

A Tiny Step for Managing Giant Global Warming

Monitoring the Polar Cryosphere with Micro-Satellites

Final goal

Securing Independent **Space Observation** for Real-Time Polar Sea Ice Monitoring and **Developing Satellite Information Utilization** for Net-Zero Contribution in Response to Korean Peninsula's Warming

Predicting the future environment and providing key information
Expected effects of remote sensing using micro-satellites

- Enhancement of Cryosphere Information
- Expansion of Climate Change Mitigation Technologies
- Strengthening Arctic scientific activities
- Smart Arctic sea navigation technology
- Stimulation of the Micro-Satellite industry

Remote sensing with micro-satellites

R&D background of the Polar Cryosphere Surveillance

- Drastic Sea Ice Decline due to Global Warming**
Melted Area over the last 40 years: **40%**
- Temperature Rise around Korea over the Last 100 years**
Temperature Rise around Korea over the Last 100 years: **1.6°C**
- High dependence on foreign satellite for Polar Observation**
No satellites for Arctic Sea Ice Research

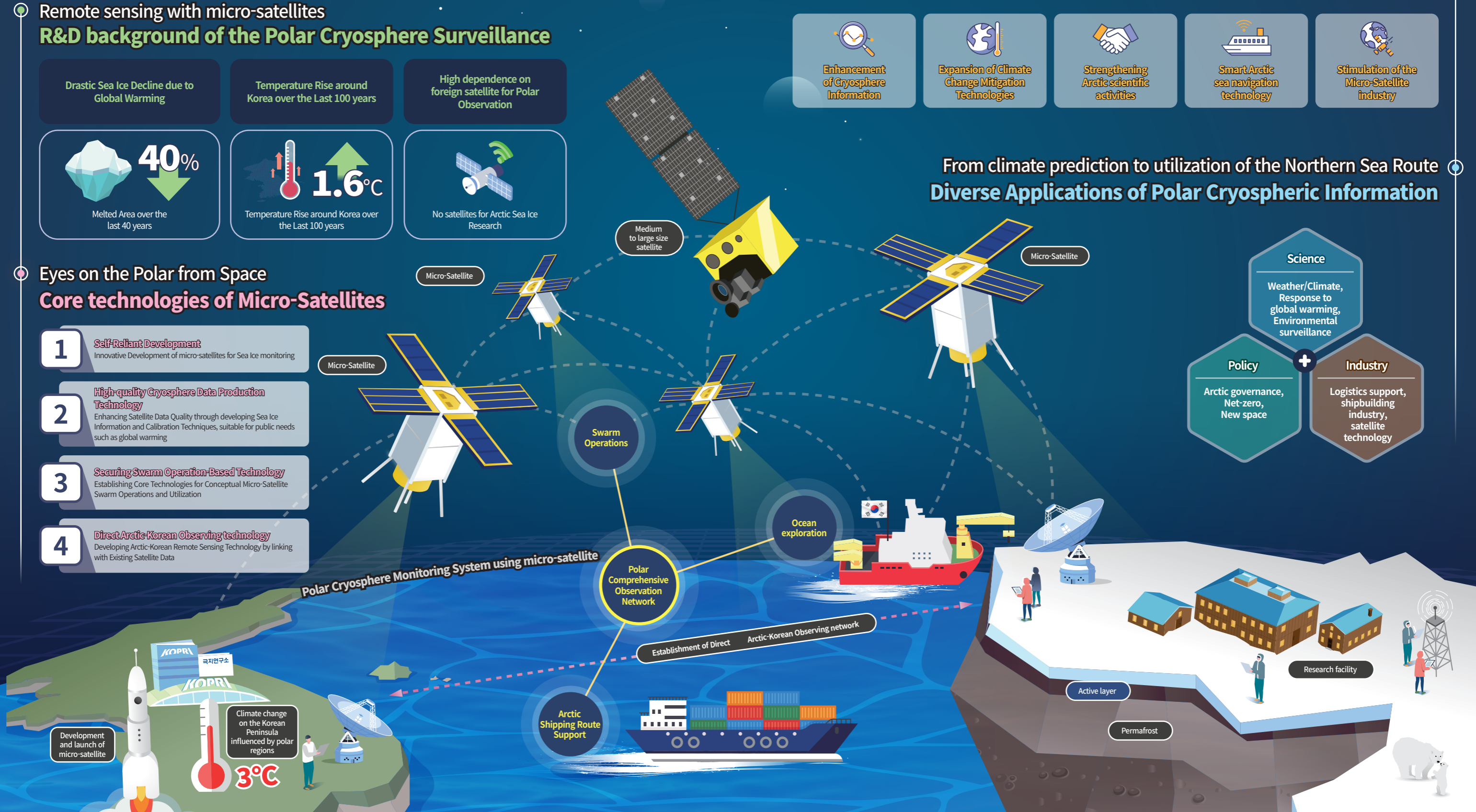
Eyes on the Polar from Space

Core technologies of Micro-Satellites

- Self-Reliant Development**
Innovative Development of micro-satellites for Sea Ice monitoring
- High-quality Cryosphere Data Production Technology**
Enhancing Satellite Data Quality through developing Sea Ice Information and Calibration Techniques, suitable for public needs such as global warming
- Securing Swarm Operation-Based Technology**
Establishing Core Technologies for Conceptual Micro-Satellite Swarm Operations and Utilization
- Direct Arctic-Korean Observing technology**
Developing Arctic Remote Sensing Technology by linking with Existing Satellite Data

From climate prediction to utilization of the Northern Sea Route Diverse Applications of Polar Cryospheric Information

- Science**
Weather/Climate, Response to global warming, Environmental surveillance
- Policy**
Arctic governance, Net-zero, New space
- Industry**
Logistics support, shipbuilding industry, satellite technology



Development and launch of micro-satellite

Climate change on the Korean Peninsula influenced by polar regions
3°C

Arctic Shipping Route Support

Establishment of Direct Arctic-Korean Observing network

Polar Comprehensive Observation Network

Swarm Operations

Ocean exploration

Active layer

Permafrost

Research facility

Micro-Satellite

Medium to large size satellite

Micro-Satellite

Micro-Satellite

1

2

3

4

KOPRI
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New Arctic route connecting Asia and Europe

Enhancing domestic support towards the Northern Sea Route

Global interest in the Northern Sea Route

☑ Focusing on efficiency and necessity

International situation

- Increasing importance & value of the Northern Sea Route**
 - The shortest maritime transport corridor connecting Asia and Europe
 - Securing commercially available Arctic resources
- Growing need for new shipping routes**
 - 'Ever Given stranding accident in Suez Canal' causes significant economic loss (2021)
- Increase in annual cargo volume on the Northern Sea Route**

Year	Cargo Volume (million tons)
2012	3.87
2022	34.03

 - The number of international ships using the Northern Sea Route continues to increase (Decreased after the Russia-Ukraine war in 2022)

Domestic situation

- Growing need for new import and export routes**
 - Korea's high dependence on maritime transportation (99.8% of total import and export volume)
- To minimize damage from international disputes, alternative routes other than the South China Sea and Taiwan Strait are needed**



Advantages of the Northern Sea Route:

☑ Rapidly emerging as an international transport corridor

The world's movement heading to the Northern Sea Route

- Denmark**
Succeeded in pilot operation of the Northern Sea Route with a container ship owned by Maersk, the world's second-largest shipping company
- China**
'NewNew Shipping Line', a container shipping company, succeeded in the first round-trip operation as a container ship level in the Northern Sea Route
China's state-owned shipping company, COSCO, is securing 20 of the world's largest icebreaking multipurpose vessels

The biggest advantage of using the Northern Sea Route: Reduced navigation distance and time



The limitations of the Arctic Sea Route and the solution

Limitations	Solutions
Lack of an Arctic Emergency Response System and SAR (Search and Rescue) Experts	Introducing a smart ship system and applying unmanned ship technology
Except during the thawing season (July-October), assistance from icebreakers is required	Due to global warming, year-round transportation in the Arctic Sea Route will be possible in the 2030s

☑ Five major key issues for activating the Northern Sea Route

- Accelerating the development of the Northern Sea Route**
 - Russia's GDP will increase by 20% (USD 370 billion) by 2035 due to the activation of the Northern Sea Route, expected to raise approximately USD 122 billion in additional tax revenue over 10 years
 - Approval of the 「Decree of the Government of the Russian Federation No. 397」
 - Declaration of the 「2035 Northern Sea Route Development Plan No. 2115-p」
- Securing cargo ships exclusively for the Arctic Sea Route**
 - 29 ice-class cargo ships in operation (41 additional ships under construction)
- Construction of Icebreaker for Northern Sea Route**
 - Total of 10 Russian icebreakers operating in the Arctic Ocean
 - A total of 17 ships are scheduled to be operated by 2030, including icebreakers under construction
- Development of Arctic sea port and transshipment terminal infrastructure**
 - Of the 70 ports along the Russian Arctic coast, 14 ports will carry out key missions
 - A transshipment terminal for LNG, oil, coal, etc. is under construction at the Port of Murmansk (Annual cargo volume expected to be 70 million tons in 2025)
- Expanding exports through the Arctic Sea Route and Inland waterways**
 - Local coal in Inland Siberia (Krasnoyarsk) → Inland waterways → Dudinka Port in the Arctic Ocean → Northern sea route → Export Coal to Asian Countries

Arctic resource transportation corridor

Emerging as a pivot of global logistics

Next 100 years with a new transportation corridor

☑ Korea's Strategy to Activate the Northern Sea Route

- Operation of Arctic Shipping Information Center**
Entity for integrated Arctic shipping information management
Serving as a smooth communication channel between Korea and Russia on the Northern Sea Route
- Analysis of satellite information**
Analyzing and compiling information related to Arctic Sea Ice
Establishing a safety system for the Northern Sea Route by operating Arctic Sea Ice observation satellites
- Incorporation of the KoARC**
Securing independence as an Arctic research cooperation platform
Ongoing research and exchange to expand the scope of Domestic & International activities in Arctic-related areas
- Strengthening Arctic Council activities**
Establishing a system to disseminate information from the international community in real time
Supporting the Participation in the Arctic Council activities of domestic experts
- Construction of next-generation icebreaking research vessel**
Launching the icebreaking research vessel, around 2027, focusing on the Arctic research expeditions
Increasing the impact of Arctic activities and responding to the climate crisis

10th Anniversary of Korea's Observership to the Arctic Council

Achievements and prospects of Korea's Arctic activities

Arctic Council

Definition

The Arctic Council is the leading intergovernmental forum promoting cooperation, coordination and interaction among the Arctic States, Arctic Indigenous Peoples and other Arctic inhabitants on common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic

Members

8 countries : Norway, Denmark(Greenland), Russia, USA, Sweden, Iceland, Canada, and Finland

Arctic Council Observer

Definition

Observer status in the Arctic Council is open to non-Arctic states, along with inter-governmental, inter-parliamentary, global, regional and non-governmental organizations that the Council determines can contribute to its work. Arctic Council Observers primarily contribute through their engagement at the level of Working Groups

Members

13 countries : Korea, Netherlands, Germany, Switzerland, Spain, Singapore, UK, Italy, India, Japan, China, Poland, and France

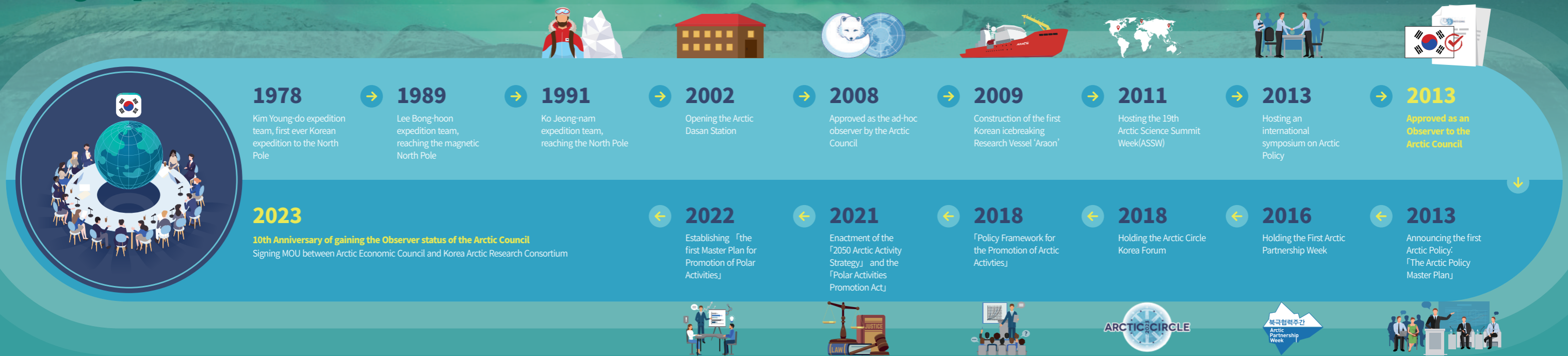
Northeast Asia and the Arctic

Korea, Japan and China act as observers of the Arctic Council

	Korea	Japan	China
Observer Status of the Arctic Council	2013	2013	2013
Related departments & research institutions	<ul style="list-style-type: none"> - Ministry of Foreign Affairs - Ministry of Oceans and Fisheries - Korea Polar Research Institute - Korea Maritime Institute - Korea Research Institute of Ships & Ocean Engineering, etc. 	<ul style="list-style-type: none"> - Ministry of Education, Culture, Sports, Science and Technology (MEXT) - Ministry of Foreign Affairs, Ministry of Land, Infrastructure, Transport and Tourism - Japan Agency for Marine-Earth Science and Technology - National Institute of Polar Research - Hokkaido University - Headquarters for Ocean Policy, etc. 	<ul style="list-style-type: none"> - Ministry of Foreign Affairs - Polar Research Institute of China - Chinese Advisory Committee for Polar Research - State Oceanic Administration - Chinese Academy of Sciences, etc.
Major Arctic activities	<ul style="list-style-type: none"> - Strengthening research activities, including the construction of next-generation icebreaking research vessel - Establishing a legal foundation, such as enacting 「the Polar Activities Promotion Act」 - Establishing the KoNAC and participating in Arctic Council activities - Strengthening KoARC activities, etc. 	<ul style="list-style-type: none"> - Establishing mega research program funds(ARCS II) at the national level - Increasing research infrastructures including the construction of new icebreaking research vessel - Establishing & Implementing Arctic policy in the Prime Minister level 	<ul style="list-style-type: none"> - Leading large amount of R&D investment and research infrastructures, including operating two icebreaking research vessels - Strengthening cooperation with Russia - Increasing national interest in the Arctic

Korea's Arctic activities before and after gaining Observer Status of the Arctic Council

Building competitiveness in Arctic research and activities



The next 10 years, emerging needs of new direction

Prospects & Challenges of Korea's activities as Arctic Council Observer

Goal

In November 2021, the Ministry of Oceans and Fisheries of the Republic of Korea announced a new Arctic vision called the 「2050 Arctic Activity Strategy」 at the Cabinet meeting : a national strategy to make Korea a leading country in Arctic governance by 2050

Promotion Strategies



The Ministry of Oceans and Fisheries

「The First Master Plan for Promotion of Polar Activities」(2022)

