DNV AS, Norway

EARTH OBSERVATIONS FOR BALTIC AND ARCTIC SHIPPING

EO4BAS Stakeholder workshop Report

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Objective: The overarching objective of the EO4BAS project is to establish current information needs and best practices for the use of Earth Observation based products and services within the Arctic and Baltic shipping sectors. This is the stakeholder workshop report, which is one of the conducted activities in WP 1.

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A	2023-04-12	First issue	JAPEVA, HAKRUU, RAKSKA	PHOFF	OGOK
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Table of contents

1 INTRODUCTION

Climate change is opening access to the Arctic waters, bringing increased traffic and new types of vessels to the Arctic region. The economic development and the increased access, raise operational and policy issues that require both individual responses and collaborative approaches among industries, national governments, and local communities.

The project **E**arth **O**bservations **for B**altic and **A**rctic **S**hipping (EO4BAS) aimed to identify the current needs and best practices for the use of satellite-based products and services within Arctic and Baltic shipping. During the project stakeholders having experience within the following business areas were brought together:

- Ship design
- Ship construction
- Ship certification
- Insurance
- Voyage planning
- End of life vessel disposal.

The project engaged with key stakeholders to build consensus on

1. the operational and managerial situations in which Earth Observation (EO) derived information products and services can be used, and
2. the key elements to be addressed to ensure that EO data products and services fit the purpose specified.

The main objective was achieved by performing working packages. The objective of WP1 was to identify and consolidate geoinformation requirements and associated constrains for business processes in Arctic and Baltic shipping. This included all business processes mentioned above and shipping operations in the Arctic and the Baltic Sea.

To obtain information directly from the industry a dedicated stakeholder workshop was organized and took place on the 22nd of March 2023 at the DNV headquarter in Høvik, Oslo. The workshop was attended by 16 stakeholders and 13 consortium partners.

The workshop consisted of the project status presentation, common and breakout sessions where geoinformation needs and restrictions for use of geoinformation from satellite earth observation were discussed with stakeholders. Discussions were steered by polls and whiteboard brainstorming exercises to ensure relevant input for work package WP1. The workshop also worked as an arena for the stakeholders and the project partners to get to know each other better, which was seen beneficial for the further work in the project especially in stakeholder involvement in the other work packages.

This report documents the main elements of the workshop.

1.1 Abbreviations

EO	Earth Observation
ESA	European Space Agency
EO4BAS	**E**arth **O**bservations **for B**altic and **A**rctic **S**hipping

2 GENERAL INFORMATION

The workshop was held at the DNV headquarter at Høvik, Oslo, on Wednesday 22. March 2023, scheduled from 10.00-15.00 UTC +1.

The workshop was organized by DNV, with the WP1 leader Janne Valkonen in lead.

2.1 Organizers and participants

The workshop was attended by 16 stakeholders, their names and companies are listed in Table 2-1. In Table 2-2 the consortium partners that attended the workshop can be found. DNV was the organizer of the workshop.

Table 2-1 Stakeholder participant list

Company	Name
Henrik Sand Damgaard	Blue Water
Alexis Dorais	FedNav
Luca Sapia	CGI
Andrew Fleming	BAS UK
Klaus Harnvig Krane	Harnvig Marine
Daniel Chiarioni	AON
Claudia Pani	AON
Paolo Modica	AON
Ola Grobak	ESA
Sara Aparicio	ESA
Nick Hughes	MET Norway
Jukka Salminen	Aker Arctic
Demarte Maurizio	Italian Hydrographic Institute
Stefanucci Samuele	Italian Hydrographic Institute
Enrico Allieri	ASSARMATORI
Morten Mejlænder-Larsen	DNV

Table 2-2 Consortium partner participant list

Company	Name
Janne Valkonen	DNV
Barbara Scarnato	DNV

Øystein Goksøyr	DNV
Håkon Jonsson Ruud	DNV
Rakel Skaret-Thoresen	DNV
David Watson	DNV
Alessandro Marin	CGI
Marzia Franceschilli	CGI
Luca Domenico Sapia	CGI
Chiara Pratola	e-GEOS
Achille Ciappa	e-GEOS
Donatella Giampaolo	e-GEOS
Dino Quattrociocchi	e-GEOS

2.2 Agenda

The agenda for the workshop is shown in Table 2-3.

Table 2-3 Agenda for the workshop

Time	Agenda item	
10:00-10:30	Welcome and introductions	All participants
10:30-11:30	EO4BAS work and findings so far on stakeholder interviews and literature survey	DNV
11:30-12:00	Stakeholder comments / feedback	DNV and stakeholders
12:00-13:00	Lunch	
13:00-13:45	Breakout session, business processes	DNV and stakeholders in smaller groups
13:45-14.00	Coffee break	
14:00-14.30	Common session for breakout session results	All participants
14:30-15:00	Project plans ahead	Consortium partners
15:00	Closing of the meeting	

3 CONTENT

3.1 Welcome and introductions

The workshop was opened by the WP1 leader Janne Valkonen. After a short introduction of the workshop agenda and goals of the day each participant got the chance to introduce themselves. As the project was still in its early stage, it was important that all participants got to know each other and got to understand what the different stakeholder could contribute with in the project.

3.2 Presentation

To achieve the WP1 objective outlined in Chapter 1, one of the activities scheduled for the initial phase of the project was to conduct interviews with stakeholders. The stakeholders who have been interviewed by DNV include Aker Artic, Arctia, FedNav, MET Norway, the Italian Hydrographic Institute, and DNV's experts on certification and end-of-life disposal.

The findings of these interviews were presented by Håkon Jonsson Ruud from DNV during the workshop. The presentation can be found in Appendix A and was subsequently distributed via email to all participants.

Comments to the presentation:

- The EO parameter “wish list” in the presentation is pretty much like how it has looked for many years. Even though there have been many accomplishments in this area, users often find it challenging to locate and access the data that is relevant to their needs. Despite the market having the required frequency on satellite data, it is sourced from various satellites, which adds to the complexity of the search process. Therefore, a significant goal would be to simplify data navigation and facilitate user access to relevant data. This is particularly important given feedback from stakeholders and users indicating that the current frequency is insufficient.
- See that one of the important parameters is ice edge and its variability. Is land fast ice of interest for the industry as well? Stakeholder from MET Norway states that information on the land fast ice border tends more to affect the people coming from land, not the ship operators. A stakeholder from BAS adds that it is recourse demanding to get that information into the ice maps as it needs to be hard coded into the maps, it is not an automatic process.

3.3 Live polls

To deepen and harmonize the information obtained in the workshop, 5 questions were asked to the workshop participants through live polls in the Teams chat. There was a short discussion after each poll to get more information behind the answers. The questions and feedback from the participants are listed below, and a screenshot of the result for each of them can be found in Appendix A.

Question 1: Most ships do not conduct tactical navigation in ice?

- Result: Yes: 83%, No: 16%
- Comments: Yes, most stakeholders agree that this is the case.

Question 2: Ice information is the most used EO data for shipping in the Arctic and Baltic Sea?

- Result: Yes: 100%, No: 0%
- Comments: Very little other EO parameters are used by the shipping industry directly from satellites

Question 3: Those who operate in ice want high frequency, fast delivered SAR with good enough resolution (no high res)?

- Result: Agree: 100%, No: 0%
- Comments: The SAR data has high enough frequency and a resolution of 250 m is good.

Question 4: If the EO data was more available, I would have used it more?

- Result: Yes: 83%, No: 16%
- Comments: Most stakeholders agree that to a large extent there is enough EO data available, but still needs to be integrated and more easily accessible. Then it would be used more.

Question 5: Have you seen any requirements from authorities related to using EO data in your operations?

- Result: Yes: 33%, No: 66%
- Comments: Most stakeholders have not, but the once that have has seen it in relation to permits for scientific operations and Polar Code requirements.

3.4 Breakout sessions

For the breakout session the stakeholders were split in two groups based on the business area they represent, the two groups can be found in Appendix D. The Microsoft Teams tool Whiteboard was used to discuss and answer three questions related to the stakeholder's use and thoughts around EO data.

During the session the stakeholders were given approximately 5 minutes to consider each question and write their answers on "sticky notes" on the whiteboard. This approach ensured that everyone's viewpoints were taken into account, not just those who were the most vocal. Once all participants had finished writing their responses, the group discussed and examined the answers together which led to very fruitful discussions on the industry needs and struggles on using EO as well as potential solutions for how to tackle the challenges in the future.

The whiteboards with the answers from each of the two breakout sessions can be found in Appendix B. A summary of the results and discussions from both breakout sessions follows below.

Question 1: What are your barriers to greater use of EO (Earth Observation) data?

- The cost of acquiring data is a significant consideration for most clients, and the pricing structures vary widely among different providers. Non-free products are often underutilized due to both their purchase costs and the fact that free products are frequently of comparable quality.
- Potential and current end users of satellite EO data face confusion regarding where to find the most relevant data for their needs. They often lack knowledge of the available data, where to access it, and the products or services that the market offers. The relevance of data is determined by its suitability for various stakeholders' purposes. However, data access remains a significant barrier for end-users due to various obstacles. For instance, ordering satellite data typically requires establishing a personal connection with the provider, and the ordering and downloading processes differ from one provider to another. There is a need for standardisation and a single point of access as well as access directly to data via API.
- Potential users need to be more aware of EO capabilities and needs to be trained in how to use them.
- Lack of resources to develop new processing chains. R&D projects often ends in products with a low readiness level. A lot is of research on data processing is done on universities, but it does not result in a ready for use product.
- In high latitudes, north of N80', the lack of good internet connection is a problem.

- Too long preparation time of EO data before dissemination.
- Lack of proper organized time series of various ice data for specific areas.
- Data policy - restricts use/sharing
- From the perspective of marine insurance, the new data could provide valuable insights that can enhance the insurance market's vision. However, we should exercise caution in how we use this data, as insurers may lack familiarity with the market. The additional data could reveal greater operational risk, which would affect the provision of insurance services. Therefore, a careful and informed approach is necessary to ensure that the new data benefits both the insurance industry and the market as a whole.

Question 2: What types of EO information could be of interest (both today and in the future)?

- During the discussion, stakeholders expressed interest in various types of ice data. These included 24/7 ice concentration and ice drift maps, as well as information about the position of ice blocks and the thickness and pressure of ice (including information about snow on ice). The stakeholders also called for improved forecasts of all sea ice parameters, which would be valuable inputs for POLARIS risk assessments. Finally, there was a request for access to historical ice data spanning ten years.
- Higher frequency, want several images throughout the day, not just one or two.
- Want processed and analysed data series for various EO data. Today its mainly up to the end users to do the needed analysis.
- Information about wind and sea currents is of interest.
- Seasonal variation of sea ice in arctic. Flexural strength of the sea ice estimated, transit times calculated for icebreakers in Caspian Sea, only way to estimate snow cover based on precipitation, it to manually estimate the snow cover.
- Need to do more with the data that we already have.
- For metocean purposes, EO information related to sea ice and iceberg hazard monitoring, including L-band synthetic aperture radar (ROSE-L) images, could be of interest. Additionally, improvements to satellite altimeter technology for measuring changes in sea level and ocean currents, as well as bistatic synthetic aperture radar for observing ocean conditions, could also provide valuable information.
- Analysis of how the weather is changing. Seem like the weather is changing more now than earlier years. This is interesting form an insurance point of view. It also seen like the weather forecast is changing more frequently now. Stakeholder from MET Norway informs that the reason for more changes in the weather forecast is due to new technology that makes it possible to do weather analysis closer to real time that makes it possible to update the forecast more often.
- An interest was also expressed for more and better in situ measurements of weather information and ice information from ships.

Question 3: What new application areas do you see for EO data?

- Route navigation optimization software's for use on board ships that calculate for the ice situation.
- Weather routing as a possible way to reduce emissions.
- Application that allows cruise shipping and fishing boats to monitor blue navigation in the Arctic.
- Targeted monitoring of specific locations (ports, straits), or voyages.

- Applications that can give valuable input to autonomous shipping.
- Emissions monitoring.
- Information on local snow showers, and nowcasting input.

5 CONCLUSION AND NEXT STEP

This workshop was held as one of the planned activities in WP1 in the project **E**arth **O**bservations **for B**altic and **A**rctic **S**hipping (EO4BAS). It succeeded in gathering stakeholders from different shipping business processes to share their knowledge and thoughts related to identifying and consolidate geoinformation requirements and associated constrains for business processes in Arctic and Baltic shipping. The stakeholders, the project partners and the workshop organizers got to know each other better, which was beneficial for the further work in the project especially in stakeholder involvement in the other work packages. The workshop was also a good opportunity to introduce new stakeholders into the project.

The workshop provided essential information for creating user personas for different business processes that are showcased in D1.2 Geoinformation Requirements. Discussions initiated by presentations, polls and breakout session questions provided deeper knowledge that built understanding of geoinformation needs for different business processes. Combined with information from the literature survey and the stakeholder interviews formed good basis for creating user personas who provide generic view for data users in different shipping business processes. Further, gathered information helped to create a better understanding of shipping industry geoinformation needs for the Arctic and Baltic Sea.

One of the general conclusions was that there is a lot of EO data on the market already, but both current and potential users face confusion regarding where to find the most relevant data for their needs. They often lack knowledge of the available data, where to access it, and the products or services that the market offers. This gap is partially closed by specific shipping service providers and initiatives in shipping companies to gather available satellite data to process it to suitable products for end users themselves. But on satellite service providers' side there were often less readily processed products available suited for shipping industry.

Surprisingly, the workshop was united on the conclusion that it is easier to access free satellite EO data than to get hold of commercial satellite products. This is because access to satellite EO in free to use platforms is more straight forward than on commercial data providers sites which are more varied in the way of access ranging from websites to need to call the provider. Also, overview on available satellite product and information on where satellite passes are better available on platforms providing free satellite EO information. Most stakeholders rely solely on free satellite EO products for this reason. Further, the cost of satellite EO data on commercial sites is a barrier for use as well. Only some specific projects with large budgets like offshore oil and gas development use commercial satellite data.

Most used geoinformation is ice information and in the form of ice charts. They are used for both strategic and operations planning. This level of information is useful for vessels that operate outside of ice or close to ice edge. Most vessels do not perform tactical navigation in ice that would typically require more detailed ice information often derived from SAR satellite products. For tactical navigation higher temporal resolution and fast delivery to ship after satellite passing is a commonly recognized requirement. Level of spatial resolution depends on combination of temporal resolution and needed swath for satellite image. Of which the latter might be more important for vessels navigating through ice.

To complete the discussions of the workshop and to get a deeper understanding of the different stakeholders need, more interviews was done in the weeks following the workshop. In addition, an online poll was sent out after the workshop to sharpen the collected information on EO parameters the industry is using and will need in the future.

APPENDIX A
Workshop presentation

Work so far:

- Interviews:
  - Aker Artic
  - Arctia
  - FedNav
  - MET Norway
  - Italian Hydrographic Institute
  - DNV experts on certification and end of life disposal
- Literature survey:
  - Key Environmental monitoring for Polar Latitudes and European Readiness (KEPLER)
  - PAME reports
  - Arctic Shipping Best Practice Information Forum
- EARSC Portal:
  - Framework developed by EARSC
  - Information will be start getting added by DNV after handover next week.

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Business processes

- Ship design,
- Ship construction
- Ship certification (class and flag)
- Insurance
- Ship operations (Voyage planning)
- End of life vessel disposal

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Ship design – use of satellite EO data

- EO data indirectly used through for determining metrological parameters in the operational area in general design process.
- Satellite data is used in early design phase as input for ship concept selection process.
  - Historical information of ice conditions,
  - Also, for selection of sea trial areas.
- During sea ice trials high resolution ice information is used for tactical navigation and for selection of suitable locations for ice tests (level ice, ridges).
- POLARIS is used to determine ice class requirement for operation area and time
  - Past ice conditions from ice charts as input

Current use:

- Ice data
  - Ice charts
  - Concentration (for POLARIS)
  - Thickness
  - Ice deformation
  - Ridges
  - Ice edge
  - Stage of development (for POLARIS)
- Weather data
  - Weather forecasts for ice trials

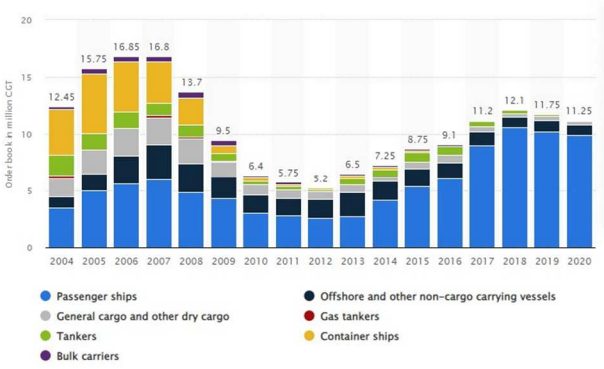
Ship design – use of satellite EO data

- Future wishes:
  - More data with easier access
  - Statistical information from historic ice data, weekly or monthly > 10 years statistics
    - Thickness, concentration deformed ice
  - Better information on ice ridges
  - Possible applications:
    - Real time tracking of operational parameters and vessels behaviour (as input to future designs).
    - Autonomous and remotely -operated ships

- Challenges:
  - Limited bandwidth in high latitudes during sea trials
  - Difficulties to access ice information
  - Suitable processed data not readily available

Ship construction

- 150 large shipyards in Europe.
  - Around 40 active in the global market for large seagoing commercial vessels.
    - Market share of around 6% in terms of tonnage and 35% for marine equipment.
- EO data is not directly used.
  - Weather forecasts are sufficient to meet their needs.



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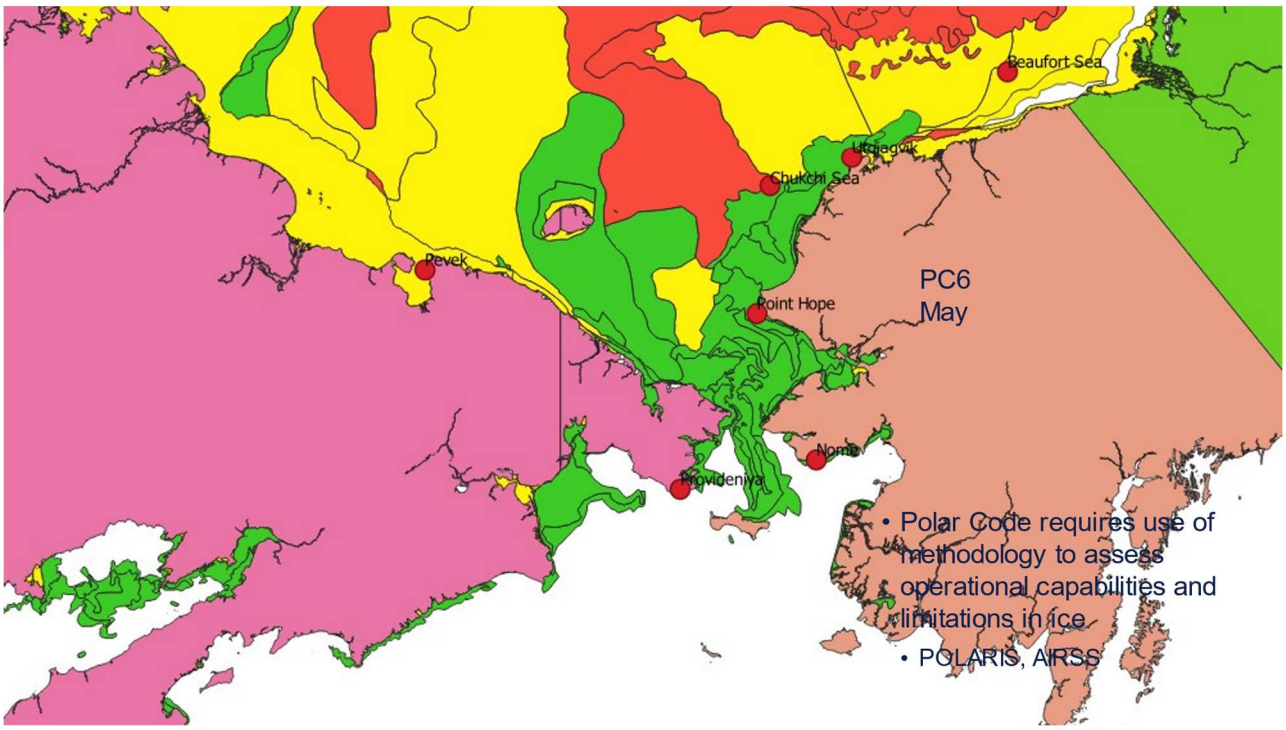

Ship insurance

"As we know, the Arctic is a challenging environment. So much so that insurers consider it to be at the frontier of risk. Arctic risks are only written on special acceptance basis as quite literally, they are off the insurance coverage map"

– Neil Roberts, Head of Marine and Aviation, Lloyd's Market Association
(Arctic Shipping Best Practice Information Forum, fifth meeting 2021)

In assessing Arctic risks, insures effectively improvise. In interviews with Reuters, those that cover Arctic voyages said they conduct their own assessments, then add up to 40% to the basic premium.

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Ship insurance

Concerns:

- Environmental hazards (ice, weather, visibility, cold, etc).
- Added challenge to crew (cold, lookout shifts).
- Technical challenges (cold, remoteness, navigation).
- Help is a long way away (minor incidents escalate into large claims).
- Little casualty data to go on.

Resulting in expected higher claims in particular with regards to:
Wreck removal, pollution, cargo claims, crew claims, salvage and towage.

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Ship insurance – use of satellite EO data

- Incident investigation
  - Ice charts
  - Satellite observation on ice
    - Location
    - Concentration
    - Ice thickness / stage of development
    - Ice edge

Poseidon principles for marine insurance

The marine insurance industry is used in accordance with IMO's GHG strategy to work as an industry driver for the decarbonization of the shipping industry.

> **"The Poseidon Principles for Marine Insurance are a global framework for assessing and disclosing the carbon intensity and climate alignment of insurers' hull and machinery portfolios"**

Principle 1: Assessment of climate alignment (with GHG goals)
Principle 2: Accountability
Principle 3: Enforcement
Principle 4: Transparency

Possible application for ensuring continuous compliance (ship emission monitoring)

Ship operations

- The EO data requirements differ depending on industry and vessels.
  - Research, fishing, shipping, icebreaking, cruise tourism, etc.
- The majority of ships operating in the Arctic and Baltic (hereunder shipping) does not operate independently inside of the ice edge.
  - For these the location, drift and forecast of the ice edge is of paramount concern.
  - All use ice charts
- Polar Code requires that vessels have means to receive weather and ice information, used in navigation and input for POLARIS or other ice risk evaluation tools.

Ship operations – parameters 1

- Rather larger geographical coverage in cost of resolution
- SAR images with information on ice type and deformation

- Ice data
  - Current use:
    - Ice charts
    - Concentration (for POLARIS)
    - Thickness
    - Ice deformation
    - Ridges
    - Ice movement, compression in ice field
    - Bergy bits
    - Ice edge
    - Multi-year ice
    - Stage of development (for POLARIS)

Ship operations – parameters 2

- Weather data
  - Current use:
    - Weather forecast
    - Wind products
- Future wishes:
  - More frequent images of sea ice (satellite passes in operation area)
  - More processed SAR products
  - Improved ice drift models (sea current forcing)
  - Waves (height and period, direction), observations
  - Wind speed and direction, observations
  - Snowing, snow showers
  - Short term forecast (nowcasting for specific operations)

- Challenges:
  - Limited bandwidth
  - Variable coverage

- Possible applications
  - Surveillance of bottle necks
  - Environmental monitoring
  - Surveillance of green corridors, animal populations.

End of life vessel disposal

(9th edition of the European list of ship recycling facilities)

- No ship recycling facilities in the Arctic
- 11 in the Baltic Sea
  - 4 in Denmark, 4 in Lithuania, 1 each in Latvia, Estonia and Finland

(NGO Shipbreaking Platform's Annual List of Ships Scrapped)

- 8 ships scrapped in the Baltic Sea in 2022 (combined GT of 35 764)

(7 of them in Denmark)

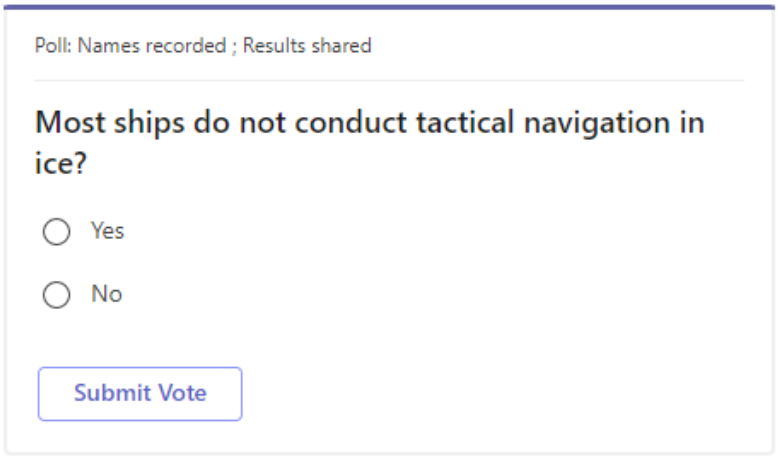
- Baltic Sea accounted for 0.43% of ships scrapped in 2022 (by combined GT)

End of life vessel disposal

Based on our interviews:

- EO data is not used in the ship recycling industry.
- Weather forecasts are sufficient to meet their needs.
- Environmental monitoring documented with in situ measurements.
  - Could be used by authorities for surveillance/inspection of yards.

APPENDIX B
Live polls



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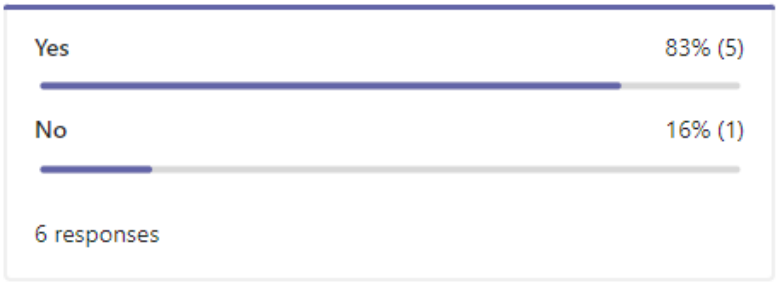

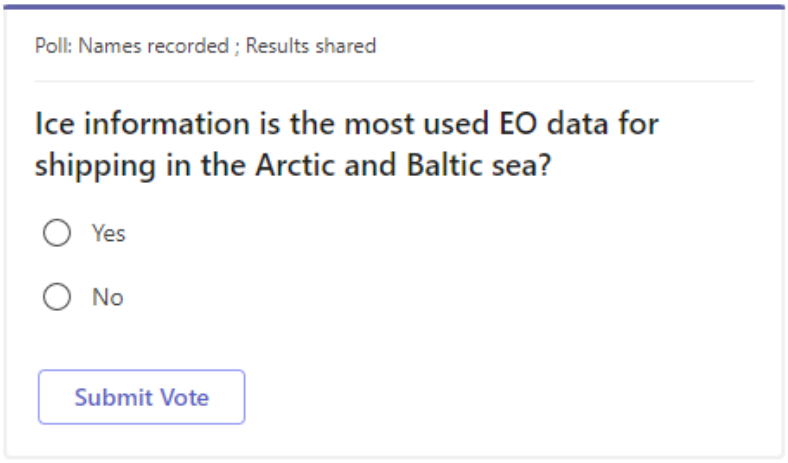

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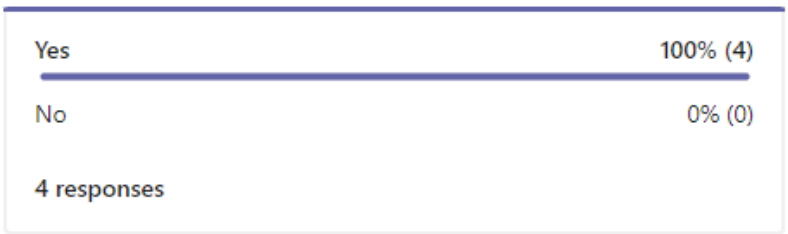


Poll: Names not recorded ; Results shared

Those who operate in ice want high frequency, fast delivered SAR with god enough resolution (no high res)?

- ◯ Agree
- ◯ Do not agree

Submit Vote

Edited

Agree	100% (7)
Do not agree	0% (0)

7 responses

Poll: Names recorded ; Results shared

If the EO data was more available I would have used it more?

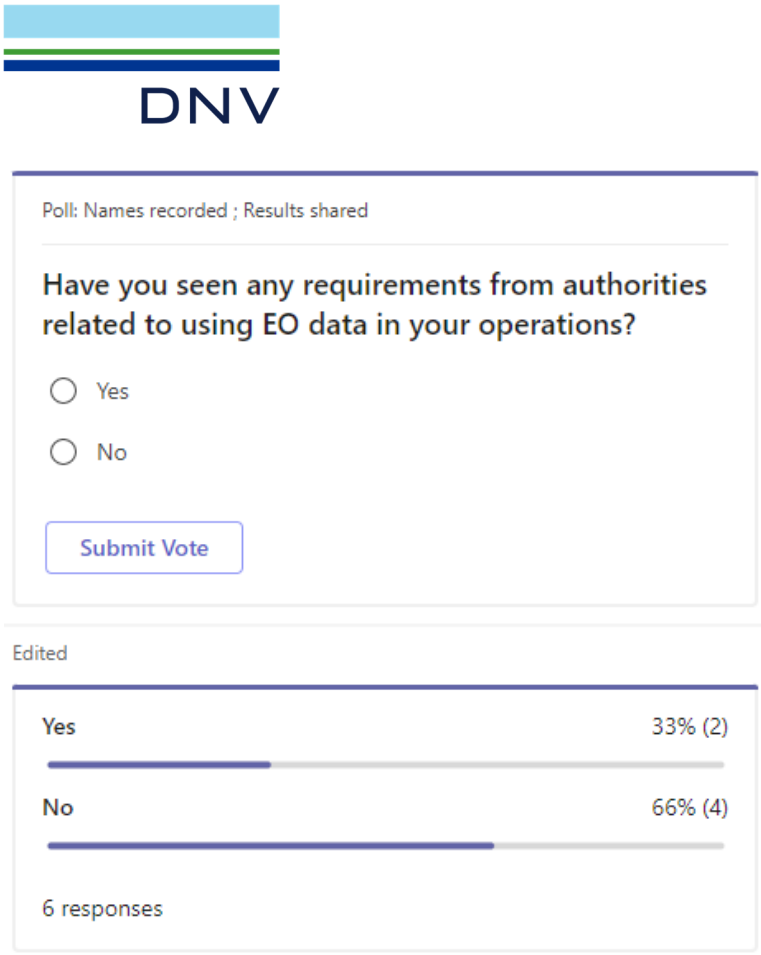
- ◯ Yes
- ◯ No

Submit Vote

Edited

Yes	83% (5)
No	16% (1)

6 responses

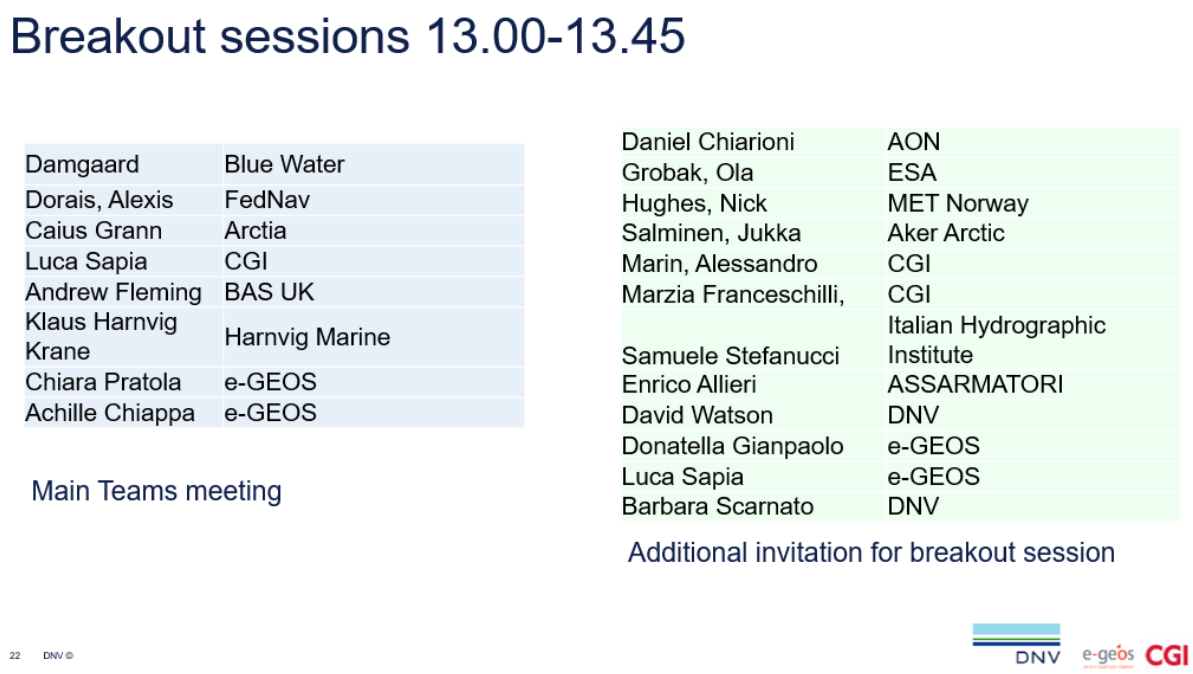

Poll: Names recorded ; Results shared
Have you seen any requirements from authorities related to using EO data in your operations?
Yes
No
Submit Vote
Edited
Yes
33% (2)
No
66% (4)
6 responses

APPENDIX C
Whiteboards from breakout sessions

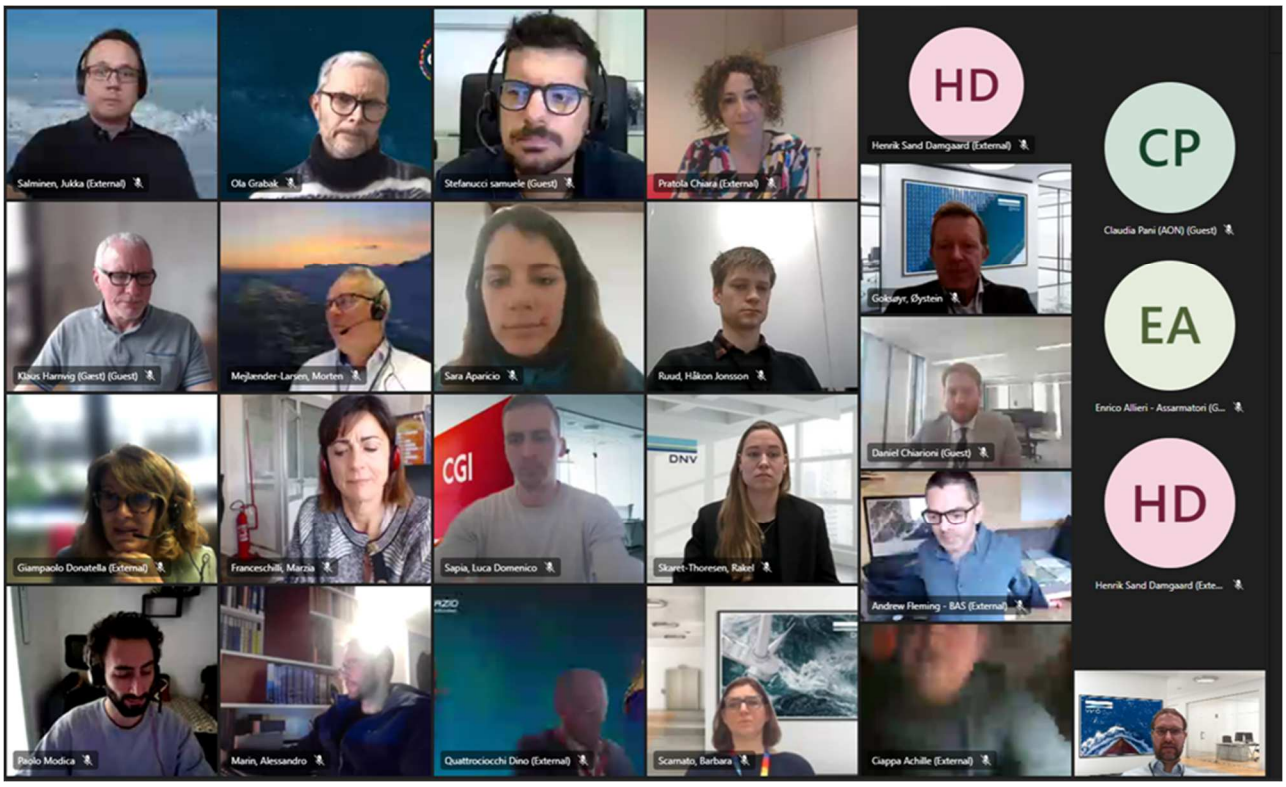
Breakout group 1:

Breakout group 2:

APPENDIX D
Breakout session groups



APPENDIX E
Workshop group picture



About DNV

DNV is the independent expert in risk management and assurance, operating in more than 100 countries. Through its broad experience and deep expertise DNV advances safety and sustainable performance, sets industry benchmarks, and inspires and invents solutions.

Whether assessing a new ship design, optimizing the performance of a wind farm, analyzing sensor data from a gas pipeline or certifying a food company's supply chain, DNV enables its customers and their stakeholders to make critical decisions with confidence.

Driven by its purpose, to safeguard life, property, and the environment, DNV helps tackle the challenges and global transformations facing its customers and the world today and is a trusted voice for many of the world's most successful and forward-thinking companies.