

# Research Prioritisation in EU-PolarNet 2

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# EU-PolarNet 2



## Consortium

- 25 consortium members
- 21 countries

All European member states and associated countries with polar programmes



**Coordination and Support Action**

**Funding:**

€3,299,253.75

**Duration:** 4 years  
(01.10.2020 – 30.09.2024)

**Project Coordinator:**  
Nicole Biebow



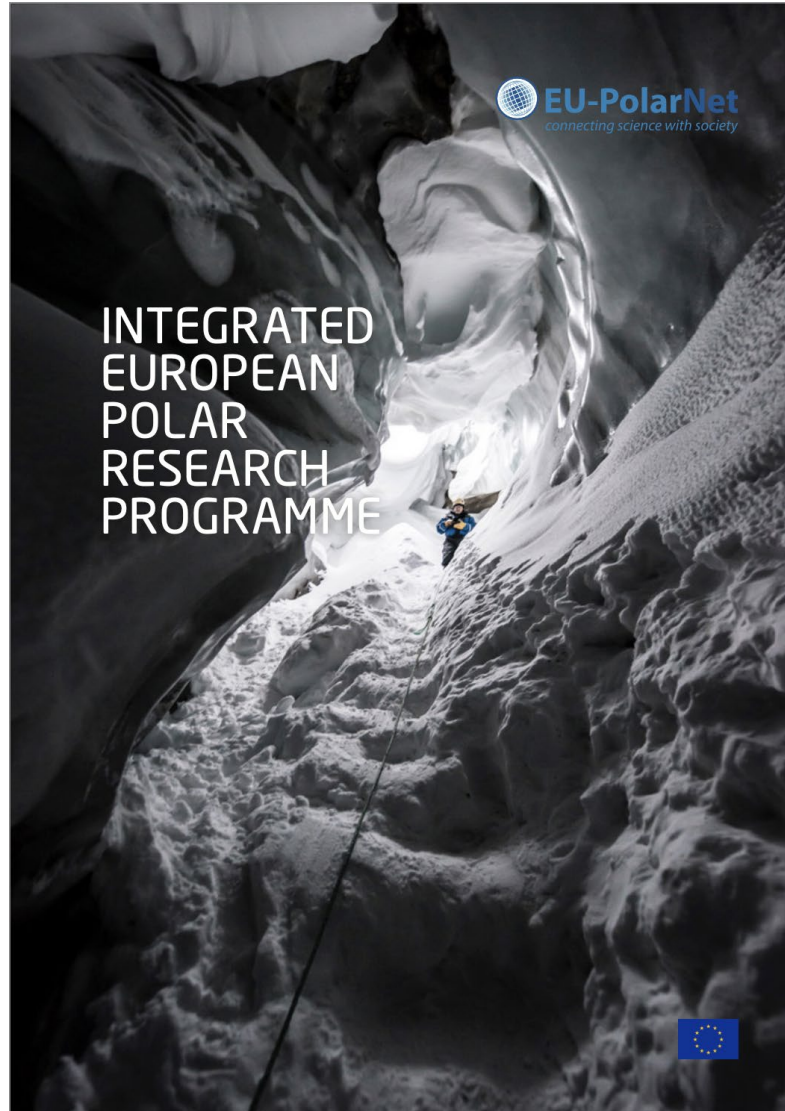
# Ambition of EU-PolarNet 2

- To advance **European Polar research actions** by establishing a sustainable coordination platform
- To support the development of **Polar actions of high societal relevance** by involving all relevant stakeholders
- To support **policymaking** processes by providing evidence-based **advice**
- To sustain the platform and the legacy of EU-PolarNet by establishing a **European Polar Coordination Office (EPCO)**





# Integrated European Polar Research Programme EU-PolarNet



## Research Need 1 Better Understanding of Climate Change in the Polar Regions

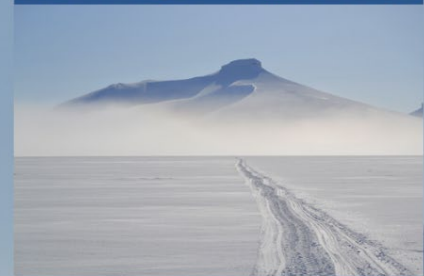


Photo: Elena Barbaro

## Research Need 2 Informed Weather and Climate Action

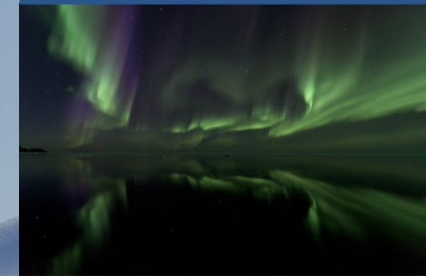


Photo: Ronald JW Visser

## Research Need 3 Resilient Socio-Ecological Systems



Photo: Ronald JW Visser

## Research Need 4 Prospering communities in the Arctic



Photo: Kirsi Latola

## Research Need 5 Challenges and Opportunities for Polar Operations



Photo: Stefan Hendricks

## Research Need 6 Inclusive Creation, Access and Usage of Knowledge

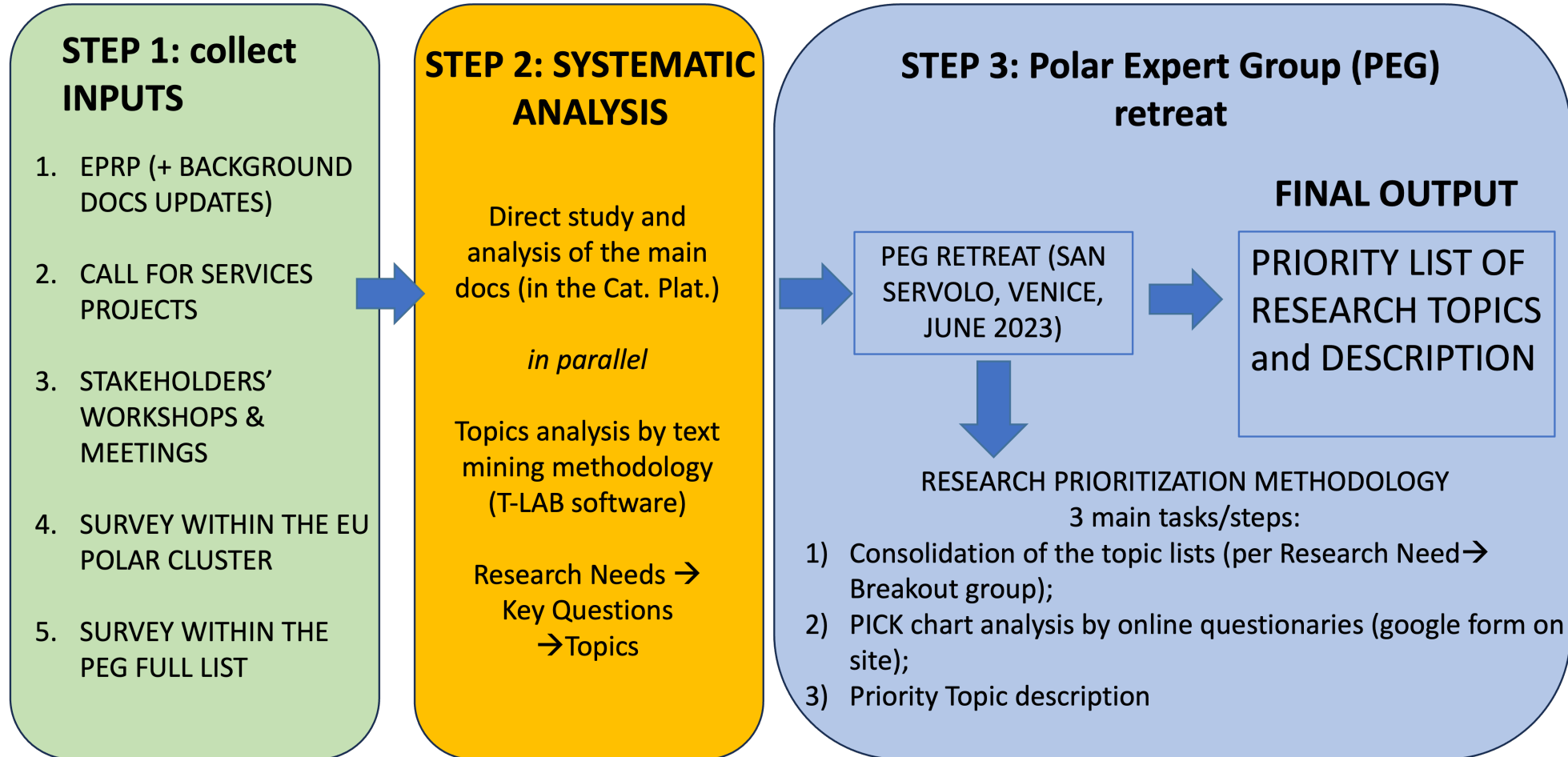


Photo: Thomas Steuer





## A THREE-STEPS METHODOLOGY



# Step 1: Collect Inputs

1. Integrated European Polar Research Programme (EPRP) & background documents (around 50) uploaded into the group “PEG-retreat-Venice” in the Catalyst Platform <https://polarcatalyst.eu>

File	Type	
SCAR - Antarctic Climate Change and the Environment - A DECADEAL SYNOPSIS AND RECOMMENDATIONS FOR ACTION	APPLICATION/PDF	# PEG-retreat-Venice PEG-retreat-Venice Unsubscribe Discussion Resources Members
The State of Environmental Science in Svalbard (SESS)– an annual report - 2022	WEB	Scientific priorities WEB Thu 30th M
Integrated European Polar Research Programme	WEB	ATCM Multi-year Strategic Work Plan APPLICATION/PDF Thu 30th M
WP2 stake and rights holder workshop outcomes	APPLICATION/VND.OPENXMLFORMATS-OFFICEDOCUMENT.WORDPROCESSINGML	CEP Five-year Work Plan APPLICATION/PDF Thu 30th M
Sami Arctic Strategy		COMNAP Antarctic Roadmap Challenges Project WEB Thu 30th M
Good Practices for Environmental Impact Assessment and Meaningful Engagement in the Arctic	APPLICATION/PDF	Future Challenges in Southern Ocean Ecology Research APPLICATION/PDF Thu 30th M
Antarctic Remotely Piloted Aircraft Systems (RPAS) Operator's Handbook		Scar Strategic plan 2023-2028 APPLICATION/PDF Fri 5th May
		EU-PolarNet 2 - PEG Consultation results APPLICATION/PDF Fri 2nd Jun
		EU-PolarNet 2 - PEG Consultation on research needs / key questions APPLICATION/PDF Fri 2nd Jun
		REPORT FROM WORKSHOPS ON RESEARCH PRIORITIES OF INDIGENOUS RIGHTSHOLDERS IN SÁPMI: NORWAY, SWEDEN, AND FINLAND APPLICATION/VND.OPENXMLFORMATS-OFFICEDOCUMENT.WORDPROCESSINGML.DOCUMENT Tue 6th Jun





# Step 1: Collect Inputs

2. Two Call for Services Projects (Task 3.3) relative to Research Need 4 (“Prospering Communities in the Arctic”) & 6 (“Inclusive creation, access, and usage of knowledge”) contributed as input for our process.
  - *ArcticXchange* - Exchanging knowledge and co-producing climate services with reindeer herders and Arctic communities
  - *CO-CREATE* - comprehensive Policy Brief to the EU Commission - A roadmap to decolonial Arctic research



# Step 1: Collect Inputs

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## 3. Stake- and rightholders' Workshops and Meetings

Contributions from:

- The Sámi Arctic Strategy (2019)
- ASSW 2021: Online Co-creation Workshop
- ICASS 2021: Online Workshop Co-creating Knowledge
- ASSW 2022: Online Co-creation Workshop
- EU-PolarNet 2 visit to Kautokeino (August 2022)
- EU-PolarNet 2 workshop during SMM – International Maritime Trade Fair” (6-9 September 2022 – Hamburg, Germany)
- EU-PolarNet 2 Workshop, Nuuk, Greenland, 7-11 November 2022





# Step 1: Collect Inputs

## 4. Consultation within the EU Polar Cluster

“What do you think are the potential gaps and future needs that should be addressed based on the expected outcome of your research?”

→ Inputs from 8 projects out of 25

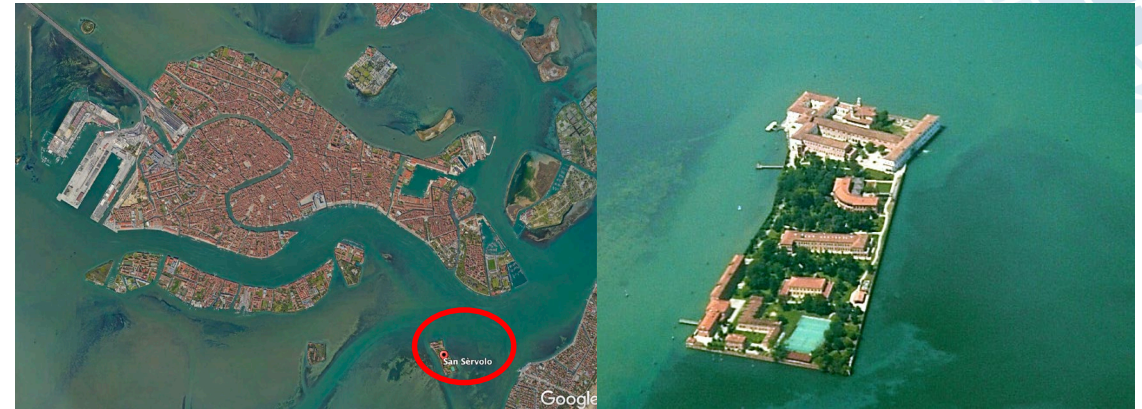


# Step 3: The PEG Retreat

**12-15 June 2023, San Servolo – Venice Lagoon**

## **34 Participants:**

1. PEG members (16 out of 29 members)
2. EU-PolarNet 2 project consortium (15 members)
3. International partner - ESA (1 member)
4. EU Polar Cluster project representatives (2)





# Step 3: The PEG Retreat

D. Jones, A. Labib, K. Willis et al.

European Journal of Operational Research 307 (2023) 827–841

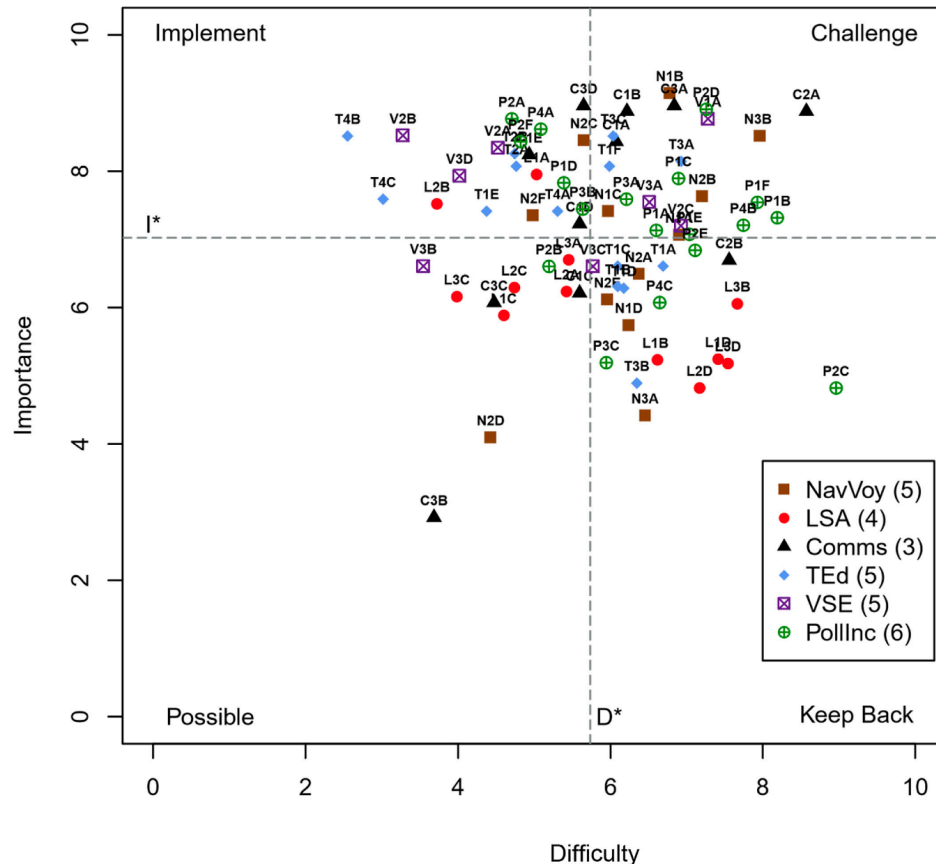


Fig. 2. PICK Chart of ANA Sub-Needs (codes given in Appendix A, the number of experts giving scores in each category is given in brackets after the category key).

## PICK (Possible, Implement, Challenge, Keep Back) Chart (Jones et al., 2023)



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

European Journal of Operational Research

journal homepage: [www.elsevier.com/locate/ejor](http://www.elsevier.com/locate/ejor)

Innovative Applications of O.R.

Multi-criteria mapping and prioritization of Arctic and North Atlantic maritime safety and security needs

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# Step 3: The PEG Retreat

WORKING GROUP	RESEARCH NEEDS	KEY QUESTIONS
Polar Climate System	1. Better understanding of climate change in the Polar Regions and its links to lower latitudes	1.1: Key processes in polar-specific components of the climate system. 1.2: Polar coupling and feedback processes at the regional and global scales. 1.3: Modelling and predicting the polar climate system. 1.4: Assessing the impact of human activities on polar climate.
	2. Informed weather and climate action	2.1: Identifying relevant indicators of polar climate change. 2.2: Designing new approaches to test the chain of processes from climate indicators to decision making. 2.3: Supporting decision making through predictions and projections of polar climate and socio-ecological systems. 2.4: Assessing the added value of the Polar Regions in relation to climate change and human activity impacts.
Polar Biodiversity	3. Resilient socio-ecological systems	3.1: Understanding key issues of polar ecosystem structure, functioning, and change. 3.2: Designing a healthy socio-ecological system. 3.3: Expanding observation of socio-ecological systems. 3.4: Ecosystem-based management, governance and transformative solutions toward a sustainable future.



# Step 3: The PEG Retreat

WORKING GROUP	RESEARCH NEEDS	KEY QUESTIONS
<b>Prospering Communities in the Arctic</b>	4. Prospering communities in the Arctic	<p>4.1: An infrastructure plan in support of sustainable community development.</p> <p>4.2: National and sub-national governance challenges in the Arctic Regions.</p> <p>4.3: Economic innovations for sustainable development of Arctic communities.</p> <p>4.4: Education as a tool to expand the capacity of Arctic residents to respond to changes.</p> <p>4.5: Learning from the past for a socio-economically balanced and gender-equal development of the Polar Regions.</p> <p>4.6: The demography of the future Arctic population.</p> <p>4.7: Cultural vitality for prosperity in the Arctic.</p>
<b>Human Impacts on Polar Systems</b>	5. Challenges and Opportunities for Polar Operations	<p>5.1: Understanding the impacts of changing environmental conditions and operations on risk and vulnerability.</p> <p>5.2: Minimising the environmental impacts of polar operations.</p> <p>5.3: Understanding and promoting the concept of social license for polar operations.</p> <p>5.4: Identifying policies, frameworks and governance which ensure safe, sustainable, and just operations.</p>
<b>Cross-Cutting</b>	6. Inclusive creation, access and usage of knowledge	<p>6.1: Developing new technologies and improved capacities in observation, modelling, and research in the Polar Regions.</p> <p>6.2: Co-production of knowledge as a benefit to societal stakeholders.</p> <p>6.3: FAIR data management principles for polar data collections.</p> <p>6.4: Ensuring knowledge access and capacity building in Polar Regions.</p> <p>6.5: Exploiting knowledge to inform decision making for the Polar Regions.</p>



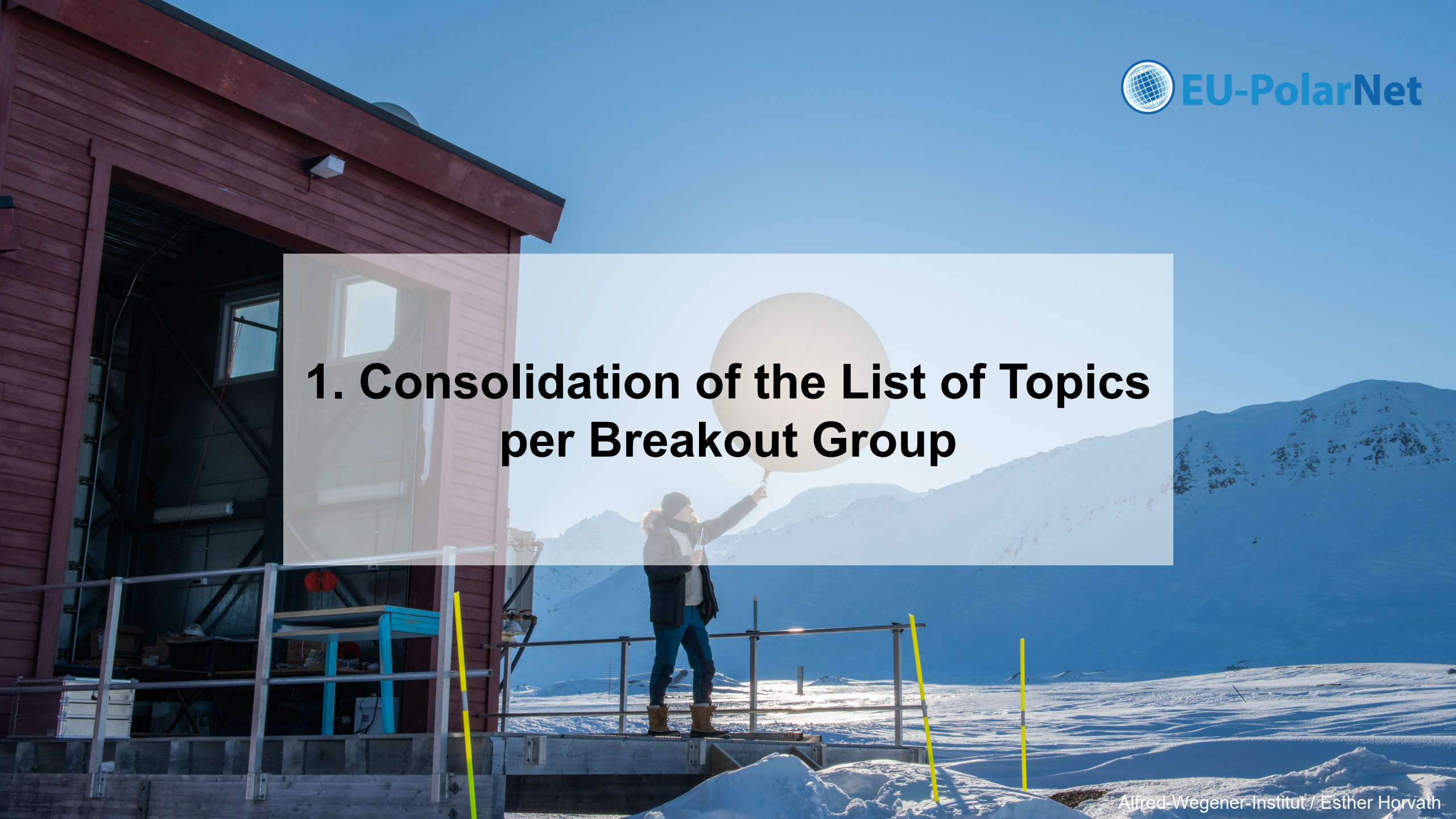


## Research Prioritisation Methodology

Main consecutive tasks/steps to be performed during the retreat:

1. Consolidation of the List of Topics per Breakout Group
2. PICK chart analysis (Jones et al., 2023) through online questionnaires collecting information from experts (Scales from 1 to 5 on the following two parameters: Importance, Difficulty)
3. Priority Topic Description





# 1. Consolidation of the List of Topics per Breakout Group



# Step 3: The PEG Retreat

## WG1 – Polar Climate System

1. Atmospheric drivers of polar climate change: changes in polar atmospheric circulation, climate sensitivity, cloud-aerosol interaction, surface (e.g. snow) processes. T3, T4, T17, T19, T32, T36
2. Extremes in polar regions, past, present and future, evaluating impacts and hazards. T25
3. Tipping points and regime shifts in the polar regions. T30
4. Connections between polar regions and global climate, two-way interaction. T23
5. Past, present and future loss of ice sheets and glaciers, instabilities, sea level change. T7, T12, T27, T30
6. Ice sheets and interactions with ocean and atmosphere. T4, T6, T7, T27, T30
7. Land to sea continuum, fluxes and interaction with ocean, impact on ecosystems (incl. benthic, marine predators). T2, T5, T20, T35, T37
8. Understanding carbon cycle and biogeochemical cycle dynamics of polar regions. Unravelling the climatic significance and future implications. Includes role of permafrost, wildfires, wetlands, ocean carbon pump. T1, T4, T10, T14, T20, T32
9. Accelerated mobilization and emergence of pollutants under CC, impact on ecosystem health. T32, T33, T35, T36, T37
10. Response of the structure, functions, and fluxes of the Arctic Ocean to CC (e.g. Atlantification, freshwater reservoir and pathways).
11. Ocean ventilation in the polar regions: past, present and future. Link to the global ocean circulation and transports. T10, T18
12. Seasonality in polar regions (all compartments). T11, T20, T37, T42
13. Sea ice-based ecosystems, biodiversity, foodweb, ... (light transmission), T2, T5, T21, T35
14. Integrated observing of the atmosphere-sea ice-ocean continuum: fluxes and response to CC
15. Coupling between atmosphere layers, space forcing, particle fluxes, radio disturbances, boreal aurora processes. T16, T31

## WG2 – Polar Biodiversity

1	Causes and consequences of expanding ranges of non-native species into and within polar areas (climate, impact, human)
2	Causes and consequences of habitat decline for polar species (climate, impact, human)
3	Conservation measures needs to be revised and updated for the polar areas in the face of climate change and increasing human pressure on marine and terrestrial ecosystems, and of the changed global geopolitics (climate, impact, human)
4	What are the impacts of changing seasonality and extreme events on polar ecology, biogeochemistry, and energy flow? (climate, impact, human)
5	What <i>ex situ</i> conservation measures, are required for the polar regions? (no overlap)
6	Develop risk assessments for the polar ecosystems (impact)
7	Biogeochemical cycling and changes in biological community functioning affecting ice-associated, water-column and benthic food web coupling (climate)
8	Ecosystem modelling: improve projections and predictions for the polar ecosystems (climate, impact)
9	Facilitating science-policy knowledge transfer on polar ecosystems <u>including implementation and evaluation</u> ; ecosystem-based management, governance and transformative solutions toward a sustainable future (impact, human)
10	Cumulative impacts of climate change on polar ecosystems - biodiversity, structure, and functioning (climate, impact)
11	Interrelationships among impacts of climate warming on hydrological regimes in polar





# Step 3: The PEG Retreat

## WG3 – Human Impacts on Polar Systems

### 5.1. UNDERSTANDING THE IMPACTS OF CHANGING ENVIRONMENTAL CONDITIONS AND OPERATIONS ON RISK AND VULNERABILITY

- 5.1.1. How to adapt preparedness and responses to projected climate change; related to SAR, pollution, wildfires, hazards, engineering, land use planning, built infrastructure, fisheries, tourism, EO-services.
- 5.1.2. Understand the impacts of changing environmental conditions on polar maritime operations (pollution, risk management, technology development, biodiversity, increased activities and seaice).

### 5.2. MINIMIZING THE ENVIRONMENTAL IMPACTS OF POLAR OPERATIONS

- 5.2.1. Development of new precautionary management approaches to mitigate the impact of commercial fishing in polar oceans
- 5.2.2. Investigate the spread and (risk of) introduction of non-native and new species introduced to the Arctic and the Antarctic; changes and loss in pastures; new parasites; new diseases; zoonotic diseases; increase in insects
- 5.2.3. Development of new regulations to reduce the likelihood of accidents; manage and minimize the impacts and risks to ecosystems due to the introduction of invasive species, oil spills, waste discharges, during operations.
- 5.2.4. Need to increase knowledge on human disturbance of Arctic species and their habitats from windfarms, hydropower production and tourism. Study of the impact of noise disturbance due to land based and marine operations on polar biota
- 5.2.5. Development of environmentally responsible methods to extract critical minerals, while developing a circular economy that re-uses spent mine waste and construction materials. Need to reduce the environmental impacts of current and past mining operations and help protection of Indigenous land uses.
- 5.2.6. Research on minimizing the environmental impacts of operations in Polar regions caused by shipping, cruising and industrial operations. Implementation of technological, spatial, temporal, and regulatory actions that reduce these impacts

## WG4 – Prospering Communities in the Arctic

New key questions (combined from key questions listed below).

- 4.1 **Food and water security** – multidisciplinary, holistic incl also capacity building/education (links also to permafrost thaw)
  - T4.01 Research on infrastructure to enable sustainable food production in the Arctic.
  - T4.02 Research on water security (including the influence of climate change) in Arctic communities
  - T4.03 Influence of climate change on agriculture, fishing and hunting. How is climate change affecting the availability of traditional food and causing a decline in food security?
  - T4.04 Impact of EU legislation on traditional subsistence practices
  - T4.05 Retreating sea ice hampers traditional subsistence hunting and fishing. What is the relationship between industrial activity impacts and ecosystem changes and their effects on subsistence activities?
  - T4.06 Innovative and sustainable use of living resources, including hydroponics for production of local food products.
  - T4.07 Need to increase bathymetric mapping in the Arctic to understand sea floor ice/ ocean interactions and resulting changes in ecosystems. Will this result in new fisheries resources and with what impact on the regional economy.
  - T4.08 Improve contaminant exposure estimates to reduce uncertainties in health risk estimates. Monitor modern diets and dietary transitions in Arctic Indigenous populations. Biomonitoring to improve estimates of health effects and exposure.





**2. PICK chart analysis (Jones et al., 2023)  
through online questionnaires collecting  
information from experts (Scales from 1 to  
5 on the following two parameters:  
Importance, Difficulty)**



# Step 3: The PEG Retreat

## Importance:

CRITERIA	DEFINITION	Weight
<b>Scientific Relevance</b>	Evaluate the scientific relevance, novelty of the research question, including its potential contribution to closing knowledge gaps and its relevance to current scientific inquiries. Consider the project's methodology, data collection techniques, and analysis procedures to ensure the production of high-quality reliable data.	<b>1</b>
<b>Collaboration</b>	Assess the potential for collaboration with local communities, other research institutions, and international partners to enhance the project's effectiveness, ensure cultural sensitivity, and promote knowledge co-production.	<b>0.7</b>
<b>Societal relevance and Impact</b>	Evaluate the potential societal relevance and impact of the research question, including its contribution to conservation efforts, sustainable development, policy-making, urgency and public awareness/engagement.	<b>1</b>
<b>Interdisciplinary Approach</b>	Encourage an interdisciplinary approach by integrating multiple scientific disciplines, such as biology, geology, climate science, oceanography, and social sciences, to provide a comprehensive understanding of polar regions.	<b>0.7</b>





# Step 3: The PEG Retreat

## Difficulty:

CRITERIA	DEFINITION	Weight
<b>Feasibility</b>	Consider the practical feasibility of answering the research question at a reasonable time scale. This includes, technical development, accessibility, methods and data availability or if new development of methods/instruments is necessary.	<b>1</b>
<b>Safety</b>	Prioritize the safety of the research team and any indigenous communities or wildlife in the polar regions, considering the harsh and unpredictable environmental conditions, extreme temperatures, and potential risks associated with fieldwork.	<b>0.7</b>
<b>Resources</b>	This includes availability of financial resources, personnel and Research Infrastructures in the given timeline.	<b>1</b>
<b>International collaboration and permits</b>	Conducting research in polar regions often requires collaboration with international partners, obtaining permits from relevant national authorities, and adhering to international regulations. Navigating these bureaucratic processes can add complexity and increase the time and effort required.	<b>0.7</b>



# Step 3: The PEG Retreat

## Qualitative descriptors associated to the SCORE scale for “Importance” and “Difficulty”

	<b>Evaluation</b>
5	exceptional urgency/ relevance
	extremely difficult
4	Very strong urgency/relevance
	Very difficult
3	Strong urgency/relevance
	Difficult
2	Some urgency/relevance
	Somehow difficult
1	Little urgency/ relevance
	Not difficult



# Step 3: The PEG Retreat

## Questionnaires:

Sezione 1 di 68

### Research Prioritisation Breakout Group 1 - Polar climate system and inclusive creation, access and usage of knowledge

Importance and Difficulty survey

Email \*

Indirizzo email valido

Questo modulo raccoglie gli indirizzi email. [Modifica impostazioni](#)

Name \*

Testo risposta breve

Dopo la sezione 1 [Continua alla sezione successiva](#)

Sezione 2 di 68

T1.01 Quantify permafrost contribution to remaining carbon budgets under policy relevant pathways, especially in coming decades and in the context of overshoot scenarios. How is the increase in permafrost thaw affecting the landscape, especially with the increased formation of sinkholes and thermokarst lakes?

**KEY QUESTION 1.1 - KEY PROCESSES IN POLAR-SPECIFIC COMPONENTS OF THE CLIMATE SYSTEM**

**Importance**

Evaluate the importance of the topic based on the following criteria.

**CRITERION 1 - Scientific Relevance.** Score 1 to 5: based on relevance, novelty, and potential to close gaps, consider methodology and ability to produce high quality data.

1      2      3      4      5

**CRITERION 2 - Collaboration.** Score 1-5: based on potential for collaboration with local communities, international partners, and knowledge co-production.





# Step 3: The PEG Retreat

**T1.** Atmospheric drivers of polar climate change: changes in polar atmospheric circulation, climate sensitivity, cloud-aerosol interaction, surface (e.g. snow) processes.

**T2.** Extremes in polar regions, past, present and future, evaluating impacts and hazards.

**T4.** Connections between polar regions and global climate, two-way interaction.

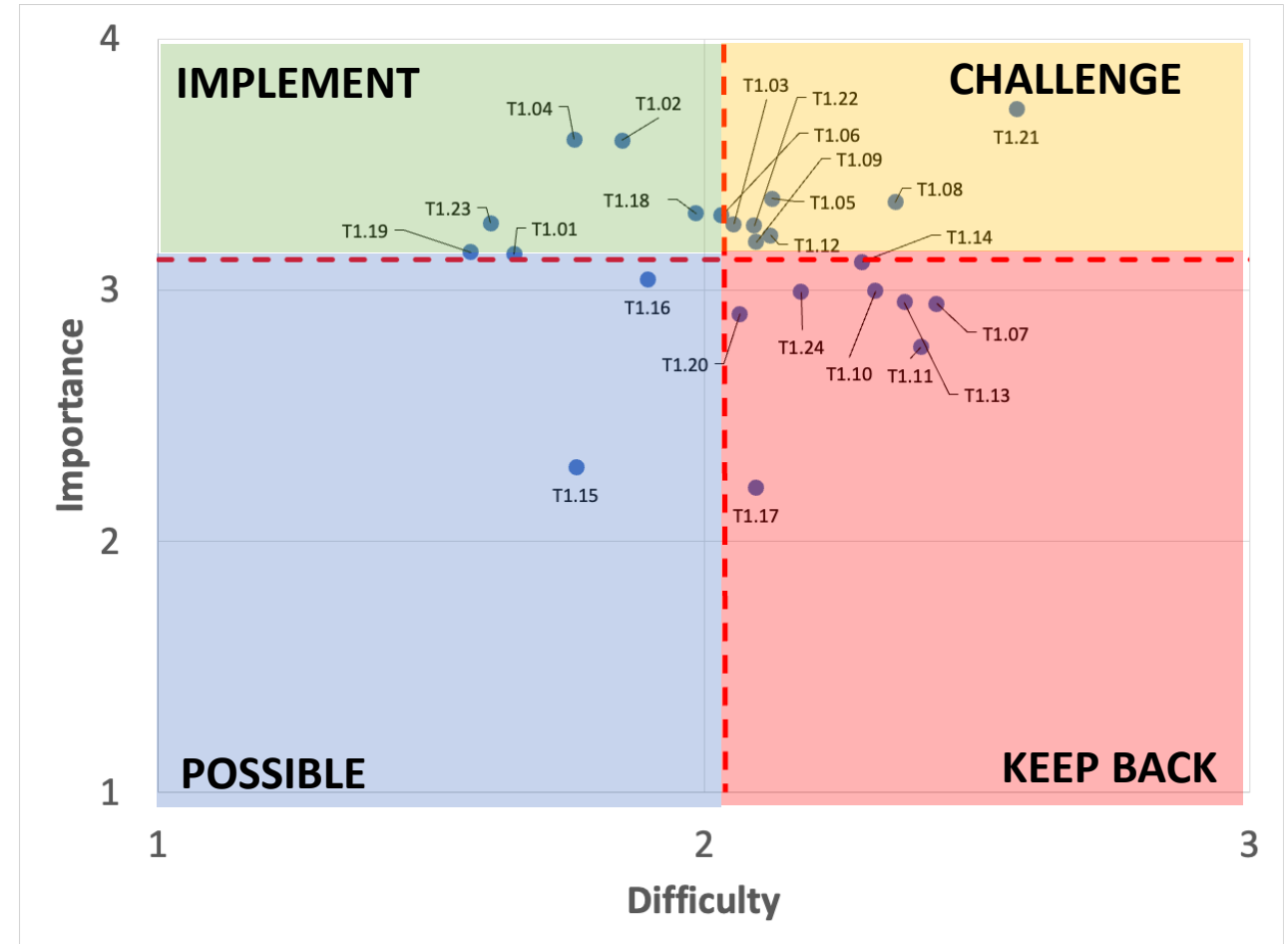
**T18.** Changes in bio-geo chemical cycles.

**T08.** Understanding carbon cycle and biogeochemical cycle dynamics of polar regions. Unravelling the climatic significance and future implications. T19

**T19.** Integrated modelling of the Polar system, through all scales. Representation of polar-specific processes in climate models : ocean cavities, clouds and aerosols, ocean mixing, ice boundary layers, ice sheet basal melting, damaging and calving, sea ice, snow, subsea permafrost, abrupt permafrost thaw.

**T23.** New methodologies for polar data processing and analysis, and in support of complex polar process modelling

## WG1 – Polar Climate System



# Step 3: The PEG Retreat

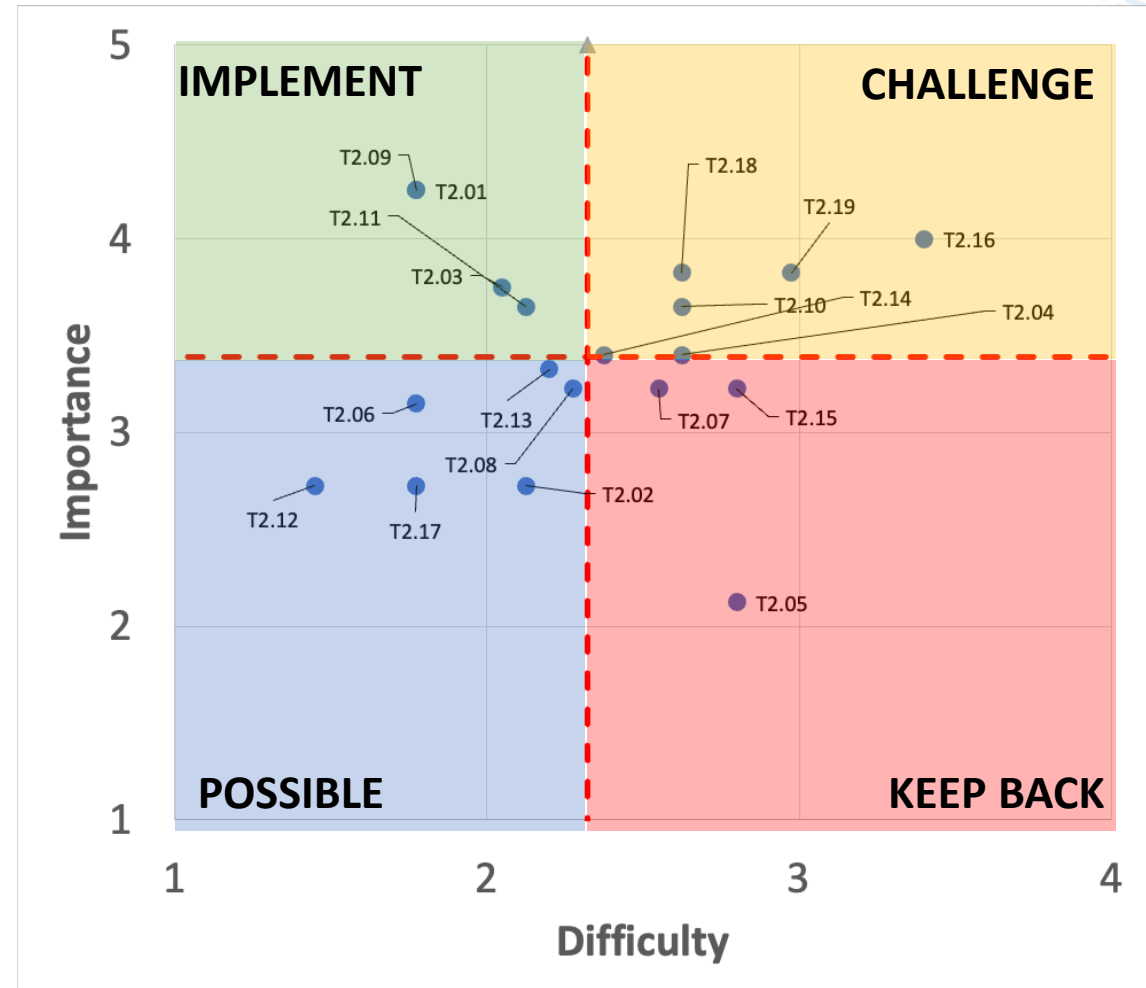
**T01.** Causes and consequences of expanding ranges of non-native species into and within polar areas (climate, impact, human)

**T03.** Conservation measures needs to be revised and updated for the polar areas in the face of climate change and increasing human pressure on marine and terrestrial ecosystems, and of the changed global geopolitics (climate, impact, human)

**T09.** Facilitating science-policy knowledge transfer on polar ecosystems including implementation and evaluation; ecosystem-based management, governance and transformative solutions toward a sustainable future (impact, human)

**T11.** Impact of tourism on polar ecosystems (impact, human)

## WG2 – Polar Biodiversity





## **3. Priority Topic Description**



# Step 3: The PEG Retreat

## WG1 – Polar Climate System

- Ice sheets and interactions with ocean and atmosphere: unravelling instabilities, implications for future sea-level rise and climate scenarios
- Advancing Understanding of Polar Amplification and Climate Feedbacks: Addressing Key Uncertainties for Enhanced Knowledge of Future Climate and Weather
- Ocean-sea ice controls of polar climate variability, feedback mechanisms and impacts on global climate
- Land-coast-ocean continuum dynamics as a key component of freshwater and carbon fluxes
- Long-term carbon dioxide and biogeochemical cycle dynamics and their feedbacks in polar regions. Unravelling the climatic significance and future implications.
- Polar climate extremes: Quantifying and projecting hazards, feedbacks, risks, and impacts for improved resilience





# Step 3: The PEG Retreat

## WG2 – Polar Biodiversity

- Changing species distributions in the polar seas
- Changing water cycle: effects on biodiversity, ecosystem productivity and human subsistence in the polar areas
- Cumulative impacts of climate change on biodiversity structure and function in polar ecosystems
- Revision of conservation measures for the polar ecosystems in the face of climate change, increasing human pressures and shifts in global geopolitics
- Development of an integrated biological-chemical-physical long-term observing system: a “Polar System of Systems”



# Step 3: The PEG Retreat

## WG3 – Human Impacts on Polar Systems

- How to understand the cumulative impacts of human activities on the environment, biodiversity and ecosystem functioning in the polar regions in the frame of climate change, with special attention for polar tourism, renewable energies, transport, polar operations
- How to ensure economic growth in the Arctic takes place in a sustainable manner and within the framework of ecosystem-based management
- How to improve international and national law and governance systems and their implementation for improving and securing environmental protection and peaceful cooperation in the Arctic and the Antarctic
- How to develop indicators for assessing the state of the environment and for long term monitoring of observed change in the polar regions and impacts of polar operations.



# Step 3: The PEG Retreat

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## WG4 – Prospering Communities in the Arctic

- Food and water security in the Arctic
- Permafrost thaw and One Health
- Indigenous societies, governance and rights.
- Sustainable economic development and energy transition.
- Demography and migration, equality.





[www.eu-polarnet.eu](http://www.eu-polarnet.eu)

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