Chemicals of Emerging Arctic Concern

Summary for Policy-makers

AMAP

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The changing face of Arctic pollution

Though distantly located from industrialized centers and agricultural source regions, the Arctic is a sink for global pollutants. The atmosphere, oceans and rivers transport the pollutants released at lower latitudes and deposit them in Arctic ecosystems. Since its establishment in 1991, the Arctic Monitoring and Assessment Programme (AMAP) has documented the extent and effects of pollution in the Arctic and tracked new developments in order to inform policy decisions.

AMAP's initial assessments of these issues in 1997 contributed significantly to the negotiation of international agreements, such as the 'UN ECE's Convention on Long-range Transboundary Air Pollution (LRTAP) Protocol on Persistent Organic Pollutants' and the 'Stockholm Convention on Persistent Organic Pollutants', to restrict and phase out the use of these chemicals on a regional and global scale. As a result of global regulations and other national and regional controls, levels of many Persistent Organic Pollutants (POPs) are now declining in the Arctic and elsewhere. But, the issue of Arctic pollution is not a solved problem.

Chemicals of emerging concern

Tens of thousands of chemicals are presently on the market and new substances continue to enter commerce each year. Many of the chemicals currently registered for use have characteristics similar to legacy pollutants, including a potential to reach the Arctic; however, most are not subject to international (global) regulation. Although international conventions, such as the Stockholm Convention, continue to add new chemicals of concern to the list subject to restrictions, their scope is limited. This, together with the sheer number of chemicals that are in everyday use may constrain their effectiveness in addressing all emerging Arctic pollutants.

Improved analytical technologies, research and screening programmes continue to reveal the presence of chemicals that have previously gone unnoticed, or were not expected to be present in the Arctic. Although newly detected in the Arctic, these so-called 'chemicals of emerging concern', have often been in use and present in the environment for years, even decades. Chemicals found in the Arctic may originate from local sources within the region or come from distant locations. The detection of a new substance in the Arctic that has no local sources is particularly important, as it provides evidence of the chemical's potential to disperse globally. As new substances and their breakdown products continue to be discovered, the notion of what constitutes an 'environmental pollutant' warranting concern also changes, and updated regulatory actions may be needed.

This policy summary refers to the most recent AMAP assessment which looks at a wide range of chemicals newly and recently detected in Arctic ecosystems. These 'chemicals of emerging Arctic concern' should be considered potential candidates for future research or monitoring and possibly for consideration under relevant global and/or regional regulations. In addition, these chemicals of emerging concern contribute to an even broader understanding of how Arctic pollution is changing, which is the primary focus of this summary document and the basis for the recommendations of the AMAP working group given later in this document.

SUBSTANCES CONSIDERED IN THE ASSESSMENT OF CHEMICALS OF EMERGING ARCTIC CONCERN

- Brominated flame retardants (BFRs)*
- Chlorinated flame retardants (CFRs)
- Chlorinated paraffins*
- Current-use pesticides (CUPs)*
- Halogenated natural products (HNPs)**
- Hexachlorobutadiene (HCBD)***
- Organophsophate-based flame retardants (PFRs)
- Organotins
- Pentachlorophenol (PCP)***
- Per- and polyfluroalkyl substances (PFASs)*
- Pharmaceuticals and personal care products (PPCPs)
- Phthalates
- Plastics and microplastics
- Polychlorinated naphthalenes (PCNs)***
- Polycyclic aromatic hydrocarbons (PAHs)
- Siloxanes
- Unintentionally generated polychlorinated biphenyls (PCBs)

*Contains at least one chemical currently being evaluated or considered for listing by Stockholm Convention

** Most HNPs have natural (biogenic) sources, however some may have anthropogenic sources

*** Added to Stockholm Convention in 2015

REPLACEMENT SUBSTANCES AS CHEMICALS OF EMERGING ARCTIC CONCERN

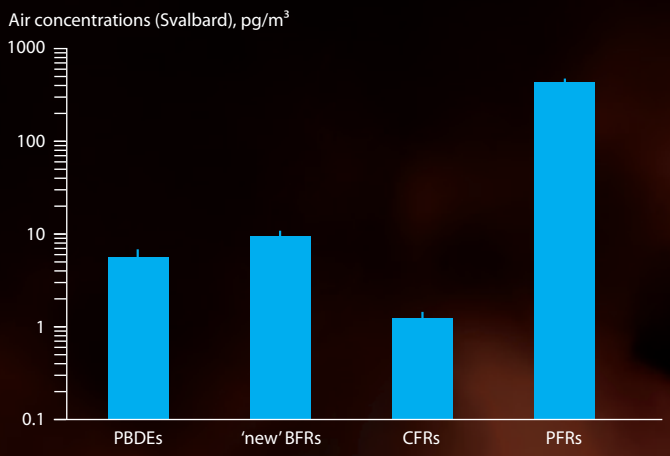
Several substances, including perfluorooctanesulphonic acid (PFOS) and hexabromocyclododecane (HBCDD) are now globally regulated under the Stockholm Convention. With the phase-out of these substances, other chemicals, often with broadly similar chemical characteristics, such as the ones below, are being increasingly used in their place.

Per- and polyfluoroalkyl substances (PFASs): Produced since the 1950s, PFASs are used in many applications, including stain repellent treatments of textiles and carpets and in the manufacture of Teflon™. Whereas many POPs accumulate in fatty tissues, PFASs tend to accumulate to a greater extent in protein-rich tissues, such as liver or blood, and are found at higher levels in water than most POPs. In the environment, PFASs may breakdown to PFOS and PFOA, a perfluorinated chemical being considered for addition to the Stockholm Convention. The fact that it is degradation products that are found in the environment is important because unregulated PFASs will continue to break down to form these chemicals.

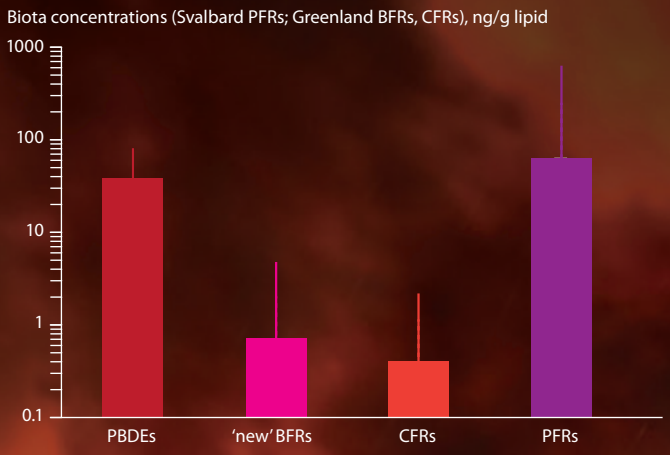
'New' brominated flame retardants (BFRs): Since the discovery of PBDEs in the Arctic, a wide range of other BFRs have been found in the region's air, water and wildlife. Although in general, environmental concentrations of these emerging BFRs are comparable to or lower than those of PBDEs, the few temporal trend studies available indicate their levels may be increasing. Deca-BDE, which has been recommended for addition to the Stockholm Convention, is still present as one of the BFRs with highest concentrations in Arctic air and snow.

Chlorinated flame retardants (CFRs): Dechlorane Plus and related chemicals are CFRs produced since the 1960s. Although consistently detected in Arctic air, and newly detected in Arctic fauna, such as reindeer, seabirds, seals, beluga, and polar bears, concentrations are generally low in comparison to PBDEs.

Organophosphate flame retardants (PFRs): PFRs are a group of high production volume chemicals that have been in use since the 1970s. Recent measurements of Arctic air have shown that PFRs are found at concentrations much greater than PBDEs. These chemicals have also been detected in Arctic fish, seabirds, seals and polar bears, indicating PFRs are capable of long-range transport and are widely present in Arctic ecosystems.



Representative air concentrations of flame retardants measured at Longyearbyen, Svalbard 2012-2013.



Representative concentrations of flame retardants in marine mammals, seabirds and fish measured at Svalbard and Greenland since 2000.

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How are new chemicals of emerging concern identified?

There are an estimated 150,000 substances in commerce today, of which less than 1000 are routinely monitored in the environment. Despite the large number of chemicals currently in use, several approaches can be used to recognize those that present a potential concern for Arctic ecosystems.

Database screening

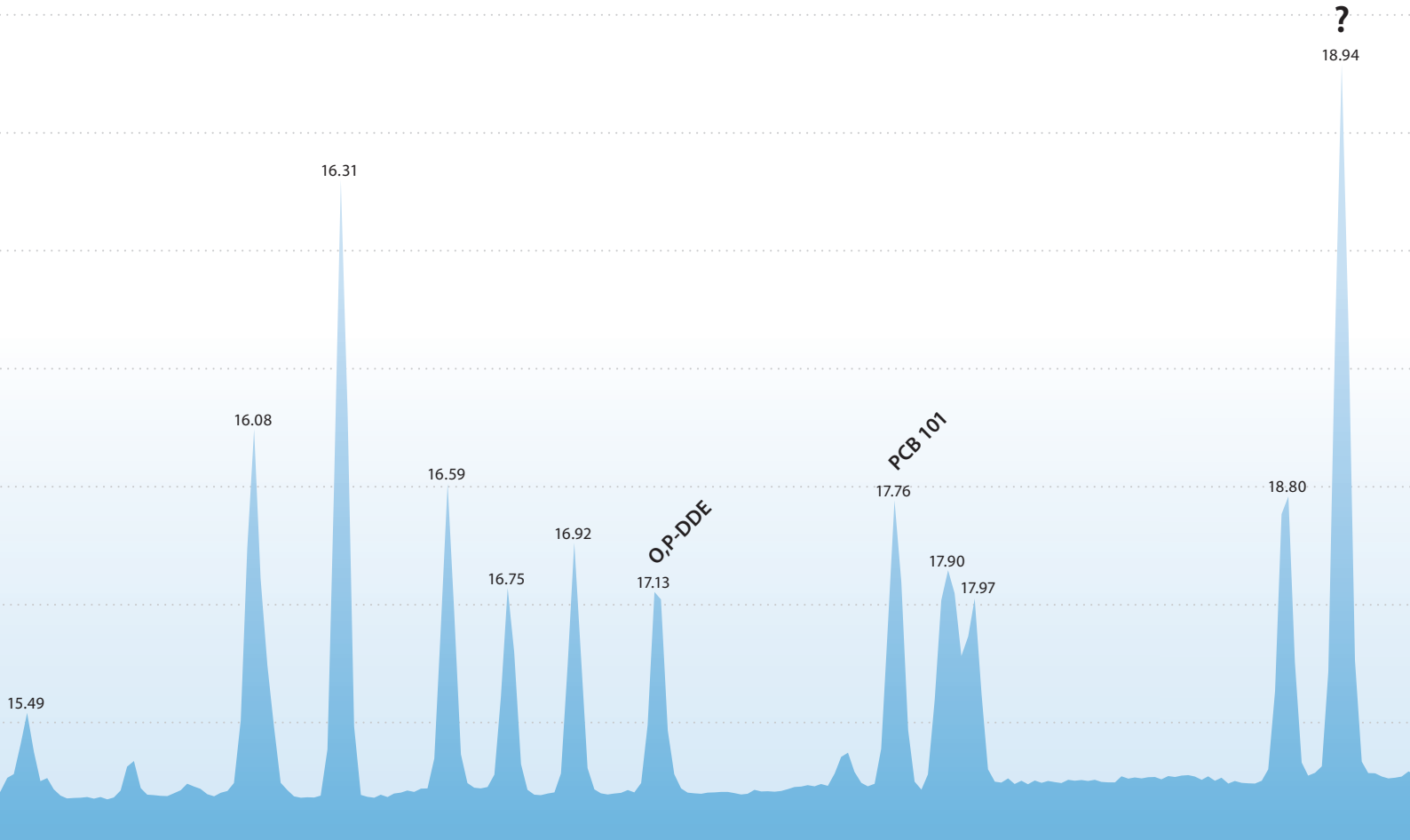
Given the large number of chemicals currently in commerce, initial steps are needed to narrow the pool of potential pollutants to those with the highest probability of being chemicals of concern for the Arctic as well as for the rest of the world. This can be done by screening databases for substances currently in use that have chemical properties similar to known pollutants and the potential for long-range atmospheric transport. The list of chemicals meeting such specifications can then be targeted for possible regulation or additional study. Recent screening of chemical databases in Europe and North America has identified up to about 1200 substances with the potential to reach the Arctic and accumulate in food webs.

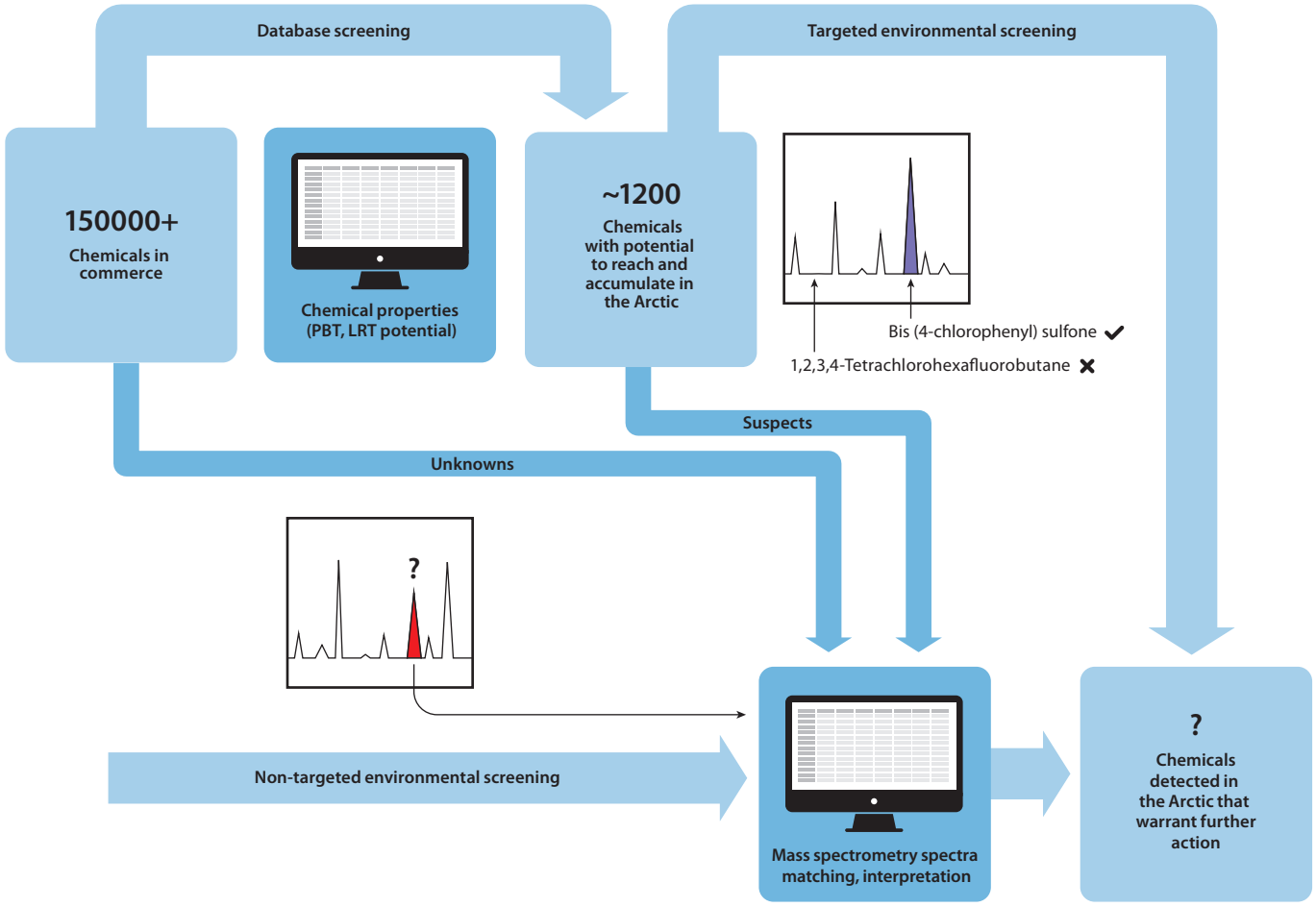
Environmental analysis

While database screening can identify chemicals with the potential to be chemicals of emerging Arctic concern, the analysis of environmental samples is required to verify the presence of a suspected chemical and its concentrations in Arctic ecosystems and their inhabitants. Such targeted analysis is responsible for identifying the chemicals of emerging Arctic concern presented in the current AMAP assessment. New technologies also permit environmental samples to be screened for the presence of unknown or unrecognized pollutants. This type of 'non-target' analysis allows substances to be identified without specifically looking for them and if regularly employed, could hasten the discovery of chemicals of emerging concern in the Arctic.

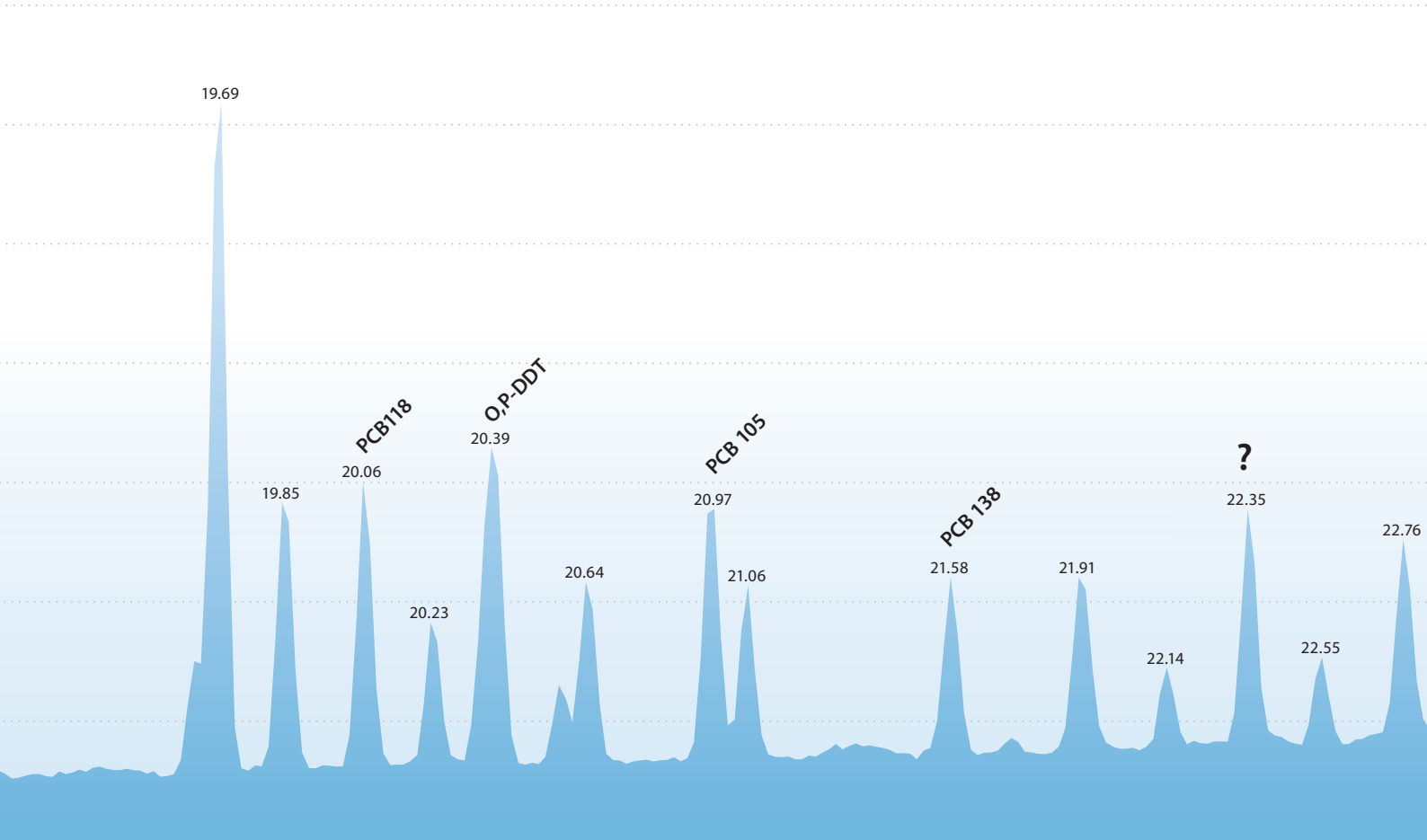
Long-term monitoring programmes and sample archives

Often, chemicals newly identified in the Arctic have been in use for years, or even decades, prior to their discovery. Thus, additional information is needed to establish how long a chemical has been present in the Arctic and whether its levels have changed through time. Historical levels of many chemicals can be determined through the analysis of archived samples stored specifically for this purpose as well as through the use of natural 'records' such as sediment layers and ice cores. The inclusion of suspected chemicals of concern in long-term monitoring programmes helps to establish trends in environmental levels moving forward, and is useful for informing policies and monitoring the effectiveness of regulations.





Tiered approach to early identification of potential chemicals of Arctic concern. Screening of large chemical databases and non-target analyses of environmental samples can be used as an initial step to identify a smaller number of substances with potential to be Arctic pollutants. In a subsequent step, the smaller pool of suspect chemicals of concern are then measured in environmental samples via targeted analysis, to confirm their actual presence in the Arctic. Those detected at consistent and elevated levels are then identified as candidates for further actions.



Differences between chemicals of emerging concern and 'conventional' pollutants

Four criteria are used to establish whether a chemical qualifies for consideration as a POP according to the Stockholm Convention: chemicals need to persist in the environment for extended periods of time, have the potential to undergo long range transport; accumulate in humans, flora or fauna, and cause adverse effects. Some of the chemicals of emerging Arctic concern meet these criteria and are already under consideration for global regulation or have yet to be assessed. However, other emerging chemicals possess characteristics that fall outside of these criteria or, in some cases information on their environmental behavior and potential to cause adverse health effects is lacking. Such chemicals may therefore not qualify for inclusion under the existing global conventions and may require alternative actions in order to control their releases in a timely manner.

Regional and local sources

Because of the remote location of the Arctic and its small population, the occurrence of chemicals in the region has mostly been attributed to their transport from distantly-located, industrial and agricultural areas. However, several chemicals of emerging concern are being found at elevated levels near Arctic towns and villages, indicating that local settlements may also serve as point sources of chemicals of concern to the Arctic region. Inadequate wastewater treatment in particular seems to be a source of some pharmaceuticals and chemicals used in personal care products, as well as other chemicals found in household products such as some siloxanes and phthalates. Such sources could be addressed through improvement in wastewater treatment in Arctic communities. Targeted monitoring in remote areas can also help to distinguish between long-range transport and local emissions as the main source.

Shorter lifespans

Some chemicals of emerging Arctic concern degrade readily in the hours to weeks following their release into the environment. Despite having shorter lifespans than POPs, these chemicals may still be a concern in the Arctic as a result of their continuous releases in high amounts or transformation into stable degradation products. For example, pharmaceuticals and personal care products released by local wastewater sources are generally not considered to persist in the environment. However, continuous release from northern communities and slow breakdown that results from the colder temperatures and reduced sunlight conditions unique to the Arctic could have consequences for local ecosystems and populations.

Unique chemical makeups

Some emerging pollution threats do not fit the mould of POPs, and thus are not eligible for consideration under current global regulatory practices. For example, plastic debris, and in particular, 'microplastics' are emerging as a major environmental concern world-wide, including in the Arctic. Microplastics are small particles comprised of a wide and diverse range of organic polymers. Although microplastics exhibit some similarities to POPs in terms of long-range transport and potential for harmful effects, because of their complex makeup, they cannot be evaluated with current risk assessment tools and criteria used for POPs, which were developed to focus very specifically on individual chemicals with specific properties.

Unknown toxicity

Owing to their more recent detection in the environment, less data are available on chemicals of emerging concern compared with legacy pollutants. Important information on the toxicity of these chemicals is particularly lacking. Without knowledge of the potential adverse effects of emerging chemicals on Arctic wildlife and human health, regulatory efforts may be delayed.

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Sources of chemicals of emerging Arctic concern are changing

The Arctic has unique geographical and climatic characteristics that make it a 'sink' for pollutants transported into the region from distant sources. Atmospheric, riverine and marine pathways carry contaminants from industrialized areas, over long distances where they are deposited in Arctic ecosystems. However, the unique sources and physicochemical properties of emerging pollutants combined with impacts of regulations and environmental changes, are changing where contaminants of Arctic concern originate from and how they are transported into the Arctic.

Climate change

Changes to hydrology, declining sea ice, increased economic development, and changes in air and ocean currents, as well as changes in the way chemicals distribute between air, water and soils are all consequences of a warming climate that are expected to alter how chemicals are released, transported to, and move around within the Arctic. Melting glaciers and sea ice, as well as thawing permafrost and surface soils, could act as an additional source of chemicals of concern as pollutants previously deposited and stored in the Arctic are re-released to the environment. Disruptions to Arctic food webs will also change how Arctic fauna and peoples are exposed to contaminants. These forthcoming ecological changes are uncertain and need to be understood to properly interpret future contaminant data and provide reliable information to policy-makers. An AMAP assessment on the impact of climate change on Arctic pollution is planned for 2017.

New source regions

Prior to the turn of the century, Europe and North America were the major sources for most chemicals entering the market. However, due to new regulations, shifts in production and increasing economic development in regions such as Asia, source regions for chemicals are changing.

Local origins

Many chemicals of emerging Arctic concern are found in consumer products such as electronics, clothing, furniture and building materials, as well as personal care products and pharmaceuticals. Thus, their existence in the Arctic may be due not only to transport from distant regions, but also local sources, such as Arctic towns and villages, community waste sites and sewage outflows. Human presence in the Arctic is also increasing in some areas; as tourism and industrial activities such as mining and gas exploration increase, Arctic regions subject to economic development will also be at a heightened risk of exposure to chemicals of emerging concern.

Long range transport by ocean currents

Our early understanding of POPs considered air to be the primary delivery route of chemicals from distant locations to the Arctic. However, several chemicals of emerging concern, such as PFASs, are more soluble in water than conventional POPs, and appear to be brought to the Arctic via ocean currents to a larger extent.

CHEMICALS OF EMERGING CONCERN WITH LOCAL SOURCES

Long range transport is considered the predominant source for chemicals found in the Arctic, but because many substances are present in consumer products, some chemicals of emerging Arctic concern may also originate from local sources, such as villages and settlements within the region.

Pharmaceuticals and personal care products (PPCPs): PPCPs are a large class of over 3000 chemicals used as drugs in human and veterinary medicine, fragrances, sunscreen agents, and cosmetic ingredients. Over 100 PPCP-related substances including anti-depressants, antibiotics and anti-inflammatory drugs, have been detected in the Arctic. Although the use of PPCPs in the region is low compared to densely populated regions of the globe, the lack of modern wastewater treatment plants allows significant levels of these chemicals to enter Arctic waters. Because many PPCPs, namely human and veterinary drugs, have been deliberately designed for the purpose of causing biological effects, high levels may not be needed to produce effects in exposed wildlife.

Phthalates: Phthalates are high production volume chemicals used as plasticisers in polyvinyl chloride (PVC) plastics and in many personal care products. Phthalates have been detected in remote regions of the Arctic, away from human activity, indicating they are brought to the region via long-range transport. However, phthalate concentrations are generally highest near populated areas, suggesting local releases are also occurring. Elevated concentrations near Arctic communities are thought to occur primarily via releases from local waste water treatment plants.

Siloxanes: In production since the 1940s, siloxanes are still used in a wide variety of cosmetic, biomedical, and industrial applications today. Certain siloxanes have been measured in Arctic biota at concentrations comparable or greater than legacy POPs. Such elevated concentrations are primarily associated with human settlements. Due to the inadequate wastewater treatment capabilities of many northern communities, wastewater treatment plants are important point sources of siloxanes to the Arctic environment.

Organotins: Primarily used as anti-foulants on ships, organotin concentrations tend to follow geographic trends in population density and shipping activity in the Arctic, with the lowest levels found in Greenland and Alaska and the highest concentrations measured in harbors in Iceland. Overall, organotin concentrations in the Arctic are generally low, but have the potential to increase along with human activity in region.

Arctic communities lack the advanced wastewater treatment facilities that remove contaminants from wastewater in major urban areas.

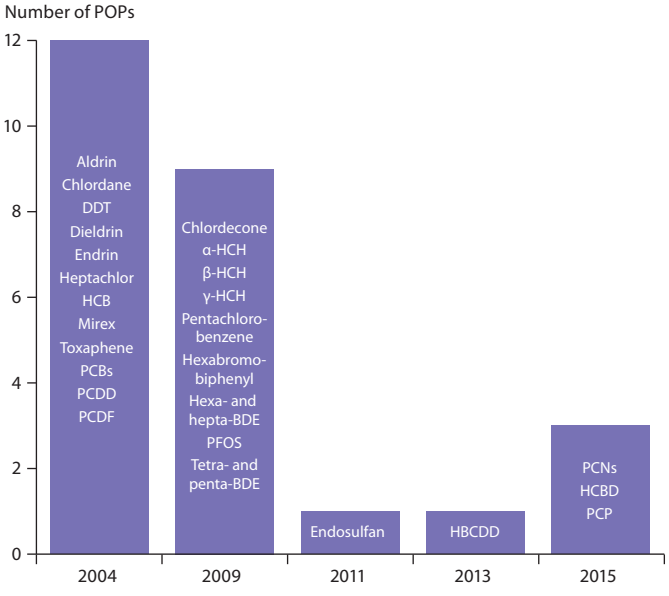
There is a need for timely and effective action on chemicals of emerging Arctic concern

A large number of unregulated chemicals are already in use and continue to enter commerce each year

As noted, a large number of chemicals are currently in commerce - many in large volumes and with the potential to reach the Arctic – and additional chemicals continue to enter the marketplace each year, often with limited documentation and testing. Given limitations in time and resources, international agreements such as the Stockholm Convention and LRTAP POPs protocol, can only address a fraction of the thousands of chemicals in use. Additional controls, in the form of national and regional actions may therefore be needed to address emerging pollution threats.

Most national regulatory systems do not sufficiently account for a chemical's potential for long range transport

While many countries have environmental regulations in place to restrict the use of chemicals meeting criteria of persistence and bioaccumulation, Canada specifically considers the potential for a chemical to be transported over long distances in air in its national Toxic Substances Management Policy and Persistence and Bioaccumulation Regulations. However, including both atmospheric and oceanic long-range transport potential in national regulatory standards could reduce the number of chemicals with the potential to become Arctic or global pollutants from entering commerce.



14 chemicals added to the Stockholm Convention between 2009 and 2015 supplement the original 'dirty dozen'

The time lag between detection of a harmful chemical and regulation is substantial

History has shown that several decades can pass between the introduction of a new chemical and an eventual agreement to ban or restrict its use. It can take several decades after a chemical has entered the environment before unintended harmful effects on wildlife (or humans) are first noticeable, and many years in addition for regulations to be introduced. Even after a chemical is officially added to the Stockholm Convention, it can take many more years for regulations to take effect and be reflected by declining levels in the environment. The implication is a need for more effective proactive arrangements to reduce risk from chemical pollutants before they are released into the environment.

The timely delivery of scientific information to appropriate regulatory bodies is essential for rapid action

AMAP's primary function is to make scientific knowledge accessible for policy and decision-making processes. Thus, AMAP is uniquely placed to recognize new POPs and other emerging chemical threats and relay such information to appropriate regulatory bodies. Mechanisms to facilitate the timely delivery of AMAP deliverables will be critical in accelerating regional and international actions on emerging chemicals of Arctic concern.

Inuit sculpture of mother and child - a gift from ICC - provided a powerful reminder to Stockholm Convention negotiators of their role in protecting vulnerable Arctic populations from global pollutants.

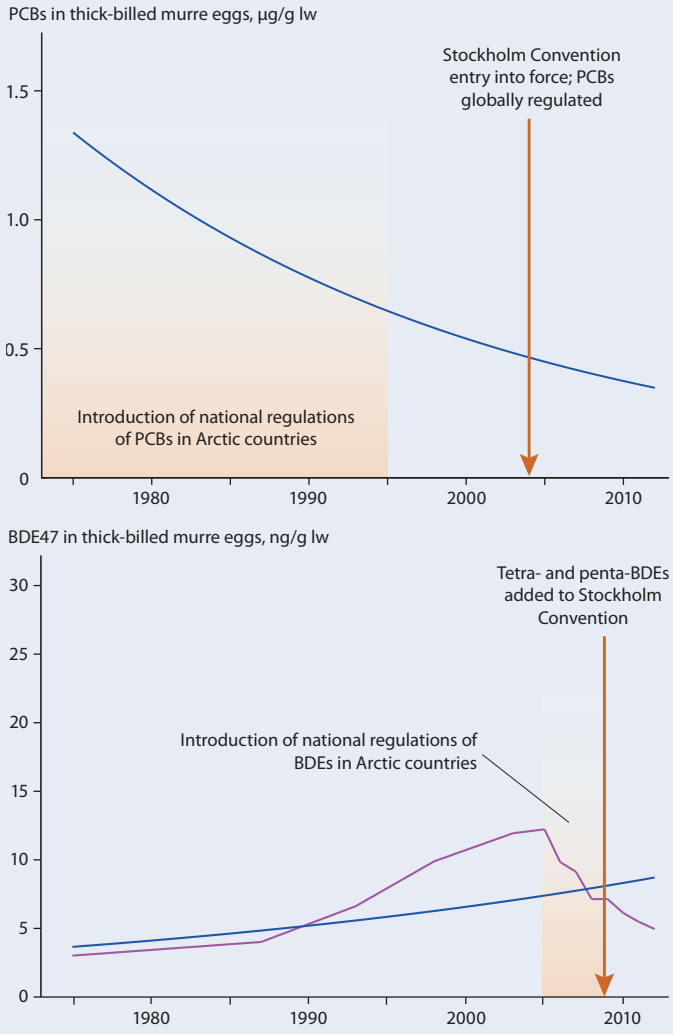
TIMELINE OF ACTION ON HARMFUL CHEMICALS: FROM DISCOVERY TO EFFECTIVE REGULATION

International conventions have taken action to regulate a number of chemicals after they have been found to be widely distributed in the environment and pose a potential health concern to humans and wildlife. Rather than chemicals only becoming candidates for global regulation after they enter the environment, global regulatory systems need to aim at preventing the release of harmful substances before they become a problem.

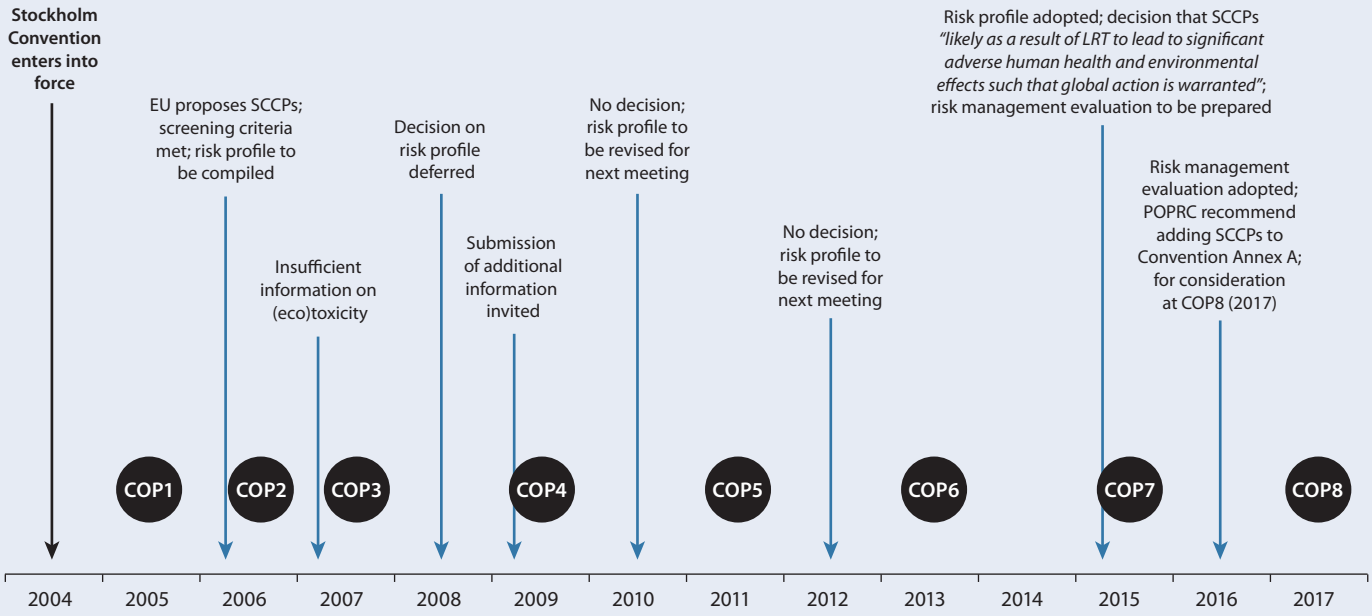
In the case of legacy contaminants such as PCBs and DDT, several decades passed between their initial use in the 1930s and 1940s, and the finding of environmental concern. Although many countries took swift action to restrict the use of these contaminants at the national level, several more decades would elapse before an international agreement was reached to control their release. It wasn't until 2004 that the Stockholm Convention entered into force, providing action at the global level on these, and ten other persistent organic pollutants, introducing a new global framework for regulating POPs.

From 2009 to 2015, 14 chemicals, including PBDEs, were added to the Stockholm Convention. Still, the approach remains largely reactive in nature. The example of SCCPs illustrates that it can still take several years to review and list a chemical for regulation.

The time lag between the discovery and regulatory action on a chemical of concern has led to calls for more proactive approaches to chemical regulation. Several countries have introduced national regulatory systems whereby substances are screened by their chemical properties prior to approval for use. Such approaches are not without their limitations – such as the lack of reliable information on chemical properties, or taking account of potential for long-range atmospheric or oceanic transport – but are a positive move towards reducing the number of chemicals of concern released to the environment.



National regulations can be effective at reducing levels of environmental contaminants while work to review them for inclusion in global regulations is being undertaken.



Consideration of short-chained chlorinated paraffins (SCCPs) by the Stockholm Convention POPs Review Committee (POPRC) and Conference of Parties (COP)

What questions remain unanswered?

The current AMAP assessment confirms that a broad range of chemicals of emerging concern that are being found at lower latitudes are now also present in the Arctic. Given their recent discovery, there is less information available on these chemicals compared to legacy contaminants. Increasing our understanding of these pollutants will be especially important as the Arctic region continues to undergo changes from a warming climate and associated increases in human activity. Environmental monitoring and Arctic-focused studies will be important for filling in current knowledge gaps and assessing the significance of these chemicals to the region.

Current extent of Arctic contamination

Monitoring data for chemicals of emerging concern are not available for large areas of the Arctic, and particularly for Russia and Alaska, US. Thus, the extent and magnitude of contamination of the region is unknown. More information on the levels of these chemicals in different polar ecosystems and over wider geographical areas are needed for a better understanding of the fate of these chemicals in the Arctic environment.

Effects on wildlife and human health

It is largely unknown whether newly identified chemicals of concern will adversely impact the health of the Arctic's human inhabitants and ecosystems. With a few exceptions, most emerging chemicals are being found in the Arctic at concentrations lower than those of legacy POPs. Although their environmental levels may be low, this information is not sufficient to conclude that emerging chemicals present a low risk. There is a general lack of information with regards to the extent to which emerging chemicals may be taken up and accumulated by Arctic fauna or indigenous Arctic peoples whose diets depend heavily on local wildlife.

Cumulative effects

The limited information on the environmental levels combined with a general lack of information regarding effects of individual emerging chemicals make assessing risks to Arctic wildlife and human inhabitants difficult. Even more challenging is understanding the risks from emerging chemicals against a background of exposures to legacy POPs and methyl mercury, as well as additional stressors, such as climate change. This is a focus of a forthcoming AMAP Assessment on Biological Effects.

PLASTICS AND MICROPLASTICS: UNIQUE EMERGING THREATS

Stephanie Wright, University of Exeter

Plastics are synthetic materials produced in staggering amounts: an estimated 322 million tons of plastic was manufactured globally in 2015 alone and worldwide production is projected to continue increasing significantly in the future. Much of that plastic ends up in the ocean and now poses a significant threat to marine ecosystems.

Most of the plastic particles floating in the world's oceans are microplastics. Microplastics are small fragments of plastic less than 5mm in diameter. Microplastics are chemically complex.

While some microplastics are deliberately manufactured for use in consumer products, others are formed in the environment from the breakdown of larger plastic debris. Mounting evidence suggests microplastics share some characteristics of traditional POPs, including their environmental persistence and potential to accumulate and cause adverse effects in fauna that ingest them. In addition to themselves being a pollution threat, microplastics can also act as a source of other chemical pollutants. Additives to plastics, such as stabilizers and flame retardants, can leach from plastics as they age. Furthermore, new evidence indicates chemicals present in marine waters can adsorb to the surface of plastics and travel with them as they are carried on ocean currents to the Arctic, presenting an additional risk to the marine animals that consume them.

Because of their complex makeup, microplastics cannot be evaluated with the current approaches used by international conventions. The Global Partnership on Marine Litter is a voluntary partnership for governments, international agencies, business and other stakeholders launched during the UN Conference on Sustainable Development in June 2012. The OSPAR Convention is also in the process of implementing a regional action plan to significantly reduce marine litter in the North East Atlantic.

Continued monitoring and efforts to reduce marine plastics and microplastics will be of increasing importance in the decades to come as climate change is expected to add to the amount of debris in the Arctic, via melting sea ice and increasing inputs from human activities.

Next steps: recommendations for future action

Pollution threats to the Arctic are continually evolving. The long-term monitoring data generated by AMAP shows international and national pollution control activities have generally been effective at reducing the occurrence and ecosystem impacts of the chemicals they regulate. Yet, the current AMAP assessment confirms a broad range of new chemicals of emerging concern are now found in the Arctic. Moreover, an even larger number of chemicals with the potential to reach the Arctic are presently in use, with new chemicals continuing to enter commerce each year.

AMAP therefore recommends that:

1. To strengthen efforts under existing global chemicals regulatory systems:

Information on chemicals of emerging Arctic concern be delivered to global and national regulatory bodies in an effective and timely manner.

This recommendation is addressed to the Arctic Council/AMAP to disseminate relevant information on chemicals of emerging Arctic concern to UNECE CLRTAP and the Parties to the Stockholm Convention.

To minimize the time from the discovery of a new chemical of concern in the Arctic to its regulation, it is essential that environmental monitoring data be efficiently delivered to relevant regulatory bodies – both global, for international regulation, and national for regional controls. Currently, national (screening monitoring) programs such as those in Nordic countries (including Greenland) and Canada conduct analyses that document the presence of chemicals of emerging concern in the Arctic and provide this information to relevant parties. The environmental data produced by these national programs and other scientific groups is summarized by AMAP, typically at five-year intervals. Systematized screening monitoring and improved communication between AMAP and relevant regulatory bodies and Parties to Conventions, such as the Stockholm Convention, would streamline this flow of information and accelerate the regulatory review process.

AMAP's 2017-2019 work-plan aims to address the need for more timely provision of information on the presence, levels, and trends in Arctic environmental contamination to global and national regulatory bodies. However, this undertaking will require improved cooperation with the intended recipients of such information, such as the Stockholm Convention Persistent Organic Pollutant Review Committee (POPRC), and commitment at the national level from Arctic States and observer countries in the form of additional nominations of candidate substances and enhanced engagement of scientific experts.

Parties to the Stockholm Convention are encouraged to nominate those chemicals of emerging Arctic concern that exhibit POPs properties.

This recommendation is addressed to governments of Arctic States and observer countries.

The recent AMAP assessment has identified new chemicals that may warrant consideration for regulation under the Stockholm Convention. Only Parties to the Stockholm Convention may propose chemicals for review of their POPs properties by the POPRC. The POPRC review process evaluates whether a chemical meets the criteria for listing it as a POP under the Stockholm Convention, including consideration of whether the chemical is likely, as a result of its long-range transport, to lead to significant adverse human health or environmental effects. Long-range transport resulting in Arctic contamination is an important piece of evidence used by the POPRC when evaluating candidate POPs, but is not the only criteria that is applied.

2. To address chemicals of emerging Arctic concern that may not meet criteria for inclusion under existing international chemicals regulatory systems, or lack information necessary to establish this:

Monitoring programmes and research be continued, with an increased capacity for new pollutants and a focus on documenting long-range transport.

This recommendation is addressed to governments of Arctic States and observer countries, and international and national research funding agencies.

Monitoring data is important in evaluating the effectiveness of international agreements to control pollutants, and providing information needed to evaluate whether new chemicals are causing harm to human health or the environment and should be regulated either nationally or internationally

through existing Conventions. In light of the large number of potential chemicals of Arctic concern presently in commerce, a wider application of targeted and non-targeted analytical screening efforts to include candidate POPs and additional contaminants, as well as their long-range transport potential, is needed. Comparable methods and QA/QC need to be developed for chemicals of emerging Arctic concern. Monitoring approaches may need to be modified to cover new POPs and other emerging chemicals, particularly for microplastics, which require new, harmonized methods for assessing their presence and significance in Arctic ecosystems. New research on the 'cocktail effect' of pollutants to assess the long-term effects of pollutant mixtures in the Arctic environment, and the fate and effects of transformation products of chemicals of emerging Arctic concern is needed. Monitoring programmes will need to be coordinated to address both chemicals from local sources associated with Arctic communities, industrial activities and tourism, as well as long-range transport pollutants from global sources, and expanded to cover additional regions. In addition, the continued archiving of samples in specimen banks is critical for assessing risks of new and emerging chemicals of concern.

The Arctic Council engage with relevant global initiatives such as the UN Environment Programme and SAICM to improve the management of chemicals of emerging Arctic concern.

This recommendation is addressed to the Arctic Council (States and Permanent Participants) and governments of observer countries, to further enhance their engagement with the governing bodies of regulatory conventions including UN ECE (LRTAP Convention) and UNEP (the Stockholm, Basel and Rotterdam Conventions), and voluntary international chemical management initiatives, such as the Strategic Approach to International Chemicals Management (SAICM) and the International Programme on Chemical Safety (IPCS).

New approaches to chemicals and waste management should be considered. Many chemicals of emerging Arctic concern, such as the organophosphate-based flame retardants (PFRs), phthalates, some siloxanes, and some current-use pesticides, as well as pollutants that are not chemicals, such as microplastics, may not meet criteria currently applied in the existing mechanisms for the global regulation of long-range transported pollutants. Furthermore, existing global chemicals management systems are addressing chemicals that have already contaminated the environment, However, there is an increased need for proactively preventing the introduction of chemicals with the potential to pollute the Arctic. Consequently, a new generation of policy instruments should be considered to address associated challenges.

Arctic States and observer countries consider the need for additional national and regional actions to control and communicate the risks of pollutants within Arctic communities.

This recommendation is addressed to governments of Arctic States and observers.

There is evidence that some chemicals of emerging Arctic concern – such as pharmaceuticals and personal care products – originate from local sources within the Arctic and therefore their risks may not be adequately managed by international conventions that focus on long-range transported chemicals. In these instances, independent actions by Arctic countries in implementing national and regional controls will be important for protecting the health of Arctic communities and ecosystems.

With regards to pollutants brought to the region via both local and long-range transport, outreach efforts led by Arctic countries will be important for informing local communities of potential health risks and exposure prevention measures until global regulatory controls are effective.

Where they do not already do so, national regulatory systems should be encouraged to take evidence of long-range transport obtained from, e.g., monitoring programmes into account in chemical risk assessment.

Access to information acquired by industry during both research and development as well as chemical manufacturing lifecycle stages be improved

This recommendation is addressed to industry producing chemicals or using them in manufactured products, as well as SAICM for consideration in its Chemicals in Products Programme.

In addition to routine monitoring programmes, non-target approaches – such as database screening and analytical approaches that identify chemicals previously unsearched for can aid the earlier identification of potential chemicals of concern. Such approaches can therefore shorten the time from identification of risk to implementation of regulation. Information on use and chemical properties, including toxicity profiles, from industry is essential for identifying chemicals via database screening and assessing the sufficiency of the existing risk management measures. At present, such information is not always comprehensive or sufficiently accessible to the scientific community and steps should be taken to engage with industry to address this.

Chemicals of Emerging Arctic Concern

Summary for Policy-makers

This document presents the AMAP 2016 Chemicals of Emerging Arctic Concern (CEAC) Assessment Summary for Policy-makers. More detailed information on the results of the assessment can be found in the CEAC Scientific Assessment Report. For more information, contact the AMAP Secretariat.

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