

Indian Scientific Endeavor to Understand the Climatic Changes in the Arctic

Rohit Srivastava

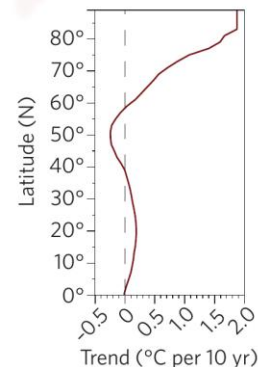
**Scientist E and In-charge
Arctic Expedition Logistics**

**National Centre for Polar and Ocean Research
Ministry of Earth Sciences, Govt. of India
Vasco-da-Gama, Goa
Email: rohits@ncpor.res.in**

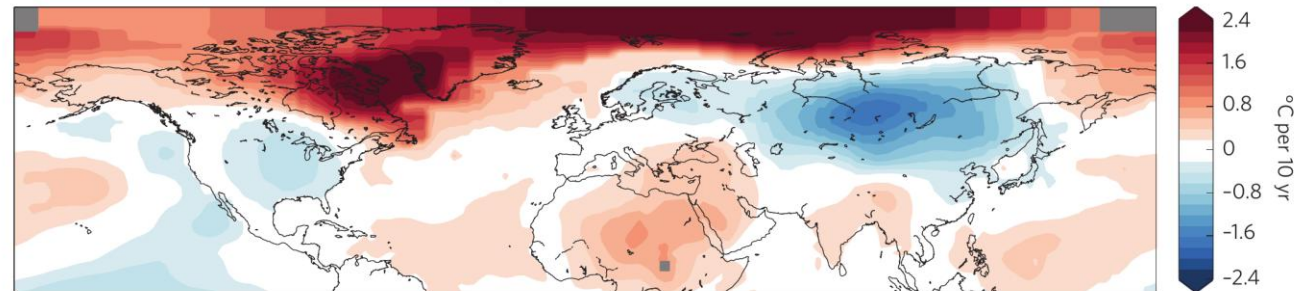


The Changing Arctic

- The Arctic influences the weather and climate of the entire Northern Hemisphere, and the cool northern region helps to moderate the climate of the rest of the planet.
- Climate Issues:
 - Arctic Amplification
 - Arctic Sea Ice Decline



DJF surface temperature trends (1990–2013)



Cohen et al., 2014, Nature Geoscience

Why India in the Arctic

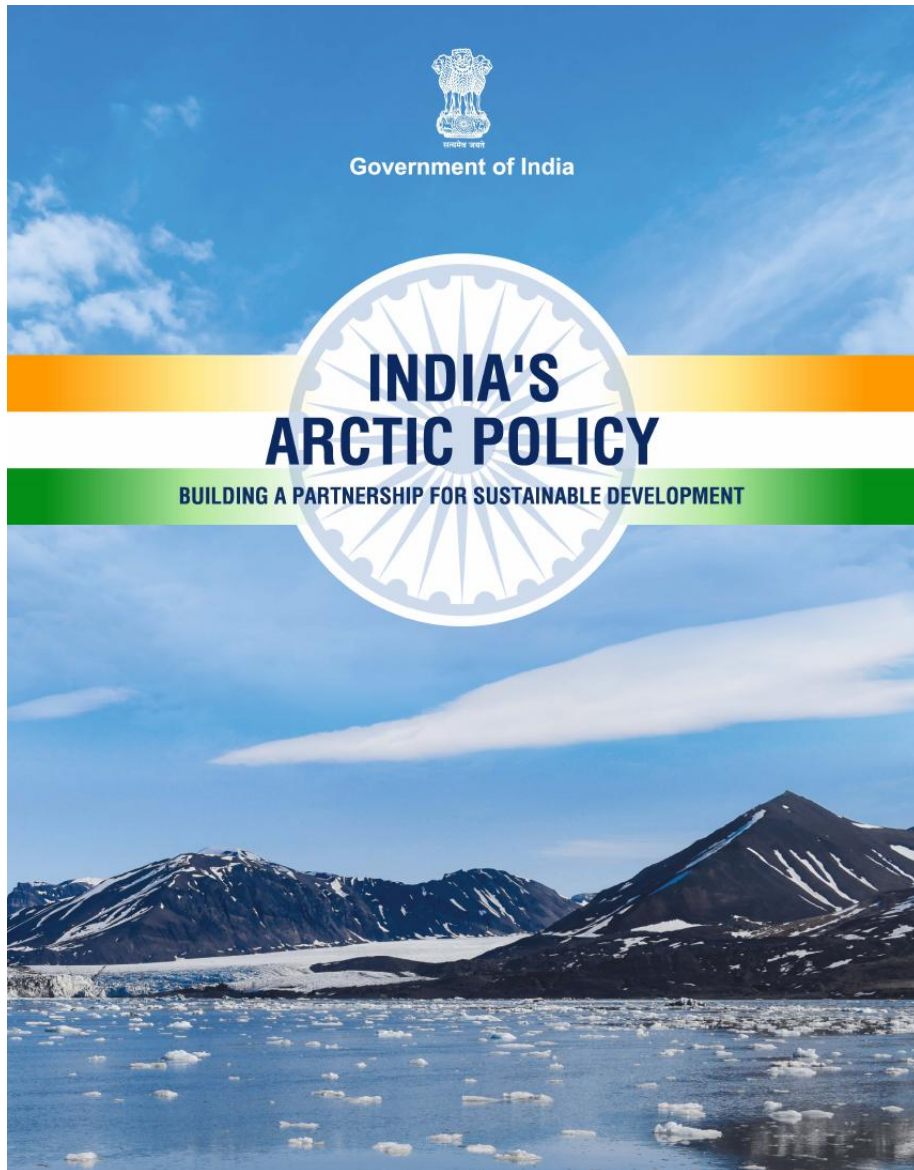
- **Tele-connection** between the Arctic/North Atlantic and the Indian Summer monsoon on Intra-seasonal, Inter-annual and decadal time scales ([Signals of Climate change is stronger in the Arctic \[melting Ice\]](#))
 - Short term **Atmospheric Bridge** and long term **Ocean tunnel** between Arctic and Asian Continent
 - India has more than 7000 km Costaline
 - Reveal past History from **Tripolar region** (Arctic, Antarctic and Himalaya) from Ice /Sediment Core
-
- In 2007, the Govt. of India explored feasibility of expanding its scientific agenda to the Arctic
 - NCPOR (then NCAOR)- nodal agency to plan, formulate, co-ordinate and implement the program as multi-institutional national endeavor

India and The Arctic – A History of Cooperation

History of India's Arctic Research



RESTS ON SIX Pillars



01

Science and Research

02

Climate and Environmental Protection

03

Economic and Human Development

04

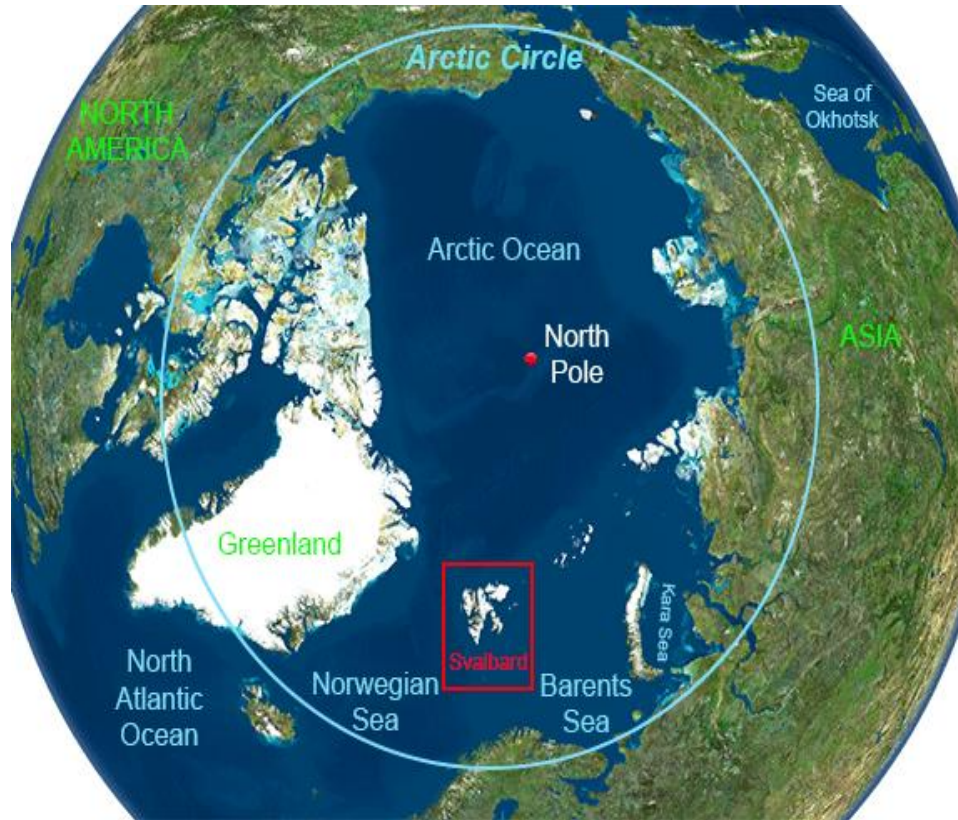
Transportation and Connectivity

05

Governance and International Cooperation

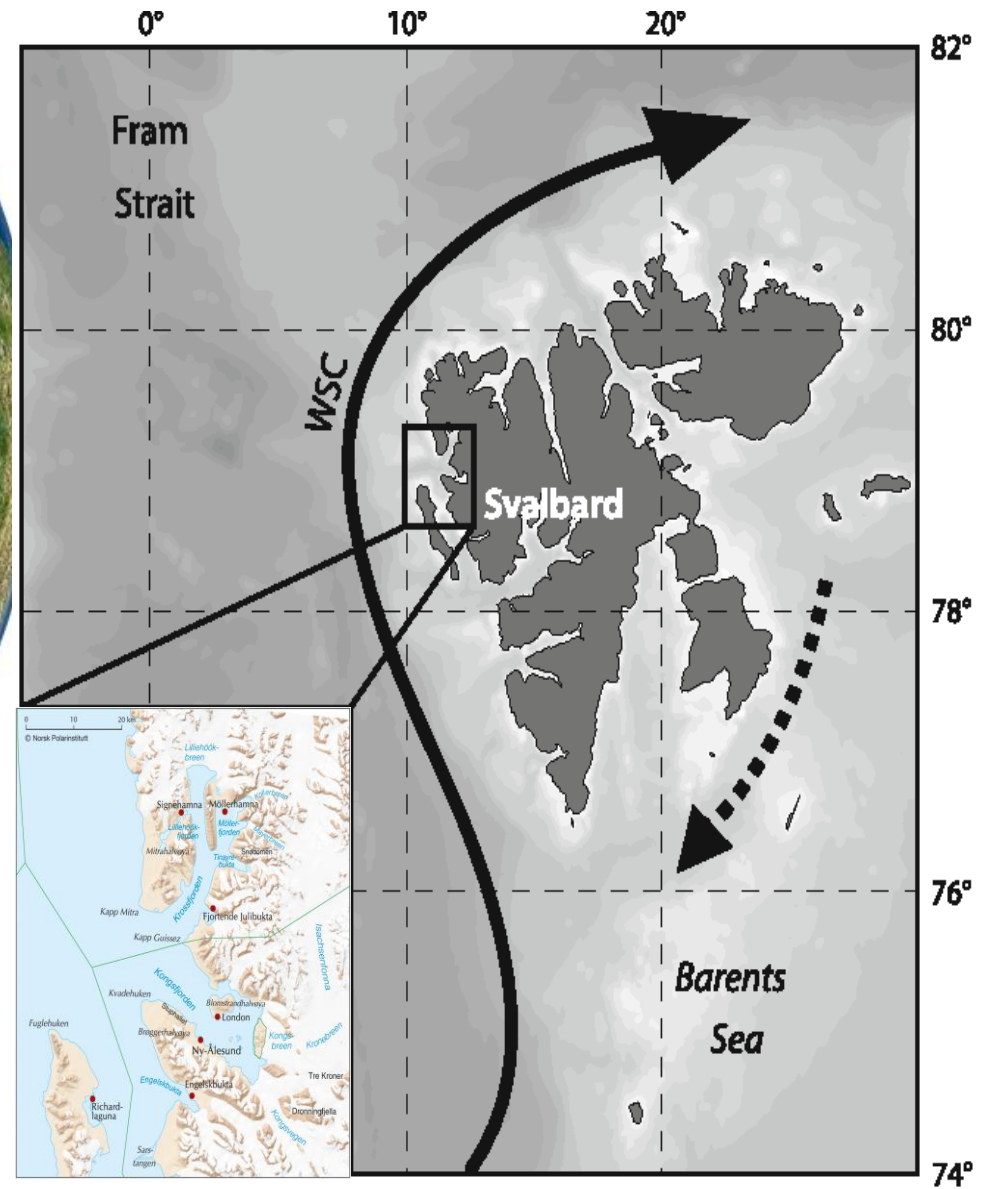
06

National Capacity Building



Position: 78°55'N 11°56'E

To North Pole: 1231 Km



HIMADRI

INDIAN ARCTIC RESEARCH STATION

Inaugurated on the 1st July, 2008

by

Shri. Kapil Sibal the-then Hon. Minister, in the presence of dignitaries
from the Norway, UK, India and Germany



Indian Arctic Program



- **Thrust Areas of Research**

- Long term monitoring of Physical, Biological, Chemical & biogeochemical aspects of Arctic fjords.
- Bacterial community dynamics in the Arctic Ecosystem
- Studies of aerosol, black carbon and pollutants
- Mass balance studies of Arctic glaciers
- Ambient Acoustic noise
- Monitoring degradation of Permafrost

- **India's Progress in Arctic Science**

- Indian Arctic program commenced in 2007
- Research Base “Himadri” dedicated to nation in 2008
- India's first multi-sensor polar mooring “IndARC” deployed in 2014
- India's atmospheric lab “Gruvebadet” operational since 2016 streams live data

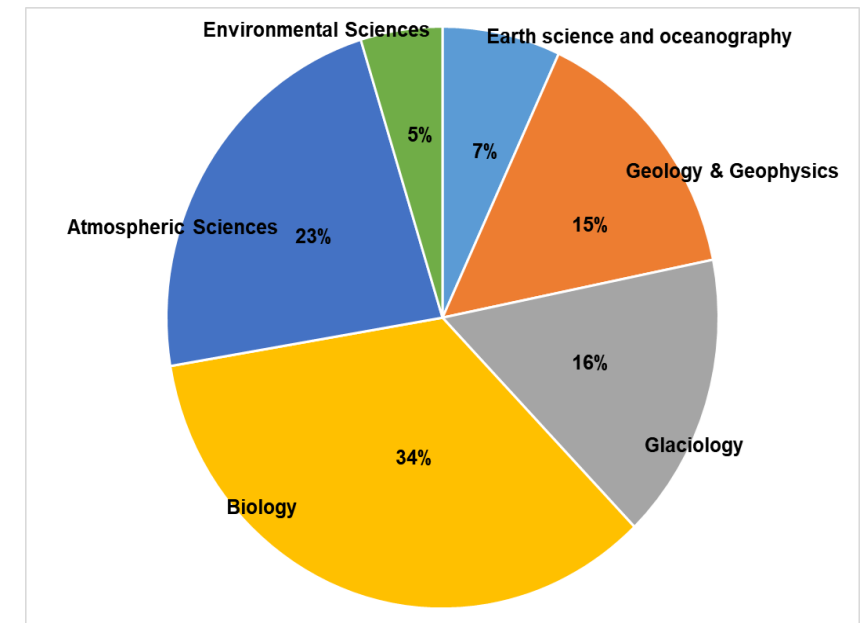


Indian Arctic Program



- India has successfully conducted 15 summer expeditions to the Arctic
- 400 research visits from India have visited Ny-Ålesund till now
- Station manned for more than 300 days per Yr

Earth science and oceanography: **13**
Geology and Geophysics: **28**
Glaciology and remote sensing: **30**
Biology and biogeochemistry: **65**
Atmospheric Sciences: **43**
Environmental Sciences: **9**



- Publications till now from Indian Activities: more than **200 publications**

Participation in Scientific cruise to the Central Arctic Ocean

- Participation in a scientific cruise to the Central Arctic Ocean onboard RV Kronprins Haakon and collected sea-ice core samples.



International Yoga day 2023 at Ny-Ålesund, Arctic

Team of Indian scientists
celebrated International Yoga day
at Ny-Ålesund, Arctic



Winter Expedition to the Arctic

- Hon'ble Minister of Earth Sciences, Govt. of India, Shri Kiren Rijiju, launched the 1st Indian Winter Expedition to the Arctic in New Delhi on 18 December 2023.
- The two winter expeditions in 2023-24 and 2024-25 were successfully completed



Research endeavours in the Canadian Arctic

- The First Canadian Arctic Expedition was undertaken from 13 August to 08 September 2023
- Two Canadian Arctic expeditions were undertaken in summer 2023 and 2024.



Challenges and Goals for near future

Improve our understanding

- Teleconnection between Polar regions and elsewhere
- Air-sea-Ice exchanges
- Glacier melting: Remote Vs. Local forcing & Quantification of Atmosphere and Ocean contribution
- Reconstruction of past climate using ice and sediment core
- Transform India's scientific approach to a pan-Arctic perspective

Observations and Modeling

- Detect the climate anomalies
- Proxy data to investigate past variability of polar climate and Tropics (Monsoon)
- Modeling: Process studies / Sensitivity studies and prediction of sea-ice changes (different time scales)

Collaborations and networking

- Closer cooperation with academic institutions (Joint centres/Courses/Degrees)
- Establish network of observatories to study 'land-sea-atmosphere-cryosphere' interactions and its variability in the scenario of rapid climatic changes
- Initiate larger scientific observations in the Arctic ocean to understand the impact of sea-ice loss
- More meaningful engagement in Arctic council and its working groups
- Closely work with NGOS like Arctic Circle



सत्यमेव जयते
Ministry of Earth Sciences
Government of India



Thank you

rohits@ncpor.res.in