

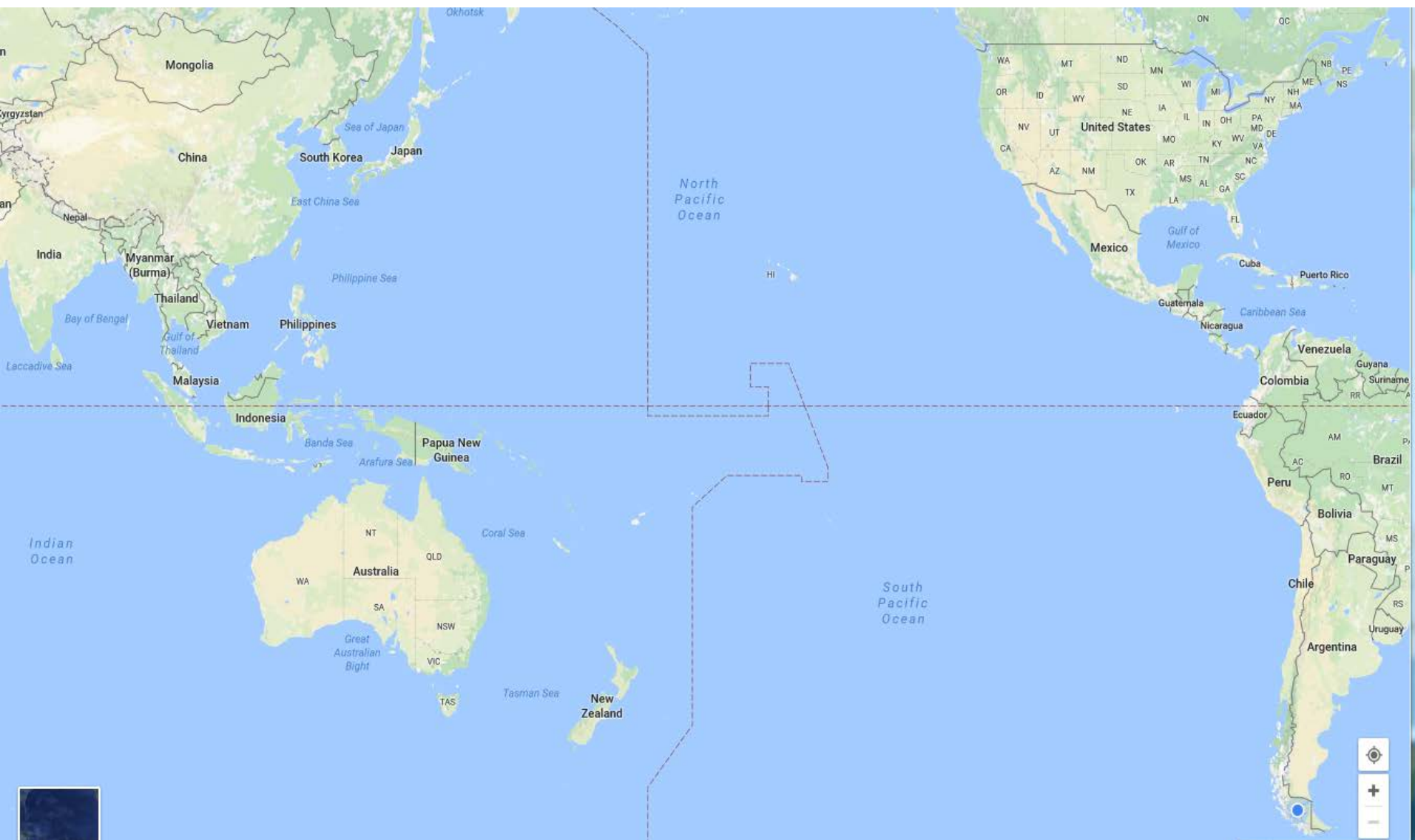




Korea Polar Research Institute (KOPRI)

Korea-Chile Antarctic Cooperation Center

Dongmin JIN

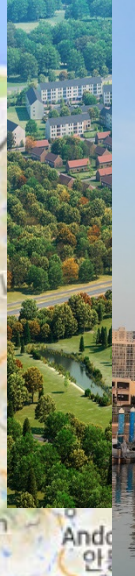
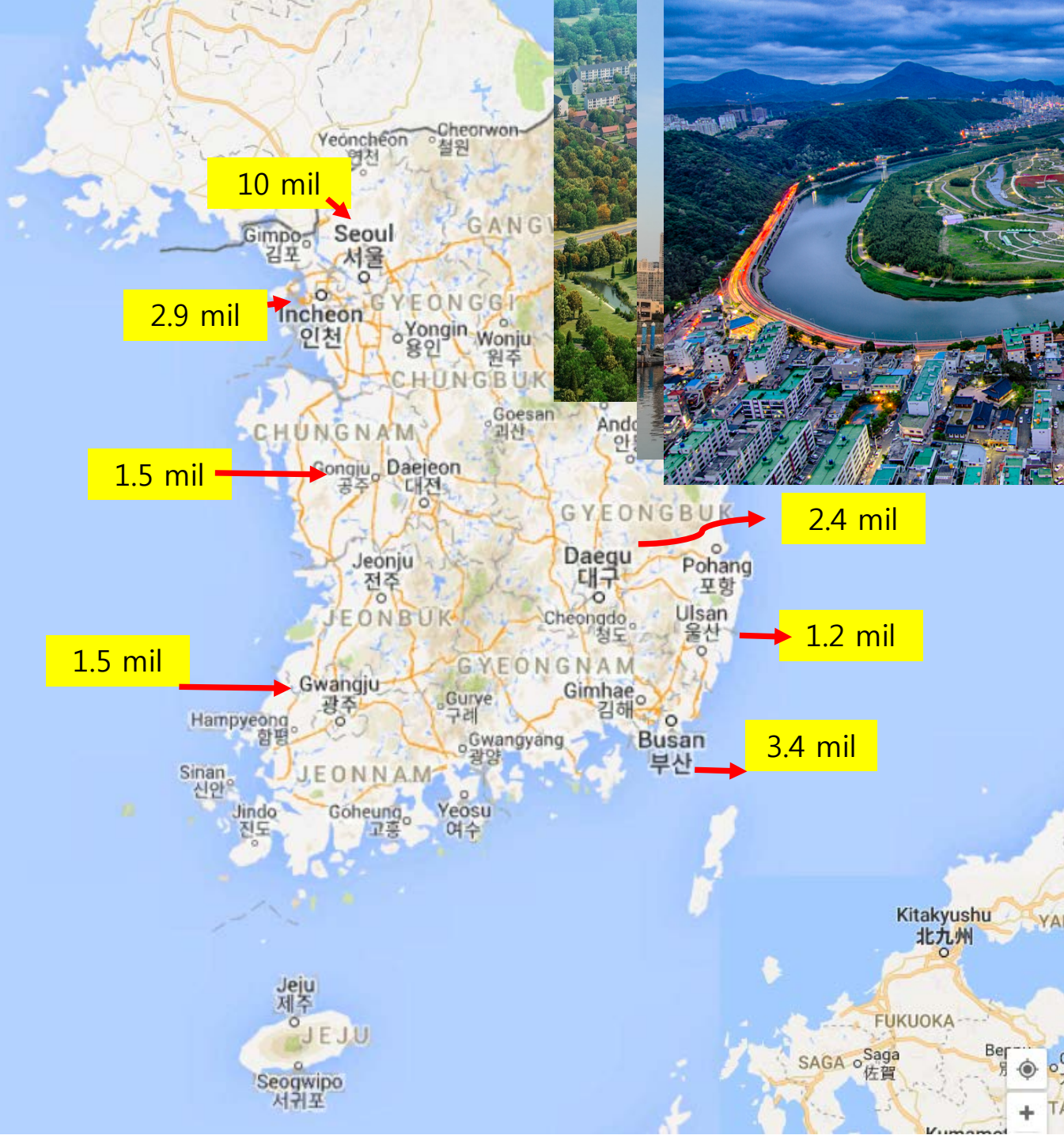


<https://www.google.cl/maps/@35.5902647,123.1184122,5.25z?hl=en>

Some Facts of Korea

- Population: 50 mil (25mil north) 99% ethnically Korean
- Area: 100,210 km² (13% of Chile)
- GDP per capita(2015) 27,221 US\$
- Main Industries: Electronics, Telecommunications, Automobile, Chemicals, Shipbuilding, Steel, etc



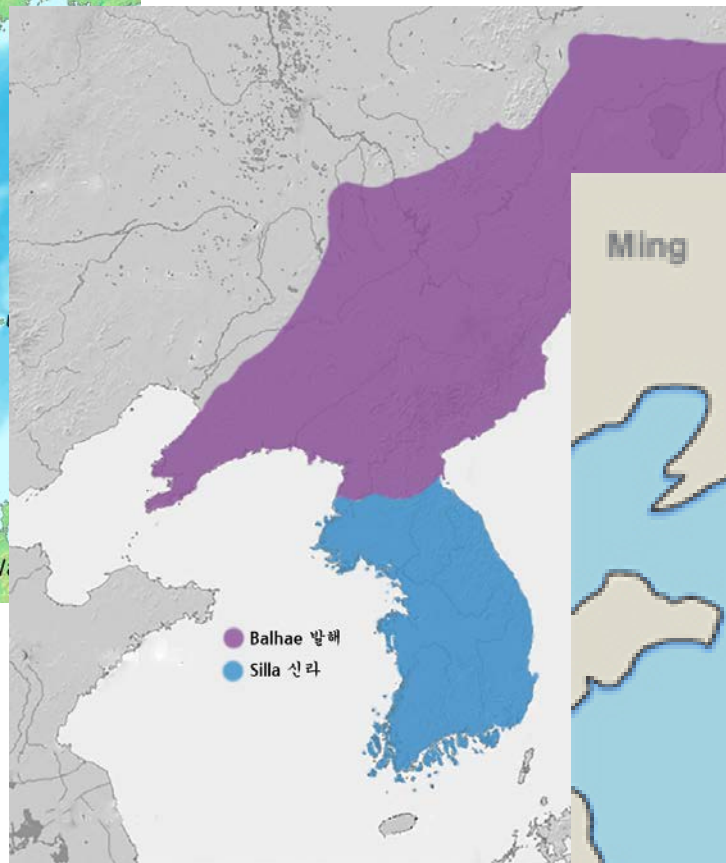


History of Korea

- Prehistory : ~ BC 108
- Proto Three Kingdoms
- Three Kingdoms & **Silla**: BC 57 ~ AD 935
- **Goryeo** : 918 ~ 1392 (474), Gaesung
- **Joseon** : 1392 ~ 1897 (505), Seoul
- Korean Empire : 1897 ~ 1910
- Japanese Rule : 1910 ~ 1945
- Provisional Government : 1919 ~ 1948
- South/North Korea : 1948 ~
- Korean War : 1950 ~ 1953



AD 390



AD 830



AD 1443

Japanese Rule

- Plunder natural resources and rice
- Forced Labor
- Forced Military Service
- Comfort Women

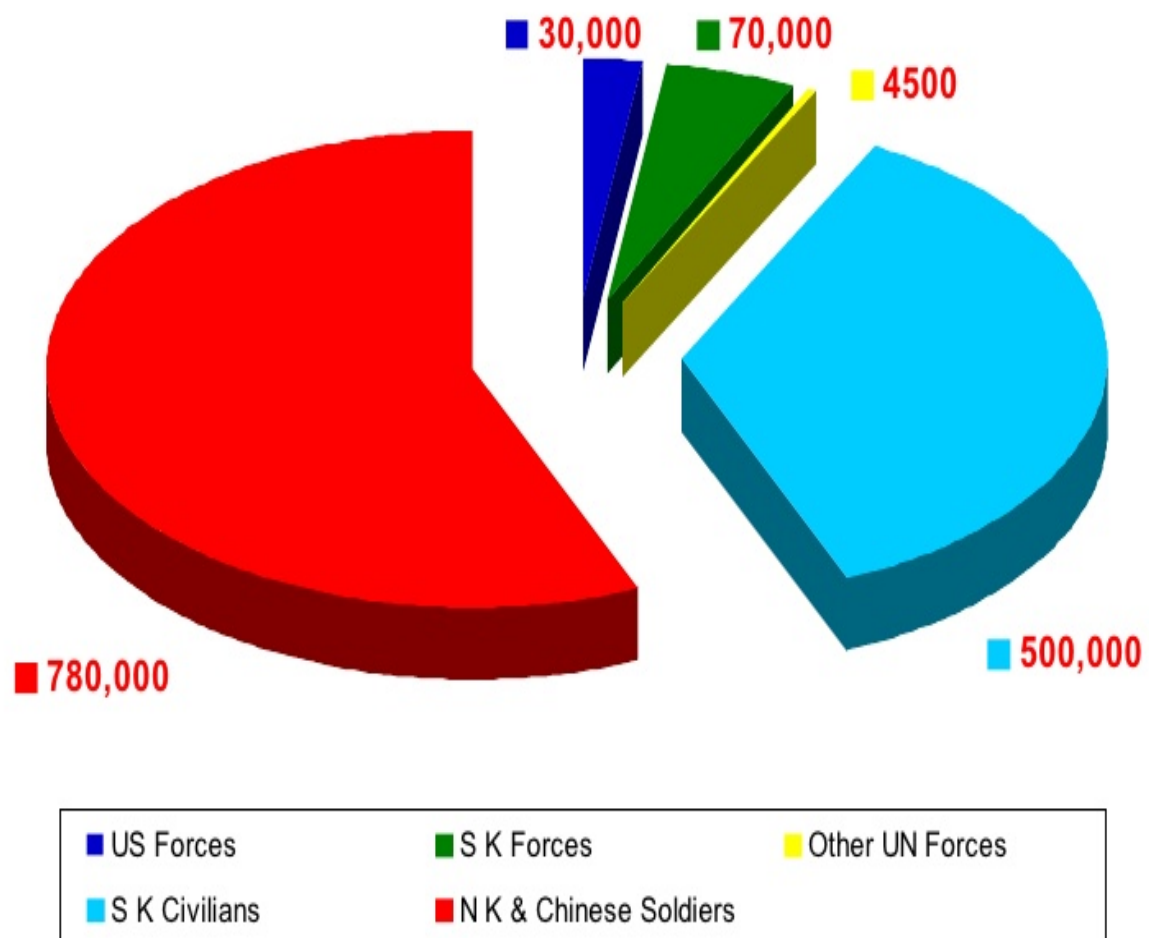


Korean War : 1950 ~ 53



 South Korea ^[a]	 North Korea
 UN Command ^[a]	 China PR
 United States	 Soviet Union
 United Kingdom	Medical support
 Canada	<ul style="list-style-type: none"> Bulgaria^[not verified in i]
 Turkey	<ul style="list-style-type: none"> Czechoslovakia^[4]
 Australia	<ul style="list-style-type: none"> East Germany^[5]
 Philippines	<ul style="list-style-type: none"> Hungary^{[5][6]}
 New Zealand	<ul style="list-style-type: none"> Poland^[not verified in bo]
 Thailand	<ul style="list-style-type: none"> Romania^[7]
 Ethiopia	Other support
 Greece	<ul style="list-style-type: none"> India^{[8][9]}
 France	<ul style="list-style-type: none"> Mongolia^[not verified in body]
 Colombia	
 Belgium	
 South Africa	
 Netherlands	
 Luxembourg	
Medical support	
<ul style="list-style-type: none"> Denmark	
<ul style="list-style-type: none"> Italy	
<ul style="list-style-type: none"> India	
<ul style="list-style-type: none"> Israel^[2]	
<ul style="list-style-type: none"> Norway	
<ul style="list-style-type: none"> Sweden	
Other support	
<ul style="list-style-type: none"> Republic of China	
<ul style="list-style-type: none"> Cuba	
<ul style="list-style-type: none"> El Salvador	
<ul style="list-style-type: none"> Japan	
<ul style="list-style-type: none"> Spain^[3]	

Casualties in the Korean War



Korean Alphabet Chart

Consonants	Vowels									
	ㅏ (a)	ㅑ (ya)	ㅓ (o)	ㅕ (yo)	ㅗ (oh)	ㅛ (yo)	ㅜ (ow)	ㅠ (you)	ㅡ (er)	ㅣ (ee)
ㄱ(G)	가	가	거	겨	고	교	구	규	그	기
ㄴ(N)	나	냐	너	녀	노	뇨	누	뉴	느	니
ㄷ(D)	다	다	더	더	도	도	두	두	드	디
ㄹ(R/L)	라	랴	러	려	로	료	루	류	르	리
ㅁ(M)	마	마	머	며	모	묘	무	뮤	므	미
ㅂ(B)	바	바	버	벼	보	보	부	뷰	브	비
ㅅ(S)	사	샤	서	셔	소	쇼	수	슈	스	시
ㅇ Silent	아	야	어	여	오	요	우	유	으	이
ㅈ(J)	자	자	저	져	조	조	주	쥬	즈	지
ㅊ(CH)	차	차	처	쳐	초	초	추	츄	츠	치
ㅋ(K)	카	카	커	켜	코	코	쿠	큐	크	키
ㅌ(T)	타	타	터	터	토	토	투	투	트	티
ㅍ(P)	파	파	퍼	펴	포	포	푸	퓨	프	피
ㅎ(H)	하	하	허	혀	호	호	후	휴	흐	히

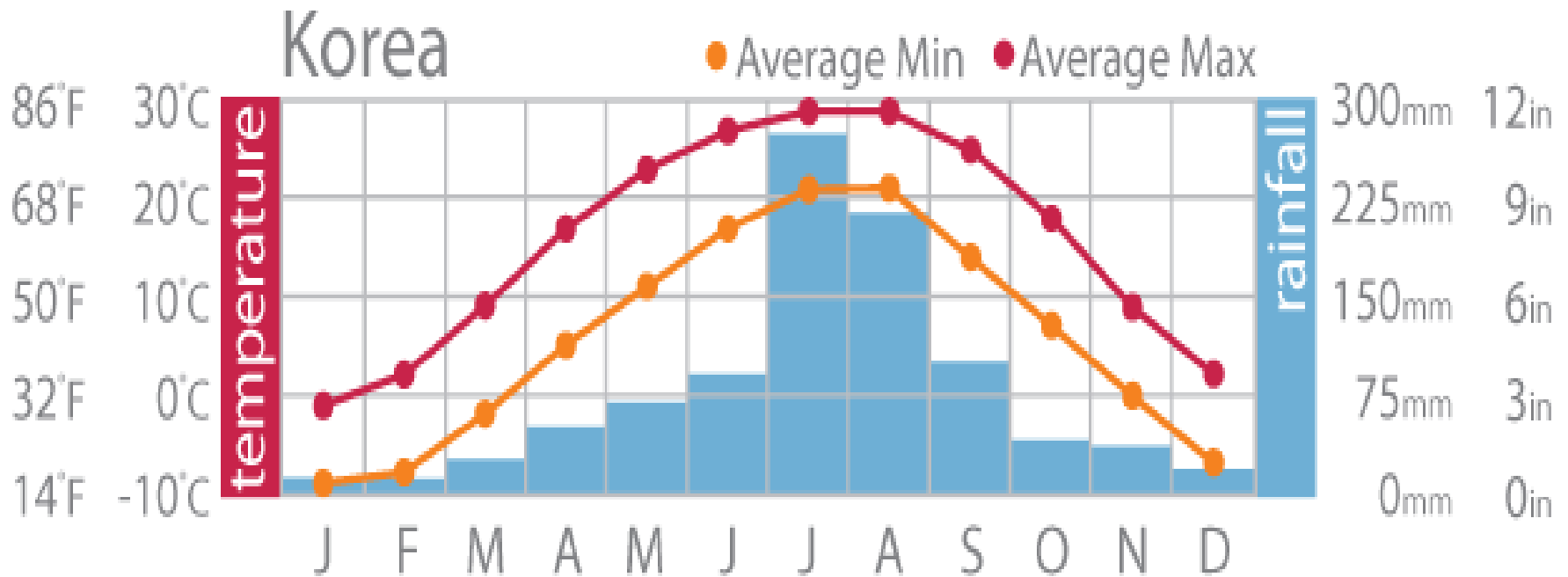
©Modern Seoul Magazine (2012)

- 14 consonants, 10 vowels
- Altaic Language Family (Turkic, Mongolic, Japonic)
- Word order (S+O+V), Often Subject ellipsis,
No distinctive intonation

Hanbok : Traditional Costume



Weather in Korea



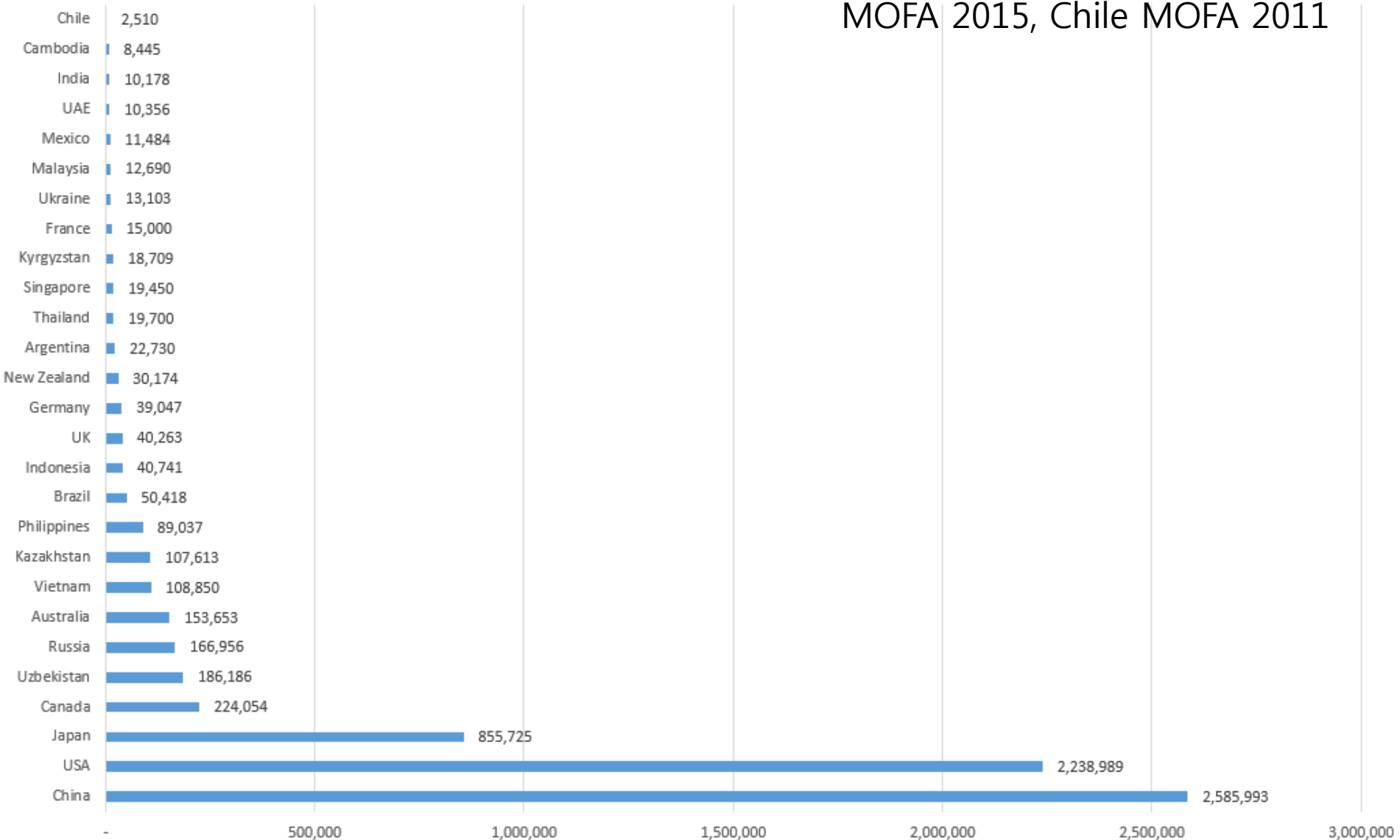
- Coldest Temp in Seoul : -18.8 (January 24, 2016), Seoul
- 29.2 (January 16, 2001), Chulwon
- 43.6 Jungkangjin (north Korea)
- Hottest Temp in Korea: 38.4 (July 24, 1994), Seoul
40.0 (August 1, 1942), Daegu

Four Seasons in Korea



Korean Diaspora

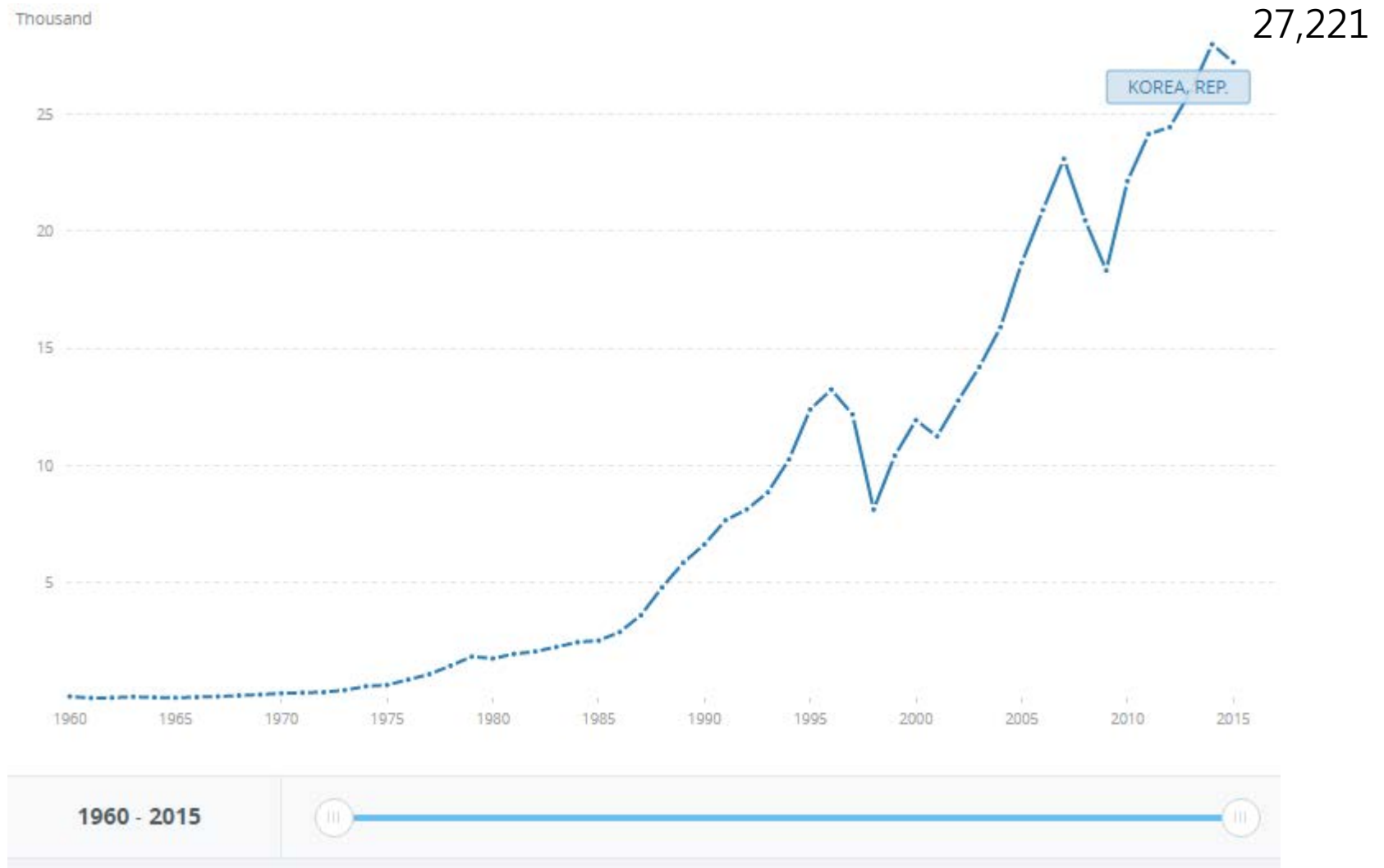
MOFA 2015, Chile MOFA 2011



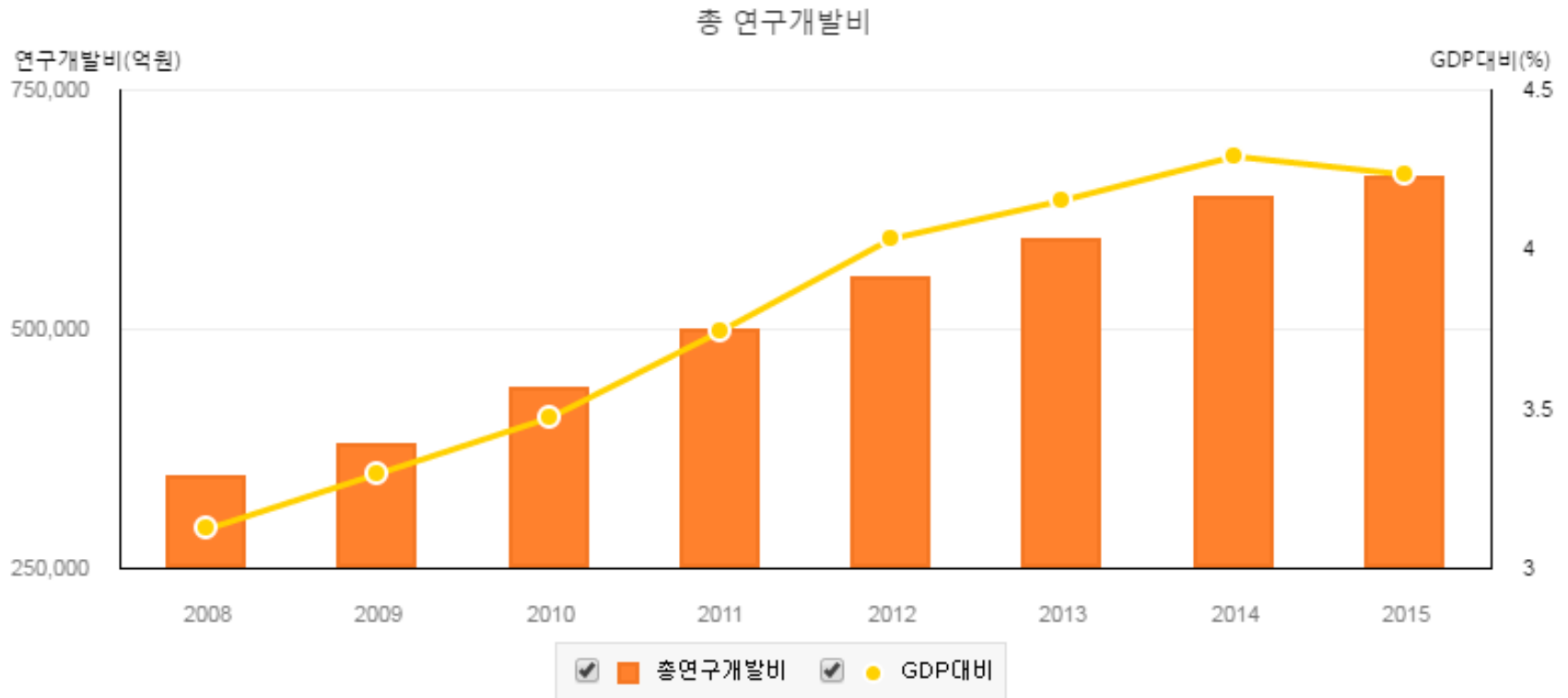
World Heritage Sites in Korea



GDP per capita / world bank

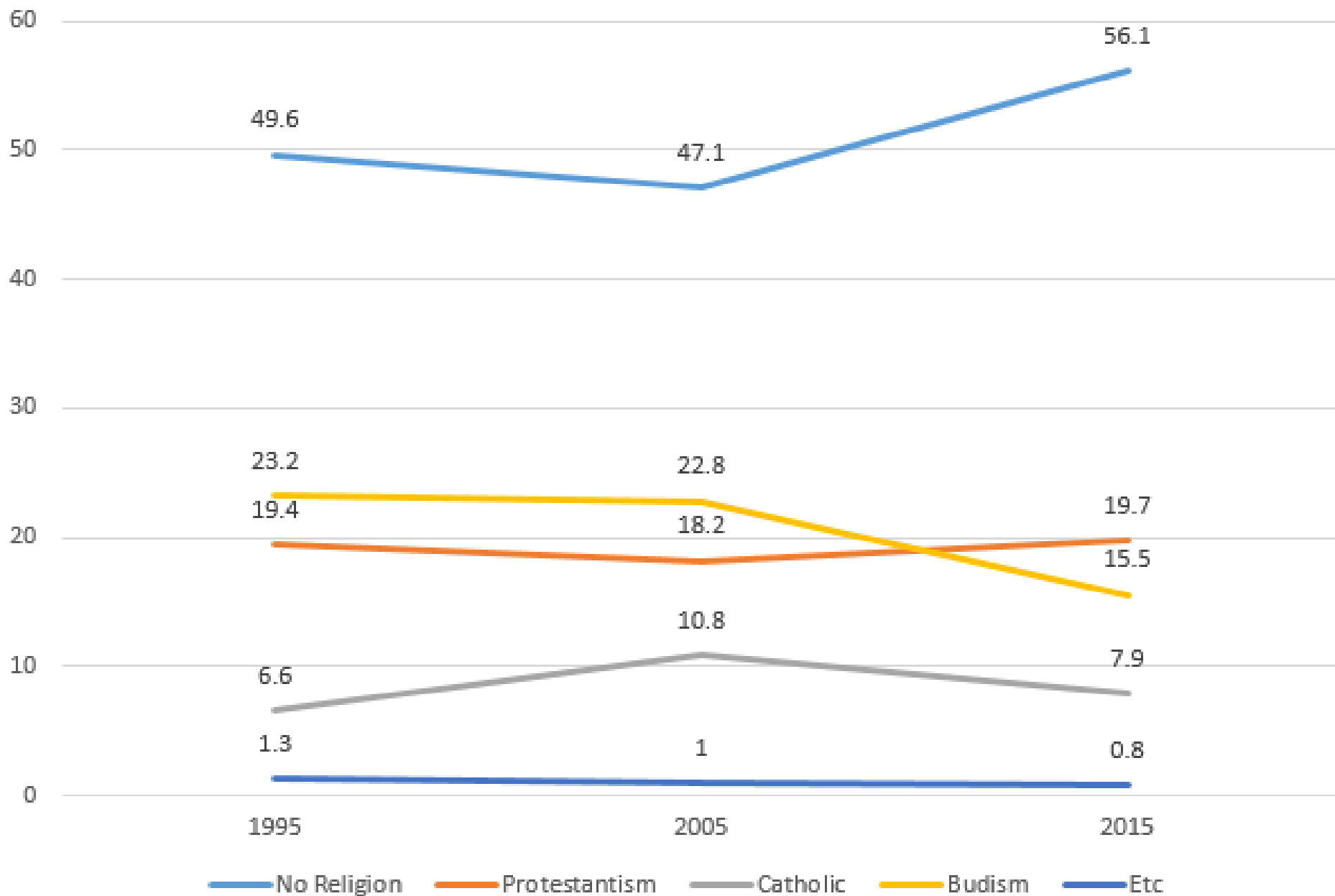


Total R&D



2015 Total R&D : 58 bill US \$, 4.24% of GDP, Top 6th in the world
GDP ratio is top
Government & Public Sector : 25%

Religions in Korea (%)



10 Things Korea does better anywhere else

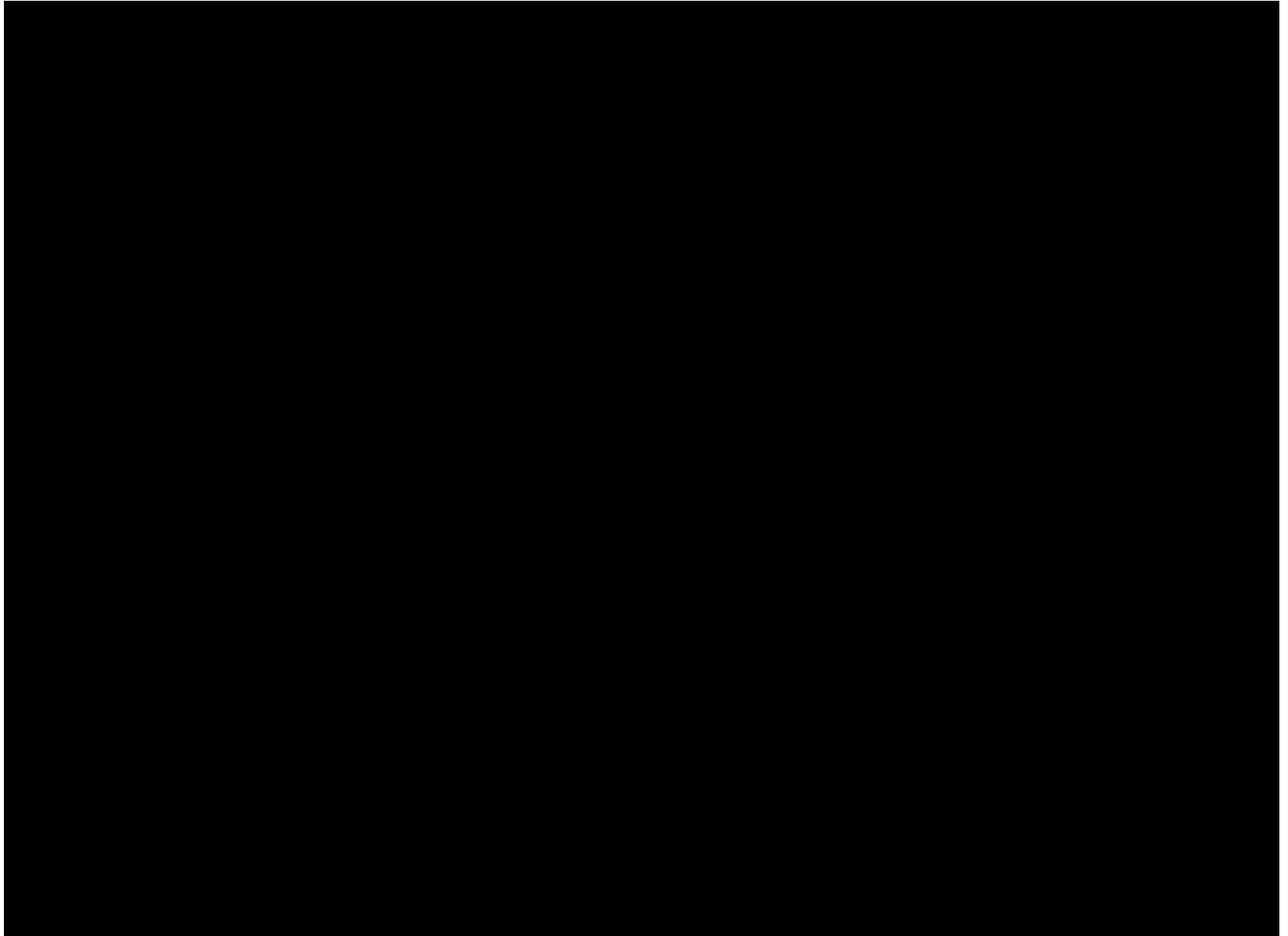
(<http://edition.cnn.com/2013/11/27/travel/10-things-south-korea-does-best/>)



Relations with Chile

- **Traditional Allied State firstly recognized Korea in South America (1949. 5), The treaty of amity at 1962**
- **Frist Partner of Korea FTA**
- **Korea to Chile (2013)**
 - **5th Export Market (China, US, Japan, Brazil)**
 - **6th Import Partner (US, China, Brazil, Argentina, Germany)**
- **Annual Trade 7,100 mil US\$ (2013)(export 2,500, import 4,600)**
 - **Export : Autos(50%), Mobile-phones, Heavy Equipment, Chemicals, Steel, ect**
 - **Import : Cooper(70%), Pulp, Fruits, Pork Meat, Fish, Wine, etc**
- **S&T Cooperation Agreement (1994)**
 - **active in the areas of Space, Biotechnology & Antarctica**
- **Antarctic Gateway since inaguaration of King Sejong Station 1988**

Vinya Del Mar International Song Festival, 1975



BTS in Santiago, 2017



Korean Short History in Polar Activities

- ✓ 1986 Joining the Antarctic Treaty
- ✓ **1988 The Antarctic King Sejong Station**
- ✓ 1989 Entitled as ATCP
- ✓ 1990 Full member of SCAR
- ✓ **2002 Arctic Dasan station Opened in Svalbard and Full member of IASC**
- ✓ **2004 KOPRI as an autonomous institute in KIOST**
- ✓ **2009 Launching of RV *ARAON* and annual bipolar research cruise**
- ✓ 2012 Oct, Joining the Treaty concerning the Archipelago of Spitsbergen
- ✓ 2013 May, Observer of AC
- ✓ **2014 Feb, the Antarctic Jang Bogo research station**
- ✓ 2014 April, KOPRI-NPI Lab at FRAM Center, Tromso, Norway
- ✓ 2014 Nov, Korea-New Zealand Antarctic Cooperation Center
- ✓ **2016 Feb, Korea-Chile Antarctic Cooperation Center**

KOPRI is

Leading agency for the national polar program (both Antarctic and Arctic)

Research institute, logistics provider, Advisor

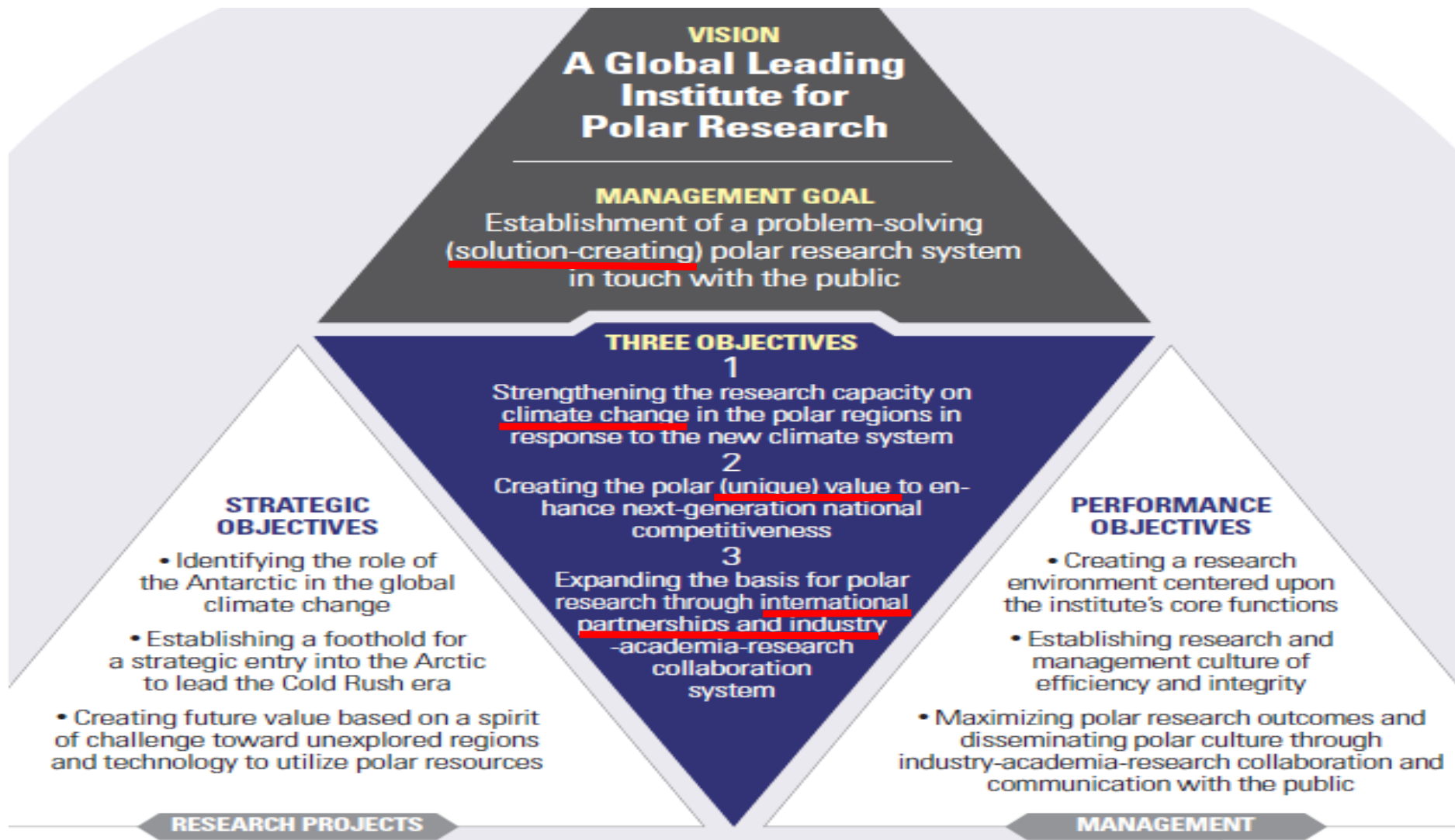
Statutory, government funded research institute under the Ministry of Oceans & Fisheries

- 25 GRIs under the National Research Council of S&T, MSIP

Autonomous institute affiliated with KIOST (Korea Institute of Ocean Science and Technology)

No. of Employees : 302/Annual Budget(2017) : USD 99mil

KOPRI's vision and management goals



Organization

❖ 5 research divisions

- Polar Climate Sciences
- Polar Earth-System Sciences
- Polar Ocean Sciences
- Polar Life Sciences
- Polar Paleo-environment

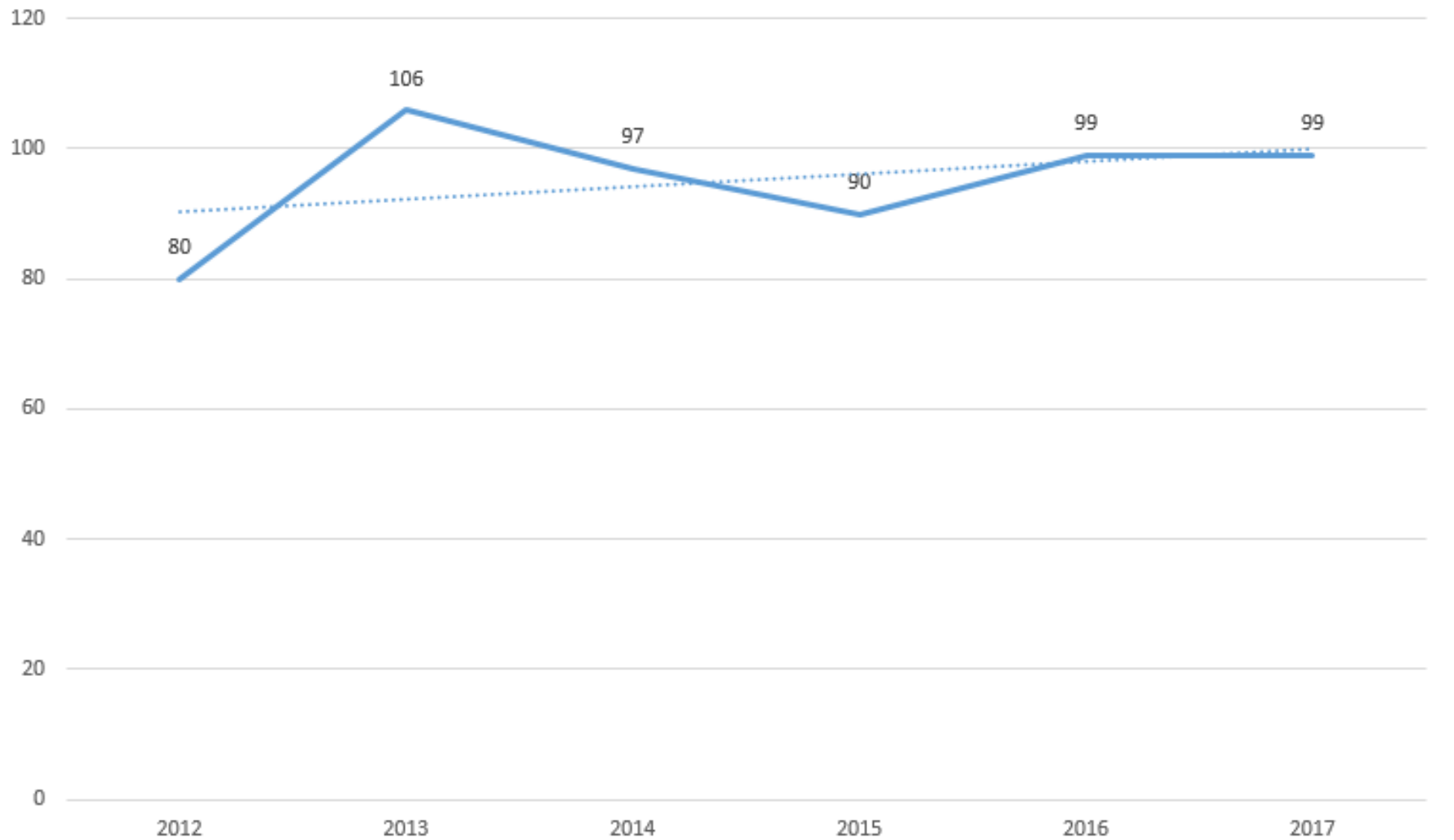
❖ 4 mission-driven research units

- Antarctic K-Route Expedition
- Ice Sheet & Sea Level Changes
- Polar Genomics
- Arctic Sea-Ice Prediction

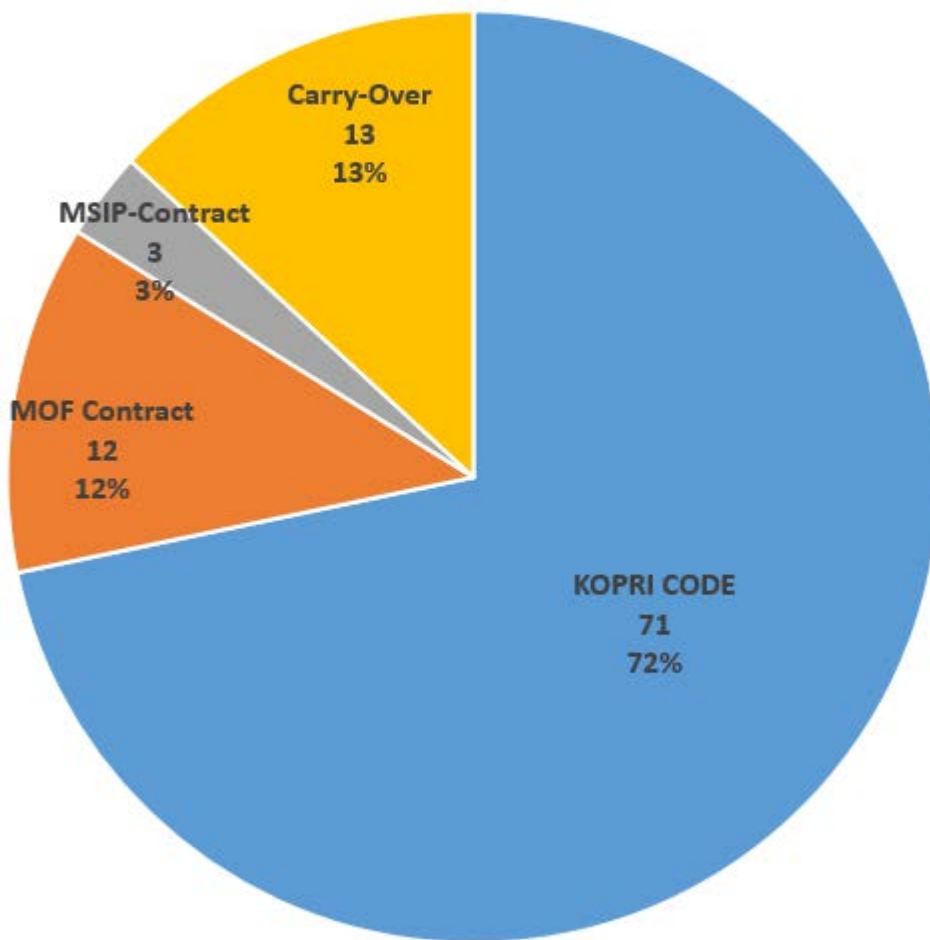
❖ Polar Logistics, Strategy & Cooperation, Management & Planning, Administration

Annual Budget

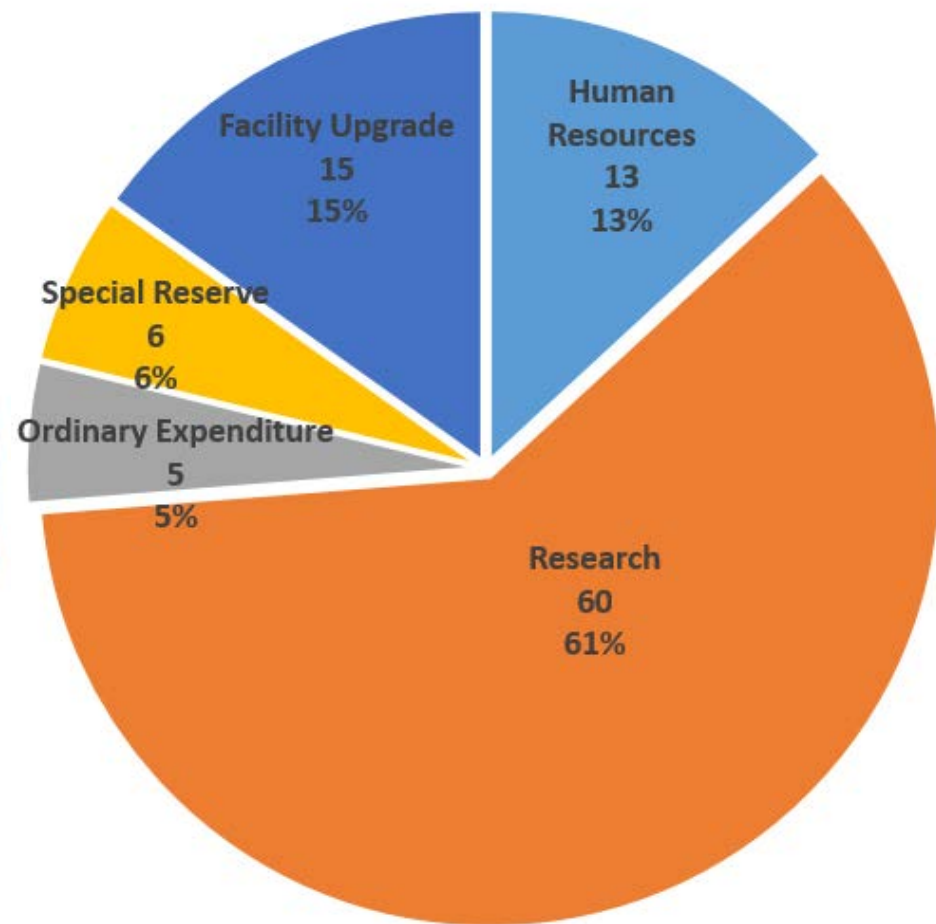
Mil US \$



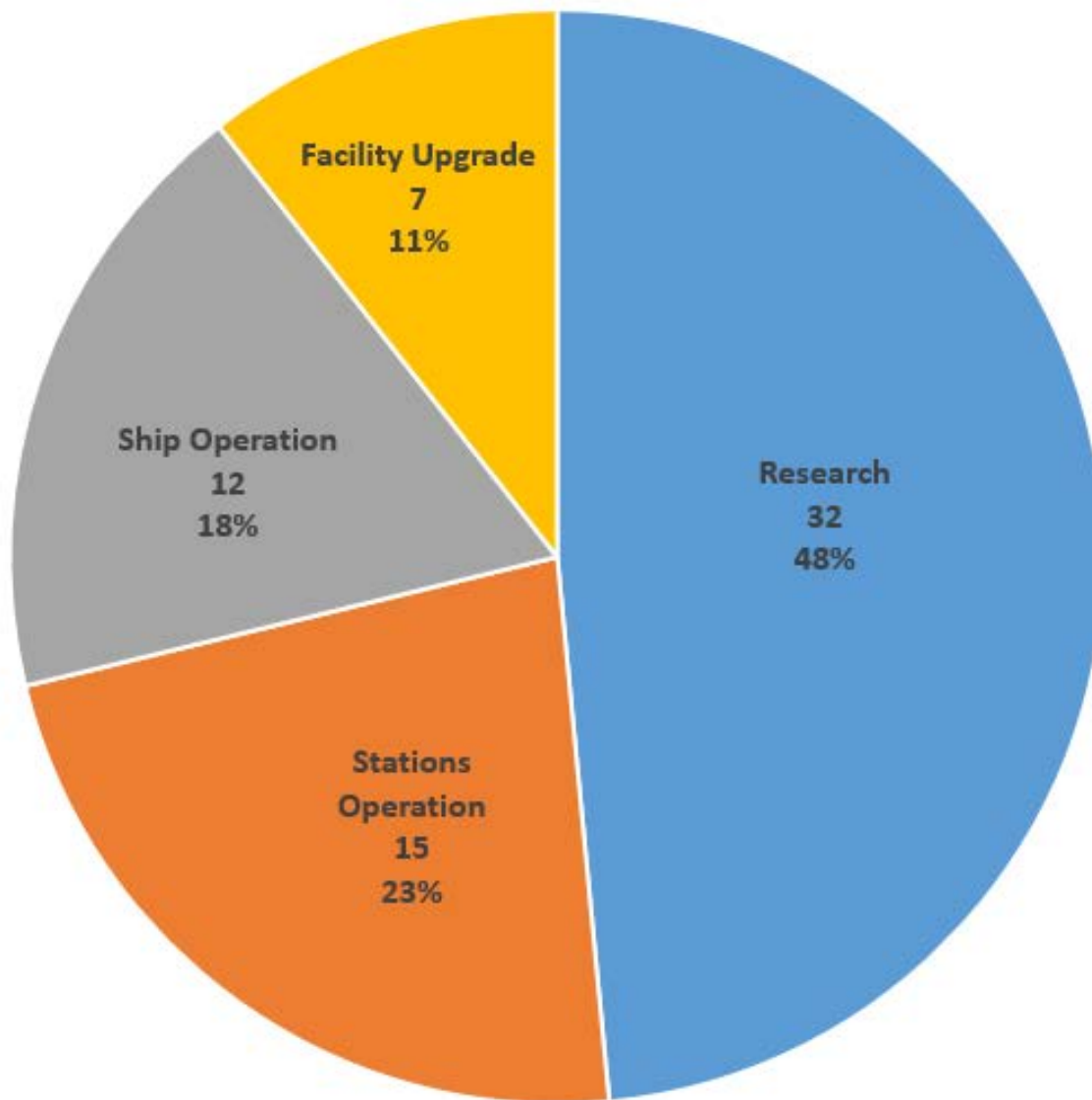
Budget (2017) Income by Source
99 mil \$



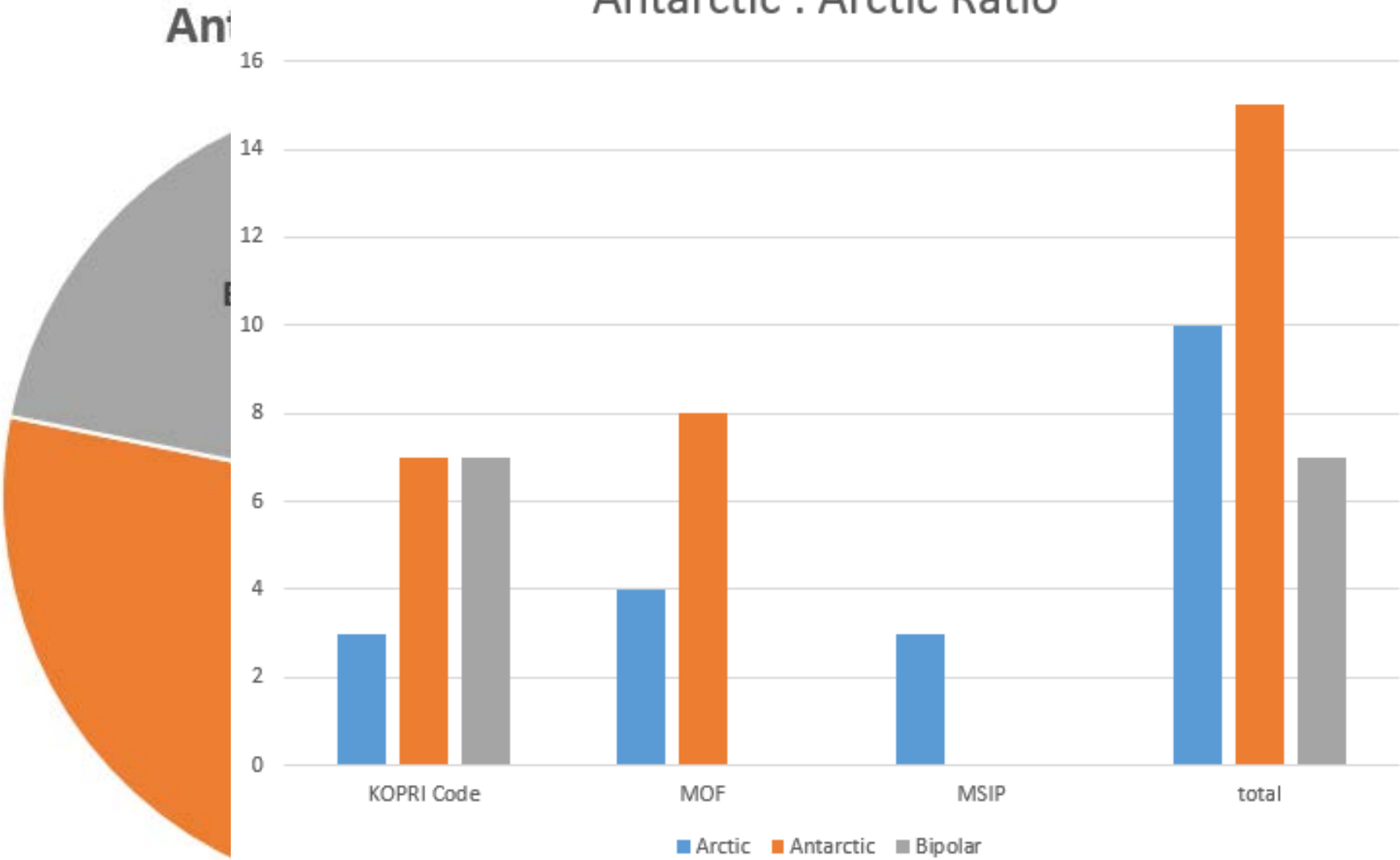
Budget(2017) Expenditure
99 mil \$



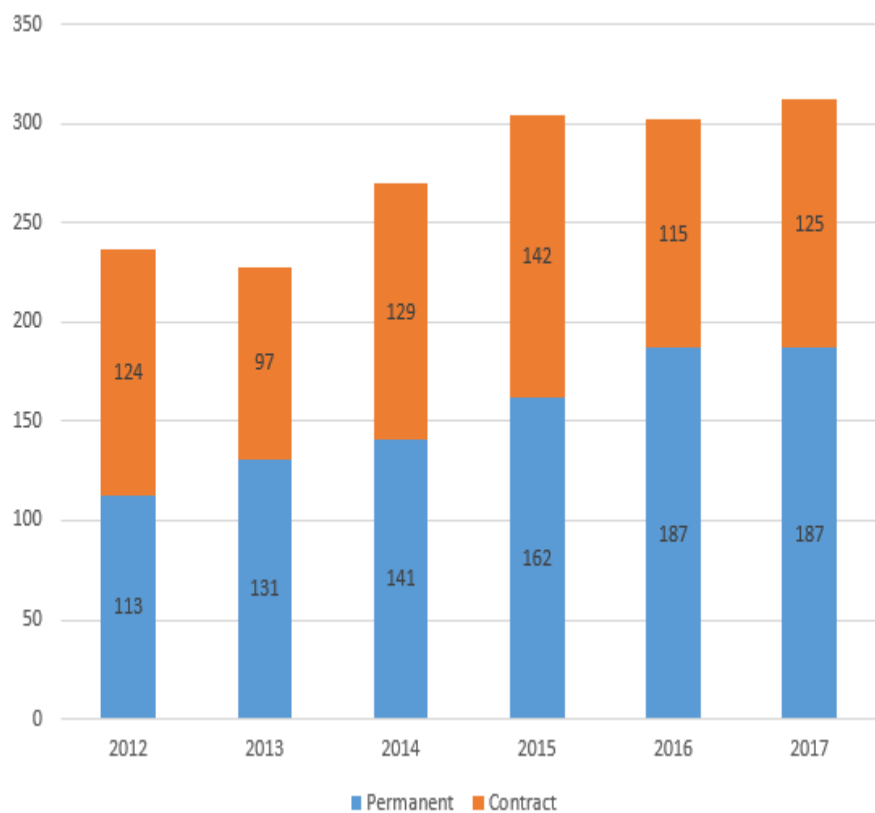
Research : Opeartion Ratio



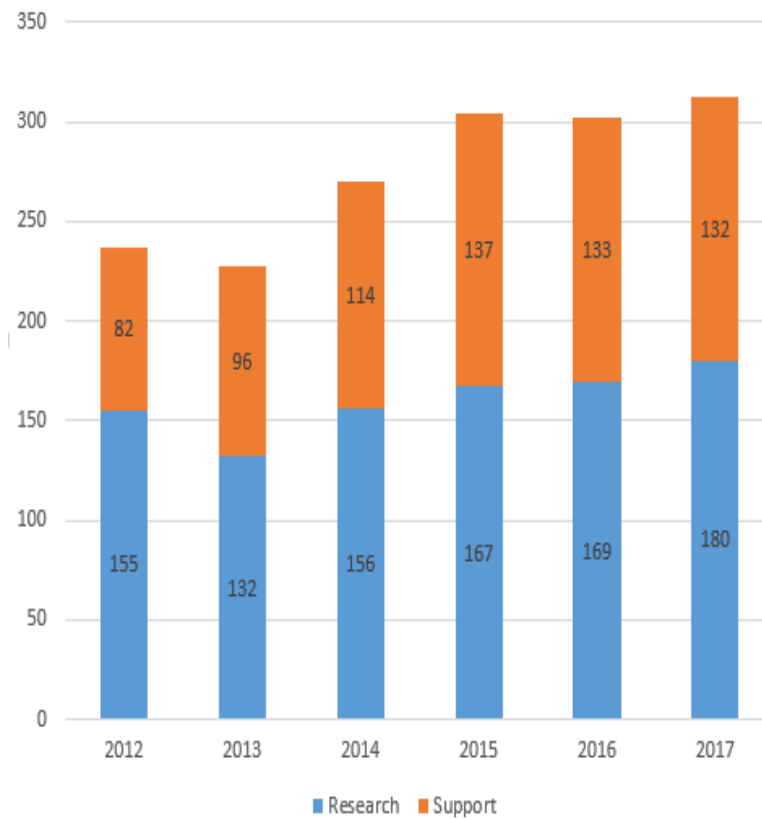
Antarctic : Arctic Ratio



Human Resources



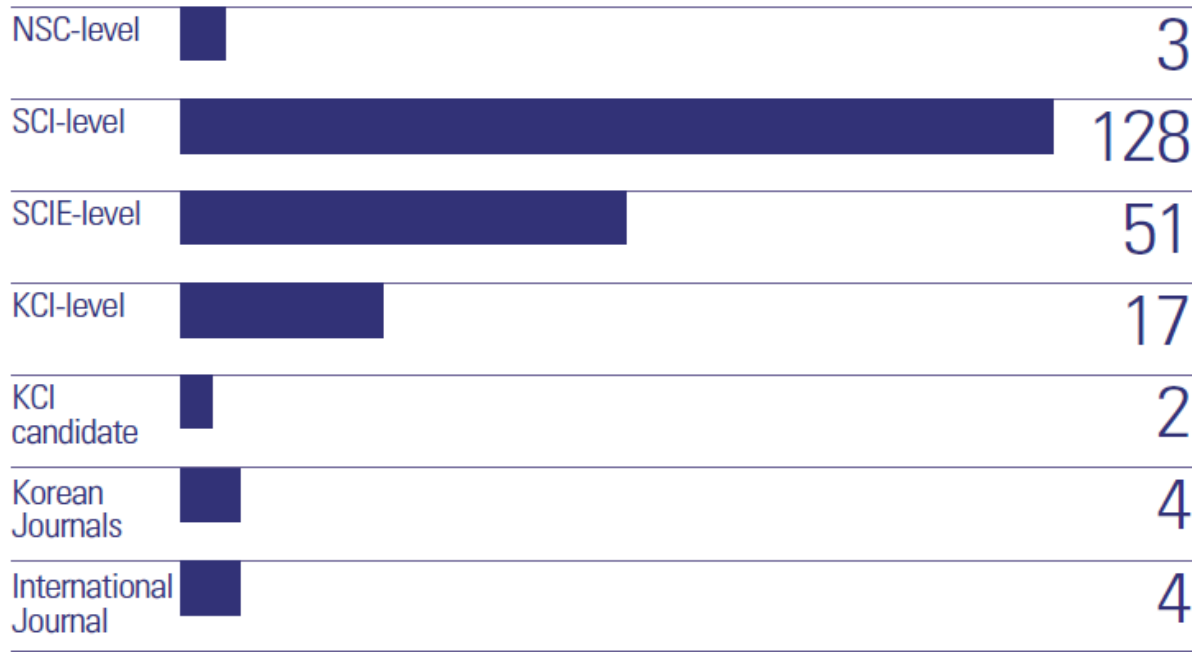
Human Resources (Research : Support)





KOPRI Research Paper Statistics(2011-2015)

Research papers in major academic journals in Korea and abroad



Total **209**



—●— Antarctic —●— Arctic 선형 (Antarctic) 선형 (Arctic)

ARTICLE

Received 20 Oct 2015 | Accepted 6 Jan 2017 | Published 17 Feb 2017

DOI: 10.1038/ncomms14507

OPEN

Mechanisms driving variability in the ocean forcing of Pine Island Glacier

Benjamin G.M. Webber¹, Karen J. Heywood¹, David P. Stevens², Pierre Dutrieux^{3,4,5}, E. Povl Abrahamsen⁵, Adrian Jenkins⁵, Stanley S. Jacobs³, Ho Kyung Ha⁶, Sang Hoon Lee⁷ & Tae Wan Kim⁷

Pine Island Glacier (PIG) terminates in a rapidly melting ice shelf, and ocean circulation and temperature are implicated in the retreat and growing contribution to sea level rise of PIG and

Korean Research Infrastructure

Arctic DASAN Station



Antarctic Sejong Station



IBRV ARAON



과학연구선 아라온



Antarctic Jang Bogo Station



KOPRI at Incheon



- Tonnage : 7,487 GRT
- Manning : 85 persons (25+60)
- Cruise Speed : 12 knot
- Endurance : 20,000 nm (70 days)

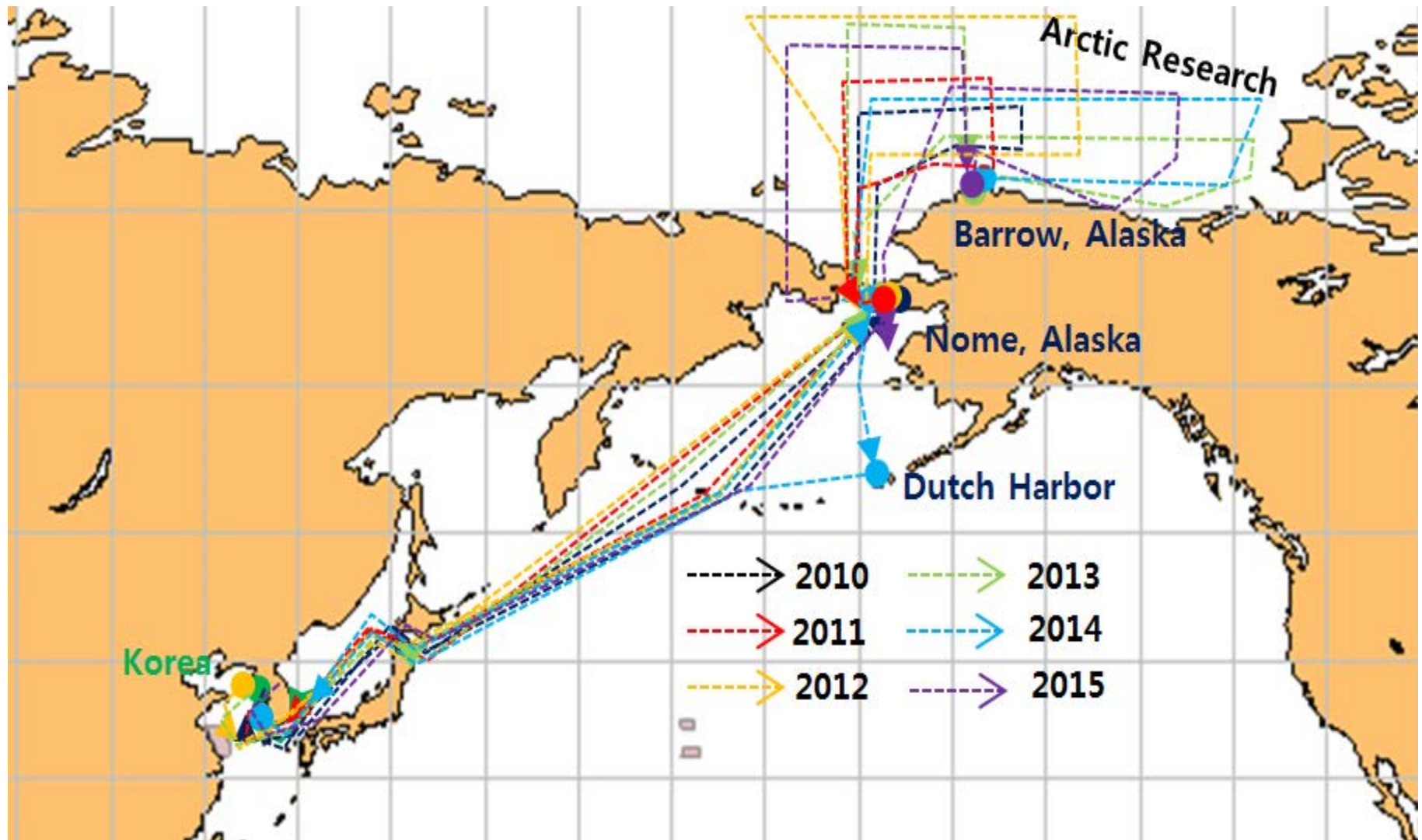
- Classification : KR PL-10
(1 m thick ice breaking at 3 knot, Dnv Polar 10)
- Propulsion : Azimuth Thruster
- Diesel electric plant : 10 MW (5 MW x 2)
- DP-2 System

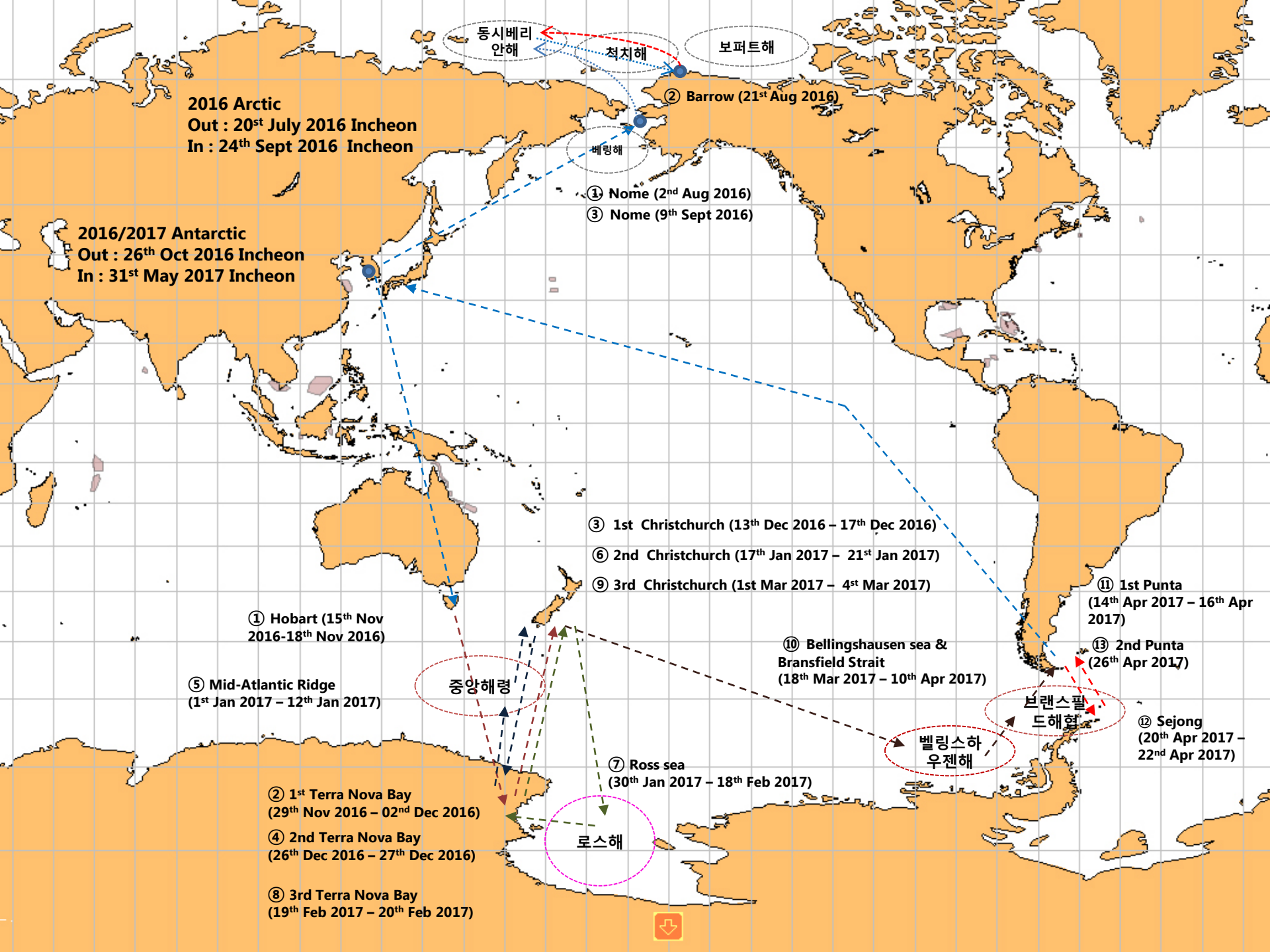


• Mission

- To conduct multidisciplinary research in worldwide oceans, including bi-polar waters
- To support logistics for the Antarctic stations

Arctic Research Cruise of Araon (2010~2015)





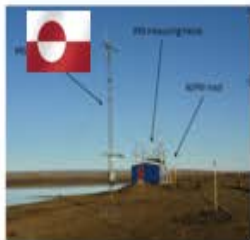
❖ Korean Circum-Arctic Observation Nodes



Council, Alaska, USA
('11.8)

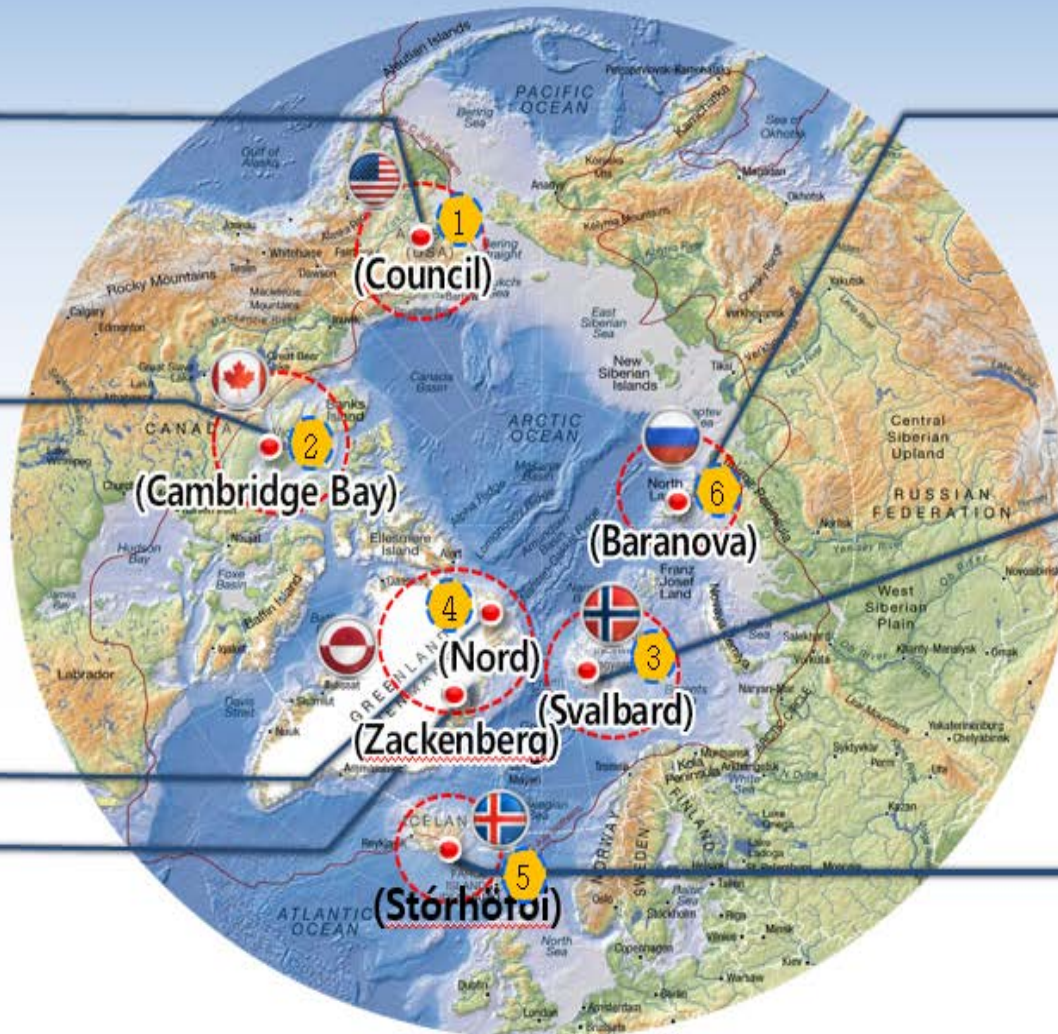


Cambridge Bay, Canada
('12.7)



Zackenberg & Nord,
Greenland

('15.10)



Baranova, Russia
('16.12)



Svalbard, Norway
('12.9)



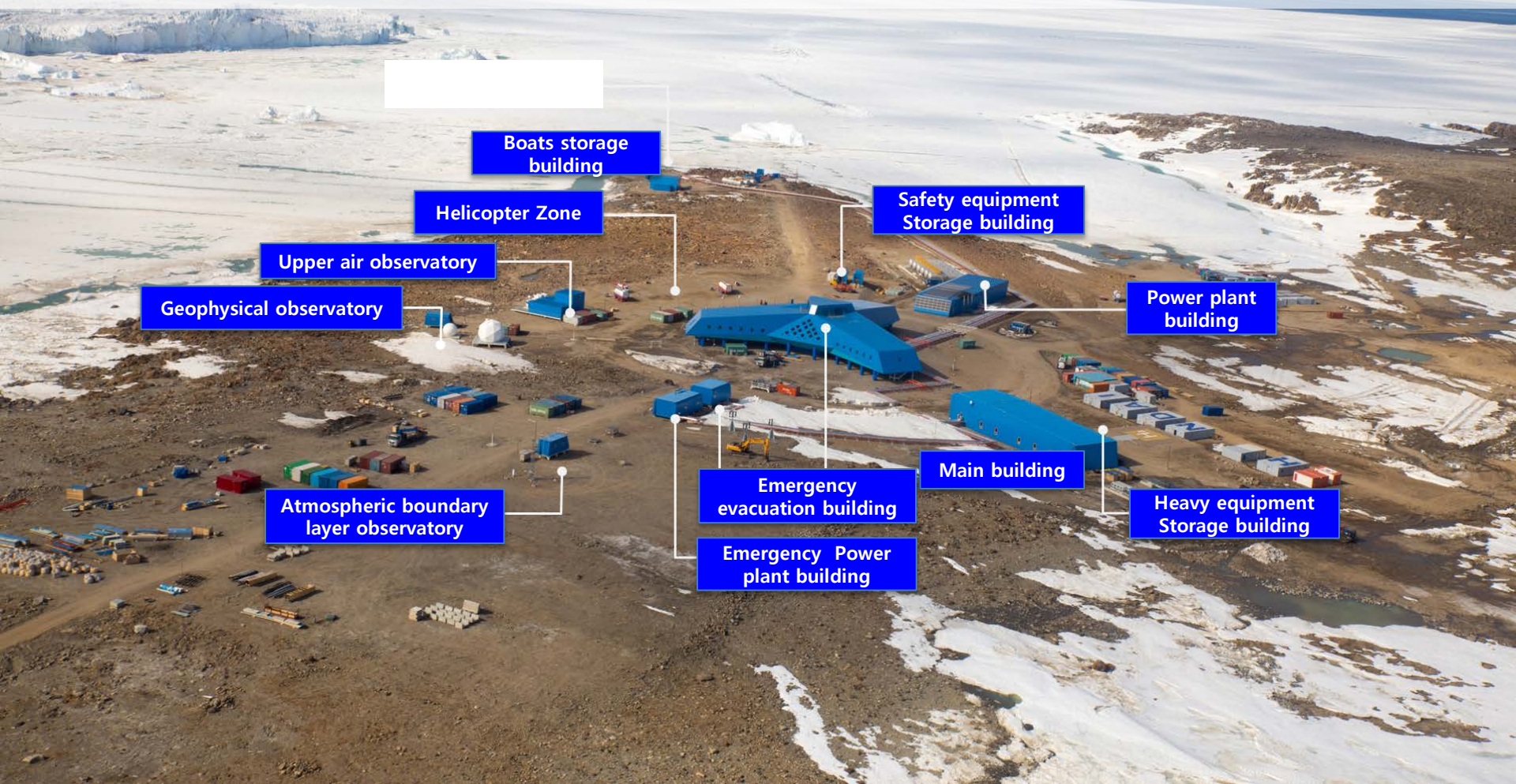
Storhotai, Iceland
('16.10)

KOPRI 극지연구소

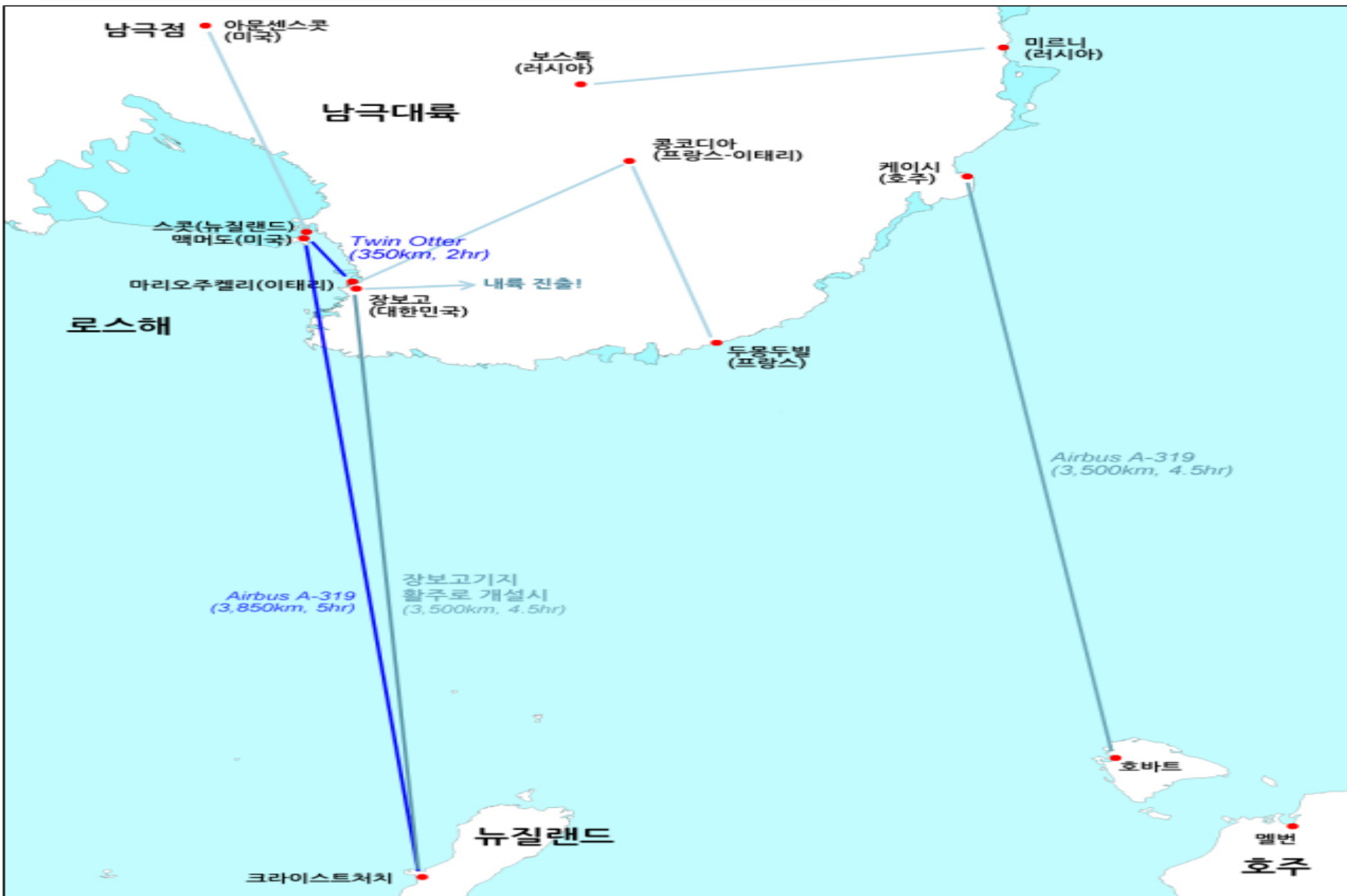




- The gross area : about 4,200m²
 - 11 buildings included main building, independent research buildings
- The independent research buildings
 - Upper air observatory, Geophysical observatory, Atmospheric boundary layer observatory, Space weather observatory, Atmospheric chemistry observatory.



Ross sea & Jang Bogo





드라이갈스키빙설

Pics on Jang Bogo



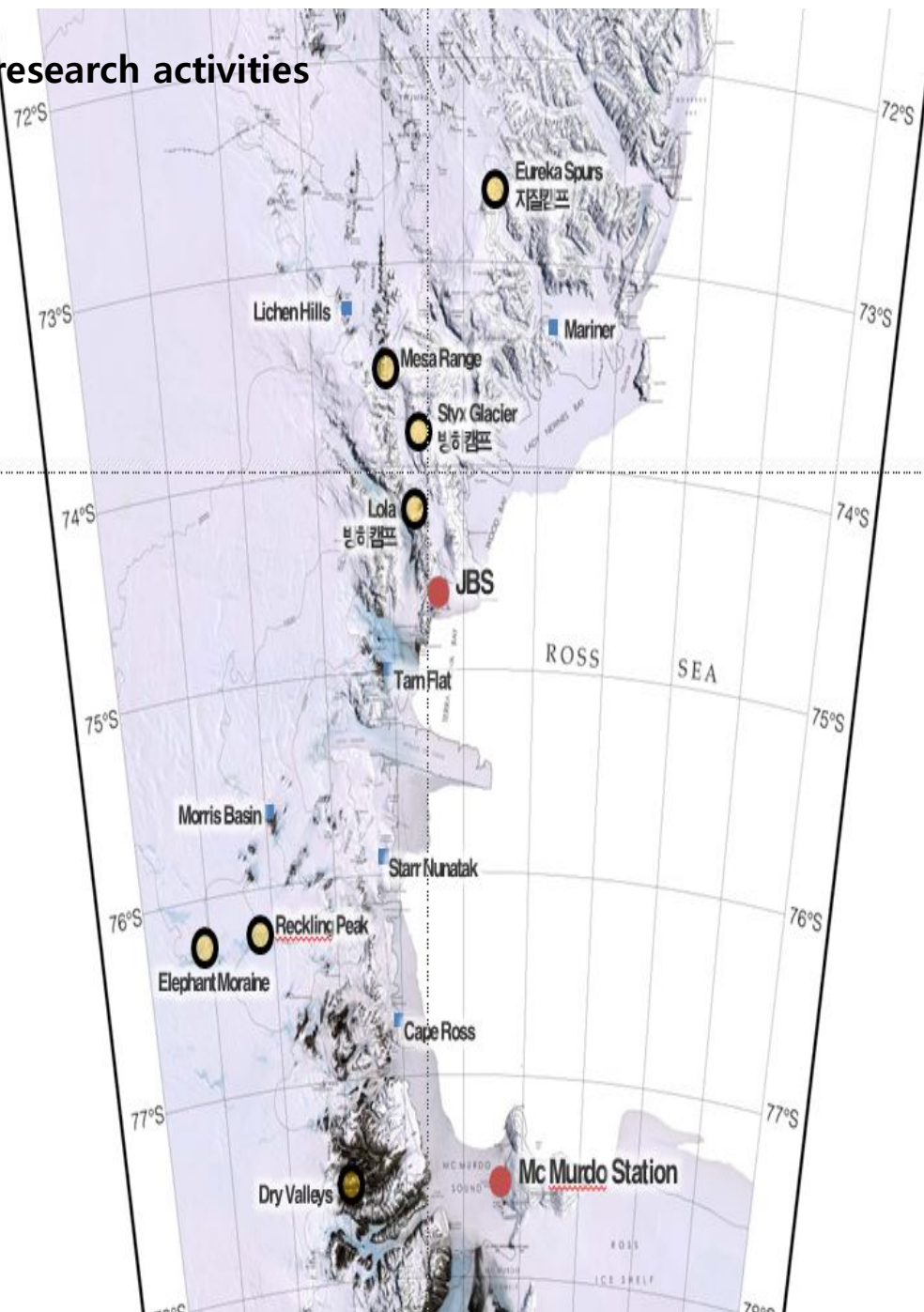
❖ Operation on the sea-ice runway



❖ Logistic operation by Araon



Summer research activities



- ❖ Chopper Traking Sys
- ❖ Eureka Spurs Geo Camp
- ❖ Styx Glacier Glacier Camp
- ❖ Mesa Range, Elephant Moraine ect. Meteolite

Major in-house research programs for the next period(2017-2019)

Beginning a new 3 year funding cycle and program selection completed

Implementation of SCAR Horizon Scan(2014) & ICARP3 (2015) and the National Plan

Climate changes in the Antarctic (in global context); observation and prediction

Arctic changes; how to understand and how to prepare for

New horizons in polar research; continental, astronomical research, carbon sequestration

In-house research projects(13 projects)

- Global issue research; 7 projects including research on Antarctic climate change, Antarctic marine environment and ecology and Antarctic sea ice
- Application oriented research and new emerging research; 4 projects
- Arctic climate change and satellite observation; 2 projects

List of In-house projects(1)

No.	Title	Key word
1	Characterizing mantle domain beneath West Antarctic Rift System and Antarctic mid-ocean ridges	Crust/mantle structure, uplift of TAM, Antarctic MORB, Seamounts, Antarctic mantle domain, West Antarctic Rift Systems
2	Ocean-to-Ice Interactions in Amundsen Sea: Ice shelf melting and its impact on ocean processes	Western Antarctic warming, Ice shelf retreat, Ocean circulation, Global climate change, Southern Ocean Ecosystem, Biogeochemical Cycle
3	Modeling responses of terrestrial organisms to environmental changes on King George Island	environmental change, terrestrial ecosystem, King George Island, modeling biological responses, critical zone observatory, prediction of ecological change
4	Reconstruction of past climate and environmental changes using high resolution ice core records in Victoria Land, Antarctica	Antarctica, Greenland Ice Core, Paleoclimate, Climate Change, High Resolution
5	Reconstruction of Antarctic ice sheet and ocean history for the past two million years using sediment records	Sediment, Antarctica, Climate change, paleoenvironment, Ice sheet, Ocean

List of In-house projects(2)

No.	Title	Key word
6	Investigation for the cause of east-west different climate responses in Antarctica	Antarctica, Climate Change, Atmosphere circulation, In-situ Observation, Numerical Modelling, Global Issue
7	Studies on the Changes in Coastal Marine Systems of the Antarctic Peninsula: A 2050 Outlook	Rapid warming, Glacier retreat, Ocean acidification, King Sejong Station, Antarctic Peninsula, Marian Cove, Coastal marine system, Future scenario modelling, 2050 Outlook
8	Analysis technique development for satellite observation of Arctic sea ice	Arctic sea, sea ice, remote sensing, data processing, information system, observation, network
9	Development and Application of the Korea Polar Prediction System (KPOPS) for Climate Change and Disastrous Weather Events	Cloud Microphysics, Polar Prediction System, Weather Extremes

List of In-house projects(3)

No.	Title	Key word
10	The Antarctic Korean Route Expedition and Development of Technologies for Deep Ice Coring and Hot Water Drilling	Korean Route, Subglacial Lake, Hot Water Drill, Deep Ice Core Drill, Single cell technology, Isotope
11	Understanding polar upper atmospheric changes by energy inputs from the space environment and the lower atmosphere	Polar upper atmosphere, Space weather forecast, Space environment, Aurora
12	Polar Genomics 101 Project: Genome analysis of polar organisms and establishment of application platform	Genome, Proteome, Transcriptome, Environmental adaptation, Transformation
13	Commercialization of useful metabolites from polar organisms	Biomaterial in polar region, Secondary metabolite, MS library, Medicine, cold adapted-enzyme, anti-freezing biopolymer

List of Contract Projects

No.	Title	Ministry
1	Korea Arctic Ocean Observing System (K-AOOS)	MOF/2.8mil
2	Investigation of Submarine Resource Environment & Seabed Methane Release in the Arctic	MOF/1mil
3	Investigating Cryospheric Evolution of the Victoria Land, Antarctica	MOF/1.6mil
4	Crustal Evolution of Victoria Land, Antarctica, and the Formative Process of Planets	MOF/2.4mil
5	Bioinformatics Study on Analysis of Marine Microbial Genomes	MOF/50thousand
6	Surface pCO ₂ Observations along R/V Araon's Cruise Track in the Coastal Seas & the East Sea Around the Korean Peninsular	MOF/4.1thousand

List of Contract Projects

No.	Title	Ministry
7	Circum Arctic Permafrost Environment Change Monitoring, Future Prediction & Development Techniques of Useful Biomaterials (CAPEC)	MSIP/2.6 mil
8	Changes in Environments & Coastal Geomorphology of Svalbard Fjords Arctic	MSIP/500 thousand
9	Multidisciplinary Approach to Understanding the Vulnerability of Antarctica's Physical & Eco-system to Changing Global Climate	MSIP/58 thousand
10	Organic Carbon Transfer Arcoss the River-Sea Interface: A case Study in Geum & Sumjin River Systems	MSIP/200 thousand
11	Environmental Management & Monitoring of Antarctic Specially Protected Area	MOE/136 th

ACT ON ANTARCTIC ACTIVITIES AND THE PROTECTION OF ANTARCTIC ENVIRONMENT

Article 21 (Establishment and Implementation of Basic Plans for Promotion of Research Activities in Antarctica)

(1) The Government shall establish a basic plan for promotion of research activities in Antarctica (hereinafter referred to as "basic plan") every five years, including the following matters in order to promote research activities in Antarctica:

(2) *The Government shall finalize basic plans through deliberation by the National Science and Technology Council under Article 9 of the Framework Act on Science and Technology and shall publish them through the Official Gazette. <Amended by Act No. 11713, Mar. 23, 2013>*

(3) The Government shall establish and implement an annual implementation plan, consistent with basic plans, for promotion of research activities in Antarctica, as prescribed by Presidential Decree.

Article 22 (Public Relations and Education)

The Government shall establish a policy for public relations and educational programs to make citizens well aware of the value of Antarctica and the importance of the environmental conservation of Antarctica.

The 3rd Antarctic R&D Master Plan



Strategy	<ul style="list-style-type: none"> • Peninsular ⇒ Continent: Araon, Jang Bogo • Basic Sciences • Build base for Convergence Research 	<ul style="list-style-type: none"> • Contient ⇒ Inland K-Route • Respond to the Global Issues 	<ul style="list-style-type: none"> • Secure Inland Research 3rd Research Station • Lead the international R&D in Antarctica
Research & Intrastructure	<ul style="list-style-type: none"> • Environment Monitoring • R&D based on stations • Secure the essential operation system 	<ul style="list-style-type: none"> • Comprehensive Environmental Protection MPA, Antarctic Maps • Safer and Specialized Operational System 	<ul style="list-style-type: none"> • Contribute to protect the Earth Environment thru Antarctica • Sharing the safer & Multi Infrastructure
Outreach & Governance	<ul style="list-style-type: none"> • Particpate in Antarctic Governance • Setup Experts Network 	<ul style="list-style-type: none"> • Contribute to solve the pending common issues • Strengthen outreaches nation wide 	<ul style="list-style-type: none"> • Lead Antarctic Issues & Governance • Promote Antarctic Science culture

The 3rd Antarctic R&D Master Plan

Vision

A Leading Antarctic State Contributing to Solve the Pending Common Issues of Human Society

Policy Goals

1. Respond to Global Issues; Climate & Ecosystem Change
2. Build Safer & Sustainable Polar Infrastructure System
3. Enhance the leadership n Antarctic Science & Governance

Major Projects

1. Predict & Adapt to the Global Environmental Change through the Antarctic Sciences
2. Explore the Inland Traverse and Unexplored Research Areas
3. Seek the Convergence R&D for 4th Industry Innovation
4. Build safer Antarctic Operation System
5. Raise the human resources and outreach activities
6. Strengthen the international cooperation
7. Initiate the science theme and agenda for Antarctic environmental protection

2013 Korea Arctic Master Plan



Muchas Gracias!

