# SIRA

## WORKSHOP

**May 7th, 2024 - Rev.: 02-24**

Naomi Vanderstockt
Rodrigue Bijlsma

Antwerp Maritime Academy

In partnership with

OFFICERS ON WATCH

# SIRA WORSHOP May 7th, 2024

Simplified IALA Risk Assessment (SIRA), an IMO-endorsed methodology performed by Antwerp Maritime Academy in partnership with Officers on Watch VZW for the Belgian Federal Government FOD Environment and DG Shipping

## Colofon (Dutch)

*Opdracht:*

STUDIE BETREFFENDE MOGELIJKE MITIGERENDE EN ADAPTIEVE MAATREGELEN OM DE VEILIGHEIDSSITUATIE IN UITZONDERLIJKE WEERSOMSTANDIGHEDEN VOOR DE SCHEEPVAART ROND DE VERSCHILLENDE BESTAANDE EN TOEKOMSTIGE INFRASTRUCTUREN IN DE BELGISCHE NOORDZEE TE VERBETEREN.

Bestek nr. DGEM/MM/SA/23019-F02

*Opdrachtgever:*

FEDERALE OVERHEIDSDIENST VOLKSGEZONDHEID, VEILIGHEID VAN DE VOEDSELKETEN EN LEEFMILIEU

*Opdrachtnemer:*

Hogere Zeevaartschool Antwerpen – Antwerp Maritime Academy, Noordkasteel Oost 6, 2030 Antwerpen BE 0850.036.932

*Datum: status / revisie:*

7 mei 2024
7 juli 2024 revisie 1
24 juli 2024 Conceptversie aangeleverd aan FOD DG Scheepvaart

*Projectmedewerkers:*
Naomi Vanderstockt
Rodrigue Bijlsma

*English language*

In order to contribute to the international research database we have decided to write the report in English.

# Table of contents

# Introduction

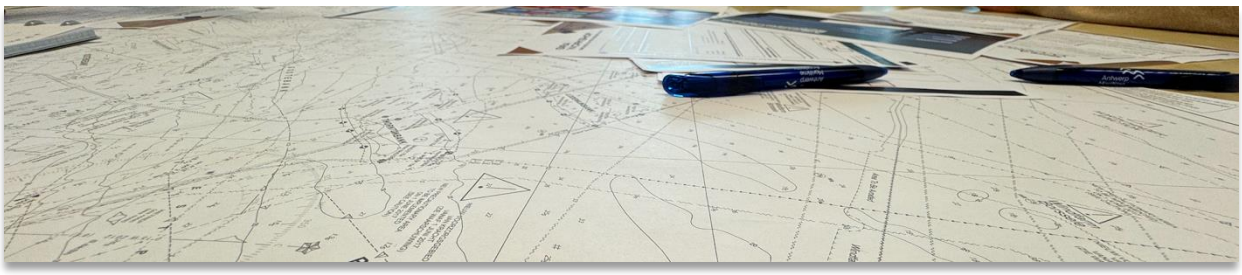


*Figure 1 - Workspace during the SIRA-workshop*

## 1 The Setting

The Simplified IALA Risk Assessment (SIRA) workshop organized by Officers on Watch and Antwerp Maritime Academy in name of FPS Mobility and Transport DG Shipping and FPS Economy on the safety surrounding offshore infrastructure in the Belgian North Sea during extreme weather conditions, was carried out on May 7th, 2024. [1]

The event was led by the lead researchers of the project Naomi Vanderstockt and Rodrigue Bijlsma, and supported by the Project Manager Jan Pas, Nathalie De Jaeger and their team.

The goal of the SIRA workshop is to establish prioritized insights into the mitigating measures supported by the stakeholders involved in marine spatial planning, governance, and operational use of the Belgian North Sea; this is part of the qualitative analysis of the full study.

This report is intended to provide feedback on the observations and the processed data from the workshop using the IMO-endorsed IALA methodology called SIRA. Additionally, the online tool Mentimeter was used to gain deeper insights into the stakeholders thought process by asking targeted questions. Mentimeter is a platform that allows participants to anonymously respond to the questions presented through their personal electronic devices. [2]

The first part gives a brief description of the workshop while highlighting several general observations. The second section discusses the recorded and processed results of the SIRA forms. These were filled out by the participants and integrated into the standard IALA excel file by the researchers, and then analyzed.

[1] International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

[2] https://www.mentimeter.com/

# 2 The Stakeholders

The twenty-five present stakeholders were organized into 4 groups, as shown in the table below. The background and expertise of each participant was considered while composing the groups to ensure optimally balanced teams. One observer from Rijkswaterstaat followed the session online.

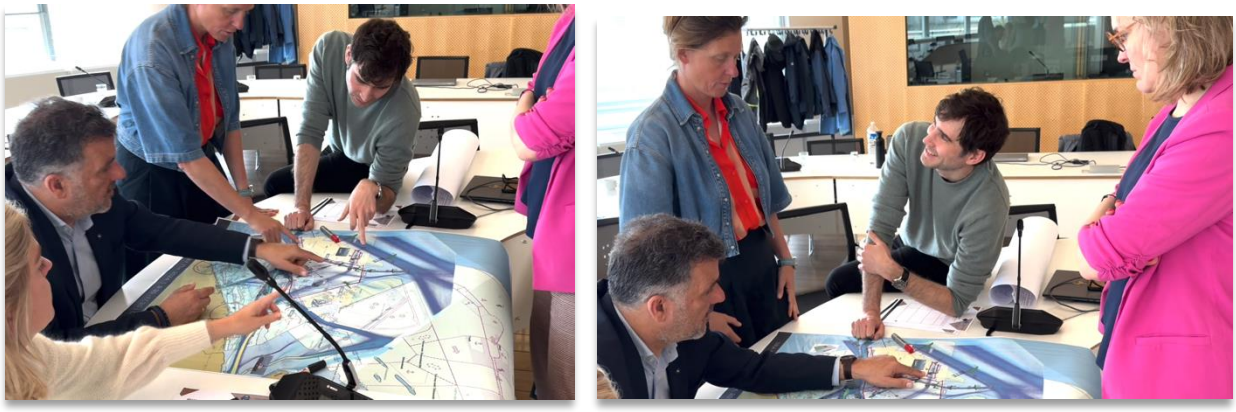


*Figure 2 – Co-working on AIS-heatmap of the Belgian North Sea*

| TEAM 1 | TEAM 2 | TEAM 3 | TEAM 4 |
|---|---|---|---|
| Dept. Governor | VTS (Head) | GNA (Head) | FOD DG Shipping |
| FOD DG Shipping | Institute of Natural Sciences (BE) | Rijkswaterstaat (NL) | FOD DG Shipping |
| FOD DG Shipping (technical manager) | Sea Pilot (BE) | MRCC | Sea Pilot Coordinator |
| Elias (Head of Assets) | Otary (COO) | FOD DG Shipping | Belgian Offshore Platform |
| Offshore Research | FOD DG Shipping | FOD DG Shipping | FOD DG Shipping |
| FOD DG Shipping | FOD DG Shipping | FOD DG Economy | FOD DG Shipping |
| Student (thesis on MSP) | | | |

*Table 1 – General overview of the team members*

# 3 The Opening questions

The tool *Mentimeter* was used to gauge responses of the participants in an interactive way. [3]
The images below show the Q&A of the following two questions:

## 3.1 Question 1: "What do you expect of the day?"

### Answers and trends

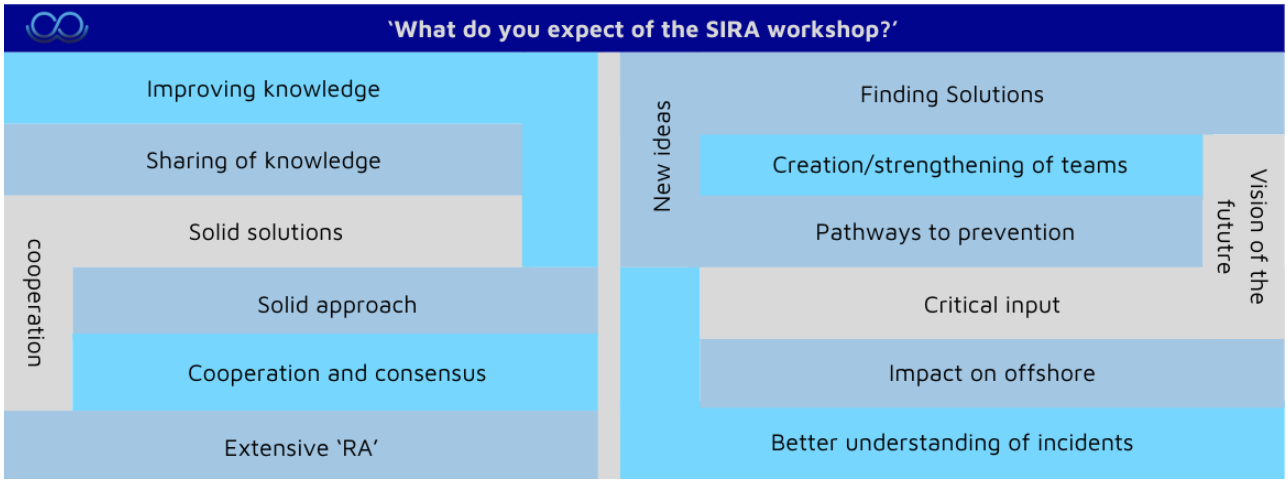



*Figure 3 – Trends for the opening question*

### Trends:

- Cooperation (x 3)
- Sharing/improving knowledge (x6)
- Concrete solutions/approach (x4)
- More holistically: vision of the future and improved safety in the North Sea (x2)

[3] https://www.mentimeter.com/

## 3.2 Question 2: "Describe your expertise in one word."

This question gives an indication of the expertise of the present participants:

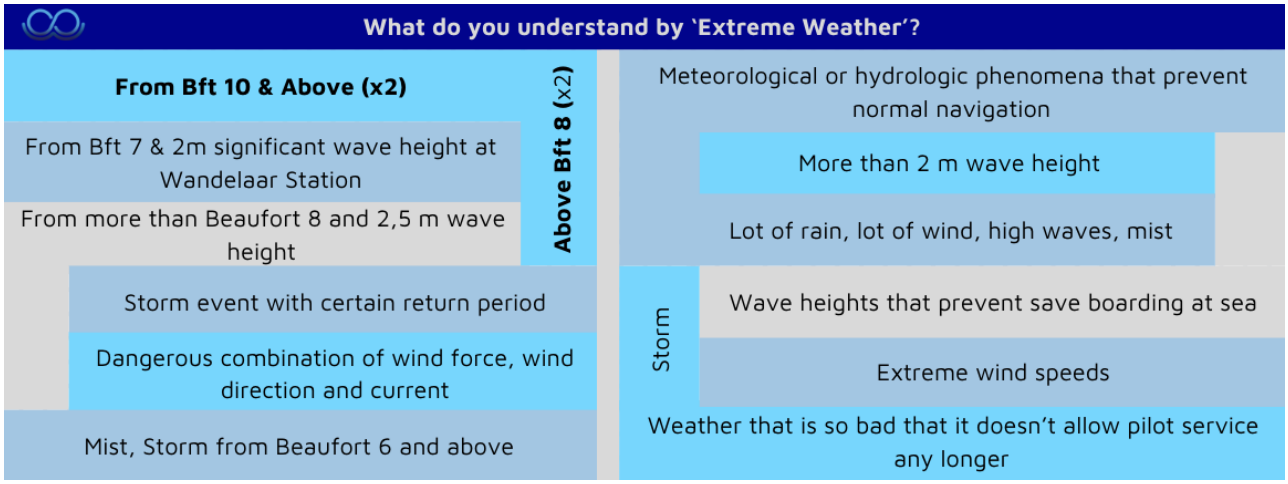
### Result for Level of expertise

| | | |
|---|---|---|
| Officer on Watch | Navigation | Governance |
| Pollution response | VTS | Marine Spatial Planning |
| Emergency Planning | Technical | Port State Control |
| Emergency Plan Coordinator | Nautical | Navigational safety |
| Offshore operations and maintenance | | |

*Figure 4 - Level of expertise as answered by the participants through Mentimeter*

# 4 Understanding of Extreme Weather

One element that jumped out with unmistakable clarity early in the session was the extent of the spectrum of the definition of 'extreme weather' amongst the stakeholders. All were asked to respond to the informal opening question anonymously through the website mentimeter.com: ***'What do you understand by 'extreme weather conditions?'*** This is the translation of the question on the image below, which is a screenshot of the question and answers that were given and effectively displays the extent of range between the views. The participants were all from the Belgian Maritime scene or closely related, with one exception being from Holland (an expert on maritime traffic from Rijkswaterstaat). This highlights that even on a national level, it does not suffice to merely refer to 'extreme weather' as this can mean very different things to different stakeholders.




*Figuur 1 Translated answers to the question: "What do you understand by 'Extreme Weather' Conditions?'*

Note that only two of the answers (marked in bold) were not unique:

- From Beaufort 10 and above (x2)
- Above Beaufort 8 (x2)

While these are merely opinions and are not necessarily connected to the actual written policies, they do provide an idea of the misalignment of the concept.

These answers provide an idea of the misalignment of the concept of "Extreme Weather". Another observation, which is also evident from the literature study on this topic, is that there are clearly detectable recurring factors such as:

- Wind force
- Visibility

- Significant (or other) wave height
- The inability to continue with pilotage service (operational limitations)
- The combination of several of the above

# 1 Methodology: Introduction

This report communicates the results of the IMO-endorsed IALA methodology called SIRA and the additional observations that were made using the online tool Mentimeter. It is part of the broader research on the safety surrounding offshore infrastructure in the Belgian North Sea during extreme weather, which has the goal of quantifying and prioritizing risks and mitigating measures during extreme weather conditions, including the evaluation of risk according to vessel type, so that informed and substantiated action can be taken by the authorities to ultimately achieve a higher degree of safety in the Belgian North Sea.
This report is part of the quantitative analysis of the complete study as can be seen in the overview of the methodoly of the complete report:

### Qualitative:

- Detailed analysis of Storm Eunice & the Area
- Literary study of European and non-European research, scientific publications, and regulatory policies
- Stakeholder Interviews
- Simplified IALA Risk Assesment (SIRA) workshop with stakeholders
- Full-mission bridge exercises

### Quantitative:

- IALA Waterway Risk Assessment Program (IWRAP MkII)
  - Case-by-case analysis method

The literary study into existing measures and studies, the quantitative and qualitative analysis result in a prioritized list of possible measures and how their risk score compares to the current one.


*Figuur 2 Presenting the SIRA steps during the workshop.*

# 2 SIRA Methodology

This section describes the SIRA steps which are part of IALA guideline G1138, and were used during the workshop and to process the data.

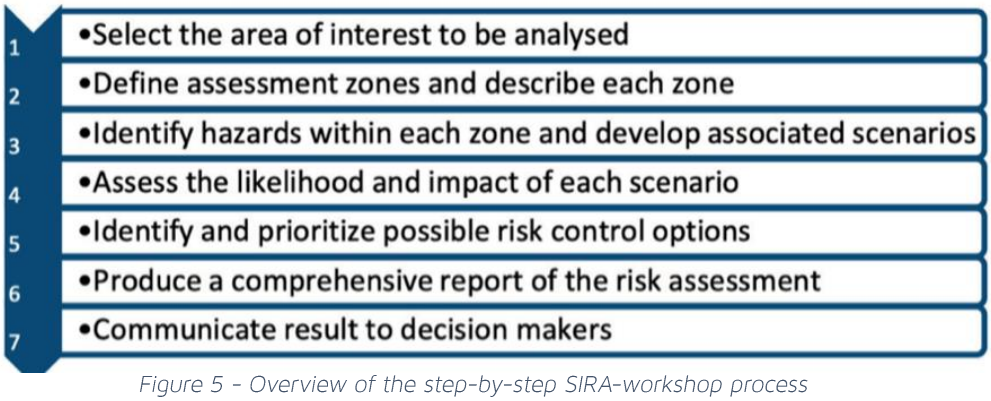



*Figure 5 - Overview of the step-by-step SIRA-workshop process*

## 2.1 STEP 1 – Preliminary zone selection (PRE-WORKSHOP)

In step 1, the zone is described and defined by the facilitator. This is done prior to the onset of the workshop.

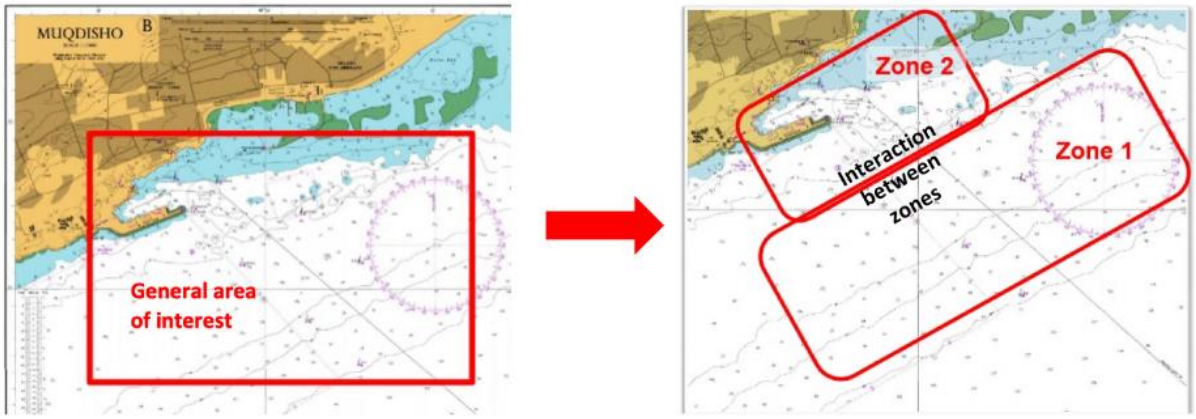



*Figure 6 – Preliminary zone selection*

## 2.2 STEP 2 – Define & Describe Assessment Zones (WORKSHOP)

While a preliminary selection of the area is proposed by the facilitator, this step of clearly defining assessment zones has to be carried out by the stakeholders as part of the workshop.
If zones are close to each other or overlapping, the possible interaction between hazards in these zones should be considered.
In some regions, where there is considerable seasonal change (e.g., increased leisure or fishing activity, etc.) a separate analysis may be required for each season. There may also be variations between day and night-time conditions. Consideration must also be given to the accuracy of available data (e.g., CatZOC).
The zones should be described in sufficient detail to identify potential hazards, and the likelihood and impact of undesirable scenarios.

Once zones have been selected, each zone and its variations can be described in terms of:

- Geographical coordinates
- Volume and mix of traffic
- Bathymetry (e.g., charts, recent hydrographic surveys)
- Geometry of routes in the area, traffic choke points and sharp bends
- Oceanographic, meteorological and environmental conditions
- Existing fixed and floating Marine Aids to Navigation and routing measures
- Port regulations and services e.g.:
- VTS
- Pilotage services (either voluntary or compulsory)
- History of maritime incidents such as collisions and groundings
- Relevant stakeholders
- Particularly Sensitive Sea Areas (PSSA), marine parks and other ecologically sensitive areas
- Restricted and danger areas
- Coastal communities (e.g., heritage, tourism, leisure, industry, fishing)

## 2.3 STEP 3 – Identify Hazards within Each Zone (WORKSHOP)

Each group should identify hazards for each of their defined zones, categorizing them and using all available resources to support their arguments. The hazards are then to be further defined as undesired events.

### Hazards can be grouped into the following categories:

- Natural
- Economic
- Technical
- Human
- Operational
- Marine spatial planning
- Waterway complexity
- Hazard identification should be based on all available relevant information, including, but not limited to:
- Volume and mix of traffic along all routes and areas within the zone.
- Geometry of routes in the area, traffic choke points and sharp bends.
- Isolated dangers including wrecks and obstructions.
- Quality of hydrographic data and charted information available.
- Anchorages, fishing grounds; aquaculture and offshore energy sites and access and egress routes
- Safe minimum depth required for vessels operating within the waterway and tidal constraints.
- Meteorological visibility in the zone.
- Passages through a narrow channel, restricted waters or port entry.
- Possible effects of low sun, background lighting or glare.
- Spoil grounds, undersea cables, military exercise areas and PSSA and other areas of ecological interest.
- Historical evidence of natural and/or malicious interference to GNSS signals.
- Information in the IMO Ships' Routeing Publication and Sailing Directions.
- Problems with marine communications that have been identified in the past.
- History of maritime incidents such as collisions and groundings.
- Future or proposed infrastructure, technological or environmental developments

When identifying hazards, the largest scale charts covering the zones should be used, and if available, AIS density plots are very useful for describing actual routes within each zone.

## 2.4 STEP 4 – assess the likelihood of impact of each scenario (WORKSHOP)

SIRA specifies five levels of likelihood and five levels of the impact that each type of undesirable scenario would create. Each is allocated a score from which a risk value is calculated as the product of likelihood and impact scores.
Each group must calibrate the scale both for likelihood and impact.

| Classification | Score | Likelihood |
|---|---|---|
| Very rare | 1 | Very rare or unlikely, will occur only in exceptional circumstances and not more than once every twenty years. |
| Rare | 2 | Rare, may occur every two to twenty years. |
| Occasional | 3 | Occasional, may occur every two months to two years. |
| Frequent | 4 | Frequent, may occur once weekly to every two months. |
| Very frequent | 5 | Very frequent, may occur at least every week |

*Table 2 – Classification of Likelihood*

The table beneath provides an example impact scale for a selection of categories, such as service disruption and the environment, and these categories are a suggested starting point. For example, areas of interest that also contain heritage or cultural assets may require individual consideration. The impact categories should reflect the features of the area of interest. The highest score across the categories should be used in combination with the likelihood score to obtain the risk value.

| Description | Score | Service disruption | Human | Environment | Reputation | Economic |
|---|---|---|---|---|---|---|
| Insignificant | 1 | No service disruption apart from some delays or nuisance. | No injury to humans, perhaps significant nuisance. | No damage. | Unaffected. No effort or expense required to recover | Insignificant impact |
| Minor | 2 | Some non-permanent loss of services such as the closure of a port or waterway for up to 4 hours. | Minor injury to one or more individuals who may require hospitalization. | Limited short-term damage to the environment. | Minimally affected. Little effort to recover. | Minor impact |
| Severe | 3 | Sustained disruption to services such as the closure of a port or waterway for 4-24 hours | Injuries to several individuals requiring hospitalization. | Short term damage to the environment in a small area. | Damaged. Some effort and expense to recover | Severe impact |
| Major | 4 | Sustained disruption to services such as the closure of a major port or waterway for 1-30 days or permanent or irreversible loss of services | Severe injuries to many individuals or loss of life. | Long term to irreversible damage to the environment in a limited area | Severely damaged. Considerable effort and expense required to recover. | Major impact |
| Catastrophic | 5 | Sustained disruption to services such as the closure of a major port or waterway for months or years | Severe injuries to numerous individuals and/or loss of several lives. | Irreversible damage to the environment in a large area. | Irrevocably destroyed or damaged. | Catastrophic impact |

*Table 3 – Scale of impacts*

Each group identifies control options for each undesired scenario and prioritizes these using risk factors. Having determined likelihood and impact scores by consensus, the risk value can be calculated in accordance with the matrix in the table below:

| | | PROBABILITY/LIKELYHOOD | | | | |
|---|---|---|---|---|---|---|
| | | Very Rare (1) | Rare (2) | Occasional (3) | Frequent (4) | Very Frequent (5) |
| CONSEQUENCE (IMPACT) | Catastrophic (5) | 5 | 10 | 15 | 20 | 25 |
| | Major (4) | 4 | 8 | 12 | 16 | 20 |
| | Severe (3) | 3 | 6 | 9 | 12 | 15 |
| | Minor (2) | 2 | 4 | 6 | 8 | 10 |
| | Insignificant (1) | 1 | 2 | 3 | 4 | 5 |

*Table 4 - Probability & Consequence Matrix*

The next step is to determine whether those risks are acceptable or not. SIRA specifies four color-banded levels of risk. These are shown in the visual below:

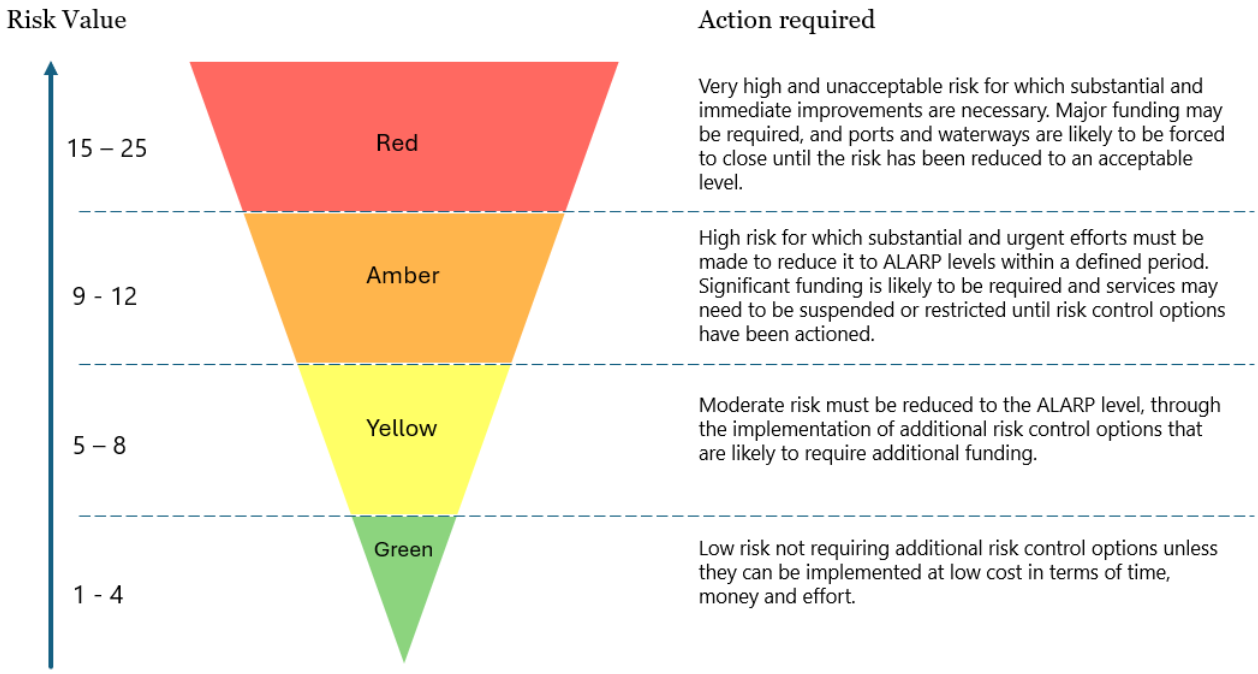



*Table 5 - Four main Risk Categories*

## 2.5 The concept of "as low as reasonably practicable" – ALARP

The FSA methodology (see figure below) requires that any risks that are intolerable (i.e., in the red category in SIRA) should be identified and improved immediately. In reality, this may not be immediately achievable through the application of the SIRA process. It may require more detailed analysis through tools such as the Ports and Waterways Safety Assessment (PAWSA) to get more detailed risk information for the remaining intolerable risks and their potential mitigation measures.

For those risks in the green category the level of risk is considered acceptable. For those risks lying in between these upper and lower bounds (i.e., yellow and amber), they should be appraised to understand how the risks can be reduced to a level "as low as reasonably practicable" ALARP.

| | | PROBABILITY/LIKELYHOOD | | | | |
|---|---|---|---|---|---|---|
| | | Very Rare (1) | Rare (2) | Occasional (3) | Frequent (4) | Very Frequent (5) |
| CONSEQUENCE (IMPACT) | Catastrophic (5) | 5 | 10 | 15 | | |
| | Major (4) | 4 | | 12 | | |
| | Severe (3) | 3 | 6 | | 12 | 15 |
| | Minor (2) | | | 6 | | 10 |
| | Insignificant (1) | | | 3 | 4 | 5 |

"INTOLERABLE"
Risks to be ALARP
"TOLERABLE"

*Table 6 - ALARP*

The definition of this ALARP level within the FSA is a level that is considered to be cost effective, technically practicable, and the associated costs should not be disproportionate to the benefits gained. This implies that there should be a balance between the reduction in risk and the costs of achieving that reduction.

Different organizations will have differing views of what is reasonably practicable to reduce risk and what level of residual risk is acceptable; this balance is also referred to as risk appetite.

By definition in the FSA, in order to understand how control measures identified through a navigational risk assessment reduce the risk level to ALARP, it is also necessary to undertake a cost-effectiveness analysis. This is beyond the scope of SIRA; the SIRA methodology facilitates identification of control measures that theoretically will reduce the risk, and an estimated cost of those control measures, but does not undertake a cost-effectiveness analysis.
The control measures and associated costs, however, can be examined in a subsequent cost-effectiveness appraisal (Step 4 of the FSA), to identify if the resulting level of risk is ALARP in reality (i.e., technically feasible and reasonably affordable) and if the residual risk is acceptable for the organization.

## 2.6 STEP 5 - Identify and Prioritize risk control options (WORKSHOP)

An objective of the assessment is to identify risk mitigation options for each undesirable scenario that could reduce the risk to an acceptable level if implemented. These may include:

- Improved coordination and planning
- Additional training and education
- Enforcement of new or existing rules and procedures
- Improved and up to date charted information, including hydrographic, meteorological and general promulgation of navigation information
- Enhanced AtoN service provision
- Improved radio communications
- Active traffic management, such as VTS
- Changes to the waterway
- Pilotage requirements

Due to the nature of the process, the outcome of the risk assessment is qualitative/subjective. The aim is to reach a consensus on each risk control option so that the relevant organization can consider implementing the proposed risk mitigation measure(s). The recommended risk mitigation measures should be prioritized to facilitate decision making. An initial whole life cost estimate of the recommended risk mitigation options may also be useful for decision makers.

## 2.7 STEP 6 – Produce a Comprehensive Report of the Risk Assessment (WORKSHOP & POST WORKSHOP)

This step was partially carried out during the workshop using the provided forms created by Officer on Watch and used to complete the standard SIRA excel form.
The risk assessment record, as described in the IALA guideline, takes the form of a matrix (on excel):

- Listing all hazards considered likely to result in an undesirable scenario;
- assigning a risk value to the undesirable scenario;
- considering risk mitigation measures for each scenario; and
- reappraising of risk value (residual risk) following mitigation.

This enables decision-makers to prioritise and assign appropriate resources to implement the suggested measures, therefore reducing the risk to an acceptable level.
A template risk matrix can also be found on the IALA website. This is a Microsoft Excel workbook with a template worksheet to assist risk assessment for a zone. The worksheets can be duplicated to align with the number of zones and the workbook serves as an essential record of the workshop conversations and risk assessment.

In addition to this requirement the researchers created this document to share the results, and the forms to collect data in a streamlined manner.

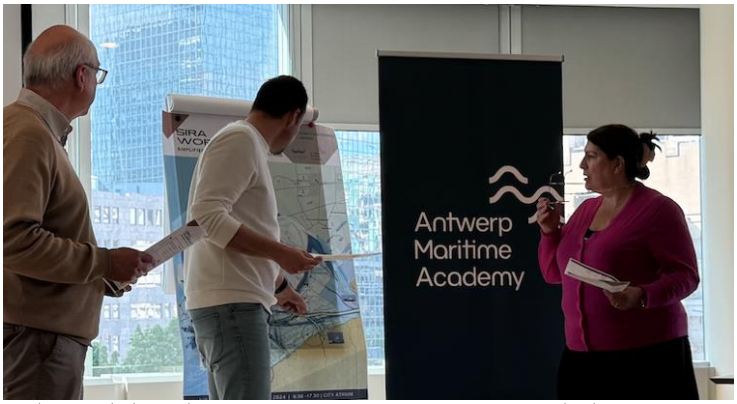



*Figure 7 – During the workshop there were intermittent sessions in which groups presented their thoughts with the other participants.*

As mentioned in the introduction, the SIRA workshop only takes the participants through steps 2 to 6; the seventh step happens after the workshop and consists of communicating the findings to the decision makers.
This final step is done in the following three ways:

- A concise report on the SIRA workshop (this document)
- A comprehensive report of the SIRA workshop with additional details on the calculations (appendix in the final study)
- The integration of the findings into the complete study on the safety of navigation surrounding offshore infrastructure in the Belgian North Sea during extreme weather conditions.

# 1 The Results: Recorded & Processed Data

While the previous section highlights the methodology, this section goes into the data collected throughout the workshop and processed as per IALA standard procedures. As explained earlier, the participants received a set of forms that they were tasked to fill out as a group for each step. These filled in forms were then used by the organizers to complete the standard IALA excel form that is part of a SIRA workshop. The complete excel form will be attached to the study, not this report. Once populated with the collected data, the researchers analyzed it to create more clarity and understanding of the mitigating measures put forward by the participants.

## 1.1 The Hazards

Part of the SIRA steps is dedicated to identifying and defining hazards and undesired scenarios. The four main categories of hazards identified by the participants where:

- Collision
- Allision
- Terroristic/Cyber Attack
- Destruction/Damage to Cables or Pipelines

For each of these main categories undesired scenarios were described by the participants. The full list can be found in the excel file that will be part of the study's final report. However, several trends will be shared in this report.

## 1.2 Allision

Allision- is the one to which the most undesired scenarios were attached. After analysis of the raw descriptions made by the participants the following two distinctions could be made in the category:

- Geographic location
- Cause: Not Under Command (nearly all) or Powered (one)

The causes allocated to allisions due to a vessel not being under command are indicated in the table below; the cause lies either with the watch keeper (37.5%) or a technical failure (62.5%).

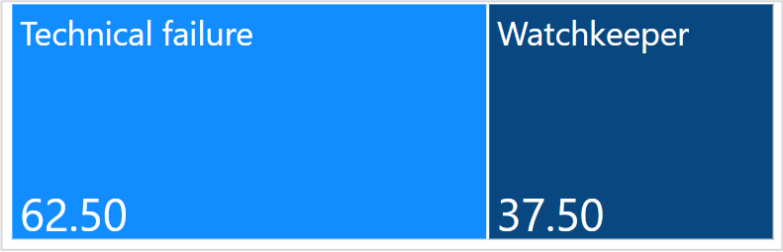



*Table 6 – Allision due to NUC*

## 1.3 The Proposed Mitigating Measures Categories

The table below shows a list of all measures proposed by the participants, grouped into categories. Note that the nuances of each are not recorded in this table but will be discussed separately. For instance, the category 'Protection of Cables/Pipelines' includes mention of several more specific measures: rock protection, digging in the cables deeper, and not allowing larger vessels in the vicinity of them.

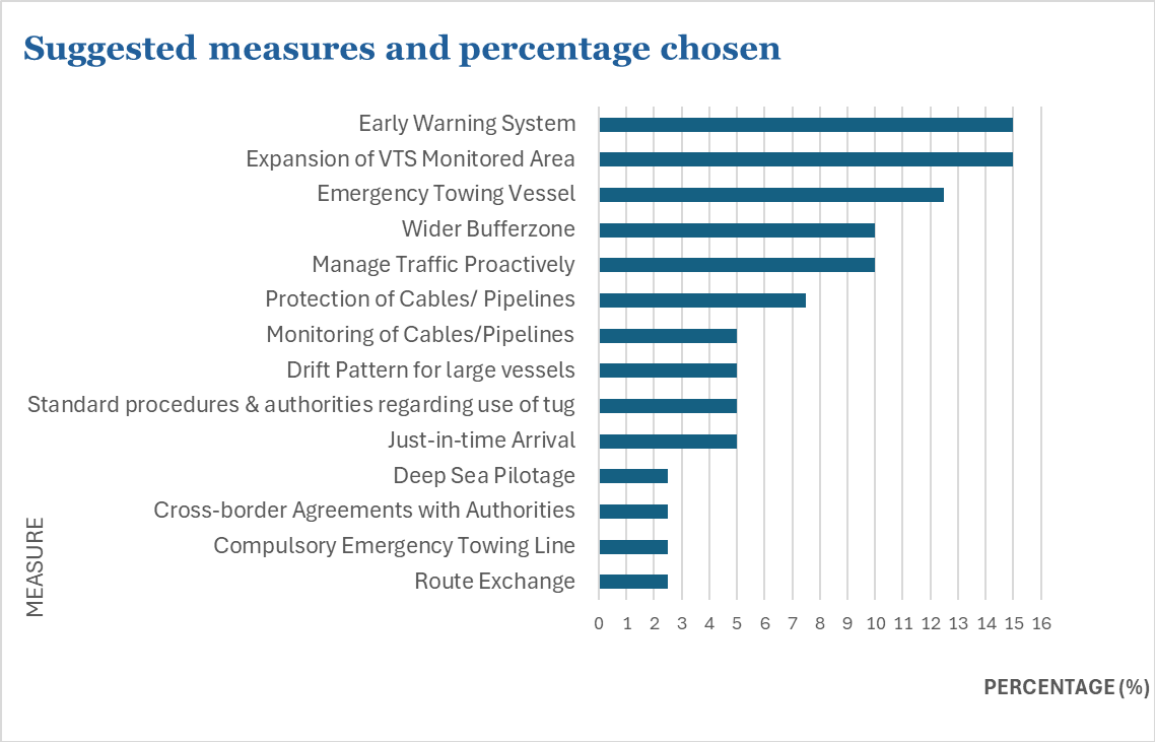



*Figure 8 - Percentages of suggested measures*

Two measures enjoy particular popularity: the expansion of the VTS Monitoring Area, and the use of an Early Warning System (each 15%). Moreover, managing traffic proactively can be considered very closely related to both – and comprises 10% of the total mentions.
The next in line, in terms of amounts of time chosen is the Emergency Towing Vessel. While as mentioned earlier this is a slightly controversial measure, the numbers resulting from the SIRA workshop do indicate that there is a relatively large support.

*Figure 9 - Brainstorm session on mitigating measures*

There seemed to be a consensus throughout the conversations and presentations during the workshop that the buffer zone currently in place around the wind farms is insufficient. This is also reflected in the significant mention of increasing the width of the buffer zone on paper (10%).

## 1.4 Combination of Measures

The table in the previous section shows each category of measures as 'standalone', however in reality nearly every proposal of measure comprised a combination of several. The average of categories combined is 2.19; this means that on average the consensus is that the combination of at least 2 measures is necessary for each undesired scenario. Note that that this number is lowered by the three unique measures for Hazard 4: Destruction/Damage to Cables or Pipelines.
The most popular combinations are extension of VTS with widening of a buffer zone, an Emergency Towing Vessel and with an Early Warning System.
The table below shows how many times either one, two, three or four measures were combined. Note that, much as in the previous table, the mean is offset by Hazard 4 (Destruction/Damage to Cables or Pipelines), for which only one measure was given all three times.

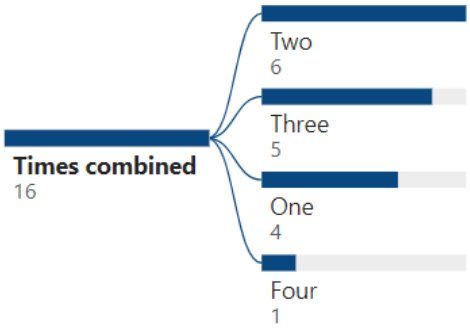



*Figure 10 – Combination of measures*


*Figure 11 – Discussion on the protection of cables*

The table below indicates the combinations made. It looks only at the single combinations and does not show where the combination was in fact of three elements or more rather than just two.

| Suggested Measure | Manage Traffic Proactively | Just-in-time Arrival | Expansion of VTS Monitored Area | Early Warning System | Emergency Towing Vessel | Wider Bufferzone | Route Exchange | Compulsory Emergency Towing Line | Cross-border Agreements with Authorities | Standard procedures & authorities regarding use of tug | Drift Pattern for large vessels | Protection of Cables/ Pipelines | Monitoring of Cables/Pipelines |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manage Traffic Proactively | | xx | | x | | x | | | | | x | | |
| Just-in-time Arrival | | | | | | | | | | | | | |
| Expansion of VTS Monitored Area | xx | | | x | xx | xxx | | | | | | | |
| Early Warning System | | | x | | xx | xx | | | | | | | |
| Emergency Towing Vessel | | | x | | | xx | | | | | | xx | x |
| Wider Bufferzone | x | | | | | | x | | | | | | |
| Route Exchange | x | | | | | | x | | | | | | |
| Compulsory Emergency Towing Line | | | x | | | | | | | | | | |
| Cross-border Agreements with Authorities | | | | x | | | | | | | | | |
| Standard procedures & authorities regarding use of tug | | x | | | x | | | | | | | | |
| Drift Pattern for large vessels | | | | | | | | | | | | | |
| Protection of Cables/ Pipelines | | | | | | | | | | | | | |
| Monitoring of Cables/Pipelines | | | | | x | | | | | | | | |
| Deep Sea Pilotage | | | | x | | | | | x | | | | |

*Table 7 – Combining suggested measures where 'x' indicates each time that combination was made. More 'x's means the combination was more popular.*

## 1.5 Calibration of Scale

A general observation of the workshop was the vigorous discussion that sprouted during the calibration of the scale to be used for scoring probability and consequence. One of the elements of disagreement was the role of 'reputation'; where the industrial participants (offshore representatives) strongly emphasized its weight and several of the Maritime Governance (GNA and Governor of West-Flanders) dismissed it with equal vigor.

While a consensus was eventually reached on which general scale to use, upon review of the scores the researchers observed that a recalibration is necessary to allow comparing the risk scores and creating a prioritized list of risks.

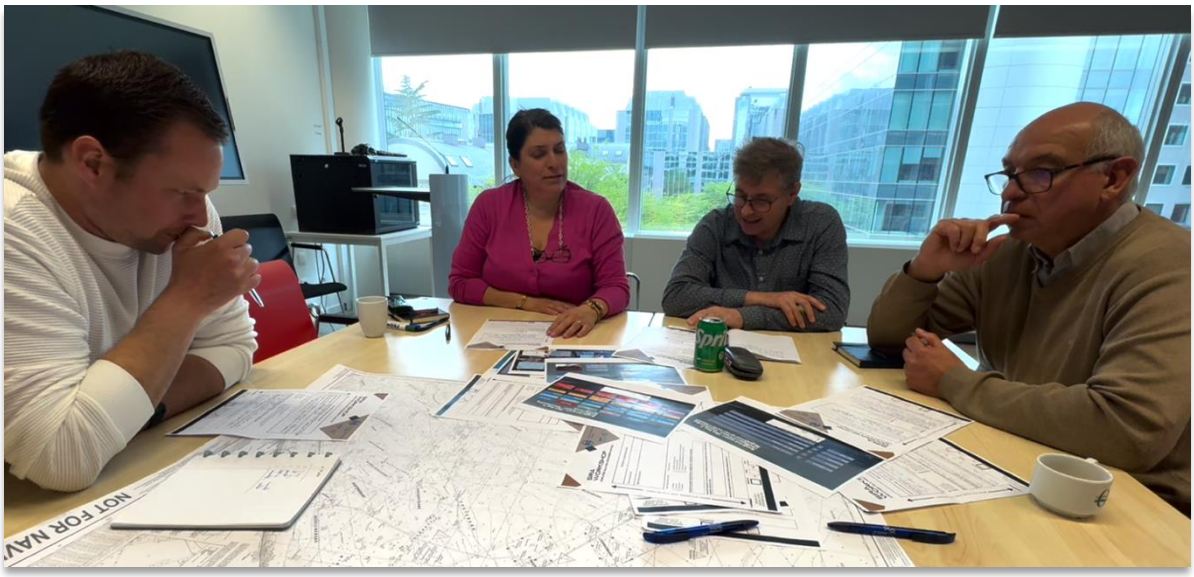


*Figure 12 - Calibration of scale*

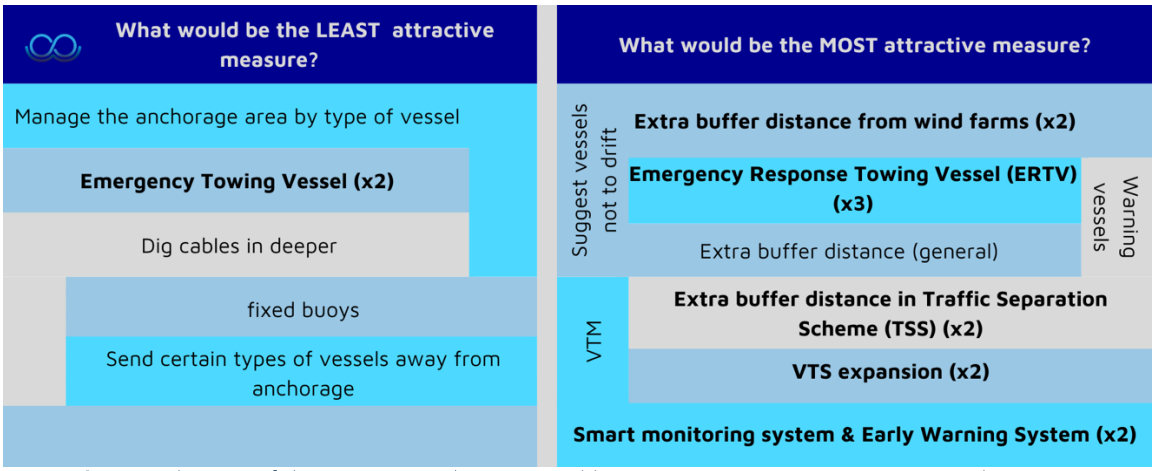
# Additional Observations

This section contains interesting insights gained throughout the workshop and gathered using Mentimeter to ask targeted questions and receive anonymous responses of the participants, and general observations made by the researchers.

## 1 Popularity of Least & Best Measures

This section contains interesting insights gained throughout the workshop and gathered using Mentimeter to ask targeted questions and receive anonymous responses of the participants, and general observations made by the researchers.
Very interesting was the response to the following questions asked at the end of the workshop through Mentimeter:

- Which of the proposed measures did you find the least good?
- Which of the proposed measures did you find best?



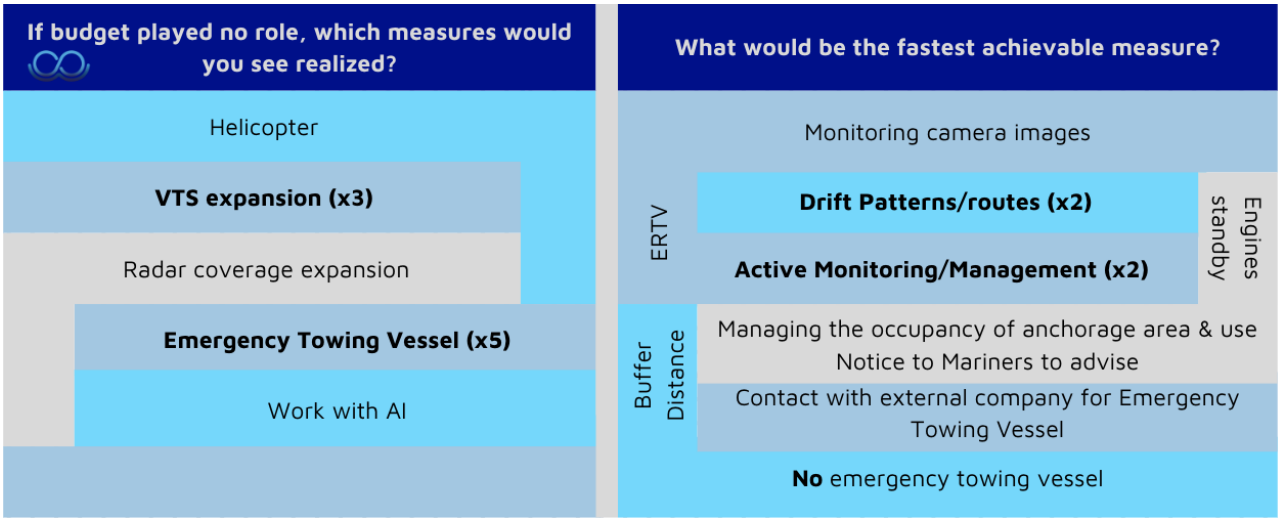

*Figuur 3 A visualization of the answers to the most and least attractive measures; as anwered on Mentimeter, translated from Dutch.*

| Measure | Best Measures | Least good measures |
|---|---|---|
| Wider Buffer Distance | 5 | 0 |
| Emergency Towing Vessel | 3 | 2 |
| Early Warning System or Smart System | 2 | 0 |
| Expansion of VTS | 2 | 0 |
| Suggest vessels not to drift | 1 | 0 |
| Vessel Traffic Monitoring | 1 | 0 |
| Warnings to vessels | 1 | 0 |
| Dig cables in deeper | 0 | 1 |
| Fixed Anchor Buoys | 0 | 1 |
| Manage Traffic Proactively by vessel type | 0 | 2 |

*Table 8 – A visualization of the above juxtaposition of least and best measures, grouped where appropriate.*

The results are slightly controversial as 'Emergency Towing Vessel' or Emergeny Response Towing Vessel (ERTV) received both the highest number of votes for being the best and the worst solution.[4] These results receive an additional degree of interest as we consider the answers to the below questions:

- 'If budget played no role, which measures would you like to see realized'
- 'What would be the fastest achievable measure?'




*Figuur 4 Translated answers to the listed questions*

Five of the twelve responses indicate an emergency towing vessel as their measure of choice if budget were not relevant. This sheds light on a potential motivation behind the controversiality of the previous replies: one concern of having a standby emergency towing vessel is likely the cost efficiency.

When asked what the fastest achievable measure would be, one of the participants suggests an emergency response towing vessel (ERTV), another specifically says 'No' ERTV, and another suggests working with an external company.

When speed of implementation is considered in isolation of money or total effectiveness, we notice that the landscape slightly shifts from the simple 'least'; and 'best' question. Instead of specifying expansion of VTS area; monitoring and active management of the traffic becomes more general in terms of who is doing it. Measures such as an Early Warning System or Smart Monitoring disappear into a simple mention of monitoring camera images. This is likely because it does require some time to correctly develop and implement such a system. Buffer distance is mentioned, but only once. The use of Drift Patterns rises in relative popularity as do specific advisory measures such as managing occupancy of the anchorage area, the use of Radio or Notice to Mariners, advising vessels to keep their engines on standby. The emergency towing vessel again takes up an interesting role: an emphatic 'NO', a 'yes' and lastly a pragmatic approach: have the vessel but don't own it – just establish agreements and communication with an external company.

[4] The term Emergency Towing Vessel and Emergency Response Towing Vessel (ERTV) are strictly speaking not the same. The latter specifies that the vessel is also used to respond to emergencies such as Search and Rescue (SAR) or oil pollution response. For the purpose of this document the terms are used interchangeably as the researchers asserted during the SIRA workshop that both were used with the same intention by the participants.

### Measure choice distribution across given categories

| Measure | Least good measures | Best Measures | Unlimited budget | Fastest to be implemented |
|---|---|---|---|---|
| Wider Buffer Distance | 0 | 5 | 0 | 1 |
| Emergency Towing Vessel | 2 | 3 | 5 | 0 |
| Early Warning System or Smart System | 0 | 2 | 1 | 0 |
| Expansion of VTS | 0 | 2 | 3 | 0 |
| Suggest vessels not to drift | 0 | 1 | 0 | 0 |
| Vessel Traffic Monitoring an Management | 0 | 1 | 0 | 4 |
| Warnings to vessels | 0 | 1 | 0 | 0 |
| Dig cables in deeper | 1 | 0 | 0 | 0 |
| Drift patterns | 0 | 0 | 0 | 2 |
| External company for Emergency Towing Vessel | 0 | 0 | 0 | 1 |
| Fixed Anchor Buoys | 1 | 0 | 0 | 0 |
| Helicopters | 0 | 0 | 1 | 0 |
| Manage Traffic Proactively by vessel type and occurence | 2 | 0 | 0 | 1 |
| Monitoring camera images | 0 | 0 | 0 | 1 |
| Radar Coverage Expansion | 0 | 0 | 1 | 0 |

*Table 9 - Results juxtaposing the results of four previously addressed questions*

# 2 Incident & Near Miss Reporting Database

Another important observation that surfaced during the workshop was the lack of a complete and accurate database of recorded incidents and near misses in the Belgian North Sea. While major incidents are recorded, many relevant near misses such as the event of the Maersk Nimbus during storm Eunice – the trigger for this research – slip through the fingers of the system. This incompleteness of situational awareness of the potentially dangerous behavior/situations in the Belgian North Sea, limits the ability to learn from these events and build in barriers. Group discussions on the topic erupted on several occasions, the underlying questions being:

*"If we do not have a complete picture – a situational awareness- of the dangerous situations/behaviors that occur in our sea, how can we effectively improve the safety of navigation?*
*How do we determine what is normal or what is rare without complete historic data? "*

# Conclusions

The SIRA workshop hosted as part of the research into the safety of navigation surrounding offshore infrastructure in the Belgian North Sea during extreme weather conditions, proved a valuable opportunity to unite stakeholders and let their insights and expertise mingle and form a list of measures. Clear categories of mitigating measures were identified during the assessment and several insights on the support of each measure or combination of measures were made.
The goal of the SIRA workshop, establish prioritized insights into the mitigating measures supported by the stakeholders involved in marine spatial planning, governance, and operational use of the Belgian North Sea can be summarized through the following:

- Expansion of Vessel Traffic Services (VTS) is the measure with the highest undisputed effectiveness.
- Emergency Response Towing Vessel (ERTV) is the most disputed solution, but scores very high in effectively reducing probability and consequence.
- When it comes to preventing allisions and collisions, stakeholders support a combination of measures, not single solutions. Monitoring and advisory measures, such as VTS or VTM, are nearly always part of the equation.

These insights into the mitigating measures supported by the stakeholders were combined by the researchers with findings from the quantitative and other elements of the qualitative analysis to result in the following prioritized list of measures:

| | | Current Risk Levels | | | | | |
|---|---|---|---|---|---|---|---|
| | | Allision | | | Collision | | |
| | | Probability | Consequence | Risk | Probability | Consequence | Risk |
| | | 3 | 4 | 12 | 3 | 4 | 12 |
| | | Allision | | | Collision | | |
| | | Probability | Consequence | Risk | Probability | Consequence | Risk |
| Monitoring & Advisory Action | Expansion of VTS and stregthening VTS authority and proactivity | 2 | 3 | 6 | 2 | 3 | 6 |
| | Vessel Traffic Monitoring (no advisory role, no international regulations, not yet know to vessels) | 3 | 3 | 9 | 3 | 3 | 9 |
| | Assistance of pilots during extreme weather to guide dangerously behaving vessels remotely (in addition to VTS) | 1 | 3 | 3 | 1 | 4 | 4 |
| | Early Warning System: digital monitoring tool to assist humans and highlight dangerous behaviors (in addition to VTS) | 1 | 3 | 3 | 1 | 4 | 4 |
| | Service Level Agreements of radar coverage of anchor and drift area ( in addition to VTS ) | 2 | 4 | 8 | 3 | 2 | 6 |
| ERTV | Emergency Towing Vessel on standby, ability to operate in extreme weather (ERTV owned by authorities) | 2 | 2 | 4 | 2 | 2 | 4 |
| | External company for Emergency Towing Vessel with and streamlining of authority to use it, ability to operate in extreme weather (external ERTV) | 2 | 2 | 4 | 3 | 2 | 6 |
| | Standard procedures & clarity on authoties regarding the use of ERTV (without changing current availability of tugs) | 2 | 2 | 4 | 3 | 2 | 6 |
| Reduce Occupancy | Manage Traffic Proactively to reduce occupancy : JIT, route exchange | 1 | 4 | 4 | 1 | 4 | 4 |
| | Manage Traffic Proactively to reduce occupancy: Cross-border agreements and coordination | 2 | 4 | 8 | 2 | 4 | 8 |
| | Manage Traffic Proactively to reduce occupancy: Drift Patterns for large vessels | 2 | 4 | 8 | 2 | 4 | 8 |
| | Fixed Anchor Buoys and defined maximum anchorage capacity | 3 | 4 | 12 | 3 | 4 | 12 |
| | Impose anchorage fee to reduce amount of vessels anchored long term in Belgian waters with other destination | 2 | 4 | 8 | 2 | 4 | 8 |
| Physical Protection | Wider Buffer Distance around offshore infrastructure where possible | 2 | 4 | 8 | 2 | 4 | 8 |
| | Physical protection of offshore infrastructure ( fendering, nets) | 1 | 4 | 4 | 3 | 4 | 12 |
| Understanding | Incident & near-miss awareness amongst all involved (VTS, pilots, decision makers, ...) through the creation of a database & systematic cross-functional training ( in addition to VTS) | 2 | 3 | 6 | 2 | 3 | 6 |

*Table 10 - Prioritized list of measures*

The following conclusions are made:

- Without implementing active **Vessel Traffic Services (VTS)** in the area of concern, other mitigating measures either partially or completely lose effectiveness. At present there is no active screen monitoring of the area of near-impact of the Maersk Nimbus; this area is not covered by Vessel Traffic Services (VTS).
- **ERTV** is the most effective measure when it comes to reducing consequence, and is in fact one of the only tools that can have a significant effect once either a collision or allision has occurred. To a lesser degree the presence of a monitoring and advisory body helps reduce the consequences due to their ability to help coordinate a fast response. In a similar way increased understanding contributes through a team that is able to respond more effectively.
- Reducing the **occupancy** of the anchorage and drift area in extreme weather has a very strong effect on the probability of occurrence of a collision and allision. This can be achieved most effectively by just-in-time (JIT) arrival and/or active traffic management.
- **Physical protection** of offshore infrastructure can strongly reduce the risk on allision, but has no effect on collisions.
- Creating a **comprehensive database** of dangerous vessel behavior, including incidents *and* near-misses, is crucial to both the accuracy of future research and investigations and to continuous training of all involved parties: VTS (operators, managers and supervisors), Pilots, and decision makers. It can also be a valuable tool when it comes to insurance and financial responsibility.
- **International cooperation** and information exchange is crucial
- The ongoing review of Marine Spatial Planning in the Belgian North Sea considers an expansion of the anchorage area, yet it is observed that as the numbers of waiting vessels in the Belgian North Sea increase, ships start to increasingly anchor in the drift area. There is no **legal framework** preventing them to do this as there is no anchorage prohibition in this area, nor is there any established maximum capacity of the current officially indicated anchorage area. Research into safety threshold and maximum capacity of the anchor and drift areas would be valuable.

# Appendix – figures and tables

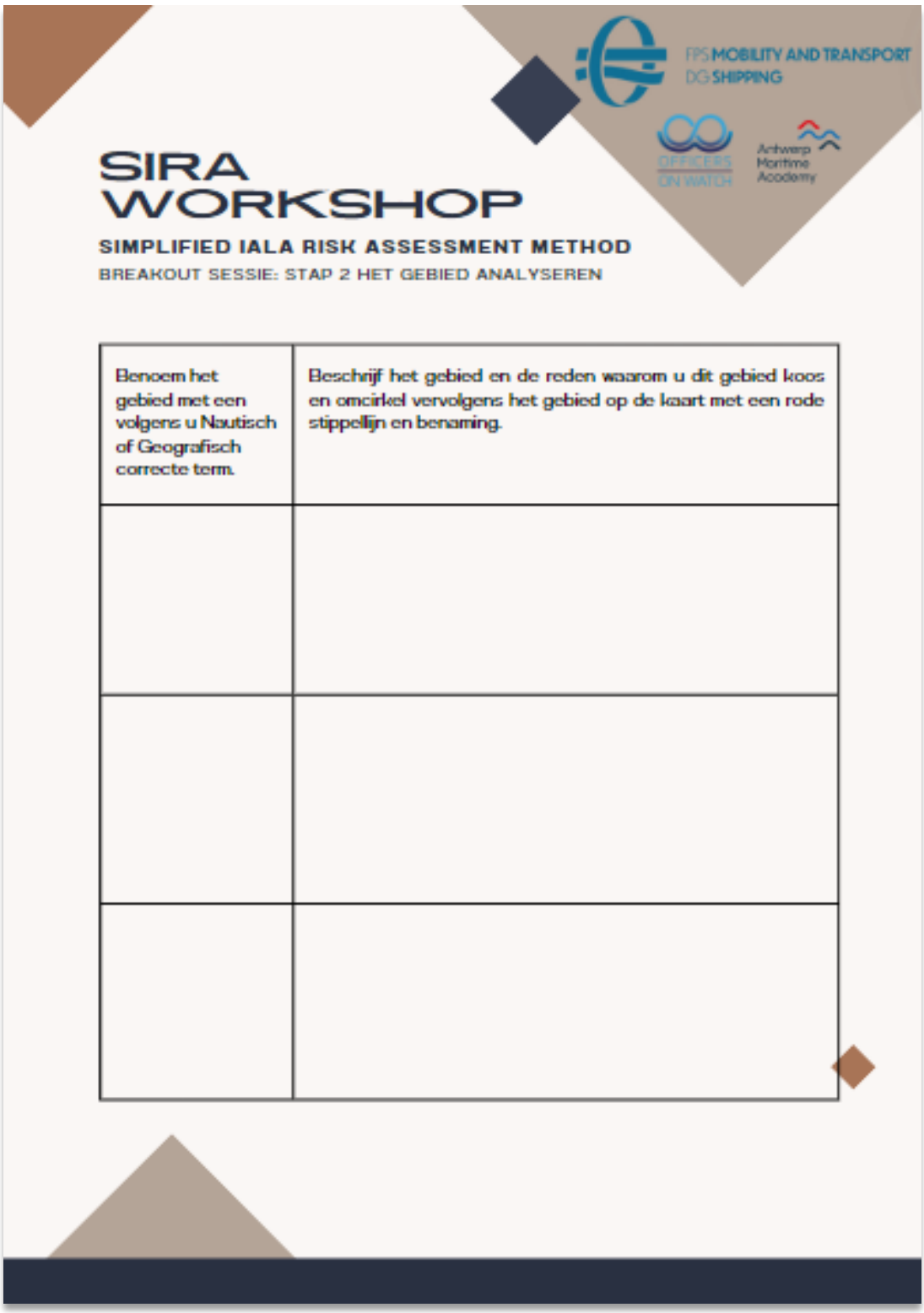
## Table of figures

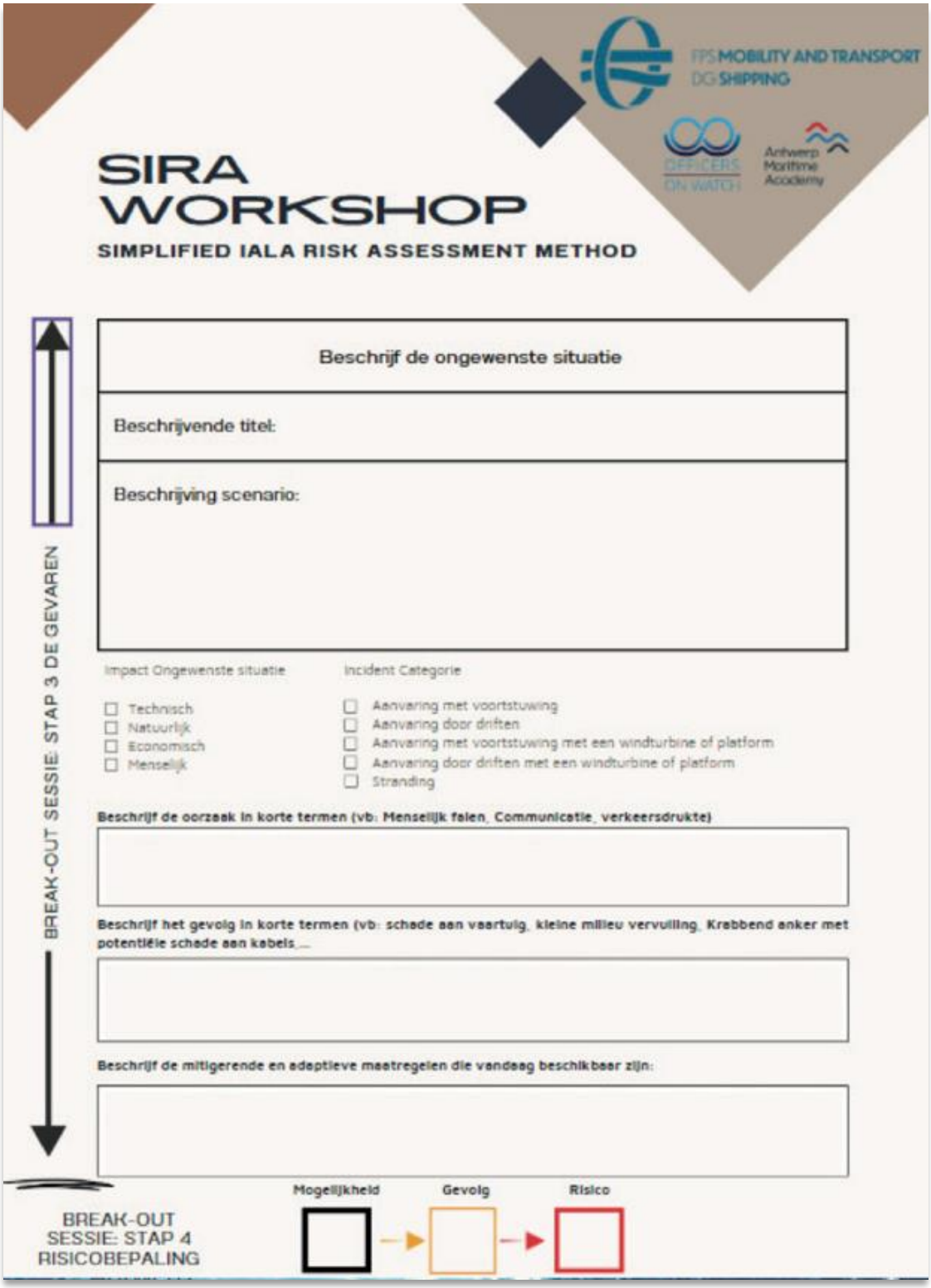


## List of Tables



## Worksheets used


FPS MOBILITY AND TRANSPORT
DG SHIPPING
OFFICERS ON WATCH
Antwerp Maritime Academy
SIRA WORKSHOP
SIMPLIFIED IALA RISK ASSESSMENT METHOD
BREAKOUT SESSIE: STAP 2 HET GEBIED ANALYSEREN
Benoem het gebied met een volgens u Nautisch of Geografisch correcte term.
Beschrijf het gebied en de reden waarom u dit gebied koos en omcirkel vervolgens het gebied op de kaart met een rode stippellijn en benaming.


FPS MOBILITY AND TRANSPORT
DG SHIPPING
SIRA
WORKSHOP
SIMPLIFIED IALA RISK ASSESSMENT METHOD
BREAK-OUT SESSIE: STAP 3 DE GEVAREN
Beschrijf de ongewenste situatie
Beschrijvende titel:
Beschrijving scenario:
Impact Ongewenste situatie
Technisch
Natuurlijk
Economisch
Menselijk
Incident Categorie
Aanvaring met voortstuwing
Aanvaring door driften
Aanvaring met voortstuwing met een windturbine of platform
Aanvaring door driften met een windturbine of platform
Stranding
Beschrijf de oorzaak in korte termen (vb: Menselijk falen, Communicatie, verkeersdrukte)
Beschrijf het gevolg in korte termen (vb: schade aan vaartuig, kleine milieu vervuiling, Krabbend anker met potentiële schade aan kabels,...
Beschrijf de mitigerende en adaptieve maatregelen die vandaag beschikbaar zijn:
BREAK-OUT
SESSIE: STAP 4
RISICOBEPALING
Mogelijkheid
Gevolg
Risico