The Northern Contaminants Program:
Observations, Evidence, Partnership, Action

Arctic Observing Summit
Davos, Switzerland  June 24, 2018

Sarah Kalhok Bourque
Crown-Indigenous Relations &
Northern Affairs Canada
25 YEARS

Northern Contaminants Program
Programme de lutte contre les contaminants dans le Nord
NCP video...
In 1991, when the NCP was established, the Arctic was generally understood to be a pristine environment

- 1962 – Rachel Carson’s *Silent Spring* raises the alarm on chemicals in the environment
- 1970s & 1980s – Persistent organic pollutants (POPs) first detected in the Arctic environment
- 1989 – POPs in the Arctic at levels not consistent with local sources but they are not recognized as a global issue
- 1989 – Also concern over levels of mercury, lead, and cadmium
A key reason for establishing the NCP stems from a ‘surprise’ discovery

- 1980s – emerging realization that contaminants were appearing in the Arctic far from known sources

- Surprisingly high levels in marine mammals important to Inuit diet

- Researchers working on Baffin Island and Nunavik in the late 1980s measured high levels of PCBs in Inuit
Where do these contaminants come from?
How do they get to the Arctic?
What happens to them in the Arctic?
What are the implications?
What can we do to stop this?
Where do these contaminants come from?

Most of the contaminants found in the Arctic ecosystem originate from sources far away

- Important source areas, leading to regional and global redistribution
- Long-Range Transboundary Air Pollution IS A REGIONAL AND GLOBAL ISSUE
The Contaminants:

Heavy Metals

**mercury**, lead, cadmium…

- Persistent Organic Pollutants (POPS)
  - PCBs,
  - DDTs,
  - toxaphene,
  - chlordanes,
  - HCHs…

- New Chemicals
  - e.g. brominated flame retardants,
  - fluorinated organic compounds…
  - including *current use pesticides*
How do these contaminants get to the Arctic?

Due to properties of the contaminants themselves, they make their way to the Arctic & into the food chain.

Revolatilization or "Grasshopper effect"

Characteristics of the ecosystem and the chemicals are important.
Persistence, Bioaccumulation & Biomagnification

- POPs concentration increases with age
- Animals that consume other animals can build up higher levels of POPs
- People: top of the food chain
What are the implications?

The issue is complex, because of the relationship between those who live in the North and food from the land and water; *the Arctic Dilemma*

- Traditional/country foods provide many benefits: nutrition, culture, economic
- Sources of traditional/country foods are often sources of contaminants in the diets of many Arctic residents
- Are traditional/country foods safe and healthy to eat?
The Northern Contaminants Program

The aim of the NCP is twofold: reduce contaminant levels + support food choice decisions

- The NCP began in 1991 with an ambitious mandate:

  - To reduce pollution from long-range transport in the Arctic and related risks to human and ecosystem health

  - To provide Northerners with the information needed to make informed dietary choices
NCP’s Knowledge to Action Challenge

• The NCP must produce scientific results and then use those results to bring about regulatory and policy actions

NCP doesn’t regulate chemicals ... but supports those who do
NCP’s Knowledge to Action Challenge

• The NCP must produce scientific results and then use those results to bring about regulatory and policy actions

• 3 Foundational Elements lay the groundwork
  – Governance structure and stakeholder engagement
  – Strategic, policy-relevant science – “blueprints”
  – Networks and international partnerships
Partnerships are at the centre of NCP’s management and governance structures

- **INAC** - Chair
- **Federal Science Departments**
- **Indigenous Partners**
- **Regions** — incl Health, Environment, and Regional Contaminants Committees
- **ArcticNet**
- **Observers** (eg CHARS/POLAR)

**Foundational Element:**
Governance & Engagement
Regional committees are key to delivery of the NCP

- Membership of **Regional Contaminants Committees** varies across the regions, but generally includes
  - Indigenous organizations
  - Regional health and wildlife authorities
  - INAC representation (territories)
  - Northern colleges and research institutions
  - Other regional government departments

- Perform Social/Cultural reviews of NCP proposals, review mid-year project reports, sit on NCP Management Committee, review key program documents, liaise with researchers and communities, support regional health authorities in issuing health advice
Indigenous partnerships exist throughout NCP’s governance structures, projects and activities

- Arctic Indigenous peoples must be included as partners at every step of the research process:
  - Priority-setting
  - Project design & leadership
  - Proposal review & funding decision-making
  - Project implementation
  - Results interpretation, authorship in publications
  - Knowledge translation and results communication – local, national, international
Domestic and International Networking

Foundational Element: Networks & Partnership

DOMESTIC

- Canada's Northern Strategy/HARS
- Chemical Management Plan (CMP)
- CEPA-DCL
- CEC-NAFTA Environment
- UN-CECE LRTAP Convention - POPs & HM Protocols

INTERNATIONAL

- Clean Air Regulatory Agenda (CARA)
- IPY
- ArcticNet
- Nasivvik
- UNEP Global Mercury
- AMAP Arctic Council
- UN Stockholm Convention on POPS
NCP has worked in close partnership with the Arctic Council’s Arctic Monitoring and Assessment Programme for 25 years to address key Arctic issues

Northern Contaminants Program (NCP)
Working to reduce / eliminate contaminants in traditional foods, and provide information that assists in food choice decisions

Arctic Monitoring and Assessment Programme (AMAP)
Providing information and scientific advice on threats to the Arctic environment related to contaminants and climate change

AMAP
25th Anniversary seminar
29.11.2016
The NCP represents Canada’s primary contribution to AMAP on the issues of mercury, POPS and human health.
The NCP Blueprints describe NCP’s research & monitoring and other program priorities

**NCP Blueprints**
- Policy relevant
- Living documents, updated annually

Priorities ensure that scientific results have impact at the policy level
- Research priorities related to understanding sources and pathways can translate into policies to reduce emissions that will have the greatest benefit to the region.

**5 Sub-programs:**
- Human Health
- Environmental Monitoring & Research
- Community-Based Monitoring & Research
- Communications, Capacity & Outreach
- Program Coordination & Indigenous Partnerships
Quality, leading-edge research and monitoring

Foundational Elements

Knowledge

- Air monitoring station
- Ringed seal
- Beluga and narwhal
- Walrus
- Burbot or lake trout
- Landlocked char
- Sea run char
- Caribou
- Seabird (eggs)
- Polar bear
- Participating communities
- Regional centre

Map showing locations in Canada with symbols representing different species and regions.
Air Monitoring

- Little Fox Lake, Yukon
- Alert, Nunavut
More recently, Passive Sites added

Fig 1. Air monitoring stations
Fish Monitoring

- Lake trout in Lake Laberge and Kusawa Lake (Yukon)
- Lake trout and burbot from Great Slave Lake, Northwest Territories

Commercial fishery

Domestic and sports fishery

Slave River mouth

East Arm
Contaminant Trends and Biological Effects in Landlocked Char

- **Collection**: Adult char (>200 - ~1500 g) collected (n=3 to >20/yr) by gill netting or by jigging through the ice – late July/early August; late June in Lake Hazen
- **Processing**: Fish dissected within 1 to 4 h after collection and subsamples of muscle+skin, liver, otoliths, stomach contents. Frozen (-20°C) for transport.
We have been monitoring a variety of halogenated compounds, as well as total mercury in eggs of three species of seabirds at Prince Leopold Island in the Canadian high Arctic since 1975.
Contaminants in Arctic Caribou

Photo: Peter Mather
Ringed seal monitoring

Sachs Harbour
Resolute Bay
Arviat
Nain
Co-production of the Western Arctic beluga monitoring program: shared perspectives on a community-team approach

Lisa Loseto¹, Emily Way-Nee², John Noksana Jr.², Shannon MacPhee¹, S. Ostertag¹, F. Pokiak³, John Iacozza¹,⁴, V. Pokiak³, R. Noksana³, L. Kikoak³, A. Gordon Jr.⁵, T. Halldorsson¹, M. Noel⁶, D. Neumann¹, K. Pleskach¹, B. Rosenberg¹, T. Smythe¹, T., Stocki⁷, G. Stern⁴, G. Tomy⁴, and many students and beluga hunters.

¹Fisheries and Oceans Canada, ²Fisheries Joint Management Committee, ³Tuktoyaktuk Hunters & Trappers Committee, ⁴University of Manitoba, ⁵Aurora Research Institute, ⁶Vancouver Aquarium, ⁷Health Canada
Polar Bear Monitoring

Presently sampled/archived and POP monitored

Presently sampled/archived

Sampled/archived in the past (prior to 2007)
NCP funded Human Health Studies 2016-2017
Inuit Health Surveys

- International Polar Year (IPY) Inuit Health Survey 2007-2008
  Regions: Inuvialuit Settlement Region (ISR), Nunavut, and Nunatsiavut

- Nunavik Inuit Health Survey 2004, 2017
Coordinated International biomonitoring
Community-Based Monitoring & Research
Tł̓ı̨chǫ Aquatic Ecosystem Monitoring Program (TAEMP)
Integrating Indigenous Knowledge (IK) into Long-term Beluga Monitoring

- Local indicators checklist developed with community members (2013 - 2016)

- Checklist used to record IK about harvested whales

- Form provided in FJMC beluga sample kit to record if abnormalities observed and to provide samples

Sonja.Ostertag@dfo-mpo.gc.ca
- NCP-AMAP QA/QC Interlaboratory Study
- Data Management – in collaboration with the Polar Data Catalogue
- NCP Publications Database – www.aina.ucalgary.ca/ncp
The use of NCP results in public health policy
Weighing the risks and benefits

- Traditional food consumption – Weighing the risks and benefits compared to market foods
Nunavik – October 2011

NRBHSS issued advice based on NCP-funded study

- Country food is generally the best food for people of Nunavik
- Increase consumption of country food, with one limitation:
  - Pregnant women, women of child-bearing age should decrease consumption of beluga meat (main source of Hg exposure)

- Although some effects of other contaminants on child development were found, there is a decreased likelihood of any significant effect in the future among Nunavik children as a result of observed declines in levels in the environment and in blood levels of Nunavimmiut.
Nunavut – 2012

Advice re. methylmercury in ringed seal liver jointly released (GN, NTI, U of Ottawa) – based on IHS

- Ringed seal is very healthy and should be enjoyed when it is available
- MeHg can affect babies’ brain development; it is only the liver of ringed seal that is a concern

- All Inuit women in Nunavut who may become pregnant should avoid eating ringed seal liver
- These women can continue to enjoy ringed seal meat
Health Advisories: NWT 2011

OFFICE OF THE CHIEF PUBLIC HEALTH OFFICER

Public Health Advisory

YELLOWKNIFE (June 28, 2011) – Dr. Lorne Clearsky, Chief Public Health Officer, is advising residents of the Northwest Territories of an increase in mercury levels in two lakes.

Thereby, a public health notice is in effect, recommending people limit the quantity of fish they eat from the following lakes:

- Nonacho Lake - Akaitcho
- Stark Lake - Akaitcho

June 28, 2011
Limit consumption of fish from 2 lakes due to mercury levels – Akaitcho region

OFFICE OF THE CHIEF PUBLIC HEALTH OFFICER

Public Health Advisory

YELLOWKNIFE (August 19, 2011) – Dr. Lorne Clearsky, Chief Public Health Officer, is advising residents of the Northwest Territories of an increase in mercury levels in three lakes.

Thereby, a public health notice is in effect, recommending people limit the quantity of fish they eat from the following lakes:

- McGill Lake - Dehcho
- Deep Lake – Dehcho
- Fish Lake - Dehcho

August 19, 2011
Limit consumption of fish from 3 lakes due to mercury levels – Dehcho region
June 16, 2010
Mercury levels in lake trout are higher than normal in Kelly Lake. Consumption advice provided
Women of child-bearing age and children under 12 should limit their consumption of large Yukon lake trout and burbot to the levels listed below:

- Less than 40 cm (or less than 2 lbs) = Unlimited consumption.
- Between 40 and 60 cm (or between 2-6 lbs): limit to 3 to 4 meals per week.
- Greater than 60 cm (or more than 6 lbs): limit to 1 or 2 meals per week.

If you are not a female of child-bearing age or you are not under the age of 12, you can eat as much lake trout and burbot as you like.

Women of child-bearing age and children under the age of 12 should also limit their consumption of commercially available swordfish, fresh or frozen tuna and shark. They should only have one serving per month. The general population may have one serving per week.
August 2011 Advisory lifted, due to decreased levels of toxaphene in fish

Mercury in Yukon Fish

Yukon fish are safe to eat, and as part of a balanced diet offer many health benefits.

Women of child-bearing age and children under 15 should limit their consumption of large trout and burbot to the levels listed:

- Less than 40 cm or less than 2 years
- Between 40 cm and 60 cm or 2 to 5 years
- More than 60 cm or more than 5 years

20 years later, it’s safe to eat fish from Yukon lake

20 years ago, the government issued an advisory telling people not to eat fish from Lake Laberge due to high levels of toxaphene.

Toxaphene is a banned pesticide. If ingested, it can damage lungs, nervous systems, kidneys, and could cause death. It was widely used in the U.S. and had limited use in Canada before both countries banned it in 1982.

Officials said the reduced levels of toxaphene may be a result of reductions in global emissions, as well as changes in the lake’s ecosystem.

— QMI Agency

A sign cautioning people from fishing in Lake Laberge in the Yukon has been removed, 20 years after it was posted.

The warning was posted in 1991 after high levels of toxaphene were discovered.

A sign cautioning people from fishing in Lake Laberge in the Yukon has been removed, 20 years after it was posted.

The warning was posted in 1991 after high levels of toxaphene were discovered.

A sign cautioning people from fishing in Lake Laberge in the Yukon has been removed, 20 years after it was posted.

The warning was posted in 1991 after high levels of toxaphene were discovered.

A sign cautioning people from fishing in Lake Laberge in the Yukon has been removed, 20 years after it was posted.

The warning was posted in 1991 after high levels of toxaphene were discovered.
NCP data provided justification for Canada to take a leading role in initiating international action.

NCP data, information and personnel have contributed to major international policies:

- Process for facilitating the use of data & information
- Links into regulatory and policy processes
- Support for active role of Indigenous peoples
Reducing contaminant levels in the Arctic requires national and international action

NCP data, information and personnel have contributed to major international policies

– UN-ECE LRTAP Convention Protocols on POPs and Heavy Metals (1998)
– UNEP Global Agreement on POPs “Stockholm Convention” (2001)
– UNEP Global Agreement on Mercury “Minamata Convention” (2013)
International level: Impact of Nunavimmiut participation

2001-2004

1992
Santé Québec
Inuit Health Survey

1996-2001
Nunavik Child Development Study

2004
Qanuippitaa – How are we?

2007

2011-2014
Northern Contaminants Program biomonitoring projects

1989 - 1990
OCs and PCBs in maternal milk in Nunavik
The Stockholm Convention on POPs regulates certain POPs globally

- The Stockholm Convention on Persistent Organic Pollutants was adopted in May 2001 and entered into force in May 2004.
- The Stockholm Convention on Persistent Organic Pollutants is a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment.
The Minamata Convention on Mercury is set to regulate mercury globally.
Indigenous peoples played key roles in international negotiations, and now in implementation

**Indigenous Peoples Cooperation on Global Contaminants Issues**

- Arctic Indigenous Peoples Against POPs (CAIPAP)
  - ICC, ITK, Dene Nation, Metis Nation, CYFN + RAIPON + Saami Council
  - Ensured international agreement on POPs, *Stockholm Convention*, protects Arctic Indigenous Peoples

- Canadian Delegation to global POPs & Mercury negotiations
  - Included Indigenous representation

*Arctic States, in solidarity with Arctic Indigenous people, can influence global regulation*
Contaminant levels in the North are generally declining.
Community Engagement
Communications & Outreach
Capacity Building

Foundational Elements
Knowledge
Assessment
Action: Health Advisories
Action: International Policies

Capacity Building
Capacity Building

- Project-by-project initiatives
- NCP-wide initiatives
- Scientists – Communities
- Elders - Youth
Communication

- Open & ongoing communication
- Communicating balanced messages
- Regional networks for communications
- Long-term relationships, respect, trust
- Communication products, activities & resources
- Assessing impacts of communications
Please remember...

- The health of Northern Indigenous peoples is intimately linked to the health of the ecosystem
  - Wildlife health → country food
GNWT Health Resources

• Contaminants Fact Sheets
  – Metals, persistent organic pollutants, radionuclides
  – Wildlife (fish, marine mammals, land mammals)
  – Provides overview of the current state of the knowledge
  – Balances messaging (benefits and risks)
The NCP has identified 10 Key Findings that summarize the state of our knowledge about the issue:

Contaminants in Canada’s North

www.science.gc.ca/ncp
Key Finding #1

Concentrations of “legacy POPs” are generally going down across the Arctic

12 legacy POPs were originally designated by the Stockholm Convention, which regulates POPs globally, and most have been largely eliminated.

**FIGURE 4.71**
Trends of ΣHCHs, ΣCBz, ΣCHL, DDT, toxaphene and ΣPCBs in lake trout muscle collected from Lake Laberge and Kusawa Lake. Symbols represent arithmetic mean concentrations (ng g⁻¹ ww ± standard deviation). Further details are provided in Annex Table A4-2.
Key Finding #2

As ‘new POPs’ come under regulation, their levels in the Arctic decline.

Source: Derek Muir and Birgit Braune, Environment Canada
Key Finding #3

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

1995-2013 Overall -1.0% annual decline

2007-2014 Overall 1.4% annual increase

Source: Sandy Steffen, Environment and Climate Change Canada
Key Finding #4

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

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.
Key Finding # 5

The complex movement of contaminants in the Arctic environment and wildlife is now better understood.
Key Finding #6

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

Exposure to PCBs can exceed toxicity thresholds in some species.
Key Finding #7

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

Average decrease of legacy POPs in Canadian Inuit mothers (AMAP 2015)
Key Finding #8

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

- Benefits generally far outweigh the risks.
- Shift toward more market food = introduction of a new set of health risks associated with diet shift.
- Traditional/country foods = higher levels of vitamins and nutrients.
- 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.
Key Finding #9

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

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

The benefits of global action on POPs can be seen in the Arctic through NCP trends monitoring.
General trends through NCP history

- **Legacy POPs** – “dirty dozen”
- **New POPs** – e.g. PFOS and PBDEs
- **Emerging contaminants** – future concerns

- NCP is born
- UNECE LRTAP POPs and Heavy metals protocols
- UNEP Stockholm Convention on POPs
- CACAR
- CACAR II
- CACAR III
- CACHAR
- 9 new POPs added to Stockholm Convention
The ‘Contaminants of Concern’ for the NCP have changed over time

- ‘legacy’ contaminants
- ‘new’ POPs
- radionuclides
- Chemicals of emerging Arctic concern
- microplastics
The work of the NCP is not done

- The establishment of global conventions that limit sources of POPs and mercury is a huge step towards solving the problem
  BUT the problem is not solved yet...

Addition of new chemicals to Stockholm Convention

Need for ongoing monitoring of effectiveness of global conventions
  - Global Monitoring Plans for POPs and mercury
    - Chemicals of Emerging Arctic Concern
    - Microplastics
    - Health biomonitoring and effects
    - Indigenous Knowledge
    - Data Management
    - Climate Change
The NCP has been a model for research programs in Canada and beyond

NCP Framework for Knowledge in Action

- Strategic program design
- Quality, leading-edge science
- Capacity-building
- Process for facilitating the use of data & information
- Partnerships
- Open & ongoing communication
- Sustained funding
Thank You

Merci

Mahsi Cho

Nakurmiik