Committee: UNEA

Agenda: Protecting Arctic and Antarctic regions concerning the reduction of aerosol emission

Student Officer: Jiwoo Kim

Introduction

Arctic and Antarctic areas' ability to reflect solar radiation and to keep the Earth's temperature balanced is important for the global climate system. They are, however, extremely vulnerable to both human-caused activities like industrial processes and natural incidents such as volcanic eruptions. What should not be neglected is that aerosols also serve as the factor that evoke polar regions' fragility. They affect cloud formation, the reflection and absorption of sunlight, and climate. Mainly, aerosols attenuate the reflectivity of snow and ice, which accelerates the melting.

While the bulk of ice is collapsing and weather is changing in unusual patterns in the Antarctic, the Arctic experiences Arctic amplification. It causes permafrost to melt, sea ice to decline, and the ecosystem to change. To put a break to these happenings, reducing aerosol emissions is significant. This is not an issue in only a particular region, but every area. Uncontrolled aerosol emissions will have social, economic, and also ecological effects globally: increasing sea levels affecting coastal towns, changing weathers affecting ecosystems, and so on.

Definition of Key Terms

Arctic Region

The Arctic includes the Arctic Ocean and parts of Canada, Russia, Greenland, the United States (Alaska), Iceland, Norway, Sweden, and Finland. However, specifically, it is the polar region that is considered as the coldest part on the Earth. It forms a unique ecosystem of its own, and it's crucial for maintaining the acceptable level of the global climate system.

Antarctic Region

The Antarctic region contains the southern ocean and the land of Antarctica. With ice covering most of the land, this region holds about 60 percent of the freshwater on Earth. It is also declared as one of the coldest, driest, and windiest regions.

Aerosols

Aerosols are small floating particles that are either liquid or solid. They are created from both human caused—car emissions, factory pollutants, or agricultural activities—and natural—volcanoes, smog, or even forest fires—events. By absorbing and scattering sunlight, aerosol affects the climate proportional to its amount. It also makes an impact on the weather by functioning as cloud formation nuclei.

Albedo Effect

The Albedo effect measures the Earth's surface reflection. High albedo surfaces, such as snow and ice, reflect a huge amount of solar radiation back to space, thus helping the plant to cool itself. It happens because the ice is usually utterly reflective, and helps to keep the surface temperature balanced.

Arctic Amplification

The Arctic Amplification is a phenomenon that occurs when the Arctic warms up quicker than the rest of the world. For example, if global warming impacts the Arctic region more than the East Asian regions, it can be considered as the Arctic Amplification. Freezing permafrost, releasing greenhouse gasses, and melting of ice entailed with decreasing albedo effect are the major causes.

Permafrost

The part of the earth that stays utterly iced for at least two years is called permafrost. It is usually found in high mountains and arctic locations. A lot of organic carbon is stored in this kind of region, which causes permafrost defrosting to lead to an uncontrollable emission of carbon dioxide. Greenhouse gasses like methane can be released as well, speeding up global warming.

Sea Ice Decline

Sea ice decline is the thinning and shrinking of sea ice in polar regions, especially in Arctic regions. As climate change gets more severe, a more rapid increase in temperature melts the ice in those cold areas. The reduction of the sea ice affects marine ecosystems, albedo effect, and even rises sea level.

History

Early observations and industrial revolution

The introduction of fossil fuels and its increased usage during the Industrial Revolution in the late 18th century, released a considerable volume of aerosols to the atmosphere. It initially affected the Arctic and Antarctic areas, mainly by changing the color of snow and ice, which meant the presence of smoke and atomic matter of toxic elements.

Mid-20th century

The study of aerosols in polar regions began in the mid 1900s. Large-scaled base data on air conditions for this study were provided during the International Geophysical Year, which was from 1957 to 1958, and the persistent research sites in Antarctica were founded in those years. The sites usually focused to keep their ongoing monitoring on polar regions and aerosols.

Late 20th Century

It was clear by the late 20th century that polar regions were greatly damaged by human activity. According to research, industrialized areas released aerosols like black carbon, which accelerated melting and decreased the albedo of ice and snow. As a result, more people realized how important it is for nations to work together to fight pollution.

Early 21st Century

Monitoring aerosol emissions was enhanced in the early 21st century by technological advancements and international cooperation. Detailed information was supplied by atmospheric models and improved satellite observations. Important laws, like the Stockholm Convention of 2001, aimed to protect the arctic regions by lowering dangerous emissions.

Key Issues

Climate change acceleration

Aerosols, especially black carbon, in the polar regions make a significant effect on the process of climate change. It does not only accelerate the process but also increase the absorption of solar radiation. By decreasing the surface covered by ice and snow when falling on them, aerosol decreases albedo effect. Thus, snow and ice melt more quickly, warming the global temperature, rising sea levels, etc.

Long-range transport of pollutants

Air currents that move between long distances obviously have the ability to carry around aerosol particles around the world. The problem is that it may carry aerosols from the industrialized and urban areas to the Arctic and Antarctic. Due to their travel, it is inevitable to cause a big influence on the ecosystem by the emission of aerosols.

Policy and governance issues

As a result of severe global warming, strong regulations and corporations are being established internationally. However, even though agreements like the Stockholm Convention are taking place, their ability to reinforce the reduction of aerosol emission or slowing the climate change are considered difficult.

Major countries like China or the United States sometimes to not compromise, and policies aiming for reducing aerosols and preserving the climate in polar regions are not focused enough.

Major Parties Involved and Their Views

Arctic Council

The Arctic Council is an intergovernmental organization formed by the representatives from Arctic states and indigenous peoples. They are strongly working for the preservation of the Arctic environment by decreasing black carbon and methane. It is said that to lessen the effects of aerosol emissions, it has been promoting studies and collaborations.

Antarctic and Southern Ocean Coalition (ASOC)

The ASOC is an environmental NGO, working to protect Antarctica's ecosystems. To reduce the impact caused by humans on the pure Antarctic environment and to address the effects on climate change, it promotes strong international regulations and rules to limit aerosol emissions globally.

United Nations Environment Assembly (UNEA)

The UNEA is an assembly that is part of the United Nations. It addresses environmental problems like aerosol emissions. It opens up conferences to lessen global impact on the climate, such as air pollution, highlighting the importance of accords like the Paris Agreement. Also, it considers protecting areas with unique and significant ecosystems, which are the Arctic and Antarctic.

Timeline of Relevant Resolutions, Treaties and Events

Date	Description of event
1979	Convention on Long-Range Transboundary Air Pollution (CLRTAP)
1987	Montreal Protocol on Substances that Deplete the Ozone Layer
1991	Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol)
1997	Kyoto Protocol
2001	Stockholm Convention on Persistent Organic Pollutants
2009	Arctic Council's Arctic Monitoring and Assessment Programme (AMAP) Report on Short-Lived Climate Forcers
	Minamata Convention on Mercury

2013	Paris Agreement
2015	Arctic Council's Framework for Action on Enhanced Black Carbon and Methane Emissions Reductions
2017	

Possible Solutions

First, enhancing the impacts of the international agreements designed for limiting the aerosol emissions would be the crucial solution. This should entail examinations on the states that have signed for the agreements to specifically consider their effects on polar regions. Despite the past agreements, creating more conventions and corporation agreements addressing the restriction of aerosol emissions should also be considered to resolve the agenda.

Second, it is essential to develop the common sense of the usage of eco-friendly energy with advancing clean energy technology. Shifting fossil fuels to renewable energy sources like wind, sun, and water, which reduces the emission of aerosols and other pollutants might be an example. By the progress, warming of the Arctic and Antarctic regions can be slowed and the greenhouse gas release can be lowered. To complete the process, investing on the infrastructures for energy technology and supporting researches and developments should be done.

Third, not only should global cooperation be supported but also knowledge-sharing programs should be encouraged. The Arctic Monitoring and Assessment Program (AMAP)—a collaborative research program that collects data about aerosol distribution and their impacts on polar regions—is one of the examples of the knowledge-sharing programs that can be supported. Increasing funding and collaboration between scientific institutions should be considered, which will hopefully lead to better-informed policies and focused responses when opening latter conferences for the agenda.

Bibliography

1. Arctic Council. "About the Arctic Council." Arctic Council, n.d., https://arctic-council.org.
2. Antarctic and Southern Ocean Coalition. "About ASOC." ASOC, n.d., https://www.asoc.org.
3. United Nations Environment Programme. "Air Quality." UNEP, n.d., https://www.unep.org/explore-topics/air.
4. United Nations Economic Commission for Europe. "Convention on Long-Range Transboundary Air Pollution." UNECE, n.d., https://unece.org/convention-and-its-achievements.
5. United Nations Environment Programme. "Montreal Protocol." UNEP, n.d., https://www.unep.org/ozonaction/who-we-are/about-montreal-protocol.
6. Secretariat of the Antarctic Treaty. "Protocol on Environmental Protection to the Antarctic Treaty." Antarctic Treaty, n.d., https://www.ats.aq/e/protocol.html.

7. United Nations Framework Convention on Climate Change. "Kyoto Protocol." UNFCCC, n.d., https://unfccc.int/kyoto_protocol.
8. Stockholm Convention. "All about the Stockholm Convention." Stockholm Convention, n.d., http://chm.pops.int/TheConvention/Overview/tabid/3351/Default.aspx.
9. Arctic Monitoring and Assessment Programme. "AMAP Assessment 2009: Short-Lived Climate Forcers." AMAP, 2009, https://www.amap.no/documents/doc/amap-assessment-2009-short-lived-climate-forcers/746.
10. United Nations Environment Programme. "Minamata Convention on Mercury." UNEP, n.d., https://www.mercuryconvention.org/.
11. United Nations Framework Convention on Climate Change. "The Paris Agreement." UNFCCC, n.d., https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.
12. Arctic Council. "Arctic Council Framework for Action on Enhanced Black Carbon and Methane Emissions Reductions." Arctic Council, 2017, https://oaarchive.arctic-council.org/handle/11374/1930.
13. United Nations Climate Change. "COP26." UN Climate Change, n.d., https://ukcop26.org.