NWT Scientists Act
NWT Archaeological Sites Regulations (pursuant to the NWT Act)
Historical Resource Act
Aurora College Act

Environmental Science and Stewardship

Commitments
Environment and Natural Resources Framework for Action
NWT Protected Area Strategy
Action Plan for Boreal Woodland Caribou Conservation in the NWT: 2010-2015
Wood Bison Management Strategy for the NWT: 2010-2020
NWT Biodiversity Action Plan
NWT State of the Environment Report
Species at Risk Act
NWT *Wildlife Act*
NWT *Scientists Act*
NWT Archaeological Sites Regulations (pursuant to the NWT Act)
Historical Resource Act
NWT Water Stewardship Strategy (in development)
NWT *Forest Management Act*
NWT Guidance for the Protection of Land, Forest and Wildlife: Oil and Gas Seismic Exploration
NWT Commercial Timber Harvest Planning and Operations Standard Operating Procedures Manual
NWT Forest Vegetation Inventory Specifications
NWT Ecosystem Classification: Taiga Plains, Taiga Shield, Boreal Cordilleran Ecozones
Environment Protection Act

Appendix

Health and Wellness

Commitments
Public Health Act
NWT *Scientists Act*
Health Information Act (draft)
Canada *Health Act*

Natural Resources Management

Commitments
Environment and Natural Resources Framework for Action
Caribou Forever: Out Heritage, Our Responsibility – A Barren-ground Caribou Management Strategy for the NWT: 2006-2010
NWT *Wildlife Act*
Strategic Investments in Northern Economic Development (SINED) – Public Geoscience Initiatives, 2005-2009 and 2009-2014
NWT Scientists Act
NWT Archaeological Sites Regulations (pursuant to the NWT Act)
Wood Bison Management Strategy for the NWT: 2010-2020
NWT Water Stewardship Strategy (in development)
NWT Sustainable Development Policy
NWT *Forest Protection Act*
Gwich'in Forest Management Plan (draft)
Canadian Wildland Fire Strategy
Forest Fire Management Policy 53.04
NWT *Forest Management Act*
ENR Traditional Knowledge Implementation Plan

Sustainable Communities

Commitments
NWT *Scientists Act*
NWT Archaeological Sites Regulations (pursuant to the NWT Act)
Historical Resource Act
NWT Water Stewardship Strategy (in development)
Access to Information and Protection of Privacy Act and Regulations
Safety Act
Fire Prevention Act
Planning Act
Civil Emergencies Act
Aurora College Act

Territoires du Nord-Ouest

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