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# BRISK II

## Risk reduction scenario selection

D 3.2

This document is developed within the BRISK II project to explain the process of selecting and deciding on risk reduction scenarios for the Baltic Sea and submitted by the Core Project team on 26.6.2026.

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# 1 Introduction

## 1.1 Background

This data report is part of the long-term risk analysis for oil and hazardous and noxious substances (HNS) pollution from shipping accidents to the marine environment in the Baltic Sea, in short BRISK II. The BRISK II project comprises the following deliverables on the analyses:

- 1 Deliverables under work package 1 include project management related reports (e.g. progress reports).
- 2 Work package 2: Basic analysis
  - 2.1 Method note
  - 2.2 Data collection note
  - 2.3 Traffic analysis
  - 2.4 Cargo analysis
  - 2.5 Accident and spill model
  - 2.6 Probability of oil and HNS release
- 3 Work package 3: Future damage analysis
  - 3.1 Traffic scenarios
  - 3.2 Risk reduction scenario selection (this report)**
  - 3.3 Impact mapping of spilt oil and HNS
  - 3.4 Mapping of environmental vulnerability
  - 3.5 Mapping of environmental damage due to oil
  - 3.6 Mapping of environmental damage due to HNS

## 1.2 Scope

This report presents the process of selecting and finalizing Risk Reduction Measure (RRM) scenarios within the BRISK II project. The relevance of this process to other data was identified and discussed in the Method Note (BRISK II, Method Note, 2025).

The scope of this report is to define the boundaries, focus areas and results of the scenario selection process. It builds upon the methodology established in BRISK I while adapting to current maritime and geopolitical realities. The analysis covers the entire Baltic Sea region, divided into six sub-regions (SR1–SR6). The report utilizes 2024 data as a baseline for current risk-reduction activities, considers the geopolitical scenarios for maritime traffic for the year 2036, and analyses the selected scenarios under these geopolitical traffic scenarios.

This report covers the prevention and response scenarios highlighted in grey in Figure 1-1. The effect of these scenarios will be reported as part of the results in reports D3.5 and D3.6.



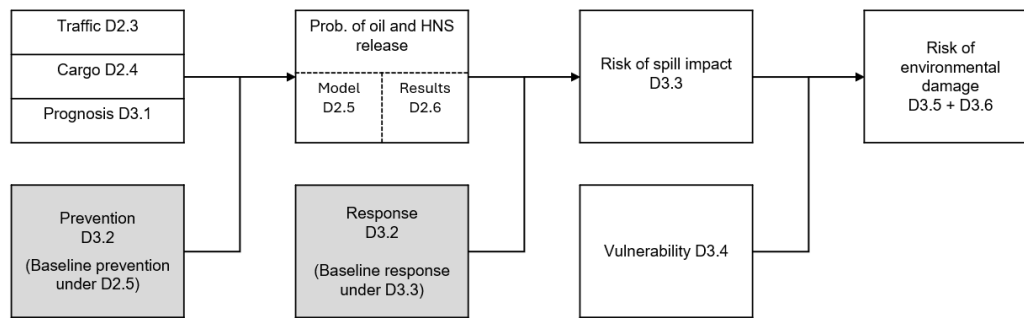


Figure 1-1 Causal chain of the BRISK II model and corresponding deliverables numbers (The present report is highlighted with grey background)

BRISK II is an update of BRISK I project. This means that the newest data on traffic, cargo, fixed objects, prevention and response measures are taken into account whereas the basic methodology is maintained unchanged for the most parts compared to BRISK I. Changes to the methodology are only made when mandated by a change in the real world, such as the appearance of the shadow fleet. Another such change is the emergence of offshore wind farms, which were an almost negligible phenomenon during BRISK I.

The Selection of risk reduction scenarios report is divided into the following chapters:

Chapter 2: Method Definition

Chapter 3: Scenarios

## 2 Method definition

### 2.1 Scenario selection in BRISK I

Based on the provisions of the BRISK I project (2009–2012), a specific methodology was followed to select scenarios aimed at building sufficient emergency and pollution response capacity in the Baltic Sea region. Three main objectives were established for the strategic planning of emergency response, and the selected scenarios were organized into the following categories:

1. Development of ship traffic.
2. Development of emergency response.
3. Additional scenarios for navigational aids, describing measures for avoiding accidents.

The baseline (reference) scenario was established based on ship traffic recorded by the AIS system over a one-year period (July 2008 to June 2009), while the future marine traffic scenario was modelled for the year 2020.

The selected scenarios, developed by Project Partners across various project-specific working groups, were divided into two categories. The first, "Response Scenarios," focused on increasing capacity for recovering oil spilled during accidents. The Additional Scenarios, or Navigational Aids Scenarios (NavA), focused on introducing aids to reduce accident risks and prevent oil spills.

These scenarios included:

#### **Additional scenarios:**

- Mandatory pilotage in Danish straits, Void (omitted)
- Additional VTS
- Additional TSS
- ECDIS (Electronic Chart Display and Information System)
- Double hulls for cargo tanks on tankers <5,000 GT
- Double hulls for bunker tank
- Escort towing

#### **Response Scenarios:**

- Relocation of existing capacities
- Additional equipment (booms, skimmers, etc.) as defined by countries

- 50% more equipment
- Night-vision equipment
- Recovery oil from ice

More details on the selection process and the analysis results for these scenarios are presented in two BRISK I reports (Model Scenarios Report and Risk Model Results, 2012).

## 2.2 Scenario development process

Within the BRISK II project, and considering evolving policies, environmental conditions, and maritime traffic in the Baltic Sea, the selection process for new scenarios began in late 2025. The primary objective was to identify five risk-reduction scenarios, focusing on prevention and/or response, ensuring they are fully aligned with current realities

Once these scenarios are finalized, their associated costs and risks will be calculated and compared against a neutral baseline. To reach the final list of scenarios, several steps were taken to ensure high engagement from national experts across the Baltic Sea countries and to confirm that technical perspectives were fully considered. These steps are mapped in figure 2-1.

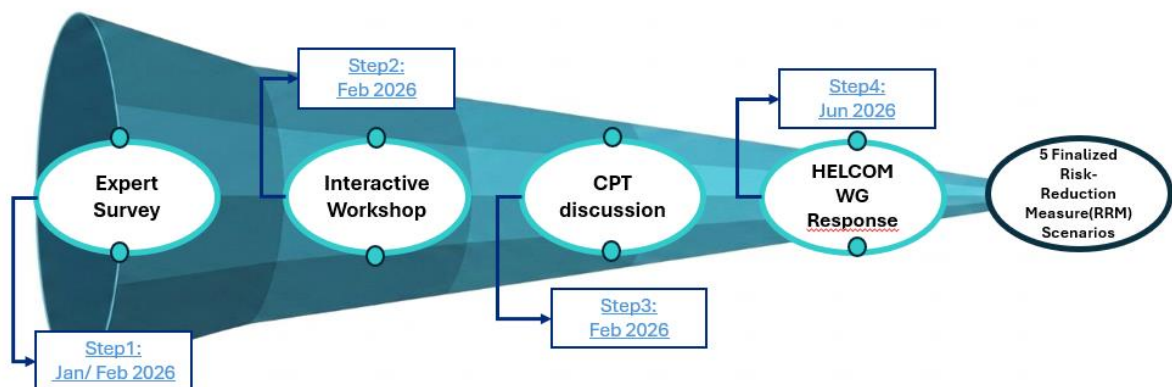


Figure 2-1 The scenario-selection funnel

### Step 1:

A structured questionnaire was developed to gather input from the national authorities of HELCOM WG RESPONSE, WG MARITIME, and additional marine specialists. They were asked to review the BRISK I scenarios and identify relevant parameters to apply to the current model. Additionally, they were invited to propose new scenario ideas (the questionnaire is available in Appendix A).

This questionnaire was distributed to experts representing eight Baltic Sea nations and the European Union. The geographical distribution of the responses is detailed in Table 2-1.

Table 2-1 The distribution of responses by country

| Country                      | Number    | Percentage  |
|------------------------------|-----------|-------------|
| Denmark                      | 1         | 9,1%        |
| Estonia                      | 2         | 18,2%       |
| Finland                      | 3         | 27,2%       |
| Germany                      | 2         | 18,2%       |
| Latvia                       | 1         | 9,1%        |
| Lithuania                    | 0         | 0,0%        |
| Poland                       | 1         | 9,1%        |
| Sweden                       | 1         | 9,1%        |
| European Union               | 0         | 0,0%        |
| <b>Number of Respondents</b> | <b>11</b> | <b>100%</b> |

Feedback from the experts regarding the inclusion of BRISK I scenarios in the BRISK II analysis is summarized in Table 2-2. The raw data and initial ideas needed to begin narrowing down the choices were provided by this valuable input.

Table 2-2 Expert preferences for BRISK I scenarios

| Scenarios                                    | Number | Percentage |
|----------------------------------------------|--------|------------|
| Additional equipment (response)              | 8      | 66,7%      |
| Recovery from ice (response)                 | 6      | 50,0%      |
| Night vision (response)                      | 6      | 50,0%      |
| Additional VTS (prevention)                  | 5      | 41,7%      |
| Double hull at bunker tanks (prevention)     | 5      | 41,7%      |
| Additional TSS (prevention)                  | 5      | 41,7%      |
| Relocation of existing capacities (response) | 5      | 41,7%      |
| Other, what                                  | 5      | 41,7%      |
| Escort towing (prevention)                   | 3      | 25,0%      |
| Number of respondents                        | 12     | -          |

## Step 2:

After collecting and analysing all feedback and comments, an interactive online workshop was held on February 26<sup>th</sup>, 2026, to present the survey results and gather expert input. Workshop participants were invited to bring forward coordinated national suggestions for potential risk reduction scenarios. The aim of the workshop was to gather input on which risk-reduction measures should be analysed as scenarios in the BRISK II project, thereby ensuring the project serves specific national and sub-regional interests while maintaining a cohesive Baltic Sea strategy.



### Step 3:

As illustrated in Figure 2-2, all workshop outputs comprising questionnaire feedback, Mentimeter comments, and verbal discussions were gathered, compiled, and brought forward to the Core Project Team (CPT) meeting in Denmark. During this meeting, held on 6–7 May 2026, these outputs were reviewed by the CPT to develop a concrete list of scenarios for model implementation, marking a transition from data collection to aligned implementation scenarios.

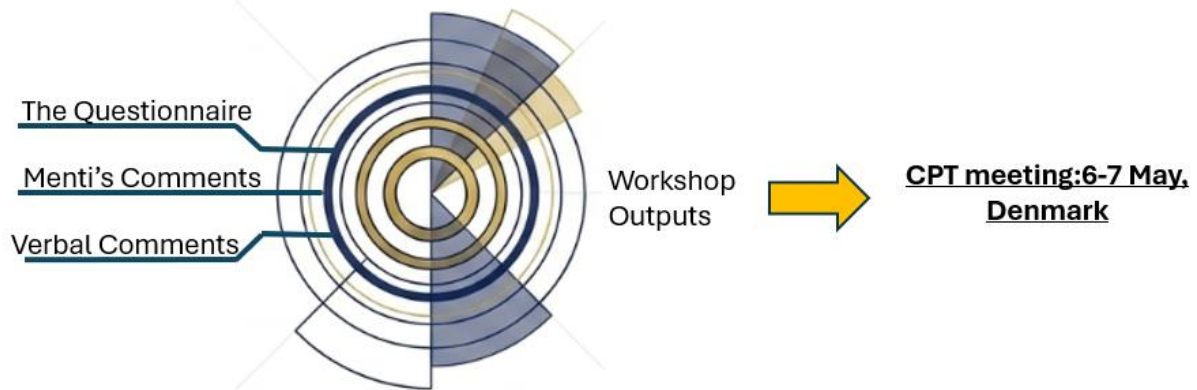


Figure 2-2 Transition from workshop outputs to CPT meeting

### Step 4:

Subsequently, an additional meeting was conducted with the HELCOM Response Working Group (WG RESPONSE 8-2026, 1–4 June 2026) in Hamburg, resulting in the finalization of the selected scenarios. The participants were asked to review and comment on the proposed scenarios, the results of which are presented in Section 3.2 (Selected RRM scenarios).

## 2.3 Decision framework

The Baltic Sea has been divided into six sub-regions, following the same regional divisions used in BRISK I project (BRISK I, Results, 2012), which helps to compare current findings with prior results in a systematic way. Nevertheless, the main purpose of the sub-regions is sub-dividing the results of the risk analysis. They are not linked to other geographical sub-divisions that have been defined to structure the input into the model (e.g. the traffic areas in D2.3 or the pilotage areas in D2.5). These areas are presented in the Figure 2-3.

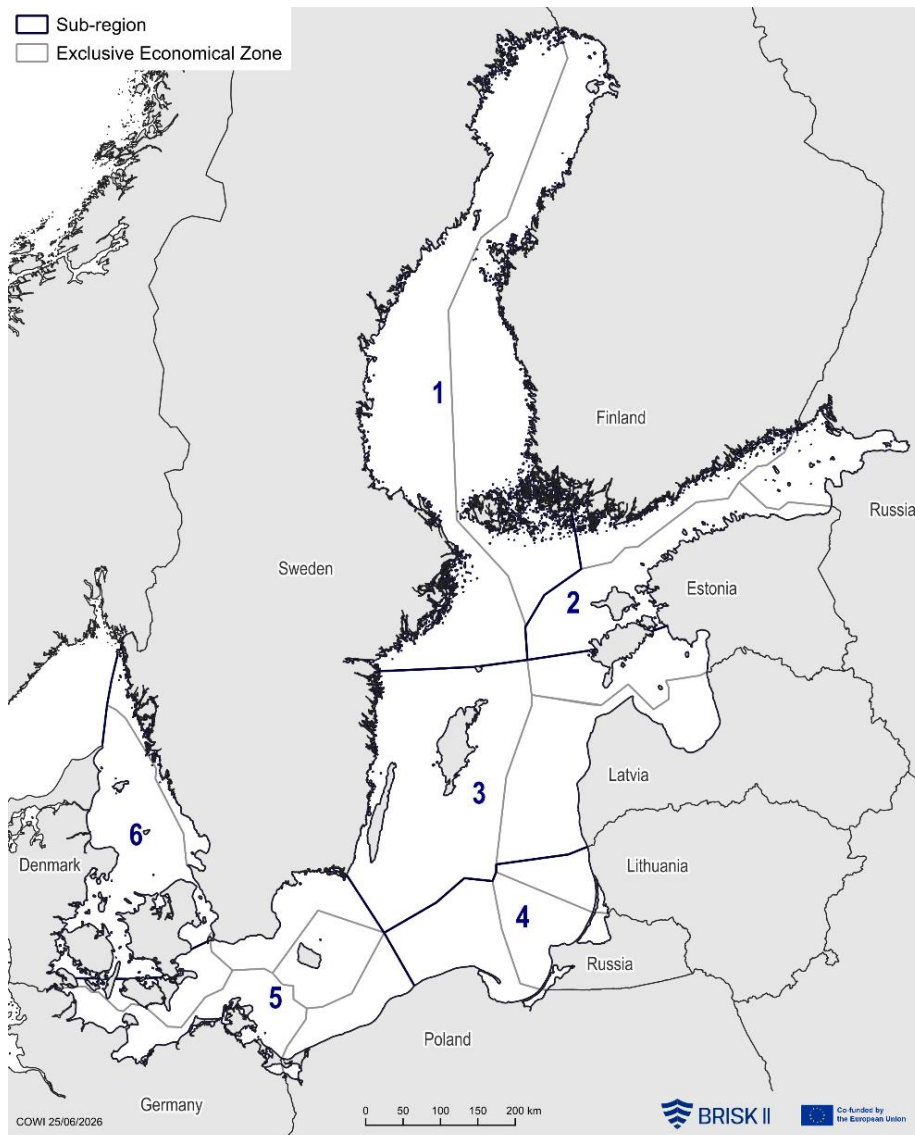


Figure 2-3 *BRISK II sub-regions*

The sub-regions comprise the following countries:

- SR1: SWE, FIN
- SR2: FIN, EST, RUS
- SR3: SWE, EST, LAT
- SR4: LIT, RUS, POL
- SR5: SWE, DEN, GER, POL
- SR6: SWE, DEN

The selection and implementation of the suggested scenarios are categorized as follows: Global (Baltic Sea-wide) Scenarios: Covering all or several parts of the project area. Local Scenarios: Covering only one sub-region or a specific Exclusive Economic Zone (EEZ). Multiple local scenarios may be bundled into a single RRM scenario for a single simulation run.

## 3 Scenarios

### 3.1 Future maritime traffic scenarios (Geopolitical scenarios)

Forecasting future ship traffic patterns is inherently complex due to numerous interconnected and unpredictable factors. This challenge is further intensified by current geopolitical instability, specifically following Russia's war against Ukraine and subsequent EU sanctions. To handle this uncertainty, two distinct traffic scenarios have been defined to represent different potential developments. The project models two maritime traffic scenarios in addition to the current situation represented by 2024 (*for further details, refer to BRISK II Project, Deliverable 3.1: Traffic Scenarios, 2025*):

- 2036-1: Unchanged or worsened geopolitical situation in 2036.
- 2036-2: Improved geopolitical situation in 2036.

### 3.2 Selected scenarios (RRM scenarios)

The five risk reduction scenarios selected are presented below.

#### Scenario 1: Shore and shallow-water response (response measure)

Both BRISK I and BRISK II projects focus on the response at sea and only include this in the baseline response model. All oil and HNS floating on or below the sea surface will eventually reach the coast unless it has been collected or disappeared due to other causes (e.g. evaporation). The baseline response model ignores the fact that some of the oil reaching the coastline can be contained by measures deployed from the shore or from shallow-water vessels. In this scenario, effects of shore response and shallow-water response are included in order to gain an understanding of their risk-reducing effect.

#### Scenario 2: Night detection (response measure)

Some vessels are already equipped with night detection systems that allow the recovery of oil and HNS during hours of darkness. This can have a large effect on the success of the recovery operation, especially during the dark half of the year. In this scenario, the effect of equipping all vessels with night detection systems is investigated.

#### Scenario 3: Combined analysis of various sub-regional response measures

A single scenario run can be used to investigate the effect of several different sub-regional measures, as long as each measure applies to its own separate geographical area. The following local measures have been selected:

- Additional storage capacity (i.e. barges/ships with tanks) in the Gulf of Bothnia (sub-region 1)
- Response to ice conditions in the Gulf of Finland (sub-region 2)
- Relocation of response in the Gulf of Riga towards the west (sub-region 3)

#### Scenario 4: Combined analysis of various sub-regional (prevention measures)

In the BRISK I project, additional traffic separation schemes (TSS) were identified as one of the most cost-effective ways of reducing the risk of oil spills. Consequently, most main routes in the Baltic Sea have since then been converted into TSS.

Vessel traffic service (VTS) is another risk-control option. It is a highly effective, but also costly way to enhance navigation safety.

The first results of the BRISK II project show that there are still some risk hot spots that can potentially be mitigated by introducing either new TSS or VTS. These include:

- Ice pilotage (sub-regions 1 and 2)
- The route from Riga to the Baltic proper, including the Irbe Strait: Relevant for TSS. The Irbe Strait itself is also relevant for VTS (eastern part of sub-region 3)
- The merging areas between the TSS in the Baltic proper (northeast of Gotland and northeast of Bornholm): Relevant for VTS (northern part of sub-region 3 and sub-region 5)

#### Scenario 5: Retrofit all existing response vessels to handle highly viscous fuel oil (response measure)

Currently, only some of the existing response vessels can recover fuel oils with a high viscosity (> 23,000 cSt). Vessels without such equipment cannot recover the spilt oil. Thus, the recovery operation will be delayed until a vessel with suitable equipment arrives at the scene.

It is assumed that half of the existing fleet is already capable of recovering highly viscous fuel oil, while all new vessels (constructed after 2024) will be built with this capability. In this scenario, the effect of equipping all existing vessels with the necessary equipment is investigated.

As shown in Figure 2-4, the matrix maps the five finalized scenarios based on two key criteria: their nature of measure and their geographic scope. This structure ensures a balanced mix of both preventative and response strategies across different geographic scales.

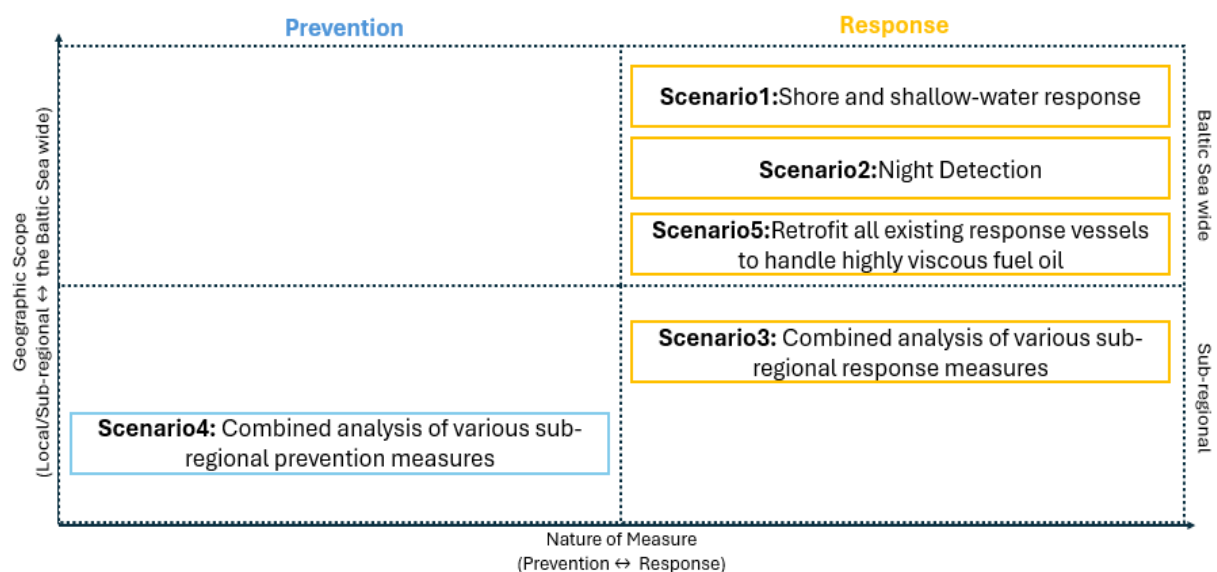


Figure 2-4 The RRM synthesis matrix

### 3.3 Overview of traffic and RRM scenario combinations

The geopolitical scenarios are evaluated against the baseline, which reflects the current state of risk reduction across the Baltic Sea (using 2024 data) and incorporates all existing prevention and response activities. For the risk calculation process, each risk-reduction measure (RRM) scenario will be paired with both future traffic scenarios to ensure a comprehensive assessment against the baseline, which incorporates existing 2024 conditions and planned 2036 traffic estimates. Consequently, a total of 13 scenario combinations will be evaluated. This combination of traffic and RRM scenarios are presented in table 2-3.

Table 2-3 Scenario Combination Matrix

| <b>Risk Reduction Measure (RRM)<br/>Scenario</b>                                                     | <b>2024</b> | <b>2036-1: Unchanged or<br/>worsened geopolitical situation<br/>in 2036</b> | <b>2036-2: Improved geopolitical<br/>situation in 2036.</b> |
|------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------|-------------------------------------------------------------|
| Baseline                                                                                             | 0-0         | 1-0                                                                         | 2-0                                                         |
| 1: Shore and shallow-water response<br>(response measure)                                            | -           | 1-1                                                                         | 2-1                                                         |
| 2: Night detection (response measure)                                                                | -           | 1-2                                                                         | 2-2                                                         |
| 3: Combined analysis of various sub-regional<br>response measures                                    | -           | 1-3                                                                         | 2-3                                                         |
| 4: Combined analysis of various sub-regional<br>(prevention measures)                                | -           | 1-4                                                                         | 2-4                                                         |
| 5: Retrofit all existing response vessels to<br>handle highly viscous fuel oil (response<br>measure) | -           | 1-5                                                                         | 2-5                                                         |

## 4 Abbreviations

|        |                                                                                                                                                                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIS    | Automatic Identification System                                                                                                                                                             |
| CEDRE  | Centre de Documentation, de Recherche et d'Expérimentation sur les Pollutions Accidentelles des Eaux (Center for Documentation, Research and Experimentation on Accidental Water Pollution) |
| CPT    | Core Project Team                                                                                                                                                                           |
| ECDIS  | Electronic Chart Display and Information System                                                                                                                                             |
| EEZ    | Exclusive Economic Zone                                                                                                                                                                     |
| GT     | Gross Tonnage                                                                                                                                                                               |
| HELCOM | Baltic Marine Environment Protection Commission (Helsinki Commission)                                                                                                                       |
| NavA   | Navigational Aids Scenarios                                                                                                                                                                 |
| RRM    | Risk-reduction measure                                                                                                                                                                      |
| SR     | Sub-region                                                                                                                                                                                  |
| TSS    | Traffic Separation Scheme                                                                                                                                                                   |
| VTs    | Vessel Traffic Services                                                                                                                                                                     |
| WG     | Working Group                                                                                                                                                                               |



## 5 References

|                                   |                                                                                                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| ASTM F-631-99                     | ASTM, F631-99. Standard Guide for Collecting Skimmer Performance Data in Controlled Environments, 1999 (Reapproved 2008) |
| BRISK I, report, 2012             | BRISK, 3.2.1. Model scenario report, 2012                                                                                |
| BRISK I, results, 2012            | BRISK, 3.2.2. Risk model results report, 2012                                                                            |
| BRISK II, Method note, 2025       | BRISK II, Method note, deliverable D2.1, 2025                                                                            |
| BRISK II, Traffic scenarios, 2025 | BRISK II, Traffic analysis, deliverable D3.1, 2025                                                                       |

## Appendix A      The questionnaire

### **BRISK II workshop on identification of relevant scenarios to be modelled.**

#### 1-Select your country

Denmark  
Estonia  
Finland  
Germany  
Latvia  
Lithuania  
Poland  
Sweden  
European Union

Welcome to the BRISK II risk reduction scenario workshop.

The BRISK II project will carry out a new strategic long-term maritime risk analysis in the Baltic Sea. The project team will organise an online workshop on 26 February 2026, bringing together HELCOM Contracting Parties that are EU Member States to discuss and select on the set of risk-reduction scenarios to be included in the project's modelling work.

This pre-workshop questionnaire collects the input of the national authorities of HELCOM WG RESPONSE and WG MARITIME. Please provide your input to this questionnaire by 20 February 2026.

Please review the attached PowerPoint presentation before filling in the questionnaire.

2- Which of the scenarios listed below should be included in the BRISK II analysis? Please add comments e.g. if you prefer some scenario to be modelled only for a specific Baltic Sea sub-region.

Note that the scenarios listed below are measures that were modelled in the BRISK I project.

- Additional VTS (prevention)
- Double-hull at bunker tanks (prevention)
- Escort towing (prevention)
- Additional TSS (prevention)
- Night vision (response)
- Relocation of existing capacities (response)
- Additional equipment (response)
- Recovery from ice (response)
- Other, what

3-Which new measures you would like to include in the BRISK II scenarios (such as dynamic/ad hoc relocation of response assets, LSFO spills, new response technologies etc.).

4-Anything you'd like to communicate to the BRISK II project team.

**Data privacy**

Please note that the collected data will only be used for the purposes of BRISK II analyses and assessments. Raw data will not be stored after this project, and individual information regarding e.g. port data will not be distinguishable in the final products. The countries will have an opportunity to review the final products before they are made publicly available.



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