
COASTEX Exercise Guide

Report no. 2 from the NKS-B
COASTEX activity

Inger Margrethe H. Eikermann¹
Øyvind Gjølme Selnæs²
Anna Nalbandyan¹
Øyvind Aas-Hansen¹
Helmuth Zika³
Michael Wallin³
Kjartan Guðnason⁴
Jeppe Vöge Jensen⁵
Tone D. Bergan⁶

¹Norwegian Radiation Protection Authority, Tromsø

²Norwegian Radiation Protection Authority, Østerås

³Swedish Radiation Safety Authority

⁴Icelandic Radiation Safety Authority

⁵Danish Emergency Management Agency

⁶Atomkameratene, Norway

Abstract

There is a notable maritime traffic of nuclear-powered civilian vessels (ice-breakers and cargo ships), nuclear-powered military vessels and maritime transports of spent nuclear fuel and other radioactive materials along the Nordic coastlines and in the Arctic. This traffic represents a risk for potential accidents and events resulting in radioactive contamination and spread of radioactive materials into the Nordic and Arctic marine and terrestrial environments. These kinds of events request a good preparedness, possibility for a direct cooperation between neighbouring countries as well as interaction, assistance and coordinated activities to manage the situation, including mitigation.

In 2015, the NKS-B NORCOP-COAST project identified several needs for further improvement of maritime emergency preparedness and cooperation, including the need for definition of relevant scenarios with follow-up exercises in the Nordic countries. To address this issue, the NKS-B COASTEX project (*Scenarios and table top exercise concept on events related to traffic of nuclear-powered vessels and transportation of spent nuclear fuel along the Nordic coastline*) was initiated.

This report is the second of the three reports of the NKS-B COASTEX project. It provides a guide on how to structure an exercise when it comes to types of exercises, exercise elements, scenarios and scenario elements - in order to establish a common platform for developing of exercises in Nordic countries and harmonise further Nordic cooperation in emergency preparedness, related to maritime traffic and activities along the Nordic coastlines, and in the Arctic region. The report describes how to facilitate timely, effective and compatible exercises on decision making by response organisations in emergency situations.

For relevant maritime accident scenarios, it is suggested to read the Report no. 1 – “*COASTEX Scenario Report*”. The NKS-B COASTEX project implementation is summarised in the Report no. 3 – “*Final report from the NKS-B project COASTEX*”.

Key words

Nordic coastline, the Arctic, maritime accident scenarios, nuclear emergencies, scenario elements, radioactive cargo, radioactive sources, nuclear icebreaker, nuclear-powered vessels, floating nuclear power plant, cross-border preparedness.

NKS-391

ISBN 978-87-7893-478-9

Electronic report, May 2017

NKS Secretariat, P.O. Box 49

DK - 4000 Roskilde, Denmark

Phone +45 4677 4041, www.nks.org, e-mail nks@nks.org



COASTEX Exercise Guide

Report no. 2 from the NKS-B COASTEX activity

(Contract: AFT_NKS-B_2016_8)

Inger Margrethe H. Eikermann¹
Øyvind Gjølme Selnæs²
Anna Nalbandyan¹
Øyvind Aas-Hansen¹
Helmuth Zika³
Michael Wallin³
Kjartan Guðnason⁴
Jeppe Vøge Jensen⁵
Tone D. Bergan⁶

^{1,2}Norwegian Radiation Protection Authority

²Swedish Radiation Safety Authority

³Icelandic Radiation Safety Authority

⁴Danish Emergency Management Agency

⁵Atomkameratene

Table of contents

- 1 Background and introduction..... 4
- 2 Methodology: moving towards decision controlled exercises..... 5
 - 2.1 Conducting exercises 6
 - 2.2 Identifying exercise objectives, targets and goals 7
 - 2.3 Building blocks in an exercise..... 8
 - 2.4 The role of scenarios in an exercise..... 9
 - 2.5 Putting the exercise together..... 10
- 3 Conclusions..... 11
- 4 References..... 12

Acknowledgements

The project partners wish to acknowledge the NKS, the participating organisations and all contributors of the COASTEX project for their valuable support and contributions.

NKS conveys its gratitude to all organisations and persons who by means of financial support or contributions in kind have made the work presented in this report possible.

Disclaimer

The views expressed in this document remain the responsibility of the authors and do not necessarily reflect those of NKS. In particular, neither NKS nor any other organisation or body supporting NKS activities can be held responsible for the material presented in this report.

1. Background and introduction

There is a notable maritime traffic of nuclear-powered civilian vessels (icebreakers and cargo ships), nuclear-powered military vessels and maritime transports of spent nuclear fuel and other radioactive materials along the Nordic coastlines and in the Arctic. This traffic represents a risk for potential accidents and events resulting in radioactive contamination and spread of radioactive materials into the Nordic and Arctic marine and terrestrial environments. These kinds of events request a good preparedness, possibility for a direct cooperation between neighbouring countries as well as interaction, assistance and coordinated activities to manage the situation, including mitigation. The uncertainty and complexity in the situation, and the large possible consequences for health, environment, local communities, industries and other societal matters, put additional pressure on monitoring and responding authorities, coastguards and rescue services.

In 2015, the NKS-B NORCOP-COAST project identified several needs for further improvement of maritime emergency preparedness and cooperation, including the need for definition of relevant scenarios with follow-up exercises in the Nordic countries. This would contribute to better emergency preparedness and response capabilities along the Nordic coastline and in the Nordic countries (Nalbandyan *et al.*, 2016). The NKS-B COASTEX project “*Scenarios and table top exercise concept on events related to traffic of nuclear-powered vessels and transportation of spent nuclear fuel along the Nordic coastlines*” was initiated by the Norwegian Radiation Protection Authority in collaboration with the Swedish Radiation Safety Authority, the Icelandic Radiation Safety Authority and the Danish Emergency Management Agency as a follow-up of the identified needs in previous work. The project resulted in three reports: The “*COASTEX Scenario Report: nine maritime accident scenarios*”, the “*COASTEX Exercise guide*”, and the “*Final Report from the NKS-B Project COASTEX*”. The reports are available on the NKS website <http://www.nks.org/>.

The “*COASTEX Scenario Report: nine maritime accident scenarios*” provides a developed scenario bank with the description of nine maritime scenarios for nuclear accidents related to the traffic of nuclear-powered vessels and transports of spent nuclear fuel and other radioactive materials. Additionally, the report includes fact sheets with source descriptions for each scenario.

The “*COASTEX Exercise guide*” is the second of the three reports of the NKS-B COASTEX project. In this report, we provide a guide on how to use the scenarios in a structured way in future exercises within this field. The aim is to facilitate exercises and to provide a common platform for further Nordic cooperation in emergency preparedness related to maritime traffic and activities along the Nordic coastlines and in the Arctic region.

The report gives an overview of a proposed framework for planning exercises developed within the project. The main aim of this part of the project has been to use the developed scenarios involving nuclear accidents at sea or in Nordic coastal waters, for further Nordic cooperation and exercises.

2. Methodology: moving towards decision controlled exercises

The aim of the COASTEX project has been to provide relevant and detailed scenarios on maritime accidents and other unwanted events in the Arctic region and along the Nordic coastlines, and a guide on how to use these scenarios in emergency management exercises.

The aim of the “*COASTEX Exercise Guide*” is to provide a straightforward guide on how to use the structured scenarios in planning and conducting exercises. The report describes how to facilitate timely, effective and compatible exercises on decision making by response organisations in emergency situations.

Maritime accidents may involve a number of countries, as well as several emergency management organisations. OECD-NEA refers to seven key strategic elements for decision making which cover the entire emergency management timeline:

- Planning for *strategic decision making* within the emergency management cycle.
- Depth of preparedness, based on *threat and risk assessments*.
- Co-ordination of decision making: *compatibility in approaches to decision making, and in the decisions taken*, to ensure optimal protection of health, environment and society.
- Anticipating *when a decision will be necessary* along an emergency management timeline and *the information needed to support the decisions* critical to emergency planning.
- *Co-ordination of decision making*, both nationally and internationally, amongst all parties in the emergency response.
- Timely decision making: the decision making processes need to be *responsive to the situation and specific to the actual emergency encountered*.
- Stakeholder involvement: planners and decision makers need to *take into account the involvement of stakeholders* in the implementation of protection strategies, particularly the international implications.

Part of the aim of the COASTEX project has been to increase the understanding and strategic basis for decision making in the Nordic countries. The aim is that the scenarios and the exercise guide will provide a platform for future co-operation on managing complex emergency situations involving many different organisations and stakeholders at local, national and international level.

2.1 Conducting exercises

Emergency situations demand that actions are taken by responsible organisations in a timely and effective manner. To deliver an effective response, it is necessary to make, maintain and exercise adequate plans and arrangements in advance of an emergency situation. These plans must contain appropriate elements and resources for preparedness, response and assistance to identified threats, recognise and include all implicated partners, and take account of international co-operation.

In a changing society, where the threats and risks are changing, where the emergency response organisations are given new responsibilities, and where the resources are moved around, planning and exercising becomes an even more important task. Some of the scenarios deal with new risks, and by exercising these new scenarios, additional challenges and elements will be discovered.

There is a number of reasons why we exercise. Exercises is an important tool to increase emergency management abilities, as well as strengthening co-operation with other actors.

Exercises can help strengthen or identify:

- the development of crisis management capability and preparedness work of responsible actors;
- the organisation's knowledge or expertise and their readiness;
- the ability to interact with other actors;
- the ability to make timely decisions and sharing information;
- the awareness of the complexity that is characteristic of emergency situations;
- the needs for capacity on individual or functional level;
- the resource requirements.

The main elements in exercise activities are planning, execution, evaluation and feedback. Very often most resources are allocated to the planning phase. However, the evaluation and feedback phase are more and more recognised as key elements in learning from experience and improving the emergency management organisation. Evaluation must be an integral part of the planning activity – and most preferable the feedback and organisational improvements are in place *before* the next exercise or event occurs.

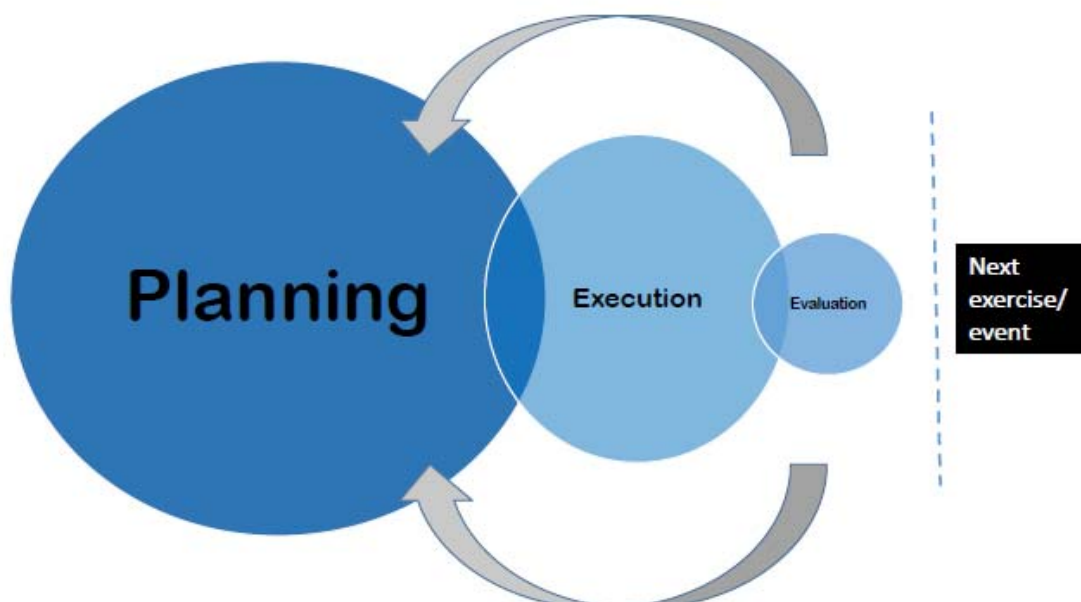


Figure 1. An illustration of time and resources spent in exercise planning, execution and evaluation.

2.2 Identifying exercise objectives, targets and goals

Exercise planning starts with deciding exercise objectives, by defining the purpose of this specific exercise. Why are we doing this? Why do we want to exercise? A good reason for why the exercise is carried out will provide a good basis for involving relevant stakeholders and actors.

Once the objective(s) are defined, exercise targets or goals can be worked out. A general recommendation is that the targets should be SMART, indicating that they should be Specific, Measurable, Achievable, Relevant and Time-bound. The targets may not always be measurable, but there should be some indicators to guide the evaluation.

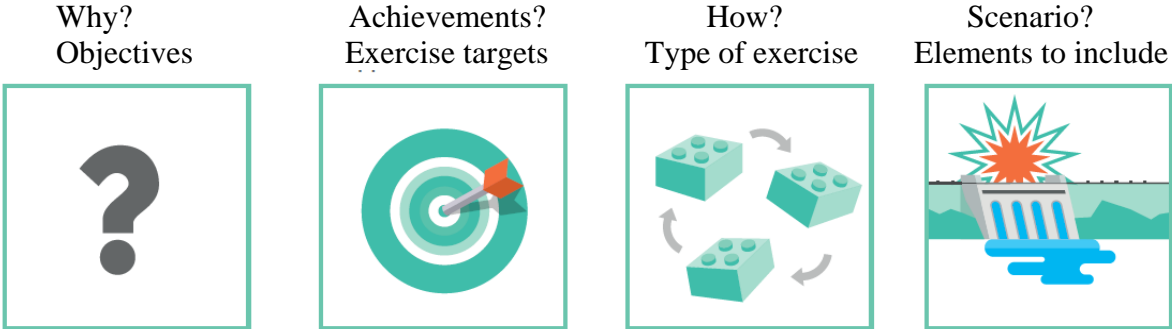


Figure 2. The different elements to decide upon when planning an exercise. Source: DSB 2016.

It is important to keep in mind that the *type* of exercise is depending on what the objectives are. For identifying areas of responsibility, procedures for international co-operation or information flow - seminars, workshops or table-tops might be the best way of exercising.

If the objective is to test capability or capacity, operation-based exercises are needed.



Figure 3. The matrix illustrates the different forms of exercise, depending on the exercise objectives. Blue colours indicate discussion based elements (Discussion-Based), whereas red colour indicates activity in the field (Operations-Based). The number of actors and stakeholders, and the complexity will normally increase as we move towards operations-based exercises.

2.3 Building blocks in an exercise

There is a number of elements that can be included in an exercise, depending on the objectives and targets of the exercise. Related to marine accidents, we have identified some of them. Starting with the source, we have identified different events that can lead to release of radioactivity into the environment. For some exercises, source and event will be sufficient to start the discussion.

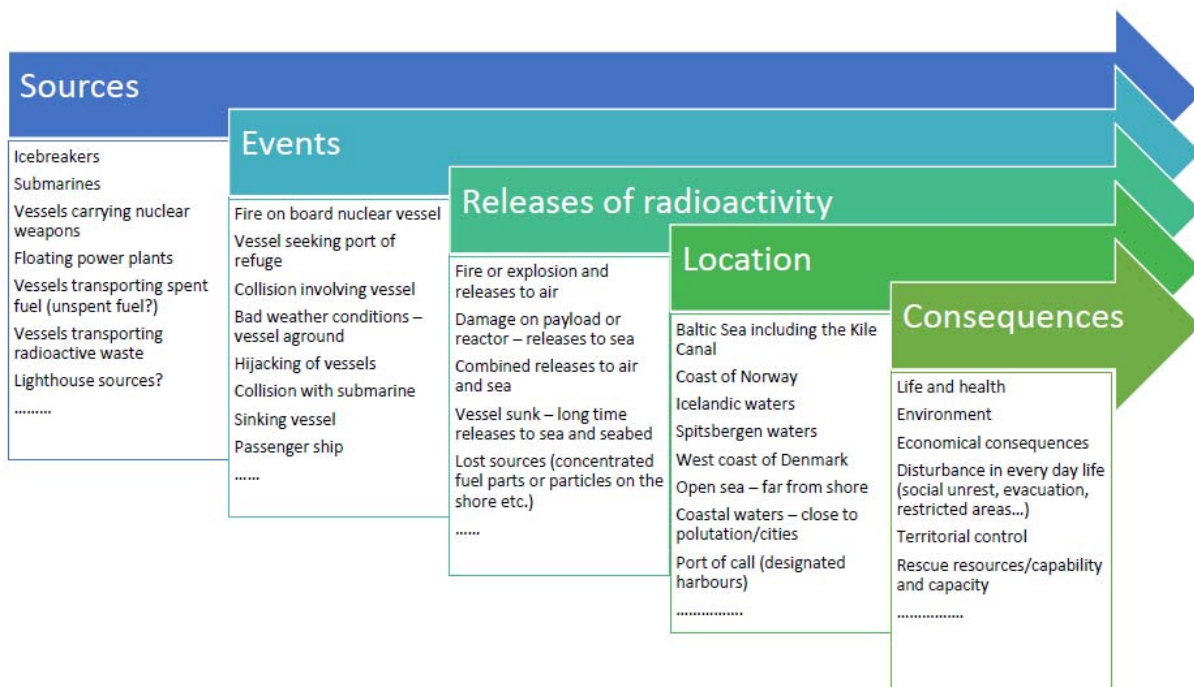


Figure 4. Examples of how different sources and events will lead to different releases of radioactivity. If assessment of consequences is a part of the exercise, location and early action and countermeasures will become important as well.

If the objective of the exercise is to test surveillance systems, alarm systems or some other capacity, the source term can be sufficient information for further discussion. If the objective is to exercise first responders, search and rescue team or initial preparedness, a source and a possible event might be enough. As the complexity increases, so does the emergency management demands. Consequence management and decisions on actions and countermeasures will require a detailed scenario with much more information.

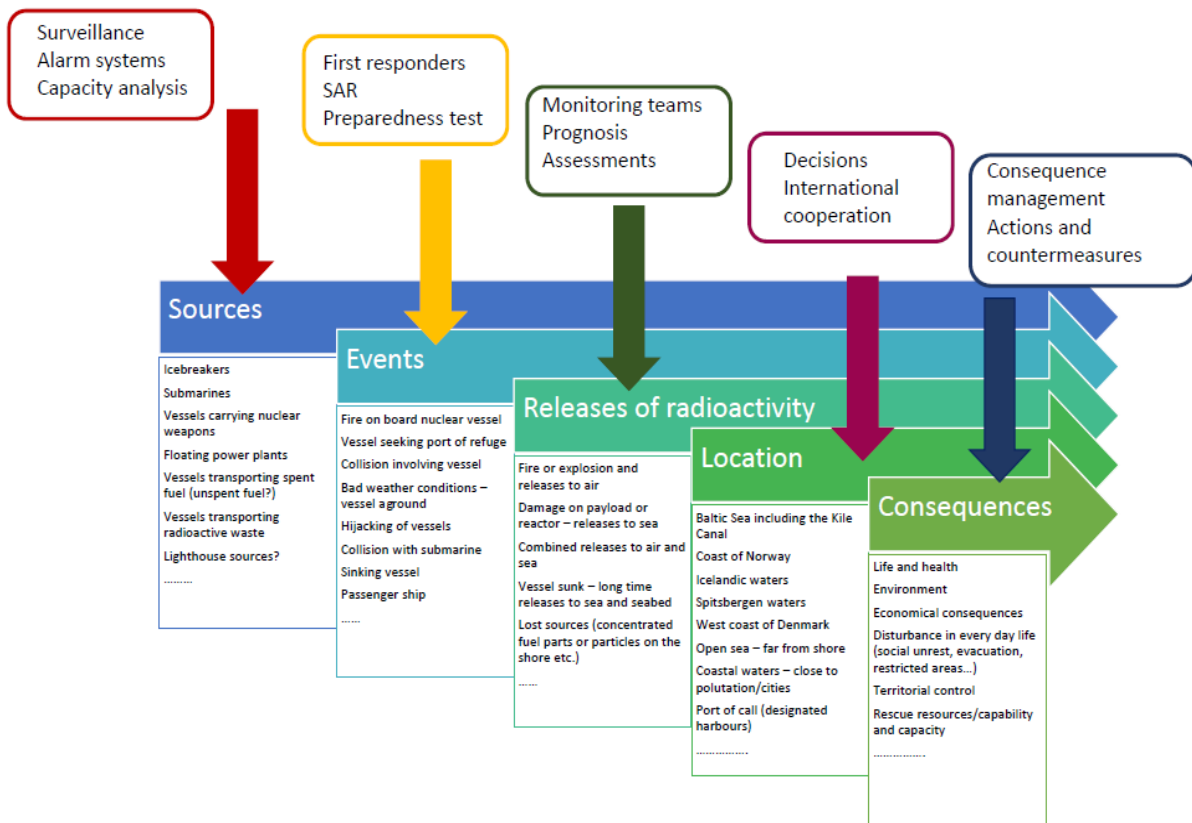


Figure 5. The objectives of the exercise will determine which scenario elements and information will be needed to prepare for the exercise.

2.4 The role of scenarios in an exercise

Once the purpose and the objectives of the exercise have been decided, it is time to choose a scenario. The scenarios contain a number of scenario elements, which can be individually changed. Such conditions may be based on facts, but adapted to the exercise's purpose and goals, or they may be fictitious.

The scenarios are also divided into three phases, corresponding to the early phase, intermediate phase and the recovery phase. This structure is introduced to aid the planning of the exercise, and provide a basis for more informed preparation of the storyboard.


















				
Time (time of year, time of day etc.)	Duration	Weather conditions	Wind (strength and direction)	Sea currents
				
Temperature (air and water)	Sequence of events	Scope (population affected, areas etc.)	Source term and amount of release /release rates	Observed levels of radioactivity
				
Comparable events	Coinciding events	Ripple effects	Contributing factors	
If this is a malicious act (intentional)				
	Intention	Background	Capacity	

Figure 6. The different scenario elements guiding further development of the storyboard.

In addition to these elements, the scenario could be supplemented with technical information such as maps, drawings, weather prognosis, dispersion of radionuclides etc.

2.5 Putting the exercise together

By providing a structure when it comes to types of exercises, exercise elements, scenarios and scenario elements, we have established a common platform for developing common exercises. The structure will be tested on a local and regional scale before we explore the possibility to conduct Nordic exercises (or bilateral cooperation). The overall goal is to move towards “decision controlled” exercises, where strategic decisions guide the development of a given scenario.

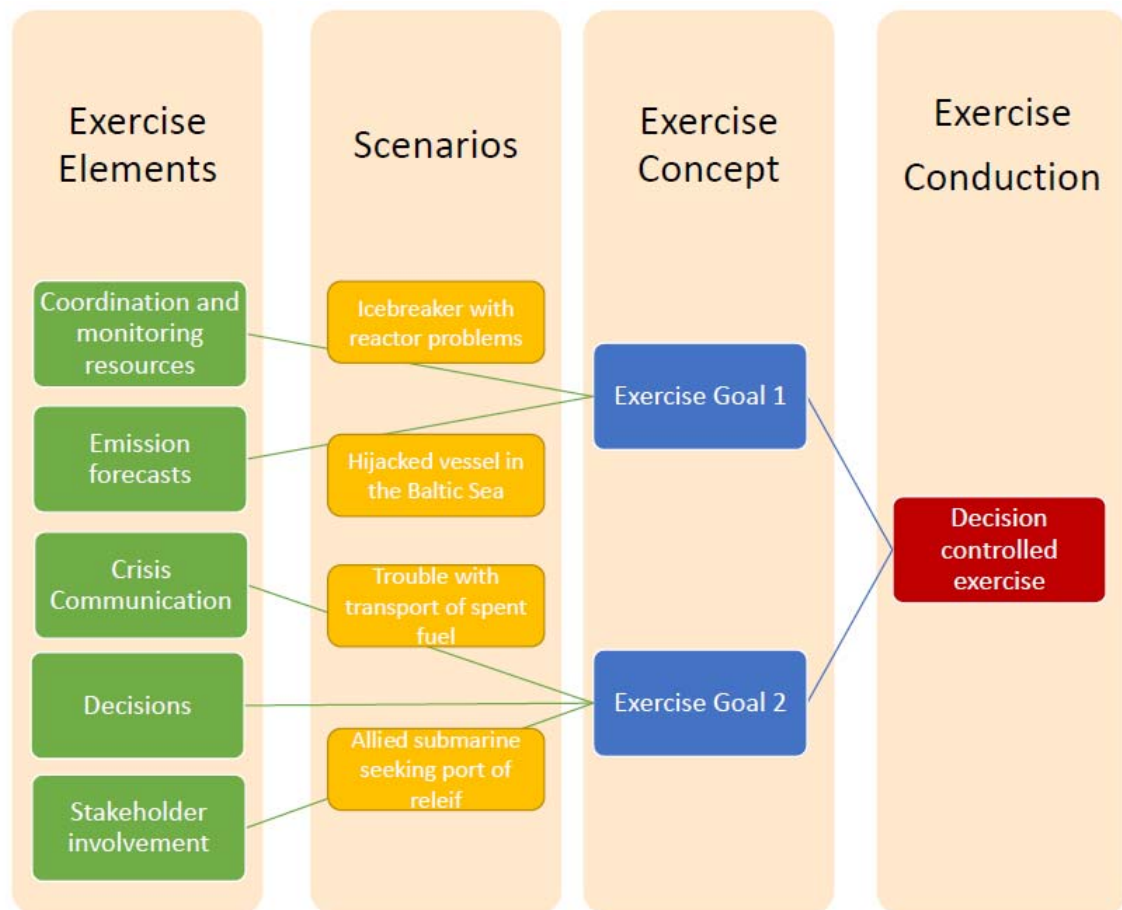


Figure 7. Illustration of how the different exercise elements can fit into a scenario and further support the exercise objective, target and goals.

3. Conclusions

The maritime traffic in the Arctic region and along the Nordic coastlines is expected to increase in future years. This includes traffic of nuclear-powered vessels and transport of radioactive materials. Global warming will open up new shipping routes, and there is also increased tourist traffic in the Arctic. An increase in traffic will increase potential risks for accidents resulting in spread of radioactive materials into the terrestrial and marine environments. All this puts an additional pressure on monitoring and responding authorities, coastguards and rescue services.

In this report we have showed how the structure of the scenarios can be joined with a structured way of planning exercises. The report provides a basis for effectively constructing focused and suitable exercises directed towards the needs of different decision making authorities and other actors involved in the emergency management of maritime accidents and other unwanted events. This includes the possibility of combining different exercise elements in order to arrange exercises to meet different needs.

Additionally, the exercise guide provides a common platform for further Nordic cooperation in the emergency management field and in the field of exercises on maritime scenarios.

For examples of maritime scenarios, see the “*COASTEX Scenario Report: nine maritime accident scenarios*” at the NKS website.

4. References

1. IAEA (2005): Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency, IAEA April 2005.
2. Nalbandyan A, Aas-Hansen Ø, Eikermann I.M, Lindgren J, Guðnason K, Peltonen T, Jensen J.V. Nuclear icebreaker traffic and transport of radioactive materials along the Nordic coastlines: response systems and cooperation to handle accidents (NORCOP-COAST): Final report. NKS-362, Electronic report, Roskilde, Denmark, 2016, 36 pp. ISBN 978-87-7893-447-5.
3. OECD-NEA (2007): OECD-NEAs Strategy for Developing and Conducting Nuclear Emergency Exercises, OECD-NEA, No.6162.
4. The Norwegian Directorate for Civil Protection. Veileder i planlegging, gjennomføring og evaluering av øvelser. Grunnbok: Introduksjon og prinsipper. DSB, October 2016, ISBN 978-82-7768-385-0.

T

Title	COASTEX Exercise Guide. Report no. 2 from the NKS-B COASTEX activity
Author(s)	Inger Margrethe H. Eikermann ¹ , Øyvind Gjøvlme Selnæs ² , Anna Nalbandyan ¹ , Øyvind Aas-Hansen ¹ , Helmuth Zika ³ , Michael Wallin ³ , Kjartan Guðnason ⁴ , Jeppe Vøge Jensen ⁵ , Tone D. Bergan ⁶
Affiliation(s)	¹ Norwegian Radiation Protection Authority, Section High North, PO Box 6606 Langnes, 9296 Tromsø, Norway ² Norwegian Radiation Protection Authority, P.O. box 55, 1332 Østerås, Norway ³ Swedish Radiation Safety Authority, S-171 16, Stockholm, Sweden ⁴ Icelandic Radiation Safety Authority, Raudararstigur 10, 150 Reykjavik, Iceland ⁵ Danish Emergency Management Agency, Datavej 16, 3460, Birkerød, Denmark ⁶ Atomkameratene, Elverhøiveien 16, 3113 Tønsberg, Norway
ISBN	978-87-7893-478-9
Date	May 2017
Project	NKS-B / COASTEX
No. of pages	12
No. of tables	0
No. of illustrations	7
No. of references	4
Abstract max. 2000 characters	There is a notable maritime traffic of nuclear-powered civilian vessels (icebreakers and cargo ships), nuclear-powered military vessels and maritime transports of spent nuclear fuel and other radioactive materials along the Nordic coastlines and in the Arctic. This traffic represents a risk for potential accidents and events resulting in radioactive contamination and spread of radioactive materials into the Nordic and Arctic marine and terrestrial environments. These kinds of events request a good preparedness, possibility for a direct cooperation between neighbouring countries as well as interaction, assistance and coordinated activities to manage the

situation, including mitigation.

In 2015, the NKS-B NORCOP-COAST project identified several needs for further improvement of maritime emergency preparedness and cooperation, including the need for definition of relevant scenarios with follow-up exercises in the Nordic countries. To address this issue, the NKS-B COASTEX project (*Scenarios and table top exercise concept on events related to traffic of nuclear-powered vessels and transportation of spent nuclear fuel along the Nordic coastline*) was initiated.

This report is the second of the three reports of the NKS-B COASTEX project. It provides a guide on how to structure an exercise when it comes to types of exercises, exercise elements, scenarios and scenario elements - in order to establish a common platform for developing of exercises in Nordic countries and harmonise further Nordic cooperation in emergency preparedness, related to maritime traffic and activities along the Nordic coastlines, and in the Arctic region. The report describes how to facilitate timely, effective and compatible exercises on decision making by response organisations in emergency situations.

For relevant maritime accident scenarios, it is suggested to read the Report no. 1 – “*COASTEX Scenario Report*”. The NKS-B COASTEX project implementation is summarised in the Report no. 3 – “*Final report from the NKS-B project COASTEX*”.

Key words

Nordic coastline, the Arctic, maritime accident scenarios, nuclear emergencies, scenario elements, radioactive cargo, radioactive sources, nuclear icebreaker, nuclear-powered vessels, floating nuclear power plant, cross-border preparedness.