



Changing Atmosphere

FACT SHEET

Arctic Haze Visible Air Pollution

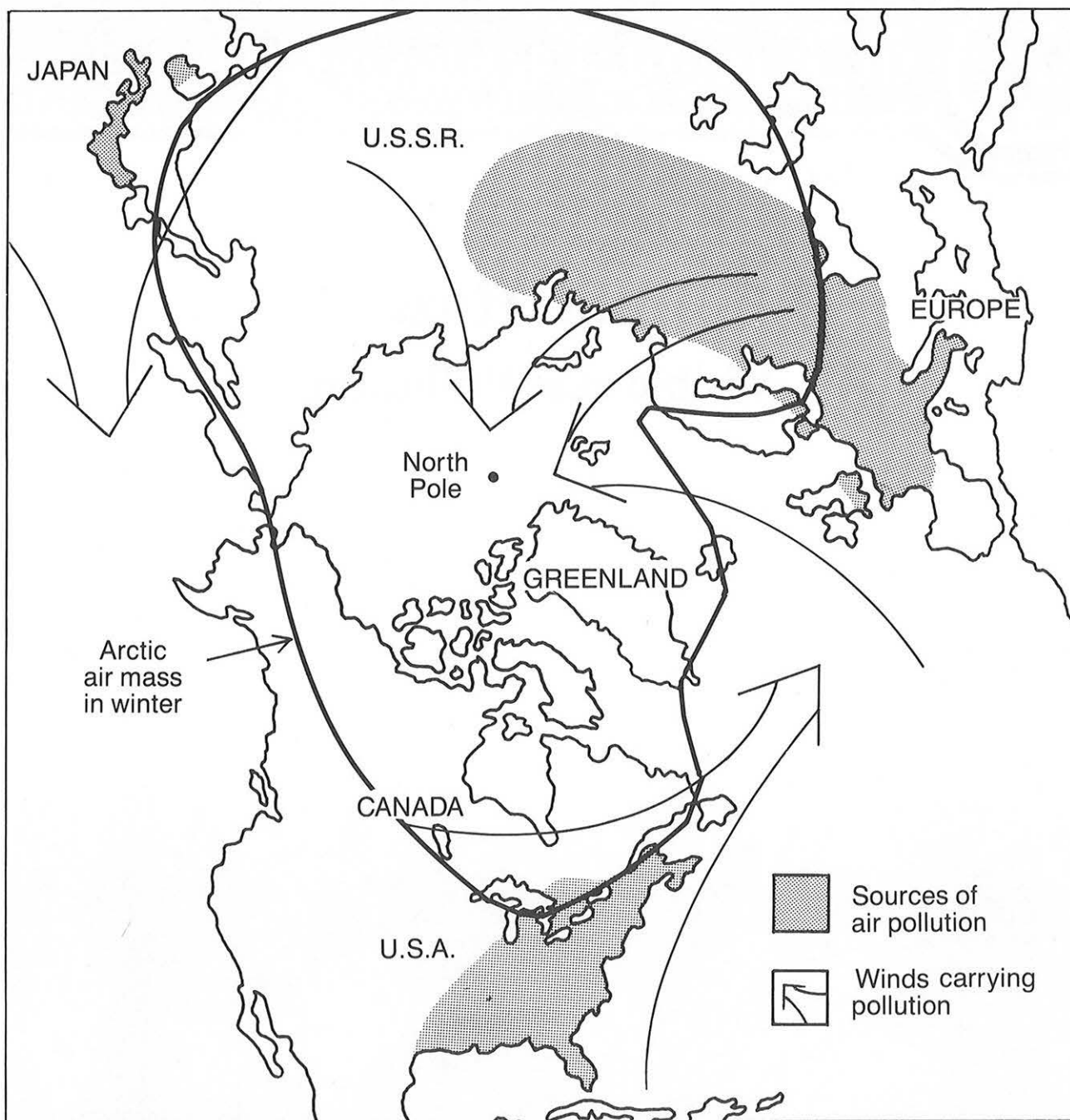


Scientists have determined that the Arctic is now contaminated by air pollution that has travelled great distances from industrial areas in more southerly latitudes.

The Arctic has long been known for its brilliantly clear air. During the early exploration of Canada's far north, travellers found they could see vast distances across the tundra. With no haze or pollution to obscure their vision, distances were often misjudged. Mountain ridges and frozen fjords, which appeared to be only a short distance away, often turned out to be 100 or more kilo-

metres away. During the 1950s, airplane pilots and weather observers first noticed that, in certain regions of the far north, distant landmarks were not clearly visible. Mountains and coastlines appeared to be obscured by particles in the atmosphere. Climatologists dubbed the unidentified particles "Arctic haze". These areas of reduced visibility were tracked and found to be 800 to 1300 km across.





Arctic air pollution is at its peak during the winter, as pollutants build up in the cold pool of air over the north pole (known as the "Arctic air mass"). Winter winds carry pollution primarily from the U.S.S.R. and Europe, with lesser amounts from North America, China and Japan.

At first, it was thought the airborne particles causing the haze were natural, consisting perhaps of wind-blown dust. During the late 1970s, scientists launched an investigation of the haze. Their findings radically changed our view of the far north as a clean, unpolluted environment. Studies carried out by Environment Canada, in cooperation with other Arctic nations, have determined the haze is actually air pollution which has travelled great distances from industrial areas in more southerly latitudes. The pollution is widespread and covers large parts of the far north during the winter.

From studies of glacial ice in the Canadian high Arctic scientists have found that the haze has been with us throughout this century, but has increased by a dramatic 75% since 1956.

Arctic haze is essentially remnants of the pollution which causes acid rain in more southerly latitudes. It consists mainly of fine droplets of sulphuric acid, particles of soot, and other industrial chemicals. These pollutants are formed primarily from the burning of fossil fuels and wood, and the smelting of sulphur-bearing ores.

The presence of Arctic haze vividly demonstrates the fragility and uniqueness of the northern environment. It has taught us that we cannot simply transfer development from the south to the north without re-thinking the environmental effects. This haze indicates that Arctic air is very susceptible to pollution. In fact, it is more "pollutable" than any other air mass in the northern hemisphere. Future industrial development must be carefully planned to take this into account.

Where does the haze come from?

Tracing back the winds which carry pollutants into the Arctic, scientists found that the primary sources are the U.S.S.R. and Europe. Lesser amounts come from North America, China and Japan.

In North America, air pollution is produced mainly in the eastern half of the continent and is blown eastward, over the Atlantic Ocean. Pollution from China and Japan travels east across the Pacific Ocean. In both cases, ocean storms wash out most airborne pollutants before they reach the Arctic. However, winds from the U.S.S.R. and Europe travel northward over land. These winds, which are particularly strong during winter, encounter fewer storms. Thus pollutants remain airborne and can be carried great distances.

How does the haze form?

Arctic haze forms as a result of the extreme cold and unusual weather conditions found in the far north. During the winter, the Arctic is shrouded in 24 hours darkness. With no heat from the sun, the temperatures plunge and the north is enveloped in a pool of cold air — known as the Arctic air mass. When air pollution enters this air mass, there is almost no precipitation to wash it out of the atmosphere, so the pollutants remain airborne for a long time (weeks or months). In the spring, when the sun comes up, the pollution is visible as Arctic haze. As the north warms in summer, precipitation in the north increases and the pollution is either washed to the earth or dispersed by winds to more southerly regions. Pollution-bearing winds from Europe and Asia also decrease during the summer. Thus Arctic haze is at its worst during the winter and early spring.

Effects of Arctic Haze

Scientists are concerned about three potential effects of Arctic haze, in the following order of importance:

1. Climate Warming

During the spring, Arctic haze could cause a rise in northern temperatures, as sunlight is absorbed by the dark soot particles in the air and on the snow-covered ground. This effect could increase the average temperature by up to 2 degrees C. during the months of March, April and May. This warming could lead to a major change in the spring climate of the Arctic and could potentially affect weather patterns throughout the northern hemisphere.

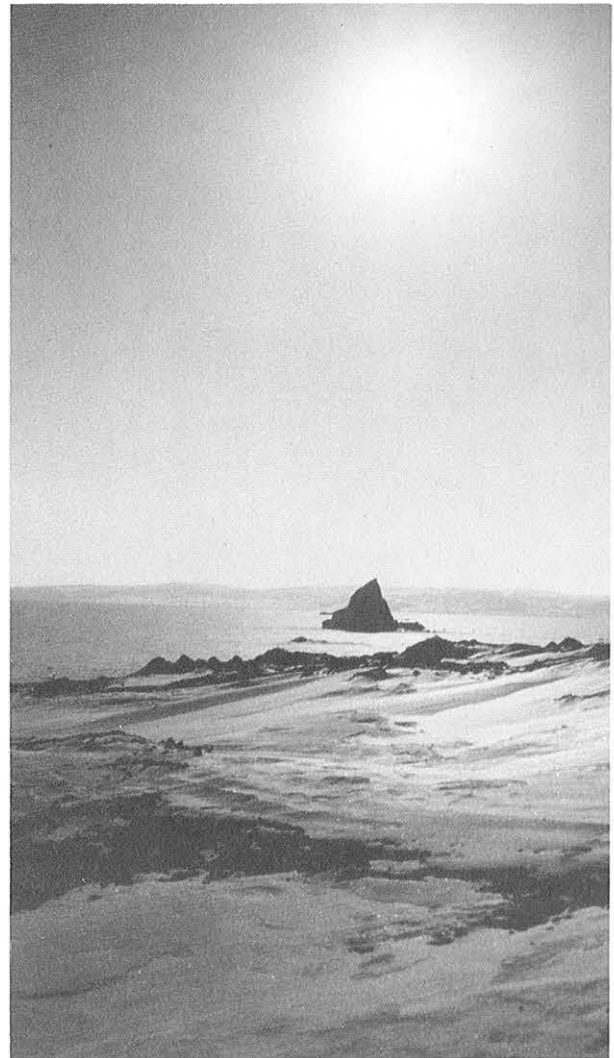
2. Decreased Visibility

When Arctic air is clear, travellers can often see as far as 200 km across the tundra. But when the haze is heavy, visibility can be reduced to 30 km. While the effect is aesthetically undesirable, it has not yet been shown to be a hazard to air navigation.

3. Acid Snow

A major component of Arctic haze is the sulphur compounds which produce acid rain at more southerly latitudes. When the haze pollutants begin their journey at mid-latitudes, much of the sulphur is in the form of sulphur dioxide. As the particles travel northward, they combine with water droplets in the air to form sulphuric acid. In the Arctic, these droplets fall as acid snow.

The acid in Arctic snow is about one tenth the level of that normally found in eastern Canada, where acid rain is a major problem. Even though there are large areas of the eastern Arctic which are sensitive to acid snow, there is no evidence that current levels are damaging to the environment.



Arctic air is more "pollutable" than any other air mass in the northern hemisphere. For this reason, future industrial development must be carefully planned.

Environment Canada's Role

Environment Canada maintains an active program in Canada's north. Our Arctic haze studies are focussed at Alert, on the northern tip of Ellesmere Island. Other studies have been carried out at Mould Bay and Igloolik. We also maintain a network of stations throughout Canada to measure acid rain, with the most northerly site located near Great Slave Lake.

Our scientists are working in cooperation with other federal departments to more fully understand northern pollution and its effect on the environment. Joint research programs have also been carried out with other northern nations, such as Norway, Sweden, the U.S.A., Denmark (Greenland), and the U.S.S.R.

Our research has indicated that to clean up the Arctic, air pollution must be reduced in industrial and agricultural areas throughout the northern hemisphere. Canada has already taken action to reduce air pollution. Our current program to reduce acid rain will ensure a 50% cut in sulphur dioxide released into the atmosphere by 1994.

Canada is also encouraging international action on this issue, by working towards a co-operative agreement with the U.S.S.R., in which the Arctic and the reduction of air pollution will play a significant part. Canada is also involved with the development of a new accord with all Arctic nations to further protect the northern environment.

Part of a series of fact sheets on Arctic air pollution. Other titles are:

- *Toxic Chemicals in the Arctic*
- *Depletion of the Arctic Ozone Layer*
- *The Greenhouse Effect: Impacts on the Arctic*



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