WAGENINGEN UNIVERSITY & RESEARCH

UMEÅ UNIVERSITY

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Danmarks Meteorologiske Institut

Norwegian Meteorological Institute

SALIENSEAS

CO-PRODUCING MARINE CLIMATE SERVICES

Enhancing the Saliency of climate services for marine mobility Sectors in European Arctic Seas

Scenario Workshop

November 13, 2018

Danish Meteorological Institute

Copenhagen, Denmark

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We would like to acknowledge the generous funding support for the SALIENSEAS Project from ERA4CS, an ERA-NET initiated by JPI Climate, and funded by FORMAS (SE), DLR (DE), BMWFW (AT), IFD (DK), MINECO (ES), ANR (FR) with co-funding by the European Union (Grant 690462). Additional support for this workshop was contributed by our host institute, the Danish Meteorological Institute who is offering their facilities and logistical resources necessary. We are also grateful for the Center for Arctic Policy Studies (University of Alaska Fairbanks) for their valuable expertise provided in support of the workshop, and for the support provided by the Polar Research and Policy Initiative's network of experts.

November 13, 2018

Good Morning Participant,

On behalf of the SALIENSEAS Project, Wageningen University, University of Tromsø, Umeå University, and the Danish and Norwegian Meteorological Institutes we would like to welcome you to our scenarios workshop.

This will be a gathering of a diverse groups of experts to explore biophysical and socio-economic systemic factors that drive the need for climate forecasting services in Arctic waters. The core purpose of the workshop is to support MET.no and DMI in strategic product development and stakeholder engagement, to support maritime sectors active in European Arctic waters with strategic planning, to inform the European Commission in support of integrated Arctic policy objectives and to shape ongoing and future plans for safe, sustainable Arctic marine resource use. You have been invited because you have expertise in one or more issue areas concerning Arctic maritime activities, and your knowledge will be considered in the assessment of service needs. Each invited participant will bring a unique perspective to the workshop so that we may form a comprehensive view of the information needed to enhance safety and sustainability in Arctic maritime activites.

Again, welcome to the SALIENSEAS scenario workshop.

Sincerely,

The Project Team

Wageningen University and Research
University of Tromsø
Umeå University
Danish Meteorological Institute
Norwegian Meteorological Institute

Agenda

Location: Danish Meteorological Institute | room *Satellitten*

8:30 – 9:00	Welcome and Registration
9:00 – 9:05	Host's Welcome
9:05 – 9:30	Introductions
9:30 – 10:00	Activity 1 | Process Introduction and focal question
10:00 – 10:15	Presentation | Key factors
10:15 – 11:15	Activity 2 | Key factors
11:15 – 11:30	Break
11:30 – 12:00	Activity 3 | Key factor discussion
12:00 – 12:30	Activity 4 | Key factor votes
12:30 – 13:30	Lunch
13:30 – 13:45	Presentation | Future projections and plausibility
13:45 – 15:15	Activity 5 | Future projections
15:15 – 15:30	Break
15:30 – 16:00	Activity 6 | Plenary discussion

scenario process ends here

16:00 – 17:00	Presentation and discussion of current projects and next steps from service provider perspective: DMI and MET.no
17:00	Adjourn

Workshop Team

Facilitator	Affiliations	SALIENSEAS role
	**Douglas Cost** Assistant Professor University of Alaska Fairbanks USA	
Moderators		
	**Machiel Lamers** Assistant Professor Wageningen University The Netherlands	SALIENSEAS Principal Investigator
	**Berill Blair** Researcher Wageningen University, The Netherlands and Polar Research and Policy Initiative	SALIENSEAS Project Team
	**Jelmer Jeuring** Researcher Umeå University Sweden	SALIENSEAS Project Team
Scribe	**Lena Hermesdorf** University of Copenhagen Denmark	

Participants

Participant	Affiliation	SALIENSEAS role
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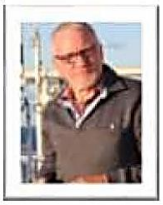
	**Dwayne Ryan Menezes** Polar Research and Policy Initiative d.menezes@polarconnection.org	
	**Siri Veland** Nordland Research Institute sve@nforsk.no	

	**Klaus Harnvig** Harnvig Arctic and Maritime Klaus.harnvig.krane@harnvig-ice.dk	SALIENSEAS Stakeholder Advisory Group Member
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Key Concepts

Scenario terms

Key Factors (Drivers of Change)
Also known as “driving forces”, or “drivers”, these are factors or conditions which collectively will influence the trajectory, magnitude and speed of changes that are relevant to the focal question.

Uncertainties
Characteristics of systems that may be relevant to the focal question, but about which limited knowledge is available or over which there is disagreement about their current or future state.

Scenario process
Identification and evaluation of plausible alternative futures for a region, in light of the identified driving forces and key uncertainties, in order to assess the implications of these alternative futures on the natural and socioeconomic resources of the region, and inform and prioritize long-term research and monitoring decisions for resource managers.

Trends
Directional changes that are relevant to the focal question (i.e., that may influence or be influenced by the outcomes to that question) and are sufficiently clear that they are to some extent predictable.

Future projection
The way a key factor/driver of change could develop in the future. Key factors usually have two to five future projections. Future projections are the core components building individual scenarios.

Plausible/Plausibility
In order to have logical storylines that make sense, developed from the scenarios process, future projections are required to be plausible. Note that plausibility of a future projection is not the same as its probability of occurring. Plausibility assessments are a key scoring component in the formal scenario building process that follows this workshop.

Consistency
Scenarios should be internally consistent, i.e., components of the scenario should not be in stark conflict to each other, or mutually exclusive of occurring. Consistency is another important scoring criteria during the scenario process following this workshop.

Robustness
A robust scenario is both plausible and consistent, but not necessary the most plausible or most consistent.

Definitions of meteorological forecasting ranges (from the WMO)

Nowcasting
A description of current weather parameters and 0 -2 hours description of forecasted weather parameters

Very short-range weather forecasting
Up to 12 hours description of weather parameters

Short-range weather forecasting
Beyond 12 hours and up to 72 hours description of weather parameters

Medium-range weather forecasting
Beyond 72 hours and up to 240 hours description of weather parameters

Extended-range weather forecasting
Beyond 10 days and up to 30 days description of weather parameters, usually averaged and expressed as a departure from climate values for that period.

Long-range forecasting
From 30 days up to two years

Monthly outlook
Description of averaged weather parameters expressed as a departure (deviation, variation, anomaly) from climate values for that month (not necessarily the coming month).

Three month or 90 day outlook
Description of averaged weather parameters expressed as a departure from climate values for that 90 day period (not necessarily the coming 90 day period).

Seasonal outlook
Description of averaged weather parameters expressed as a departure from climate values for that season.

Notes:
(1) In some countries, long-range forecasts are considered to be climate products
(2) Season has been loosely defined as Dec/Jan/Feb = Winter; Mar/Apr/May = Spring; etc...in the northern hemisphere. In the tropical areas seasons may have different durations. Outlooks spanning several months such as multi-seasonal outlooks or tropical rainy season outlooks may be provided.

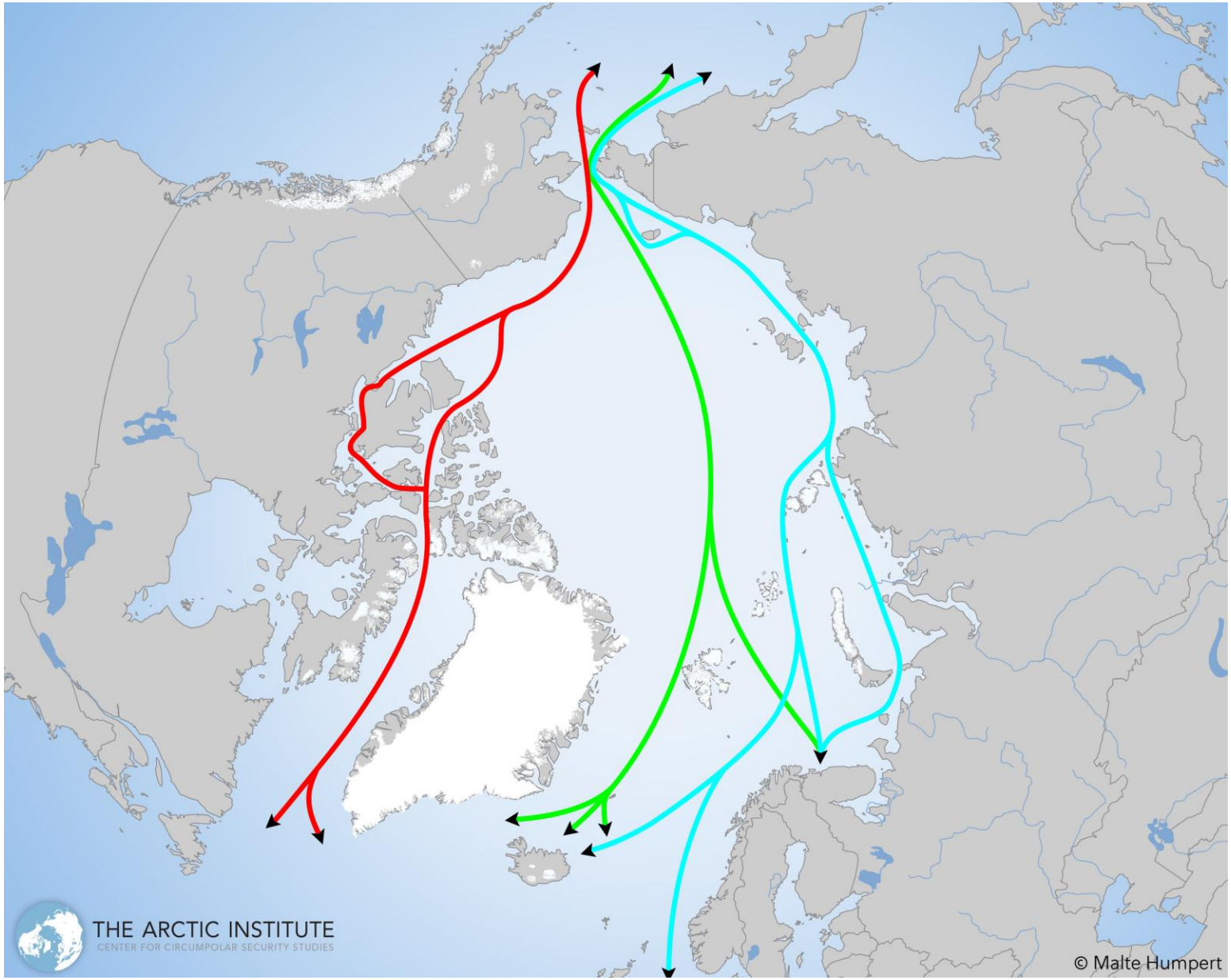
Climate forecasting
Beyond two years

Climate variability prediction
Description of the expected climate parameters associated with the variation of inter-annual, decadal and multi-decadal climate anomalies.

Climate prediction
Description of expected future climate including the effects of both natural and human influences.

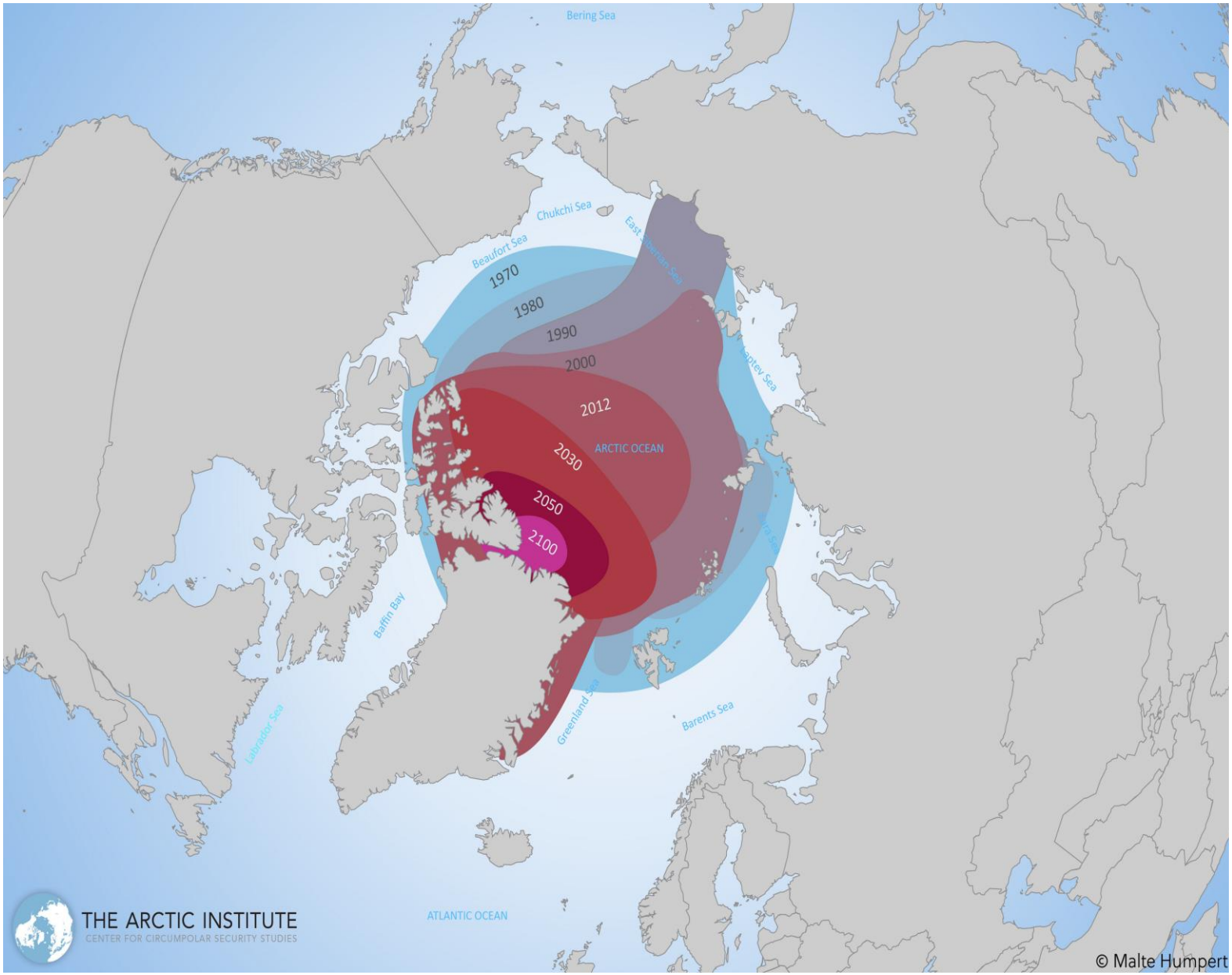
Subseasonal prediction
Time scale of two weeks to two months.

Arctic Shipping Routes



Arctic Search and Rescue Zones

Summer Ice Extent: 1970 - 2100



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Appendix

SALIENSEAS scenario workshop: Supporting maritime stakeholders' metocean and sea ice service needs until 2035 in European Arctic waters

Agenda and detailed schedule of activities

8:30 – 9:00 **Registration, coffee**

9:00 – 9:05 **Host's welcome**
S. Olsen

9:05 -9:30 **Introductions**
M. Lamers

9:30 – 10:00 **Activity 1 | Process Introduction and focal question: "What information is needed for optimal decisions toward safe and sustainable maritime activities now and through 2035?"**
D. Cost and M. Lamers

Description:
This initial activity is intended to explore the scenario process and the focal question. Following a brief presentation on the workshop and expectations, the focal question is considered by the whole group. In the final minutes, participants are asked to write down, on post-it notes, words that complete the sentences "The things that enhance safety in maritime activities include..." and/or "The things that promote sustainability in maritime activities include..." Post-it notes are collected at the end and put on display.

Activity Goal:
Participants feel welcome and understand the point of the workshop and its outcomes
People begin to consider (i) the interplay between metocean information and safe operations, and (ii) larger systemic factors that impact this interplay.

Results
Notes taken during the icebreaker and discussion of focal question, and participant sticky notes finishing the sentence

10:00 – 10:15 **Plenary Presentation | Introduction to Activity 2**
D. Cost

10:15 – 11:15 Activity 2 | Key Factors: Small Group Exercise

Description:
Participants are divided into 4 groups. Small groups deliberate and come up with 4-8 important drivers of change in each group (minimum 4, maximum 8), that impact the interplay between metocean services needs and safe & sustainable maritime operations (optimal decision making environment). These are planned and discussed through writing on flip charts with markers to allow room for bullet list of ideas and any notes. The final list is written on 8 post-it notes (one key factor per) in each group, affixed to a flip chart page. At the end of the exercise, group leaders hang their sheet on the wall for next activity.

Activity Goal:
Participants identify the most important drivers of change that impact currently, and will continue to do so, the type of services and information that create the most optimal decision making environments for maritime sectors.

Results
Collection of 30-40 key factors produced by participants on post-it notes, and notes taken during the small group discussions.

11:15 – 11:30 Break

11:30 – 12:00 Activity 3 | Key Factors: Plenary

M. Lamers and J. Jeuring

Description:
Plenary discussion about the list of key factors identified in small groups: duplicates are collated to eliminate redundancy.

Activity Goal:
This activity will result in a list of key factors that impact currently, and will continue to do so, the type of services and information that create the most optimal decision making environments for maritime sectors. proposed by participants without duplicates.

RESULTS:
List of 20-25 unique key factors identified by participants that impact currently, and will continue to do so, the type of services and information that create the most optimal decision making environments for maritime sectors.

12:00 – 12:30 Activity 4 | Voting on most influential key factors: Plenary

D. Cost

Description:
Each participant works on their own. Using color dot stickers that represent key factor impact (green dots) and key factor uncertainties (red dots) participants rank each key factor based on how much they impact information needs for safe/sustainable marine activities, and the level of uncertainty they pose. Participants may put several (or all) color dots on one key factor, or distribute across several.

Guiding questions:

- Which of the drivers most influence metocean / sea ice forecast needs in the region?
- Which drivers have a high level of uncertainty?
- Which drivers have the most influence over future change?

Activity Goal:

Identify the key drivers and relationships among these key drivers that will have the most influence upon the future of maritime operations and metocean service needs in the region. This activity will organize this group of key factors by their relative levels of influence on change and by their level of uncertainty. The participants will have a list in mind of what key factors are affecting service / information needs; what they know about as important and less important; what they feel is most uncertain about our knowledge.

RESULTS:
Key factors ranked by level of impact and level of uncertainty.

12:30 – 13:30 Lunch

13:30 – 13:45 Plenary Presentation | Future projections small group exercise: Introduction to Activity 5

D. Cost

13:45 - 15:15 Activity 5 | Future projections: Small groups exercise

13:45 – 15:00 Activity 5 Part I: Future projections, plausibility

Description:
Participants are divided into 4 groups, each group is tasked with 3 key factors and their future states. This activity will identify a number of possible future states (2-4 depending on expert input) for each key factor. A very simplified example: if *marine traffic* is determined as a key factor in driving Arctic metservices demands, and is one of the top 10, participants might identify 3 possible future states for this driver of change: (i) increased traffic, (ii) unchanged levels of traffic, (iii) decreased traffic. Participants are encouraged to make a bullet list of what maritime operations would look like under each future projection especially with regards to any impacts on the type of metservices decision makers will need.

To finish the activity, each participant completes a plausibility scoring sheet for the future projections in their group. Participants consider the future projections they designed for their assigned key factors, and give a plausibility score for each. Example: taking 1.0 as the total sum plausibility score, the key factor marine traffic may see future projections increased traffic; unchanged levels of traffic; and decreased traffic receive plausibility scores of 0.8, 0.1, and 0.1 respectively.

Activity Goal:
Identify the possible evolutions of each key factor, taking into account the system as a whole (six-system view).

Results
List of key factors and their future projections. Each future projection receives a plausibility score, which is vital to later stages of WP2 simulation tool development. Notes taken during group discussions by note takers on description of future projections (these should have descriptive titles, nevertheless more detail is useful)

15:00 – 15:15 Activity 5 Part II: Indicators

Activity Goals:
Participants consider and reflect on indicators for future projections: for each, what are measurable variables that allow us to track decision points, thresholds, signal points?

Results: Each future projection receives a list of indicators that can be used to observe, measure (simulate) phenomenon.

15:15 – 15:30 Break

15:30 – 16:00 Activity 6 | Plenary Reflections

M. Lamers and D. Cost

Description:
In the first half of the activity, each group reports to the whole group on their final list of future projections, with a very brief description. Activity ends with group reflection on the day's activities.

----Scenarios process concludes here

16:00 – 17:00 DMI and MET.no take the floor | Presentation and discussion of ongoing projects and next steps from service provider perspective

M. Mueller, S. Olsen, M. Lamers

17:00 Adjourn

Notes


Baffin Bay
Greenland Sea