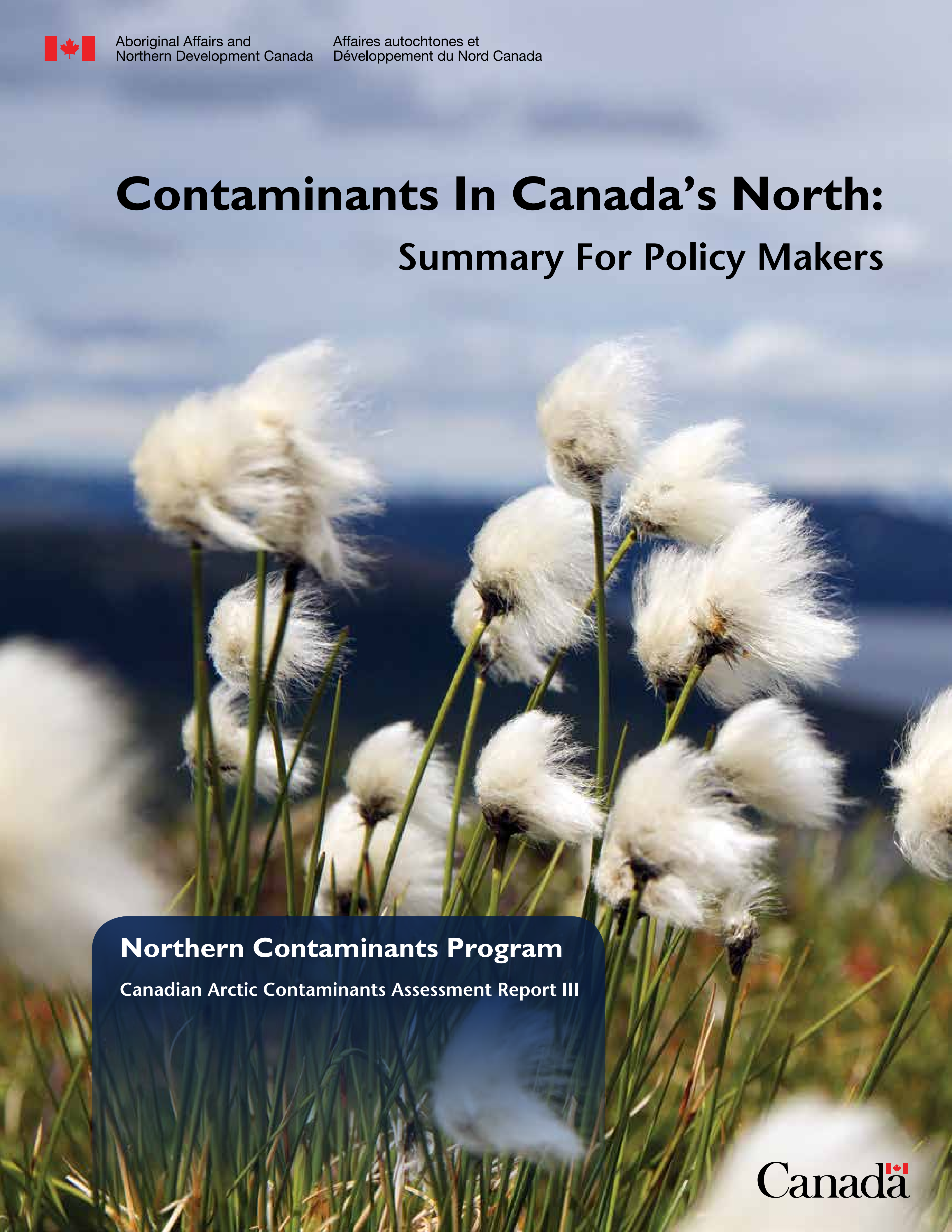
Aboriginal Affairs and
Northern Development Canada

Affaires autochtones et
Développement du Nord Canada

Contaminants In Canada's North:

Summary For Policy Makers



Northern Contaminants Program

Canadian Arctic Contaminants Assessment Report III

Canada

Contaminants in Canada's North

Many people in Canada's North rely on foods harvested from the land and sea as an important part of their diet, particularly in Inuit and First Nations communities. These foods provide significant health, economic, social and cultural benefits; they also expose people to contaminants such as persistent organic pollutants (POPs) and mercury from long-range sources – an issue that has been studied extensively for more than two decades by the Northern Contaminants Program (NCP).

1) WHERE DO THEY COME FROM?

SOURCES/EMISSIONS

- Most of the POPs and mercury in Canada's North come from sources far away, meaning outside Canada and from other continents.
- Large-scale production of POPs began in the early 20th century. Sources have mainly been industry (e.g. PCBs) and agricultural pesticides (e.g. DDT). While some previously widely used POPs are no longer in production or use, the development of new POPs continues.
- Mercury is a naturally occurring element that has always existed in the environment. Since the beginning of the world's period of industrialization, mercury has been emitted to the atmosphere primarily through the combustion of coal. Recently, artisanal and small-scale gold mining has been identified as another major source.
- Emissions of POPs occur during their production, use or disposal. They enter either the atmosphere and/or water bodies and land surfaces (e.g. via agriculture).
- Chemicals in household products (such as flame retardants in furniture and carpets, which are ultimately disposed of in local landfills in northern communities) are an increasing source of new POPs.

2) HOW DO THEY GET TO THE ARCTIC?

LONG RANGE TRANSPORT

- Contaminants can travel to Canada's North through the atmosphere (the quickest way, it can take days or weeks), through ocean currents (it can take years); and via rivers, which can carry contaminants to the Arctic from within their watersheds (it can take from weeks to years).

DEPOSITION

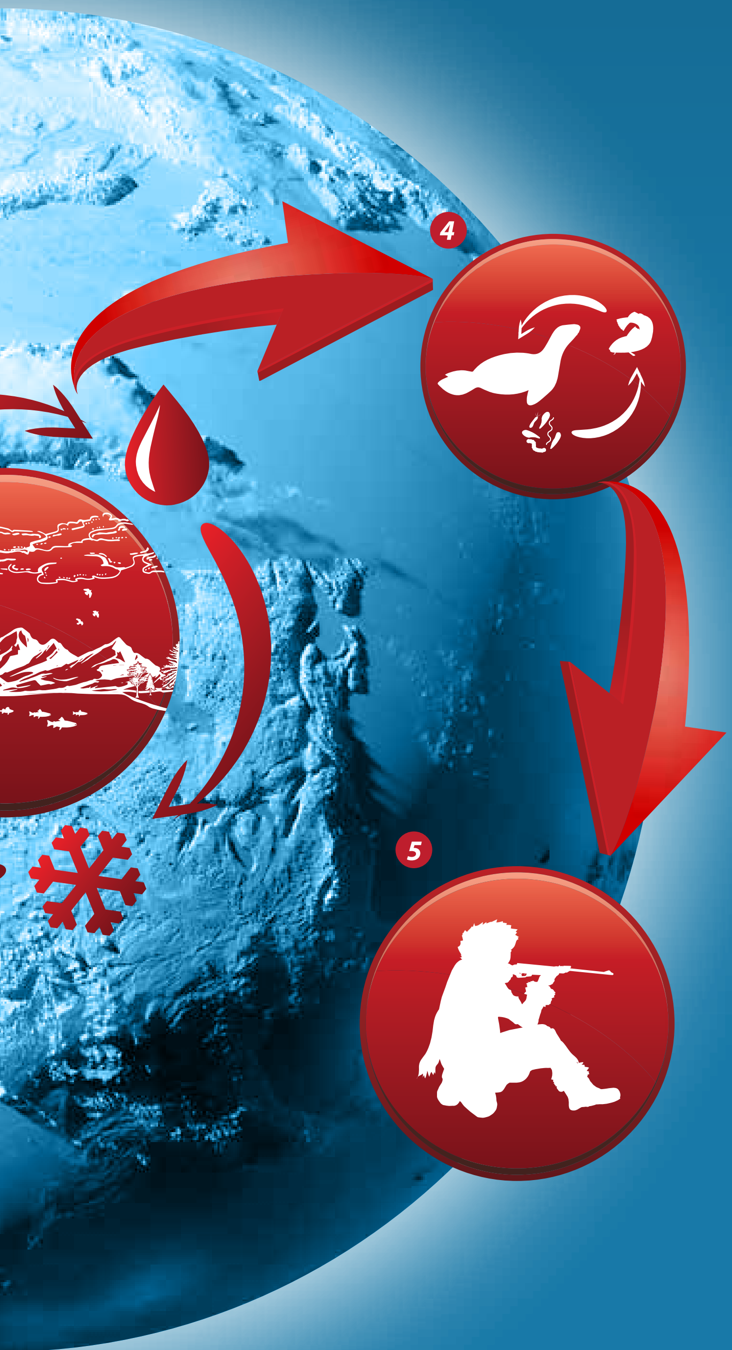
- Once in the Arctic, POPs and mercury in the atmosphere can deposit on any surface, such as land, water, ice and snow.
- Because of the cold climate and the nature of these contaminants, they tend to persist in the Arctic environment where they can be taken up into the food web.

3) WHAT HAPPENS ONCE THEY ARE IN THE ARCTIC?

CYCLING

- Contaminants can move, or cycle, between the air, water, snow and sediment.

Cover Photo: Rodd Laing



TRANSFORMATION

- Contaminants can also change from one form to another. For example, mercury is mainly deposited in an inorganic form. However, some bacteria can methylate inorganic mercury, transforming it into organic methylmercury which is more toxic.
- POPs can naturally degrade biologically or chemically (e.g. by ultraviolet radiation in sunlight), which can eventually lead to their elimination from the environment. POPs that degrade slowly are said to be more persistent.

4) HOW DO ANIMALS AND PEOPLE BECOME EXPOSED?

FOOD WEB

- Animals and people get exposed to POPs and mercury through the food they eat. Contaminants usually first enter through the lowest (trophic) level of a food web, such as through algae, which are in turn eaten by bigger animals.
- Over time, an individual organism will bioaccumulate contaminants in its tissue (especially POPs, because they are retained in fatty tissues).
- Biomagnification leads to an increase in concentration with each step up the food chain. A top predator will therefore usually have the highest concentration.
- Most POPs tend to accumulate in fatty tissue. Mercury accumulates in protein-rich tissue such as muscle. Both accumulate in the liver.
- Animals can dispose of some contaminants in their body through natural biological processes such as metabolism, reproduction, and hair growth.

5) WHAT ARE THE HEALTH IMPACTS OF EXPOSURE TO CONTAMINANTS?

HEALTH EFFECTS AND RISK-BENEFIT ANALYSIS

- At high levels of exposure, both POPs and mercury can affect the health of wildlife and people. For example, mercury can affect the brain, reproduction and nervous system, and POPs can affect the immune, endocrine and reproductive systems.
- Understanding the human health implications of contaminants at levels found in Canada's North requires balancing the risks with the many benefits from a diet rich in traditional/country foods.
- Stress caused by exposure to contaminants is compounded by other stresses affecting wildlife, such as habitat loss, food shortage, disease and extremes in weather. This is often referred to as "cumulative stress".

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NCP Knowledge to Action

1) HOW ARE CONTAMINANTS STUDIED?

MONITORING AND RESEARCH

- Contaminants are measured in samples collected by scientists and community-based monitors, and at remote, automated stations in the field, such as the air station at Alert. Increasingly, traditional knowledge is used alongside natural, health and social sciences to interpret results and assess impacts.

ASSESSMENT

- Information on contaminant levels is used to assess ecosystem and human health risks. Concentrations are compared with known threshold concentrations for wildlife effects and with human health effects guidelines, such as Health Canada's blood guidance value for mercury. Human health risks are assessed within a risk-benefit context for traditional/country foods.

PARTNERSHIPS IN RESEARCH

- In Canada, NCP and its partners perform the monitoring, research and assessment. Key partners include federal government departments (Aboriginal Affairs and Northern Development Canada, Health Canada, Environment Canada, Fisheries and Oceans Canada), university scientists, Aboriginal organizations (Council of Yukon First Nations, Dene Nation, Inuit Tapiriit Kanatami and Inuit Circumpolar Council-Canada), territorial/regional governments, regional organizations, Hunters and Trappers Organizations and other members of northern communities, and other research programs (e.g. ArcticNet).
- Canadian researchers and Aboriginal partners also regularly collaborate with international bodies such as the Arctic Monitoring and Assessment Programme (AMAP), and other working groups under the Arctic Council, for example, to produce Arctic Pollution Reports.

2) HOW ARE THE RESEARCH RESULTS COMMUNICATED?

COMMUNICATION

- Awareness of contaminant issues is raised through communicating results with key audiences such as Northerners, and particularly women of child-bearing age.
- Key communicators for the NCP include its Aboriginal partners, the Regional Contaminants Committees, the Inuit Research Advisors and the research teams themselves.
- Health advisories are developed by territorial/regional health authorities and communicated with Northerners.
- NCP collaborates with international partners such as AMAP, Arctic Council, and the United Nations Environment Programme (UNEP) and Aboriginal partner organizations to communicate results to policy makers and public audiences outside of Canada.

Photo: Lisa Loseto

3) HOW ARE RESULTS ACTED UPON?

REGULATORS AND POLICY MAKERS

- Policy-relevant science conclusions and recommendations are developed based on an evaluation of all available results and information. These are used by government to inform new and enhanced regulations that control emissions and to develop health advice that reduces contaminants exposure.
- Recommendations are also made to direct new research to fill gaps in knowledge.
- Results have been used by Aboriginal organizations, governments, and international organizations in the development and ongoing support of global regulations: the *Stockholm Convention on Persistent Organic Pollutants* (entered into force in 2004), which aims to eliminate or restrict the production and use of POPs; and the *UNEP Minamata Convention on Mercury* (adopted in 2013), which aims to reduce global emissions and releases of mercury.

Photo: Shutterstock

4) WHAT HAPPENS NEXT?

LOWER EMISSIONS AND RISK, MORE RESEARCH

- Once regulations are in place and industry ceases to produce a particular contaminant, then emissions should begin to decline along with risks to the health of wildlife and people. However, this can take a long time to occur and depends on many factors, e.g. climate change, changing dietary habits. Ongoing monitoring is required to measure progress.
- While some chemicals have been phased out, hundreds of new chemicals enter global markets every year. It is important that NCP researchers continue to look for new chemical contaminants in samples from the Arctic.

Photo: Eric Loring

Photo: Shutterstock

NCP Across Canada's North

YUKON

1. Air monitoring at the Little Fox Lake and Alert (Nunavut) stations shows that the levels of many regulated POPs, such as PCBs, are generally going down – mainly because emissions from agricultural and industrial sources have been reduced or eliminated through international efforts such as the Stockholm Convention.

Photo: Yukon Government

2. Between 1994 and 2010, Yukon hunters donated organ and tissue samples from over 2 000 moose and caribou they had hunted. It was an overwhelming response to an NCP request. The support helped NCP to assess the animals in large enough numbers to make confident conclusions, one being that mercury is not a concern for people consuming moose and caribou.

NORTHWEST TERRITORIES

3. Mercury concentrations increased by approximately 50% among freshwater fish in the Mackenzie Valley since the 1990s, and doubled in Mackenzie River burbot since 1985. A possible driver is climate warming which may be increasing the exposure of aquatic food webs to methylmercury.

4. Community members, hunters and NCP researchers worked together to study the effects of contaminants on beluga whales at Hendrickson Island. Traditional knowledge is being used alongside western science to assess beluga health.

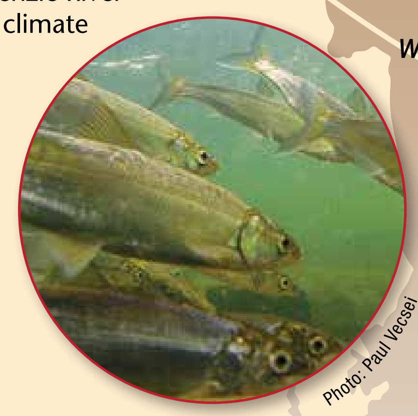

Photo: Paul Vecsei

Photo: Jennifer Provencher

NUNAVUT

5. Thick-billed murres in North Hudson Bay have shifted their diet from Arctic cod to capelin and sand lance, probably because climate change has made conditions more favorable for them. This shift may have slowed down the rate of decline of concentrations of PCB and DDT in murre eggs at Coats Island in Hudson Strait. At Prince Leopold Island, the analysis showed that PBDEs (a class of flame retardant) reached maximum concentrations in northern fulmar and thick-billed murre eggs in 2005 and 2006, respectively, and declined to levels similar to those in the early 1990s within three years.

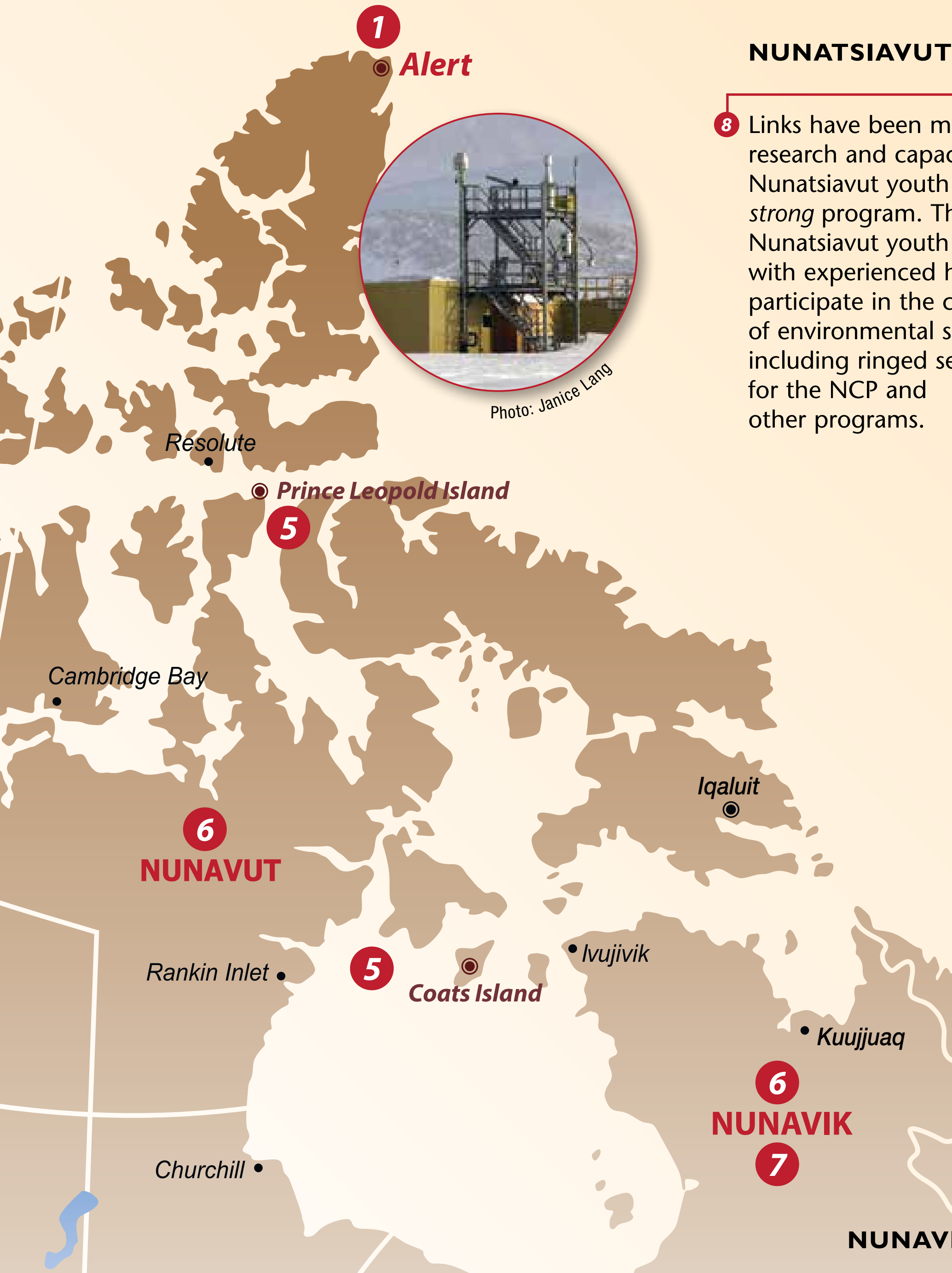

Photo: Janice Lang

NUNATSIAVUT

8 Links have been made between NCP contaminants research and capacity building and training for Nunatsiavut youth through the *Going off, going strong* program. Through this program, Nunatsiavut youth were paired with experienced hunters to participate in the collection of environmental samples, including ringed seal, for the NCP and other programs.

Photo: Sam Bentley

NUNAVIK

7 With NCP support, a long-term study was undertaken in Nunavik on the possible effects of prenatal and childhood exposure to contaminants on infant and child development. The results of this ongoing study, released in 2011, suggest that there are subtle behavioural and developmental effects in children, caused by certain environmental contaminants, including mercury and PCBs. These effects include lower birth weight and increased occurrences of attention deficit disorder.

Photo: Eric Loring

6 In Nunavik, the percentage of women of child-bearing age exceeding the mercury guidance value dropped from 73% in 1992 to 38% in 2013. For PCBs, the levels in pregnant women in Nunavik and Nunavut have dropped by 75% since the mid-1990s. While these decreases are encouraging, it is still a concern that 44% and 38% of women of child-bearing age in Nunavut and Nunavik, respectively, are exceeding the guidance value for mercury.

Photo: Eric Loring

Key Findings

KEY FINDING #1:

Concentrations of `legacy POPs´ are generally going down across the Arctic.

The levels of many legacy POPs in the environment and in wildlife are generally going down. Since 1990, the NCP has measured an approximate 50%-80% decrease in most POPs in Arctic wildlife, substantially reducing the risk of toxic effects in most species. This decrease is mainly due to the fact that the emissions of many POPs from agricultural and industrial sources (e.g. DDT and PCBs) have been reduced or eliminated as a result of national and international regulations over the last 20+ years. A rapid decline of POPs levels in the environment was observed through the 1990s, following decreases in global use and emissions. The rate of decline of most POPs has now slowed since new emissions have been virtually eliminated, however, large quantities of these contaminants are now stored in what scientists call `environmental reservoirs´ within areas such as the world's oceans and forests. As POPs naturally break down, these reservoirs will eventually be depleted, although this will take a long time. Levels of some legacy POPs are also decreasing faster than others. One reason is that certain POPs, like PCBs, are more persistent in the environment and take longer to degrade than do other POPs, such as DDT.

12 legacy POPs were originally designated by the Stockholm Convention, which regulates POPs globally, and most have been largely eliminated. Additional chemicals, referred to as new POPs, some of which are now regulated, have similar chemical properties that can enable them, too, to make their way into northern ecosystems.

Photo: Eric Loring

KEY FINDING #2:

As `new POPs´ come under regulation, their levels in the Arctic decline.

Since 2000, some 35 `new POPs´ have been added to the list of contaminants that NCP monitors in the Arctic. The levels of most new POPs in the environment and wildlife are still low when compared to the levels of legacy POPs, and do not currently pose a risk to wildlife health. This could change however, if levels were to increase. Some new POPs have become regulated, e.g. through addition to the Stockholm Convention, while others remain unregulated. In some cases concentrations increased rapidly after they were introduced by industry, but then began declining after the mid-2000s, often following regulation. New POPs fall into three classes: (1) *Perfluorinated and polyfluorinated alkyl substances (PFASs)*. Monitoring of PFASs showed an exponential increase in PFOS (a now regulated chemical that was used in coatings to make fabrics stain-resistant) in wildlife up until the early 2000s, after which levels have significantly decreased. Other non-regulated PFASs are still increasing; (2) *Brominated flame retardants (BFRs* used, for example, in electronic products to reduce flammability). Some regulated PBDEs, the most commonly found BFRs in the Arctic, increased through the 1990s and early 2000s, but have since been decreasing as a result of domestic and international regulations; and (3) *Current use pesticides (CUPs)* have now become routinely reported in air and seawater, but it seems that most do not biomagnify, as they are currently rarely observed in wildlife. NCP scientists continue to discover previously unknown chemical contaminants in the Arctic every year. These newer POPs, such as newer PFASs (e.g. PFOA), which are not regulated globally, will continue to increase until they too are subject to regulation.

KEY FINDING #3:

Mercury levels in the Arctic are stabilizing but are still several times higher than during pre-industrial times.

Mercury levels in the Arctic are now several times higher than they were during the early 1800s, with estimates ranging from 3x higher in freshwater to 10x higher in marine ecosystems. However, NCP monitoring of recent trends indicates that mercury levels in Arctic air peaked about 10 years ago and have since slightly declined. Over the same period, no consistent trend in mercury concentrations was observed in wildlife across Canada's North. Some wildlife populations have shown increasing concentrations, such as a 50% increase in freshwater fish from the Mackenzie Valley and a 30% increase in seabird eggs from Nunavut. Meanwhile others, like ringed seal and beluga, show no consistent increasing or decreasing trend. Information about mercury concentrations in air and wildlife has improved as a result of NCP's long-term monitoring program, which is the most comprehensive in the circumpolar Arctic. Mercury levels are anticipated to slowly decrease over the long-term with the implementation of the UNEP Minamata Convention on Mercury and associated decreases in emissions from industrial sources.

KEY FINDING #4:

Climate change can affect how POPs and mercury cycle in the Arctic environment and accumulate in wildlife.

Climate change is causing profound changes in the Arctic environment. NCP scientists are linking those changes with measurements of contaminants over time. One general observation is that climate change is altering the availability of contaminants for uptake in the Arctic food web in a variety of ways. Examples include: (1) rising air temperatures may be causing atmospheric mercury deposition events (AMDEs – see box below) to occur earlier in the spring; (2) an increase in forest fire activity can re-release POPs and mercury into the atmosphere; (3) longer ice-free seasons can lead to a greater exchange of POPs between air and sea water; (4) rising water temperatures which can increase algae and bacteria production can lead to an increase in the transformation of mercury to methylmercury, which is more toxic and bioaccumulative; (5) more precipitation can lead to increased runoff carrying more contaminants to water bodies; and (6) changes in food webs can alter what an animal eats, thereby influencing its exposure to contaminants. Some of these changes may cause levels in wildlife to increase, while others could result in a decrease. The cumulative effect of these and other climate-induced changes is highly complex and requires further research to be better understood.

Climate change can affect just about everything connected with contaminants, including their transport, cycling and transformation, and how they enter into food webs and people. One example: climate change is influencing biological communities causing shifts in the diets of many animals, which can lead to an increase in the ingestion of contaminants and a greater risk of health impacts.

Atmospheric mercury depletion events, or AMDEs, occur soon after the first sunrise marking the end of the long Arctic winter and can last a few weeks. Caused by sunlight-induced chemical reactions, AMDEs can result in significant deposits of mercury out of the atmosphere and onto any Arctic surface.

Photo: Eric Loring

KEY FINDING #5:

The complex movement of contaminants in the Arctic environment and wildlife is now better understood.

As a result of recent scientific advances, we have a broader understanding of how mercury and POPs move through different Arctic environments and how they transform and bioaccumulate. For example, scientists thought that contaminants (e.g. POPs) from distant sources were primarily carried to the Canadian Arctic through the atmosphere as gases. However, recent NCP research analyzing arctic air and glaciers shows that some contaminants, which were initially thought to be "too heavy" to be transported by air, are also carried to the Canadian Arctic by fine particles (dust) in the atmosphere. Furthermore, ocean currents can be an important carrier for contaminants that dissolve in water. Once these currents reach the Arctic, ocean water can, in turn, release contaminants to the air. We now know

that ocean water is also an important site for the `methylation´ of mercury, which then bioaccumulates in marine animals. Additionally, it was previously thought that all POPs accumulate in fat, but we now know that some new POPs, specifically PFASs, accumulate in protein-rich tissues such as muscle and liver. These advances in knowledge help us to better understand what is happening to contaminants in the environment, and to make better predictions for the future.

KEY FINDING #6:

Current levels of POPs and mercury may be a risk for the health of some Arctic wildlife species.

The evidence suggests that mercury and POPs are not having acute or severe biological or toxic effects on Canadian arctic wildlife, although some species may be at risk of more subtle adverse effects. For example, research suggests that methylmercury exposure at current levels may affect the brains of some Arctic top predators, such as polar bears. In some cases, PCB concentrations in beluga and polar bears are high enough to cause possible effects to the immune system and hormones. Fortunately, the science looking into the effects of contaminants on wildlife has dramatically improved – specific Arctic species, rather than non-Arctic ones, are now being studied more in their natural environment and in labs. For example, a recent NCP laboratory study, where seabird eggs were injected with methylmercury, determined the concentration at which certain species, such as thick-billed murres, experienced reduced egg survival, a phenomenon observed in wild birds nesting in areas impacted by pollution. Furthermore, new research also finds that `cumulative stress´, the combination of contaminants exposure with other factors such as climate change, is also a real threat. While difficult to assess, further research is needed to determine how multiple stressors and contaminant mixtures affect populations of Arctic fish, seabirds, and marine mammals.

KEY FINDING #7:

While exposure to most POPs and mercury is generally decreasing among Northerners, mercury remains a concern in some regions.

Since the 1990s, exposure to many regulated POPs and mercury has decreased among people who live in Canada's North. Levels of mercury and POPs vary among different groups of Northerners, with the highest levels associated with consumers of marine mammals. Since the early 1990s, levels of POPs in maternal blood have declined substantially. For example, PCBs in pregnant women have dropped by as much as 75% across studies, and as a result, fewer mothers had blood levels that exceeded Health Canada blood guidance values. However, many women still have elevated levels of mercury, for example, in 2007-2008, 44% of women of child-bearing age in Nunavut had mercury levels exceeding the mercury blood guidance value. Declining contaminant levels in people may reflect lower contaminant levels in traditional/country foods – an observation that is consistent with lower levels of POPs being monitored in wildlife. However, mercury levels in traditional/country foods have not declined to the same extent as in people. Another explanation could be that Northerners are eating less traditional/country foods – itself a concern, because traditional/country food consumption provides many benefits.

KEY FINDING #8:

Traditional/country foods continue to be important for maintaining a healthy diet for Northerners.

While contaminants can be detected in traditional/country foods, the benefits of eating these foods generally far outweigh the risks. In regions where contaminant levels in some people have been found to exceed blood guidance values, NCP information has been used by regional health authorities to issue advice to limit consumption of a particular traditional/country food among certain members of the population (e.g. women of child-bearing age). The consumption of traditional/country foods is still fairly widespread and remains an important factor for food security in the Canadian Arctic, although there has been a continuing shift over time toward more consumption of market food. New research shows that youth in particular tend to eat less traditional/country foods. Most traditional/country foods are more nutrient-rich in comparison to much of the market food that is accessible and commonly selected in the North. Recent results from the Inuit Health Survey suggest that this dietary shift is associated with a range of nutritional health implications including micronutrient deficiencies, obesity, and an increased risk of developing diseases such as diabetes, cardiovascular disease and osteoporosis. Further efforts are needed to support diet choices that include traditional/country foods, in part by reinforcing messages about the safety and benefits of traditional/country food sources.

Photo: Eric Loring

KEY FINDING #9:

Environmental exposure to contaminants in the Arctic has been linked to health effects in people.

It has been known for a long time that high exposure to contaminants can be harmful to peoples' health. However, only a few studies exist about the possible effects of exposure to contaminants found in the fish and wildlife that are traditionally eaten by northern peoples. With NCP support, a long-term study was undertaken in Nunavik on the possible effects of prenatal and childhood exposure to contaminants on infant and child development. Results of this ongoing study, released in 2011, suggest that there are subtle behavioral and developmental effects in children, caused by certain environmental contaminants, including mercury and PCBs. These effects include lower birth weight and increased occurrences of attention deficit disorder. In response, the Regional Health Authority in Nunavik advised pregnant women and women of child-bearing age to reduce their consumption of beluga meat, while encouraging the consumption of other traditional/country foods that are low in contaminants and rich in nutrients (e.g. arctic char). Studies are also under way looking at the role of mercury and POPs exposure in the development of other health conditions, such as cardiovascular diseases and diabetes. Our knowledge of the effects of contaminant exposure at levels found in the environment is still growing. Messages to the public about possible health effects need to be put into a broader health context that is balanced with information about the benefits of a diet rich in traditional/country foods.

KEY FINDING #10:

Continued international action is vital to reducing contaminant levels in the Arctic.

Most of the POPs and mercury that are found in Canada's Arctic originated elsewhere in the world. International action and cooperation are therefore essential for reducing contaminant levels in the Arctic and ultimately for reducing contaminant-related health risks for people and wildlife in the North. Since 1991, NCP and its partners have been using the results of NCP monitoring and research as a call to action for the international community. Early NCP results provided essential background science that raised public and political awareness about the issue of long-range contaminants. Given that the Arctic is a remote and sensitive indicator region, and because of the high quality of Canadian research, Canada's findings have been very influential internationally.

Early international success was achieved through the United Nations Economic Commission for Europe *Convention on Long-Range Transboundary Air Pollution* with the addition of protocols on POPs and heavy metals (entered into force in 2003). While regional in scope, these protocols paved the way for more powerful global action through the *UNEP Stockholm Convention on Persistent Organic Pollutants* (entered into force in 2004), which aims to eliminate or restrict the production and use of POPs, and the more recent UNEP Minamata Convention on Mercury (adopted in 2013), which aims to reduce global emissions of mercury. Evidence that international agreements work is found in the decreasing levels of POPs found in Arctic people and wildlife in the years that follow the time when regulations take effect. Similar decreases in mercury levels are anticipated in the future, once the Minamata Convention enters into force, which will occur when at least 50 countries ratify the agreement. Continued environmental monitoring by NCP and AMAP is critical to evaluating the effectiveness of these conventions.

Future Directions and Recommendations

Future Directions:

Contaminants from long-range, global sources continue to be of concern in Canada's North. These contaminants accumulate in animals that serve as foods traditionally consumed by Northerners and impact on the health and well-being of both wildlife and people. While much progress has been made in Canada and internationally to address the issue of some POPs and mercury, the problem has not been solved, particularly as many new POPs appear in the Arctic environment, and as climate and other changes (e.g. increased economic development in the Arctic) alter the dynamic nature of the problem. Work must continue on the monitoring and research of this issue to determine the risks to ecosystems and people in a changing Arctic, and to inform and develop policies that reduce Arctic contaminant exposure and improve food safety for Northerners.

In light of the findings of the Canadian Arctic Contaminants Assessment Report III (CACAR III) assessments, the NCP has identified the following priorities for future work.

The NCP will:

ENVIRONMENTAL MONITORING AND RESEARCH

- continue to play a critical role in the detection of new chemical contaminants of concern to the Arctic and continuously review and refine its list of contaminants of concern.
- enhance the measurement of long-term trends of mercury and POPs by filling gaps in geographic coverage.
- carry out more research to understand the effects of climate change and predict their impacts on contaminant dynamics and ecosystem and human health risks.
- expand community-based monitoring that builds scientific capacity in the North, and optimizes the use of traditional knowledge.

Photo: Alexandra Steffen

HUMAN HEALTH

- address ongoing public health concerns related to contaminants and food safety, in partnership with territorial/regional health authorities by:
  - weighing the risks associated with exposure to POPs and mercury against the wide ranging benefits of consuming traditional/country foods, and
  - expanding monitoring of contaminant exposure among human populations across the North, and research on potential health effects in collaboration with Northern communities, to provide current information to public health officials

Photo: Eric Loring

COMMUNICATIONS

- communicate research results and information about contaminants and risk to Northerners in the context of broader environmental (e.g. climate change) and health messages. Timely and culturally sensitive messages will be developed and communicated in association with regional health authorities and other appropriate spokespeople; these communication initiatives will be evaluated for their effectiveness.
- ensure that NCP data and information is effectively communicated to key international networks, such as AMAP, and the Global Monitoring Plans under the Stockholm and Minamata Conventions for the purpose of evaluating the effectiveness of global regulations.

Photo: Eric Loring

Recommendations

In light of the findings of the CACAR III assessments, the NCP also calls for broader action on measures related to achieving its mandate and supporting Arctic science in general:

Canadian research and monitoring programs, including the NCP, must work together to:

- ensure long-term monitoring networks have the resources they need to continue to be operational into the future.
- ensure that northern data are properly archived, managed and made available in an open, transparent, and timely manner, e.g. through the Polar Data Catalogue, and research results are communicated in timely and culturally appropriate ways.
- ensure that programs are complementary, with results feeding into one another in a way that enables multidisciplinary assessments of cross-cutting issues, such as climate change.
- engage and empower northern communities, organizations and governments to lead and fully participate in Arctic research through capacity building initiatives, support for community-based research and shared decision-making.
- engage in international networks and multi-national monitoring and research initiatives, to the greatest extent possible, in order to address the circumpolar and global scientific challenges presented by climate change and contaminants.

Arctic Nations, including Canada must:

- communicate national POPs data and information promptly to Arctic Council/AMAP and Stockholm Convention's Global Monitoring Plan and POPs Review Committee to ensure maximum global impact.
- be encouraged to swiftly ratify the Minamata Convention, so that it may enter into force as soon as possible, leading to a reduction in mercury entering into Arctic ecosystems.
- ensure that the issue of food (and water) security, which includes the safety of traditional/country foods, is recognized by Northern policy makers in Canada and by the Arctic Council as a priority for action.
- monitor the impacts of socio-economic and environmental changes in the Arctic on local sources of contaminants to assess their potential influence on overall exposures in the Arctic.
- consider the impacts of contaminants on ecosystems and people in the development of adaptation strategies for a changing Arctic.

Photo: iStockphoto.com

About the Northern Contaminants Program (NCP)

The NCP engages Northerners and scientists in research and monitoring related to long-range contaminants in the Canadian Arctic. The data generated by the NCP is used to assess ecosystem and human health, and the findings of these assessments are used to address the safety and security of traditional/country foods that are important to the health and traditional lifestyles of Northerners and northern communities. The findings also inform policy, resulting in action to eliminate contaminants from long-range sources.

The NCP is managed through a partnership that includes federal, territorial and northern regional/Aboriginal governments, Aboriginal organizations, and other key Arctic research programs. It is chaired by Aboriginal Affairs and Northern Development Canada.

About this Report

This document was prepared by the Northern Contaminants Program's Management Committee to summarize the integrated highlights and main findings from its three most recent assessment reports: the *Canadian Arctic Contaminants Assessment Reports III* on persistent organic pollutants (2013) and mercury (2012), and the *Canadian Arctic Contaminants and Health Assessment Report* (2009). A related and more detailed *Highlights Report*, with additional region-specific information, will be released in 2015.

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Photo: Martina Koblizkova