Climate Change, Microplastics and their Impact of Environmental Health in Arctic Communities

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Alaska Community Action on Toxics

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Who we are

What we believe …

…everyone has the right to clean air, clean water, and toxic-free food. Driven by a core belief in environmental justice, ACAT empowers communities to eliminate exposure to toxics through collaborative research, shared science, education, organizing, and advocacy.

Core values:

Community right-to-know

Environmental justice

Precautionary principle

Elimination of the production and release of toxics

Rights and sovereignty of Indigenous peoples

Culture of caring and wellness

Our work

- We help communities implement effective strategies to limit their exposure to toxic substances and to protect and restore the ecosystems that sustain them and their way of life.

- We work to eliminate the production and release of harmful chemicals by industry and military sources, ensure the public's right-to-know, achieve policies based on the precautionary principle, and support the rights of Indigenous peoples.

Climate change

Climate change refers to significant changes in global temperature, precipitation, wind patterns and other measures of climate that occur over several decades or longer.

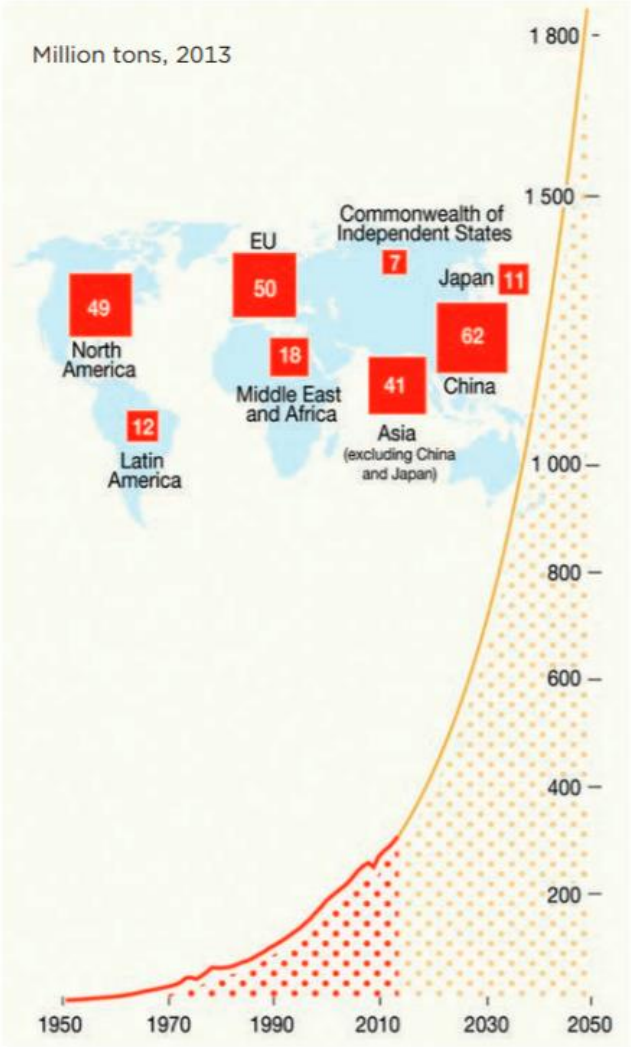
What changes are you witnessing in your community? How it affects your health and the well-being of the community you live in?

World

February 2019

FIGURE 1

Global Plastic Production and Future Trends



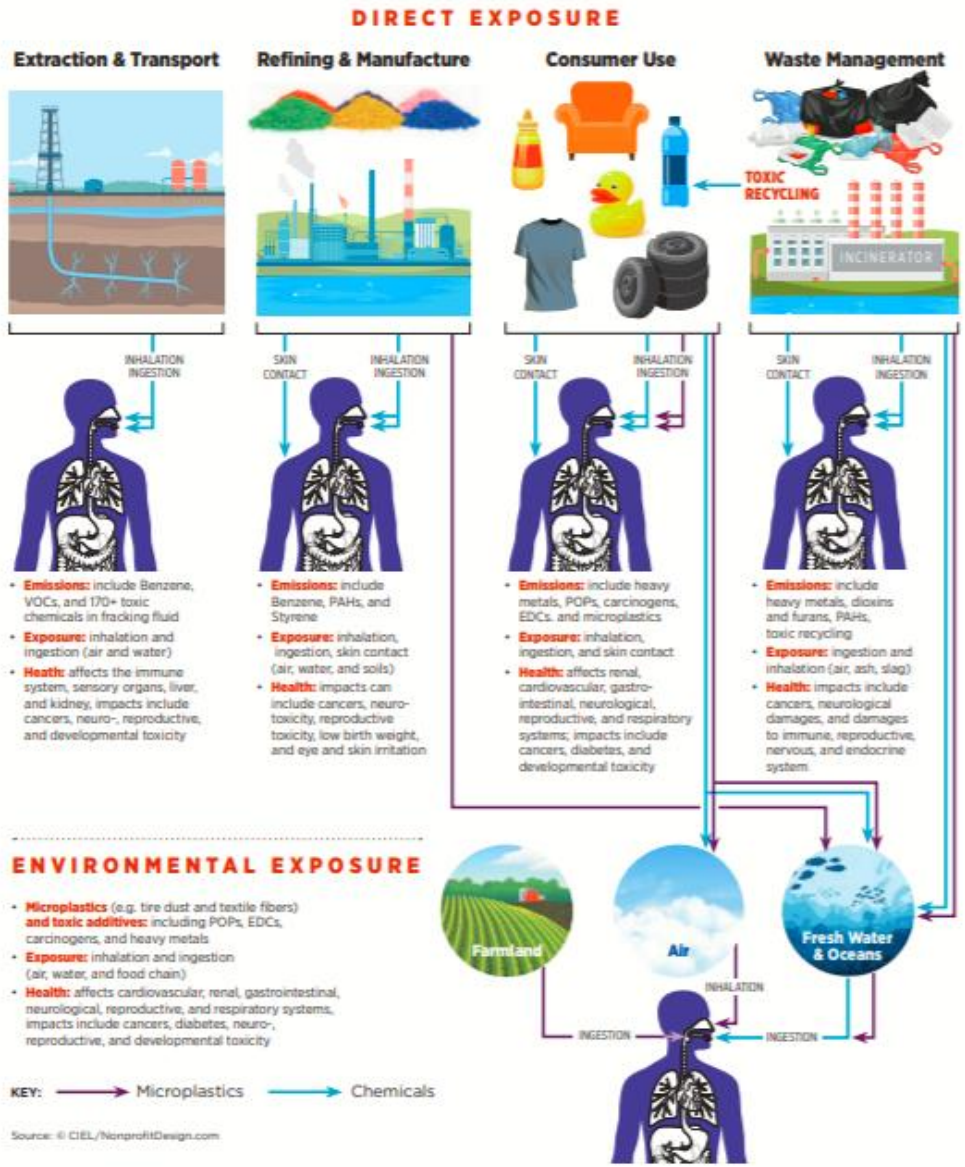
Source: Ryan, A Brief History of Marine Litter Research, in M. Bergmann, L. Gutow, M. Klages (Eds.), Marine Anthropogenic Litter, Berling Springer, 2015; Plastics Europe

Based on current investment projections, estimates indicate that production of ethylene and propylene, the two main precursors used for the production of plastic, will increase by 33-36 percent—approximately 100 million Mt—by 2025.

FIGURE 2

Plastic & Health: The Hidden Costs of a Plastic Planet

Humans are exposed to a large variety of toxic chemicals and microplastics through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.



Extraction and Transport

99% of plastic comes from fossil fuels. The extraction of oil and gas, particularly hydraulic fracturing for natural gas, releases an array of toxic substances into the air and water, often in significant volumes. Over 170 fracking chemicals that are used to produce the main feedstocks for plastic have known human health impacts, including cancer, neurological, reproductive, and developmental toxicity, impairment of the immune system, and more. These toxins have direct and documented impacts on skin, eyes, and other sensory organs, the respiratory, nervous, and gastrointestinal systems, liver, and brain.

Refining and Manufacture

Transforming fossil fuel into plastic resins and additives releases carcinogenic and other highly toxic substances into the air. Documented effects of exposure to these substances include impairment of the nervous system, reproductive and developmental problems, cancer, leukemia, and genetic impacts like low birth weight. Industry workers and communities neighboring refining facilities are at greatest risk and face both chronic and acute exposures during uncontrolled releases and emergencies.

Consumer Products and Packaging

Use of plastic products leads to ingestion and/or inhalation of large amounts of both microplastic particles and hundreds of toxic substances with known or suspected carcinogenic, developmental, or endocrine-disrupting impacts.

Waste Management

All plastic waste management technologies (including incineration, co-incineration, gasification, and pyrolysis) result in the release of toxic metals, such as lead and mercury, organic substances (dioxins and furans), acid gases, and other toxic substances to the air, water, and soils. All such technologies lead to direct and indirect exposure to toxic substances for workers and nearby communities, including through inhalation of contaminated air, direct contact with contaminated soil or water, and ingestion of foods that were grown in an environment polluted with these substances. Toxins from emissions, fly ash, and slag in a burn pile can travel long distances and deposit in soil and water, eventually entering human bodies after being accumulated in the tissues of plants and animals.

Plastic in the Environment

Once plastic reaches the environment in the form of macro- or microplastics, it contaminates and accumulates in food chains through agricultural soils, terrestrial and aquatic food chains, and the water supply. This environmental plastic can easily leach toxic additives or concentrate toxins already in the environment, making them bioavailable again for direct or indirect human

Opposite: © iStockphoto/George Clerk

exposure. As plastic particles degrade, new surface areas are exposed, allowing continued leaching of additives from the core to the surface of the particle in the environment and the human body. Microplastics entering the human body via direct exposures through ingestion or inhalation can lead to an array of health impacts, including inflammation, genotoxicity, oxidative stress, apoptosis, and necrosis, which are linked to an array of negative health outcomes including cancer, cardiovascular diseases, inflammatory bowel disease, diabetes, rheumatoid arthritis, chronic inflammation, autoimmune conditions, neurodegenerative diseases, and stroke.

Uncertainties and knowledge gaps undermine the full evaluation of both acute and long-term health risks at all stages of the plastic lifecycle, and limit the ability of consumers, communities, and regulators to make informed choices.

- Lack of transparency of the chemicals in plastic and its production processes prevents a full assessment of its impacts, reduces the ability of regulators to develop adequate safeguards; consumers to make informed choices; and fenceline communities to limit their exposure.
- Further research is urgently needed to: evaluate intersecting exposures, synergistic effects, and cumulative impacts of the mixtures of thousands of chemicals used in consumer goods; understand the potential transfer of microplastics and associated toxic chemicals to crops and animals; and understand the toxic impacts of microfibers and other plastic microparticles increasingly documented in human tissues.

Photo: © Nandakumar S. Haridas/Greenpeace. Inset: © Marco Garcia/Greenpeace

Reducing toxic exposure to plastic will require a variety of solutions and options because plastic has a complex lifecycle with a diverse universe of actors.

- At every stage of the plastic lifecycle and across those stages, solutions should be guided by respect for human health and the right to a healthy environment. Despite remaining uncertainties, existing information about the severe health impacts of the plastic lifecycle justifies the application of a strong precautionary approach to the lifecycle of plastic and the overall reduction of plastic production and uses.
- Health impact assessments that focus solely on the plastic components of products while ignoring thousands of additives and their behavior at every stage of the plastic lifecycle are incomplete.
- Addressing plastic pollution requires adapting and adopting legal frameworks to ensure access to information regarding the petrochemical substances in products and processes, as well as increased independent research to fill existing and future knowledge gaps.
- Solutions must be built on transparency, participation, and the right to remedy. Transparency is required to identify the nature and breadth of exposure to toxic material, as well to assess possible health and environmental impacts of technologies touted as "solutions," such as incineration and plastic-to-fuel technologies. Solutions must integrate the right to meaningful participation in decision-making about plastic-related risks, and access to justice when harms arise.
- Measures that succeed at a local level or with respect to a single product stream are often undermined or offset by the emergence of new plastic, new additives, and new exposure pathways that are interwoven in supply chains that cross and recross borders, continents, and oceans. Until we confront the impacts of the full plastic lifecycle, the current piecemeal approach to addressing the plastic pollution crisis will not succeed.

The findings of this report are clear. Even with the limited data available, the health impacts of plastic throughout its lifecycle are overwhelming. Many actions and solutions are needed to confront this threat to human life and human rights. To be effective, they must ultimately reduce the production, use, and disposal of plastic and associated toxic chemicals.

This report was made possible through the generous support of the 11th Hour Foundation, Broad Reach Fund of the Maine Community Trust, Gallifrey Foundation, Heinrich Böll Stiftung, Leonardo DiCaprio Foundation, Marisla Foundation, Passport Foundation, Plastic Solutions Fund, Threshold Foundation, and Wallace Global Foundation.

The full report is available online at **www.ciel.org/plasticandhealth**

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World

https://www.theguardian.com/news/datablog/2019/nov/09/coca-cola-world-biggest-plastics-polluter-again-datablog#img-1

- Amidst growing concern about the impacts of plastic on the oceans, ecosystems, and human health, there's another largely hidden dimension of the plastic crisis: plastic's contribution to global greenhouse gas emissions and climate change.
- This report examines each of these stages of the plastic lifecycle to identify the major sources of greenhouse gas emissions, sources of uncounted emissions, and uncertainties that likely lead to underestimation of plastic's climate impacts.
- The report compares greenhouse gas emissions estimates against global carbon budgets and emissions commitments, and it considers how current trends and projections will impact our ability to reach agreed emissions targets.

https://www.ciel.org/reports/plastic-health-the-hidden-costs-of-a-plastic-planet-may-2019/

United States

- Fought the addition of plastics to the Basel Convention
- US is the largest exporter of plastic to China, Cambodia and Indonesia
- 2018 China closed doors to receive plastic
- 2019 China made it illegal to receive plastics
- Now the US has to find a solution for managing and disposing of it responsibly
- In the US, the biggest producers of plastic pollution were Nestlé, followed by Solo Cup Company and Starbucks. In Europe, Heineken was the third-largest plastic polluter.

How Our Health is Harmed by Climate Change:
Impacts Differ by Geographic Region

The Medical Society Consortium ON CLIMATE & HEALTH

Extreme Temperatures

Outdoor Air Quality

Extreme Events
Flooding, Hurricanes, Storms, Drought

Food-Related Infection & Agriculture

Water-Related Infection

Mosquito- and Tick-Borne Infections

Wildfires

Mental Health & Well-being

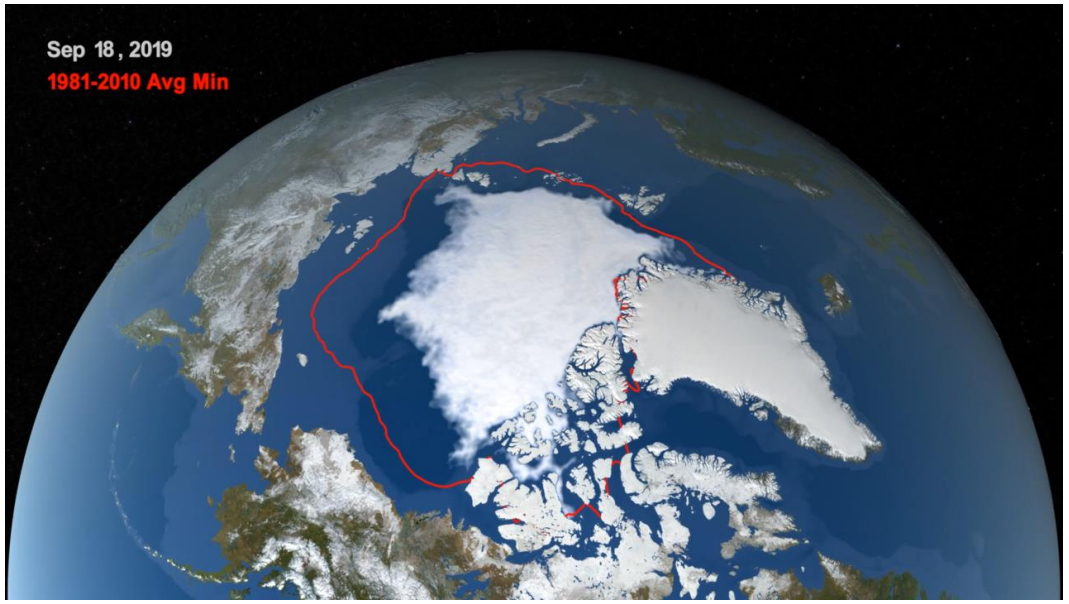
This graphic illustrates key impacts of climate change on health and is based on reports from the U.S. Global Change Research Program. For more information, visit www.globalchange.gov.

Alaska

- This past summer in Alaska, we have witnessed record-breaking heat, wildfires and smoke, drought, salmon dying of heat stress in our rivers, and extensive seabird and marine mammal die-offs. Here are a few statistics:
- Wildfires have burned more that 2.5 million acres in 2019, resulting in evacuations, loss of homes, school and road closures, and health advisories due to unhealthy air.
- July 2019 stands as Alaska's hottest month on record and the 12th consecutive month in which average temperatures were above normal every day.

Alaska

- This past August had the lowest levels of arctic sea ice ever, according to the National Snow and Ice Data Center.
- This is the fifth consecutive year of large seabird die-offs. There have been 32 dead gray whales found in Alaska waters this year and at least 137 dead ice seals were found on Bering Strait area beaches.



Alaska

- Alaska is warming faster than any other state in the U.S. and at least twice as fast as the rest of the planet as a whole. The science is conclusive that human activity is the dominant cause of rising global temperatures over the past 50 years and without immediate action irreversible damage is likely.'

International Panel on Climate Change. (2014). *Climate change 2014 synthesis report: Summary for policymakers:* http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

https://climateandhealthtoolkit.org/climate-101/

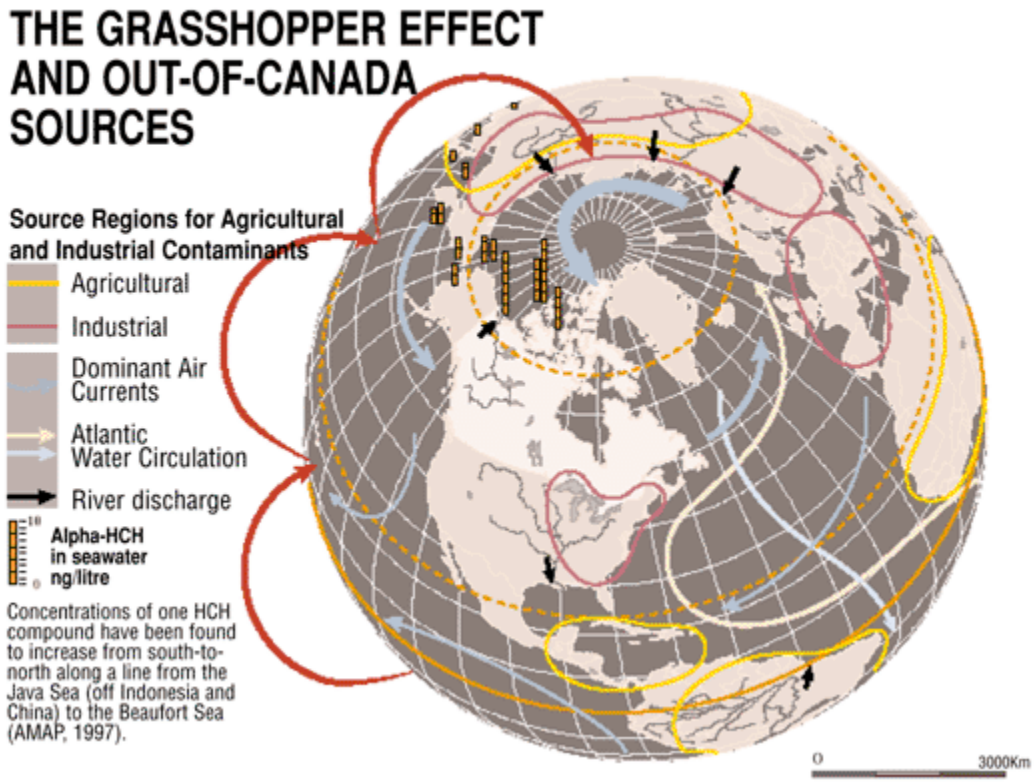
Contaminants and climate change

- The Arctic Climate Impact Assessment (ACIA) report of 2004 warns that warming probably speeds up the transport of pollutants to the Arctic and increased precipitation would lead to more POP deposits in the Arctic.
- In addition, the melting of snow, ice, and permafrost, releases the contaminants accumulated over decades in the form of melt water, which will then enter the food chain.
- The increased frequency of forest fires due to climate change could also release increasing amounts of pollutants into the air.

The Arctic

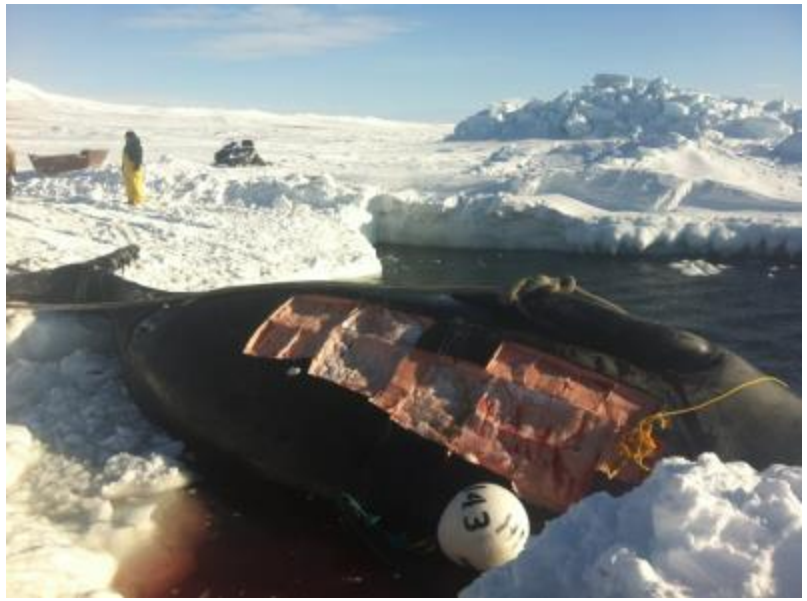
- The Arctic has become a hemispheric sink for persistent industrial chemicals that are transported on atmospheric and oceanic currents from distant sources and accumulate in the bodies of fish, wildlife, and people.
- Climate warming is exacerbating the mobilization and transport of chemical contaminants in our northern environments.

Figure 4.2: The Grasshopper Effect



The Arctic

Food security



The Arctic, Climate Change and Persistent Organic Pollutnats (POPs)

- Scientists observe that accelerated melting of polar snow, ice, and permafrost mobilizes sequestered contaminants and enhances air-to-sea exchange, rendering greater bioavailability of contaminants within arctic food webs, threatening our food security and health.

The Arctic, climate change and POPs

- The preamble of the United Nations Stockholm Convention on Persistent Pollutants states, “Arctic ecosystems and indigenous communities are particularly at risk because of the biomagnification of persistent organic pollutants” and “contamination of their traditional foods is a public health issue.”

- The Arctic contains some of the most highly contaminated animals and people in the world.

Microplastics

- We release about 8 million metric tons of plastics into our oceans each year.
- The plastics disintegrate into tiny particles called microplastics that can be ingested by fish and other marine animals.

Microplastics

- Phthalates in birds in the Bering Sea, Veronica Pedula

A nearly decade-long University of Alaska project to monitor the ecology of puffins, crested auklets and other seabirds that flock to the storm-tossed Aleutian Islands has produced crucial baseline information about microplastics contamination in marine waters off Alaska.

Of more than 200 Aleutian birds initially examined, nearly 1 in 5 turned out to have some type of organic materials in their stomachs, researchers found.

Microplastics, POPs & the Arctic

- Arctic sea ice is also a major global sink for microplastic particles.
- A recent study found that the Arctic Ocean contains more plastic waste than any other ocean.

  "Thousands of particles of microplastic were in nearly every sample from the Arctic; a single liter of snow contained 14,000 grains of the stuff."

- We are all too familiar with the images of fish, marine mammals and seabirds choked, tangled and mangled by the vast quantities of plastics in our oceans, however the less visible effects also pose profound threats to the health of marine organisms and people.

Microplastics, POPs & Human Health

- All plastics contain highly toxic additives that are endocrine disrupting, such as phthalates and bisphenols; and these plastics also absorb persistent and toxic chemicals at sea such as PCBs and PBDEs (flame retardant chemicals).
- Plastics leach toxic additives as well as concentrate chemicals that are already in the environment, making them a source of human exposure and harm to health.
- Endocrine disrupting chemicals affect reproduction, learning and behavior, and can cause cancers.

What can we do?

- Increase the awareness of peers and policymakers (including Senators Murkowski and Sullivan, Congressman Don Young, and state legislators) about how climate change harms health. Alaska Natives and other vulnerable populations must have a significant role in bringing environmental health-focused discussion and decision making to national climate change policy, regulations and initiatives.
- Advocate for health-protective climate, chemicals, and energy policies.
- Support climate-friendly practices in tribal governments, schools, home and clinics.
- Move towards zero waste.
- Demand ambitious greenhouse gas reduction that take plastics into account.
- Force plastics producers to accept responsibility for environmental and health impacts.
- Prevent the development of new and harmful oil, gas, petrochemical infrastructure.

What can we do?

- Conserving energy as part of your daily routine and your decisions as a consumer.
- Provide your support for climate change and climate friendly initiatives and groups that are working towards climate justice.
- Make people aware on how climate change harms health.
- Tell your representatives that transitioning from dirty fossil fuels to clean renewable energy must be a top priority because it’s vital for healthier and safer communities.
- Stop the use of single use plastics and eliminate unnecessary uses of plastic at home and work.
- When buying new appliances like refrigerators, washers, and dryers, look for products with the Energy Star label; they meet a higher standard for energy efficiency than the minimum federal requirements.
- When buying a car, look for one with the highest gas mileage and lowest emissions.
- You can also reduce your emissions by taking public transportation, bicycling, walking or carpooling when possible.

Additional Resources

- **International Pollutants Elimination Network (IPEN)**: https://ipen.org/resources
- **Healthy Babies, Bright Future (HBBF)**: https://www.hbbf.org/
- **Collaborative on Health and Environment (CHE Call):**

"Plastic & Health: The Hidden Costs of a Plastic Planet"

https://www.akaction.org/plastic-health-the-hidden-costs-of-a-plastic-planet/

- **Democracy Now:**

The World Just Took a Major Step to Curb Plastic Pollution, But the U.S. Refused to Join Effort

https://www.democracynow.org/2019/5/16/the_world_just_took_a_major

Additional Resources

- **Center for International Environmental Law** reports:
  - Plastics and Climate: The Hidden Costs of a Plastics Planet. A Report by the Center for International Environmental Law. May 2019. https://www.ciel.org/plasticandclimate/.
  - Plastics and Health: The Hidden Costs of a Plastic Planet. A Report by the Center for International Environmental Law. February 2019. https://www.ciel.org/news/plasticandhealth/.
- **Alaska Community Action on Toxics**: www.akaction.org
- **Alaska Native Tribal Health Consortium Center for Climate and Health**: https://anthc.org/what-we-do/community-environment-and-health/center-for-climate-and-health/
- **State of Alaska Epidemiology Bulletin**: State Assessment of the Potential Health Impacts of Climate Change in Alaska. 2018. http://www.epi.alaska.gov/bulletins/docs/rr2018_01.pdf

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Thank you!

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