R&D-Report

Emergency management competence needs

Education and training for key emergency management personnel in a maritime Arctic environment MARPART2-(MAN), Project Report 2

Odd Jarl Borch
Ensieh Roud

Nord University
R&D-Report no. 75
Bodø 2021

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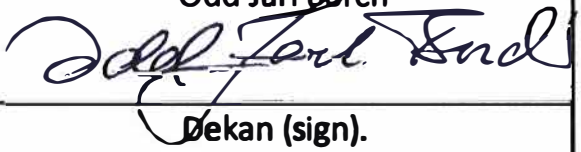
R&D-Report no. 75
ISBN 978-82-7456-843-3
ISSN 2535-2733
Bodø 2021

NORD University

NORD universitet

Godkjenning av dekan

Tittel: EMERGENCY MANAGEMENT COMPETENCE NEEDS – education and training for key emergency management personnel in a maritime Arctic environment	**Offentlig tilgjengelig:** Ja	**Publikasjonsnr.** 75
	ISBN 978-82-7456-843-3	**ISSN** 2535-2733
	Antall sider og bilag: 120	**Dato:** 20.05.2021
Forfatter(e) / redaktør(er): Odd Jarl Borch, Ensieh Roud	**Prosjektansvarlig (sign).** Odd Jarl Borch  **Dekan (sign).** 	
Prosjekt: MARPART2-MAN	**Oppdragsgiver(e)**	
	Oppdragsgivers referanse	
Sammendrag:	**Emneord:**	
Summary: This report focuses on competence demands among key management personnel responsible for maritime emergency response. The report has a special focus on competence challenges related to operations in an Arctic environment.	**Keywords:** Maritime Emergency Response Competence needs Search and Rescue Educational Programs and Trainings Response Capabilities Emergency management Exercises and Simulations Arctic High North	

MARPART

INTERNATIONAL R&D PARTNERSHIP ON MARITIME SAFETY AND SECURITY IN THE HIGH NORTH

The report is developed under the project:

MARPART 2 (MAN): Joint-Task Force Management in High North Emergency Response - Cross-Border Knowledge Acquisition and Training for Increased Joint-Force Effectiveness

Project period:

2017-2020

The project is financed by:

- The Ministry of Foreign Affairs of Norway
- Nordland County Administration
- Nord University
- Project partners' own contribution

Project partners:

- High North Center at Nord University Business School (Norway)
- Norwegian Police University College (Norway)
- University Center in Svalbard (Norway)
- The Norwegian Fire Protection Institute (Norway)
- Norwegian Defense Research Establishment (Norway)
- World Maritime University (Sweden)
- Danish National Police (Denmark)
- Royal Norwegian Naval Academy Navigation Centre (Norway)
- Northern (Arctic) Federal University (Russia)
- Murmansk State Technical University (Russia)

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ABBREVIATIONS

BI	Norwegian Business School
BSTU “VOENMEH”	Baltic State Technical University- “VOENMEH” named after D.F. Ustinov
CWO	Cold Water Operation
ETU	Saint-Petersburg Electrotechnical University "LETI"
GMDSS	Global Maritime Distress and Safety System
HVL	Western Norway University of Applied Sciences
ICS	Incident command system
IMO	International Maritime Organization
IMSAR	International Aeronautical and Maritime Search and Rescue Manual
INN	Inland Norway University of Applied Science
ITMO	Information Technologies, Mechanics and Optics
JRCC / RCC	Joint Rescue Coordination Center
KSTU	Kaliningrad State Technical University
MARPOL	International Convention for the Prevention of Pollution from Ships
MSP	Maritime Search Planning Courses
MSTU	Murmansk State Technical University
NBSK	Norwegian Fire Protection Institute
NCA	Norwegian Coastal Administration
NOFO	Norsk Oljevernforening For Operatørselskap / Norwegian Clean Seas Association for Operating Companies
NArFU	Northern (Arctic) Federal University named after M.V. Lomonosov
NTNU	Norwegian University of Science and Technology
NUSB	The National Education Center for Social Security and Emergency Planning (NUSB)
OSC	On scene commander
PHS	Norwegian Police University College
PGUPS	Emperor Alexander I Saint-Petersburg State Transport University
PTIL	Petroleumstilsynet / Petroleum safety authority Norway
PWOM	Polar water operational manual
RITS	Special Force for Fire at Sea
RNoNA	Royal Norwegian Naval Academy
SAR	Search and rescue
SITSPR	Saint-Petersburg State Technological Institute
SMC	SAR Mission Coordinator
SMS	Safety management system

SMTU	State Marine Technical University
SOLAS	International Convention for the Safety of Life at Sea
SPbPU	Peter the Great St.Petersburg Polytechnic University
SPbMU	Saint–Petersburg Mining University
SPSUACE	Saint-Petersburg State University of Architecture and Civil Engineering
SPbSUCA	Saint-Petersburg State University of Civil Aviation
SPbSUITD	Saint-Petersburg State University of Industrial Technologies and Design
SPbUSFS	Saint-Petersburg University of State Fire Service
STCW	The International Convention on Standards of Training, Certification and Watch keeping for Seafarers
SUAI	Saint-Petersburg State University of Aerospace Instrumentation
SUMIS	Admiral Makarov State University of Maritime and Inland Shipping
SykTSU	Syktyvkar State University
TTX	Table top exercise
UGTU	Ukhta State Technical University
UIT	The Arctic university of Norway
UIS	University in Stavanger
USN	University of Southeast Norway
VA	Violent Action
VSTU	Vologda State University
VYATSU	Vyatka State University
WP	Work packages

EXECUTIVE SUMMARY

This report focuses on competence demands among key management personnel responsible for maritime emergency response. The report has a special focus on competence challenges related to operations in an Arctic environment. The report is written within the MARPART-MAN project: *Joint-Task Force Management In High North Emergency Response - Cross-Border Knowledge Acquisition And Training For Increased Joint-Force Effectiveness.* The purpose of this project is to increase knowledge on emergency management competences at different decision levels within companies and emergency response agencies. We focus on action tasks in a context of limited emergency response resources and the role of integrating personnel and equipment from neighboring countries. The MARPART-MAN project aims to contribute to cross-border knowledge transfer between institutions responsible for education, training and exercise programs in this region.

In this report we reflect on the management levels and their need for both general and tailor-made training and education for meeting emergency response. We provide examples of the educational programs in the academic and training institutions in some Arctic countries and reflect on some gaps between the demand side competence needs, and the existing competence programs within emergency management education and training institutions in Norway, Sweden and Russia.

We also reflect on areas of improvement in the emergency management education and training supply side. In report 1 from the MARPART 2 -project, we have discussed the demand-side of emergency management competence needed, especially focusing on experiences from large-scale incidents, exercises and direct input from the emergency response units. This report follows up report 1 where we first map current educational programs and training within emergency management in the Arctic academic and professional training institutions. Secondly, we analyze the supply side and thirdly, we link the supply and demand side revealing possible areas of improvement as to contents within emergency management education.

We conclude that there are improvement areas when it comes to key personnel education and training. First, the commercial vessels operating in the Arctic should train on evacuation in a cold climate setting in harsh weather. Secondly, the commercial vessel officers should be more prepared to assist vessel in distress serving as vessel of opportunities. This calls for professional training and preparedness in coordinating emergency operations (the on-scene coordinator role) and serving as search and rescue units and hospital ships. This also applies to training related to safeguarding and evacuation tasks, survival in cold waters and management of rescue operations together with other units and the government agencies. Thus, officers on board merchant vessels and especially cruise ships operating in the Arctic should receive more extensive training and exercises than the standard education and training received within the certificate-related safety courses, the GMDSS radio courses, and the Polar code courses. This is especially true for vessels with a large number of passengers such as cruise ships, offshore platforms and installations, vessels with dangerous goods, and vessels operating in the ice. The role as on-scene coordinator should be given a more central place, among others in the radio operator training (GMDSS courses) and should be included in the bridge resource management courses for officers of merchant or passenger vessels, or as a separate OSC course.

Furthermore, this report illuminates that today's training programs for the government emergency response agencies are largely internal and have a limited focus on cross-agency cooperation, maritime operations and international collaboration. There is a need for more comprehensive education platforms for various players and decision makers that may be involved in maritime emergencies. For all emergency response actors insight into equipment required by the various government agencies, including physical resources such as satellites and drones, coordination, communication and control (C3) technology are needed. Also, one should learn about immaterial capabilities such as organization, used terminology, procedures and processes. This call for joint courses for key personnel involved in air, sea and/or land based emergency response including both companies, RCCs, coastal administrations, and coast guards. Systematic training in simulators, table top exercises, and preferably at least an annual full-scale exercises in a realistic Arctic context may contribute significantly. The number and range of exercises arranged today are not sufficient, and there is limited degree of realism in many of the exercises. Most exercises take place in the Summer time, close to shore and in calm weather, with a limited degree of complexity.

With regard to the current courses for the professional emergency personnel, the offerings are fragmented, with each agency having their separate programs with limited cross-institutional and cross-country coordination and collaboration. More cooperation is needed to cover all the functions included in the SAR, oil spill response, and violent action response operations, and for exchange of core competences. Joint Arctic educational programs at different management levels should be created. These programs may integrate the academic courses and the internal practice-oriented courses currently provided by various professional actors in the field. More joint exercises including government agencies, companies, volunteers and academia may be at hand building upon experiences, evaluations and research related to previous incidents and exercises.

Joint exercises like the Barents Rescue Exercise, the Exercise Barents and the Arctic Coast Guard Forum Exercises may be linked to international educational packages that provide expertise on the coordination and applying resources in an Arctic context according to the SAR, OSR or violent action or multiple scenarios. This includes knowledge about the development of the most important capabilities in the public sector, as well as capacities for other emergency organizations and operators in the Arctic environment. This cooperation also should include industry actors like the cruise industry and the oil and gas sector, and local communities. An example here is the cooperation on tests and exercises between the oil and gas oil spill response organization NOFO and the Norwegian Coastal Administration, and the cooperation between safety equipment providers in the maritime industry and the coast guard testing out equipment and exercising together with the coast guard in icy conditions.

Meeting places between relevant stakeholders, academia and key emergency personnel are lacking except for the occasional conferences and workshops. More regular joint workshops and exercise planning arenas should be developed for collaboration across countries, for example as an extension of the Arctic Council EPPR working group. Such meeting places for competence exchange should include both military and civilian competence resources. Apart from SAR, there are limited large-scale international collaboration exercises for other types of maritime emergencies such as OSR and violent action response.

This report also reveals that despite substantial demand for competence development at strategic level, limited formal education are offered by academia. The military and police academies are

providing some specialized courses. We are in need of more generic and cross-institutional educational programs for key personnel at regional and national strategic levels.

INTRODUCTION

Responding to crises at sea is demanding calling for a lot of specialized maritime competence. The cold climate context creates additional challenges for the maritime emergency response. The Arctic climate provides a more complex working environment with higher risk of injuries and accidents for everybody. Besides the risk of frostbite, the cooling involves chilling discomfort, impaired judgment, reduced capacity for work and reduced endurance. The cold affects concentration, attention and decision making (Swedish Sea Rescue Society, 2016).

The emergency operations in cold climate may involve snow, ice and wind as well as short and partly dark days. Good equipment, training, information and good planning are therefore key elements in the prevention work. The response time for an emergency response unit is crucial for saving lives particularity in the Arctic. The water cools down the body so many times faster than air and if the person is not pulled out of the water almost immediately, the probability for survival is very low. Warm survival clothing is mandatory in the rescue boats. The helicopter is often the optimal resource for rescue at sea, but the use of helicopters is limited by weather. Poor visibility and icing of the rotor blades are factors that may prevent flight. Regarding accidents far from the coast, the fastest rescue unit might be a nearby merchant or ferry since other actors are having long distances to travel (Sjöräddningssällskapet, 2016).

Oil spills at low temperatures and in ice are behaving differently than oil spills in warmer regions. This calls for more advanced collection technology, additional vessel capacities and a lot of training. The challenges for the emergency response concerning a violent action in cold climate is not much different from the above mentioned challenges with search and rescue operations and oil spills. However, a violent action might require assistance from the specialized forces of the police and these are to be found far away from the scene, the logistics may be difficult and take a lot of time, and the forces may not be sufficiently familiar with the maritime environment.

In order to overcome the challenges above, emergency response shall be fast enough with adequate resources to type, quality and quantity, and the coordination and control of the different resources throughout the operation at different levels. It demands a broad range of knowledge,

that varies according to the scenario, where you are positioned in the emergency response , and at what level. Those involved directly in a response operations require specialized, focused education and training responding fast and with great practical skills and team work (Phelan, 2008). A broad range of roles have to be fulfilled throughout a long emergency response system (Borch & Andreassen, 2016). Emergency management personnel benefit from education emphasizing concepts and theories, principles and practices of management (Phelan, 2008). An important aspect is to create a generic understanding for a broad range of crisis types that improves the ability to apply different resources, understand the cause as well as the effect of a crisis, the effect of different response tools, and how to improvise according to situation. The response teams need detailed understanding of the practice field, how people and equipment work together, and the best practice and procedures developed for the different emergency types. Both emergency operators and top management have critical roles to play in preparing for, mobilizing, responding to, and recovering from disaster. At each level of command there is a need for skills on acquiring data, creating an understanding of the causal relations and develop situational awareness, to have broad resource overview, and a need for communication, coordination and control within and between the units of operation.

Emergencies call for immediate response, multi-stage operations with partly overlapping or parallel phases, and will include a large number of participants from many organizations, institutions and companies. It the Arctic context, it may also be regarded as an extremely complex and dynamic operation where actions, problems, resources and solutions are mixed in a flux that is difficult to overview and even more difficult to coordinate. Scarcity of resources will be part of the challenge. The need for competence must be assessed in relation to both context and the tasks. As emergency services grow in complexity, the need for more management, coordination and control grows and more skills are needed (Phelan, 2008).

In this report, we review the supply of educational programs offered by universities, sector specialized professional colleges and training centers for key personnel within the preparedness organizations.

A key issue has been how to define and select “relevant” education and course within emergency management. As the topic is multidimensional, it is not easy to identify what programs and courses should be included or excluded from the review. Our ambition is to include issues related

to the different layers of what has been called emergency-disaster-crisis management. Thus, this report includes programs and courses related to emergency aspects at top level (national and strategic level), a meso level (operational level) and a micro level (tactical, on-scene level).

The demand side of study in the part II of the report builds upon the earlier studies within the MARPART projects. Within these reports we have considered the most relevant types of emergencies such as search and rescue, oil spill and violent action to identify the needs.

In this report we have collected information from a broad range of academic institutions. We have interviewed key actors within the maritime industry and the professional emergency response agencies. We have also looked through the experiences from a broad range of exercises to search for explored weaknesses.

Terminology

Large-scale emergency incidents are defined as events including a lot of persons, physical units, cover larger geographical areas that are difficult to cope with and may result in a large amount of lives lost or persons wounded, and/or severe environmental damages and damages to values and communities. We have a special focus on incidents that is not routine, the odd accidents with potential large consequences.. Major incidents are, fortunately, rare. However, they must be planned and prepared for. This preparation includes an additional element of education, training and exercises. Personnel within the emergency response agencies as well as commercial vessels are generally used to handling routine, small-scale incidents. They do not gain the same levels of direct experience in dealing with large scale emergencies. The need for specific training therefore increases commensurately (IMO guidelines, 2006, SAREX report 7).

As for the Arctic there is no uniform definition of the Arctic area. We have a special emphasis on area with cold climate issues, sparse population and a lack of infrastructure within the sea regions north of the Arctic circle. This includes Northern Canada, Greenland, Iceland, Northern Norway and Svalbard, Northern Russia and Alaska. In this report we include experiences from Sweden as their sea region, the Bottenviken, has significant amount of ice in the winter time.

In this report we divide the levels of management within emergency response into three management levels. The terms used for different levels involved in emergency management structure are not established as a standard, either nationally or internationally. The terms used in

this report are those used by most private and public emergency organizations both nationally and internationally. The table below illustrates the term variation between sectors.

Table 1. Example of terms for management levels within different sectors

	Tactical	**Operational**	**Strategic**
Maritime SAR	On-scene coordination	SAR Mission coordination	Rescue management
Police	Regional or national tactical level Bronze level	Regional or national Operational Level Silver level	Regional or national strategic level Gold level
International (NATO)	Operative level	Tactical level	Strategic level (staff)
Fire brigades	Incident commander	Incident commander	Chief

In this report, we use the following terms for the different levels:

Strategic Level: Lead and coordinate efforts to safeguard the overall interest, to ensure continuity of operation, and coordinate resources involved in an operation.

Operational Level: Lead, coordinate and support tactical level with competence, resources, and communication with higher levels

Tactical level: Lead and coordinate response action at or near the site to prevent or reduce damages to people, environment and economic value.

For the different levels, there will also be a broad range of actors with different titles and tasks. For maritime search and rescue (SAR) incidents, there will be more tasks to coordinate, and international laws of the sea and SAR-conventions to follow. Thus, there will be a broader range of personnel involved on scene. Also, the operative company, their stakeholders and preparedness partners will play an important role at operational level. There will be different titles for the different organizations according to type of incident involved in an operation, not the least when resources from several countries are involved. For example, the fire brigades as well as oil spill

response agencies follow the incident command system (ICM) with a as shown in the table below.

Table 2. Example of key personnel included in the emergency operation

Tactical (on-scene)	**Operational (coordination)**	**Strategic (staff)**
• Distress vessel captain • Samaritan vessel captain • On-scene coordinator • On-scene commander	• SAR Mission coordinator • Fire brigade operational leader • Police operational leader • Paramedics operational leader • Operations section chief • Ship owner crisis staff	• Rescue management- • Rescue management staff members • Ship owner management • Incident commander

The lack of a united terminology adds to the need for joint education and training schemes. With language challenges included, confusion of terms may create extra coordination challenges in joint operations.

METHODOLOGY

Main Approach

In order to assess the competence development needs within emergency management in the academic and training institutions, a qualitative research approach together with a case study approach were selected. The report build upon knowledge of the context, responsibility areas, the organizations and institutions. This approach involves a wide range of data sources. Key sources have been:

- Review of study programs from universities, colleges and other educational institutions
- Interviews with key personnel
- Exercises
- International and national standards regulation and training programs

Target Group

The target groups and key actors within this study are as follow:

- Management within government emergency institutions
- Company managers responsible for safety and security
- Tactical and operational managers within emergency institutions
- Offshore installation managers and on-scene coordinators on vessels, and oil rigs
- Masters and officers on vessels
- Members of shipping and oil companies Preparedness organization
- Managers of government agencies involved in emergency operations and coordinating bodies

Empirical Data

Empirical data has been collected from the emergency organizations, and educational institutions. The main body of interviews were conducted with key personnel in emergency organizations within the four main focus area: search and rescue, fire, oil spill response, and violent action. The table below provide an overview of the considered aspects of the report.

Table 3. Institutions within emergency management included in this study

Key actors	Level	SAR	Fire	Oil spill	Violent action
JRCC	Operational	X	X	X	X
Police	Strategic/Operational/ tactical	X			X
Coast guard	Operational/Tactical	X	X	X	X
Coastal administration	Operational / Tactical	X	X	X	
Military	Tactical	X	X	X	X
Oil and gas companies	Strategic/Operational/ Tactical	X	X	X	X
Oil spill response	Operational/Tactical			X	
Private rescue companies	Tactical	X	X	X	
Volunteer organizations	Tactical	X		X	
Municipality	Operational/Tactical	X	X	X	
County governor	Operational	X	X	X	
Health	Strategic/Operational/Tactical	X			

PART I. CURRENT EDUCATIONAL PROGRAMS AND TRAINING WITHIN EMERGENCY MANAGEMENT IN THE ARCTIC COUNTRIES

The competence of key personnel within the maritime companies and emergency management institutions is a combination of 1) Basic vocational education (high school and bachelor level), 2) graduate education (master level), 3) specialized courses within the various professions or positions, 4) individual and collective training, 5) exercises related to defined events, and 6) experience from real incidents. The responsibility for offering education is divided between universities, professional colleges, and sector specialized schools and course providers. The universities and university colleges provide bachelor degree education as well as masters and doctoral level education. These programs may be operational such as nautical officer education with a safety focus, tailor-made education within safety, security and emergency response, or they may be more generic management, technical or social science programs. We also find a range of specialized courses with relevance for the emergency response agencies offered in different countries, such as an OSC-course. In this report, we have categorized the educational program and courses into *generic*, *sector specialized* and *experience and research based* education.

Table 4. Categories of competence development

Different categories of competence development in Norway	
Generic education	
1. **Formal education**	a) Third level vocational schools b) Universities (bachelor, master degree, PhD) c) Profession specialized university colleges (bachelor, master)
Sector specialized education	
2. **Specialized courses and seminars**	a) Course centers b) Consultants
3. **Special training and testing**	a) Training centers b) On-the-job training facilities
4. **Exercises**	a) Simulation centers b) Exercise arenas
Experience and research based education	
5. **Real experience**	a) Individual participation b) Logs c) Pictures and videos
6. **R&D**	a) Shared data base b) Follow-up research c) Comparative studies d) National programs to summarize the analyses and dissemination

Much of the education is specialized within professions and giving by specialized colleges for the profession in question such as police fire fighters professional schools and coast guard.

NORWAY

Norway has a broad range of institutions educating personnel for the commercial sector, including marine, maritime and offshore oil and gas industries. Within these programs safety and environment protection may be included, and for some occupations like sea officers education safety and emergency response education and training is obligatory. Norway also has professional vocational schools and university colleges for different professions such as police, fire brigades, coast guards, etc. Finally, there is a broad range of private companies offering education and training. There are few systematic studies emphasizing the competence needs of emergency response personnel in general and very few focusing on the challenges in an Arctic context. Some recent publications provide more applied understanding of the competence needs, for example Johannessen and Glomseth (2016) for the police sector. An informative booklet on management training of relevance is made by Hareide and Ostnes (2016). Within the SARINOR project, Borch et al (2016) emphasized the need for specialized training within search and rescue in the Arctic regions, including more competence tailor-made for shipping companies. The Ministry of Justice and Public Security commissioned two committees working on the need for education and especially training for inter-organizational collaboration between police, fire and rescue brigades and paramedics, with a special focus on the need for analyses capacities related to exercises and real events, as a platform for (SAR-) training and exercises.

An important part of the competence requirements is defined through experiences from actions and exercises that provide input to course design, and training and exercise plans within the agencies. This is largely left to the individual agency, and is relatively limited for maritime emergency management. For search and rescue at sea, each country has to follow the demands of the International Maritime Organization with the SOLAS and SAR convention, manifested in the IAMSAR manual for training emergency response personnel. The Ministry of Justice and Public Security (JD) as the Coordinating Department of Preparedness has not drawn up its own competence plans for emergency preparedness but left this to the underlying agencies. The ministry also have a limited competence development activity and funding in the maritime emergency response area.

According to the Norwegian Ministry of Justice and Public Security, emergency organization should be hierarchically structured with various managerial levels (government.no). It is critical to maintain a clear responsibility and command structure in emergency situations, where there is normally no time and opportunity to carry out comprehensive decision-making processes.

Within Norwegian emergency management, there are some central principles. These principles are divided into the *proactive principles* and the *national principles*.

The proactive principles help Norway to be sufficiently proactive in emergency situations by implementing risk mitigation measures to prevent adverse escalation of emergency situation. There are three proactive principles to exercise effective emergency management.

Include uncertainties: Always initiate early mobilization and implement the risk mitigation measures as well as further alerting when discovering or receiving notice of a potential emergency incident. This also means that Norway will only refrain from mobilization or further alerting if they are absolutely sure that the event will not be so serious they demand mobilization and alerting.

Moderate overreaction: Always try to implement resource mobilization to ensure that they have available overcapacity of important resources and must always implement risk mitigation measures that can prevent or reduce the consequences of an emergency situation, although this is not considered necessary at the time of decision.

The first informer: Always inform as soon as you can. Norwegian emergency organizations shall always be open and honest in their communication.

The national principles are guidelines to utilize the structure of public emergency organizations that is recommended to private organizations as well. There are four national principles: *similarity*, *responsibility*, *subsidiarity* and *cooperation*. The first three has been established by the Norwegian rescue service in 1970s, while the cooperation principle has been introduced after the terror attack at Utoya in Norway, in July 2011.

*Similarity (likhetsprinsippet)***:** The principle of similarity means that an emergency organization's daily operation and procedures should be as similar as if it is under adverse emergency condition. Dealing with emergencies will be easier since the organization follows similar procedures,

features and devices. This facilitate communication because information channels and communication lines are already established between departments and sections.

Responsibility (ansvarsprinsippet): Responsibility principle means, whoever is responsible for an expertise area in a normal situation, also have a responsibility to deal with incidents on the same area. Because it is easier to cooperate both for the person assigned a responsibility and for those who are to co-operate with, if the responsibilities stays unchanged during an emergency incident. The principle of responsibility promotes mutual overview, knowledge and understanding within organization.

Subsidiarity (nærhetsprinsippet): Rapid decision making with least delay through long lines of communication is often crucial in emergency response. The principle of subsidiarity means, unwanted events should be organized at the lowest organizational level. Delegating decision-making authority to the closest unit to the emergency response place is important in order to take necessary actions early enough. However, an important clarification is that the subsidiarity principle does not mean that the emergency organization closest to the incident should make all decisions.

Cooperation (samvirkeprinsippet): Cooperation means that all public organizations that have appropriate emergency resources must put effort to coordinate their resources and capabilities in an emergency situation for cooperation with the others. Experience from real events has shown that achieving effective communication and coordinated efforts between various public entities is a challenge that needs to be improved. The core of the cooperation principle shall be exercised both at public and private emergency organizations.

The principles above underline the need to education and train the whole organization at all levels with safety and emergency response, and also focus on the cooperation issues where the organization has to know the different tasks of the partners from the alarm phase and the creation of situational awareness, to mobilization and effective interaction on scene.

Current Educational Programs and Courses in Norway

The programs within emergency response in Norway should try to meet the obligations stated in the principles above. In this report, we focus on the generic and sector specialized educations. In the following we present the courses and program within the two sectors.

Generic Education

Tertiary Vocational Education

Tertiary vocational education is an alternative to higher education and is based on upper secondary education and training or equivalent non-formal (no vocational school or university credit) competence (government.no). The Tertiary Vocational Education Act defines vocational education as "education that provides competence for working life without further general training measures" (in force as of 1 Aug 2007 pursuant to the Decree of 29 June 2007 no. 758). Pursuant to the Act, the tertiary vocational colleges shall provide education of high quality and equip students with satisfactory skills and conditions. The county authorities are responsible for ensuring the provision of accredited tertiary vocational education that considers local, regional and national competence requirements within priority sectors.

Teaching usually takes place in classes where the students get a close dialogue with the lecturers. There are also many online studies. Many of those who teach at vocational schools have solid industry experience in the field they teach, which helps to prepare for working life. Students learn to combine theory with practice by working on real-world challenges, which makes the students, qualify to go straight to work. The duration of study is normally two years for fulltime student.

The emergency management education at this level is first and foremost given to officers in the merchant fleet. This kind of education mostly falls under tactical level of emergency management. The education is based on the International Maritime Organizations STCW convention. Education within emergency management is quite limited and related to general management courses, the maritime distress radio courses (GMDSS) according to the IAMSAR (International Aeronautical and Maritime Search and Rescue) manual, and within week-long safety management courses. There are also more specialized courses like 2-days crowd and crises short courses. In Norway, there are around 15 schools giving this type of education and training.

For operations in the polar regions, there are also week-long Polar code courses for deck officers (basic and advanced) offered by a few schools.

The Norwegian Fire Protection Institute (NBSK)

The fire brigade education in Norway is given through tailor-made courses to the different levels of management, from tactical up to strategic level. Unlike the other emergency response professions, there is no official programs at bachelor level for the managers within the fire brigade.

The Norwegian Fire Protection Institute (NBSK) is a public vocational school for fire, rescue and oil recovery education. The teaching consists of both theory and practical exercises and covers both basic and managerial courses. Norway's fire school offers varied courses in fire and rescue at several levels. One of the most relevant programs is the Incident Command System (ICS), a standardized international organizational design concept that emphasizes cooperation and coordination, supportive operation, national preparedness, coping with emotion and stress.

All the official programs have practical exercises in the last semester that will be graded. Alongside theoretical education, they have internal systematic training every three months. After fulfilling the specific hours of training, they can start working in cooperation with 110 center. The Special Force for Fire at Sea (RITS) involves six teams at several selected sea area along the coast. There are no formal education programs for the RITS forces outside of the basic fire education and management courses. However, they do frequent training and exercises with other partners in the emergency response system. The NBSKs targets are to actively participate in the research and development connected to fire, rescue and preparedness as well as developing knowledge and experience through cooperation with other training/ education centers and other sources of expertise. Moreover, it is targeting optimal resource-use for delivery of training with a high technical quality. The professional and administrative responsibility of The Norwegian Fire Protection Institute (NBSK) lies under the Directorate for Social Security and Preparedness (DSB). The National Education Center for Societal Security and Emergency Planning (NUSB) providing short, tailor-made emergency response courses also belongs to DSB portfolio.

University Programs

The second source of obtaining generic education for competence development is through universities and university colleges. Norway currently has 10 universities, 6 university colleges

and 5 scientific colleges owned by the state. In addition, there are 4 professional colleges (Government.no). Most of these provide safety and emergency management courses of relevance. The evaluation of Quality Assurance Systems and accreditation of both public and private institutions are handled by a national agency for quality assurance (NOKUT).

In 2003, a national reform, called the Quality reform, was implemented throughout the entire national higher education system (Ministry of education and research). Norway was one of the first countries in Europe to implement the Bologna convention (European higher education area), thus creating a 3+2+3 year system in accordance with the Bologna Process. A further step was taken in 2005 when the Act Relating to Universities and University Colleges and the Private Higher Education Institutions Act were merged into one Common Act (Government.no). The Common Act ensures greater equality between the public and private higher education institutions, thus focusing more on the quality in higher education than ownership.

Universities in Norway cover relatively similar courses within emergency management field. The literature and reading lists are slightly different depending on the university and the course objectives. The table below lists the name of institutions and the degree levels, it also includes some relevant single courses within emergency management field.

Table 5. List of universities and colleges with examples of emergency management programs/courses

Institutions		
	Bachelor	Master
UIT	• Nurse • International preparedness • Societal security and environment	• Technology and safety in the High North • Societal security
Nord	• Paramedics • Nurse	• Social Science with specialization in public security and terrorism studies • Preparedness and Crisis Management
NTNU	• Nurse • Nautical science	• Managing demanding marine operations • Marine technology Health, Safety and Environment (single course for masters)
UIS	• Nurse	• Master of technology in societal security
INN	• Nurse • Preparedness and crisis management • Emergency Risks, Vulnerability and Preparedness (one year)	
USN	• Nurse	

	• Marine engineering • Nautical science	
HVL	• Nurse	• Fire safety
BI		• Organizing for the Unexpected (single executive course in Security Specialization)

Bachelor Level

At bachelor level there are few study programs specialized on emergency management. The bachelor in international emergency preparedness at UiT Harstad, however, offers a broad range of courses related to different types of emergencies and management issues. At the Innland university College there is a one year program in preparedness and crisis management

Most of the universities and university colleges provide nursing education and the four largest universities provide medicine education. Some universities provide more specialized bachelor programs, such as paramedics focusing on ambulance personnel and on scene incident commanders within health Some bachelor programs such as nautical science have some courses and training related to safety and emergency response. There are courses in medical care and safety management and organizational theory that focus on organizational aspects and human factors in the maritime context. In addition, there are basic and advanced safety training courses.

Bachelor of preparedness and crisis management (INN)

The study is based on the areas of risk and vulnerability, preparedness and crisis management in organizational and management perspective. The study aims to develop competence in social security, preparedness and crisis management in the public or private sector. The target group for the study is primarily people working or wanting to work with security, preparedness and crisis management in the public sector.

Table 6. Program structure and courses

Term	7.5 Credits	Contents
1. Term	3RIS120 Security Management 3KRI110 Crisis Management 3RIS100 Preparedness and management	Important organizational elements and the role of manager and management in terms of risk, vulnerability, prevention and crisis management in organizations Elements in the safety management system (HSE), risk and vulnerability analysis (ROS) and threats to society Planning of emergency preparedness and crisis management and implementing in practice Crisis communication International crisis management History of subject, traditions, distinctive character in society
2. Term	3RIS160 Risk analysis and social security 3RIS140 Emergency preparedness and crisis management in practice 3KRI130 Crisis Communication Management	
3. Term	3KRI210 Emergency Ethics and Crisis Management 3RIS200 Emergency and Support Services Work in Acute Events 3KRI200 Crisis, stress and mastering	
4. Term	3KRI220 International crisis management 3LED140 Workgroup and team in organizations 3MET100 Information Competence and Method - Method 1	
5. Term	3ORG310 Organization for the unexpected 3RIS300 Security in the cyber domain RMET200 Method and data processing - method 2	
6. Term	3RIS310 Emergency training and exercise 3BA300 Bachelor thesis 15 Credits	

Bachelor of societal security and environment (UIT)

The study in Societal Security and the Environment provides information on management strategy, social planning, environmental management, safety in the Arctic, health, environment and safety (HSE) and emergency management. The goal is to learn how to strengthen preparedness and safeguard the security of society as well as prevent and, in particular, handle any crises. The program provides knowledge about safety and the environment in social institutions, companies, municipalities and other forms of public and private preparedness and entities. Moreover, the study delivers knowledge to assess the social consequences of critical decisions in emergencies. The main objective of the program is to give a vocational study that can be used within public administration, organizations and private entities.

Table 7. Program structure and courses

Term	**10 credits**	**10 credits**	**10 credits**
1. Term	SVF-1202 Accidents and safety	SVF-1201 Environment and Vulnerability in the Arctic	FIL-0700 Exam philosophical, Tromsø variant
2. Term	SVF-2106 Crisis Management	SVF-1204 Organization and Security	SVF-1205 Risk, Society and Infrastructure.
3. Term	SIK-1003 HSE (Health, Safety and Environment)	SVF-2101 Exercises in the Highlands	SVF-1050 Social science method
4. Term	SVF-2103 Risk Analysis	SIK-2002 MTO (Human, Technology and Organization)	SVF-2102 Environment and resource management
5. Term	Elective	Elective	Elective
6. Term	SVF-1203 Municipal Security and Emergency Planning	SVF-2120 Bachelor thesis	

Bachelor of International Preparedness (UIT)

The study at UiT campus Harstad is conducted in close cooperation with NBSK - Norway's Fire School in Fjelldal, in the Tjeldsund municipality. The study aims to develop competence in social security and emergency preparedness. The study reflects on public sector, private business and voluntary organizations. Key topics for this study are Arctic knowledge, natural disasters, environment and vulnerability, organization, management and logistics, operational management, risk and risk management, and exercises (planning and conducting). Upon completion of the study, students will have theoretical knowledge of the Arctic and an understanding of how the communities in the Arctic are organized and politically controlled. Among the courses within the study, operational management is very central. The course provides understanding and knowledge about the authorities' activities on emergency preparedness and environmental monitoring, including knowledge of public authorities and political priorities. Furthermore, it refers to recent years 'knowledge development regarding public and private organizations' preparedness and emergency plans for various types of unwanted incidents (natural, systemic, human and terror).

Table 8. Program structure and courses

Term	10 credits	Contents
1. Term	BIB1007 Introduction to method BIB1004 Introduction to emergency preparedness BIB1002 Emergency Logistics	Emergency preparedness actors and emergency preparedness activities Levels of emergency management Introduction to Risk and Vulnerability (ROS) Basic logistics/ logistics in emergency mode. The connection between ROS, contingency plans and exercises Exercise Planning Exercise management and implementation Evaluate exercises Legislative requirements regulating exercise / training of preparedness Municipal emergency plans for handling unwanted incidents Larger national and international emergency preparedness exercises The 4 Sustainable Principles in Social Security (Co-operation, Responsibility, Equality and Subsidiarity) Emergency planning at national, regional and local levels National strategies for crisis management Crisis Support Tools Crisis communication Oil conservation, organization and responsibility for acute pollution at the various levels Relevant laws, regulations and agreements ROS analysis, focusing on acute pollution
2. Term	BIB1003 North Area Policy BIB1008 Natural disasters BIB1009 Exercise planning and implementation	
3. Term	BIB2001 Risk, risk management and vulnerability analysis BIB2004 Operational management BIB2005 Environment and vulnerability	
4. Term	BIB2003 Safety and logistics in cold climate BIB2002 Crisis management and communication BIB2017 Applied research method	
5. Term	BIB2014 Oil spill management BIB2016 Practical project management BIB2006 Hazardous Goods and Hazardous Substances (HAZMAT)	
6. Term	BIB2015 Crisis and disaster in a psychosocial perspective BHP1001 Bachelor thesis	

Emergency Risks, Vulnerability and Preparedness- One year (INN)

The study Emergency Risks, Vulnerability and Preparedness is a basic education of 30 credits. The study is conducted as a joint-based part-time study over two semesters. The Risk, Vulnerability and Preparedness program provides expertise in preventing crises, and in establishing preparedness to handle the emergency situation. The program is part of the university's study offerings related to emergency preparedness management and crisis management. The program's target group is employees at public and private sector responsible for security, preparedness and crisis management. The program qualifies for work on emergency preparedness planning. The study will provide specific expertise in the use of analytical tools to assess vulnerability and estimate risk.

Table 9. Program structure and courses

Term	7.5 Credits	Contents
1. Term	Preparedness and management	Basic management models Personal qualities for management in a risk and preparedness perspective Situation and organization conditions for management In general, cognitive processes, with emphasis on decision making and learning Individual differences in decision-making and learning processes Situation conditions in decision-making and learning processes Ethical and moral balances in a risk and preparedness perspective
	Security Management	Characteristics of an effective security culture (e.g. "High Reliability Organizations") Principles of risk management Security Management and Internal Control System in a Business (Case) Directives and requirements for safety management Requirements for management in connection with safety work HSE in a societal perspective
2.Term	Emergency preparedness and crisis management in practice	Prevention of crises Characteristics of crises Causes of crises Consequences of crises Follow-up of crises Types of crises Military-civilian cooperation in emergency preparedness and crisis management Team training within crisis and preparedness management future Scenarios
	Risk analysis and social security	Critical social functions and critical infrastructure Methods for risk and vulnerability analyses Security Management Models Organization of social security, preparedness and crisis management Experience data in risk and vulnerability analyses Experiential learning and reduction of vulnerability

As we see from the course list above, the programs provide a broad competence within the field safety, emergency preparedness and response. Especially the bachelor program at UiT Harstad includes a range of very important emergency response subjects. Within these studies there are limited practical training. However, many of the students will be working within the emergency preparedness system.

Master Level

There are five master degree programs in Norway with focus on safety, security and emergency management. The main focus is on safety issues both at company and society level.
In the following we present each programs focal area and approach.

Master of Technology and safety in the High North (UIT)

This program focuses on the technical and safety related challenges associated with industrial activities in the Arctic. Special attention is given to maritime and offshore operations in the harsh and vulnerable Arctic environment. The students are introduced to methods and tools for managing advanced, complex and integrated technical systems with respect to operation and maintenance, reliability and production assurance, health, safety and environmental risk as well as emergency preparedness. This master program has two specializations offered in Norway.

Risk and reliability specialization: The discipline within "Risk and Reliability" enlightens the theoretical fundament of risk and reliability analyses, and techniques available to assess risk and reliability. The study focus on the technical and safety related challenges associated with industrial activities in the Arctic.

Nautical science specialization: The discipline within nautical science enlightens operations -and floating structures on a general base, particularly in the Arctic, focusing on advanced and safe operations in the ocean. This includes; ship stability, dynamic positioning, collision and grounding avoidance, weather routing and hydrodynamic aspects in marine operations in the ocean space. Navigational instruments such as; Global Navigation Satellite System (GNSS), inertial navigation, sub-sea navigation and the integration of such systems.

Table 10. Program structure and courses

Term	**10 credits**	**10 credits**	**10 credits**
1. Term	TEK-3002 Reliability Engineering	Specialization Nautical science: TEK-3011 Ship stability Specialization Risk and Reliability: STA-2001 Stochastic Processes	Specialization/optional course
2. Term	TEK-3006 Cold Climate Engineering	Specialization Nautical science: Marine Operations Specialization Risk and Reliability: TEK-3001 Operation and Maintenance Management	Specialization/optional course
3. Term	TEK-3004 Specialization Project with method seminars	Specialization Nautical science: Navigation Systems Specialization Risk and Reliability: TEK-3008 Marine Engineering	Specialization/optional course
4. Term	TEK-3901 Master thesis		

Master of Managing demanding marine operations- Part time (NTNU)

This master program puts the human interaction into focus in demanding operations, with emphasis on the complex operations to support the installations of subsea field equipment.

This experienced-based master offers a practical approach for marine officers, shore-based personnel, and executive and operational managers within other operational organizations, in search of deeper knowledge within management of demanding operations. There is a focus on integrated operations, e.g. between the bridge and on-shore personnel, between personnel from different organizations between personnel in operation at different time periods. The program is oriented towards leadership effectiveness, with special attention on influence strategies that lead to superior performance regarding safety and effectiveness issues. Another topic of the program will be on management challenges when an organization is exposed to risks. Anyone responsible for or participating in an operation should be conscious both about the risks facing the operation and the risks the operation is creating itself.

Table11. Program structure and courses

Term	**7.5 credits**	**7.5 credits**
1. Term	TS501015 Integrated Operations I: Management of Demanding Operations	TS500915 Industrial Psychology and Human Resources Management
2. Term	TS500213 Integrated Operations II: Risk management	TS501115 Scientific theory and methods
3. Term	TS500813 Human Factors	TS500313 Integrated Operations III: Cultural Understanding and Communication
4. Term	TS500413 Integrated Operations IV: Management of the Unpredictable	TS500915 Project Management (optional)
5&6. Terms	TS500713 Master thesis 30 credits	

Master of technology in societal security (UIS)

The study provides knowledge on how to use different methods such as risk and vulnerability analyzes, planning, management and decision-making tools to prevent unwanted events and prevent damage if it happens. The study also emphasizes on how risk information can be utilized

in society's planning and decision-making processes in serious incidents. Some of the subjects are shared with the master program in societal security. In the first year, the focus is placed on vulnerabilities in society's infrastructure, risk analysis and risk management. Some examples are technical systems in transport, industry, power and water supply and health services. In addition, crisis management is addressed with the challenges facing different businesses in acute emergencies. In the second year, emphasis is on how risk related information can be utilized in society's planning and decision-making processes, for example the investigation of serious events.

Table 12. Program structure and courses

Term	**10 credits**	**10 credits / Electives**
1. Term	MSA115_1 Risk and social security MSA125_1 Crisis management STA500_1 Probability calculation and statistics 2	
2. Term	SAM500_1 Infrastructure and Vulnerability SAM510_1 Risk-based management	RIS510_1 Change management - from theory to practice RIS510_1 Reliability
3. Term	MEN115_1 Qualitative Methods	RIS520_1 Technical Security SAM600_1 Examination Methods SAM610_1 Technical Safety
4. Term	SAMMAS_1 Master thesis 30 credits	

Master of Marine Technology (NTNU)

The first two years of this degree program emphasizes basic technological subjects such as mathematics, physics, chemistry, etc. as well as basic marine technology. These subjects make the basic knowledge that is needed to solve marine technological challenges. After the first two years that are common to all, they can choose between eight different specialization directions. One of them is security management that provides knowledge of the elements that affect efficiency, safety, environment and costs, and how to take into account these in different life stages of a technical facility. Furthermore, provide basic knowledge of strategies, systems and requirements for the control and management of these elements. Key issues are reliability, accessibility, maintenance and security (RAMS) in a life cycle perspective.

Master of Fire Safety (HVL)

The primary objective of this master's program is to provide industry and society with highly qualified candidates who through in-depth knowledge in the field can contribute to a more fire safe society. One of the most important aspects in this context is procedures to reduce risks in major accidents. The master's program is organized in close contact with industry partners focusing particularly on fire technical issues.

Table 13. Program structure and courses

Term	**10 credits**
1. Term	ING4004 Advanced fire dynamics ING4005 Fire risk assessment ING 4006 Advanced fire and egress modelling
2. Term	ING4007 Industrial fire safety ING4008 Building fire safety ING4009 Contingency management
3. Term	Master thesis 60 credits

Health, Safety and Environment- Single course (NTNU)

The HSE-course for master students provides information about health and safety at work. It includes training in first aid and fire protection. Lecture in HSE in general for master students at the Faculty of Natural Sciences. Issues applying for all students are covered. The key concepts are:

- Laws and regulations.
- Roles and responsibilities
- Reporting HSE-problems and unacceptable conditions
- Risk assessment
- Emergency preparedness
- Behavior at the scene, notification and receipt of external assistance
- Demonstrations and practical exercises focusing on first aid for unconsciousness
- Fire protection

Various programs are offered at Norwegian universities and colleges that can be suitable for competence development at operational and strategic level.

Master in Preparedness and Crisis Management (Nord university)

This program started in the Autumn 2018 and is tailor-made for the management levels within emergency response. This program emphasizes knowledge and practical skills on how to handle and lead successful response and provide effective strategies for continuous development of preparedness resources. This master's program offers management-oriented education in emergency preparedness and response, and significant training in simulator facilities as well as participation in an annually full-scale exercise with professional emergency responders. The program targets leaders, managers and other personnel with safety and preparedness responsibilities in both public and private organizations as well as professionals within the emergency preparedness field. An important aim of this experience-based program is establishing and strengthening forums and networks for exchange of knowledge and experience among the leaders of the various actors in business and public sector, and research.

The program provides in depth knowledge on how public and private preparedness system is organized and gives specific insight in critical factors influencing response in private and public organizations. Moreover, the students obtain advanced knowledge in how strategic competence management efforts can be planned in order to promote organizations' crisis management competences. In addition, the program delivers applied knowledge in strategic communication both regarding management of media and utilizing the digital technologies for information. The students come from all parts of the national response system, including a large group with education within the military.

Table 14. Program structure and courses

Term	**7.5 Credits**
1. Term	Introduction to change and crisis management Emergency organizations and crisis management
2. Term	Strategic media management Emergency preparedness and crisis management
3. Term	Mobility and Technology Human factors
4. Term	Digital preparedness Methods
5 & 5 Term	Master thesis 30 Credits

Master of social science with specialization in public security and terrorism studies (Nord)

This specialization in public security and terrorism studies provides knowledge and understanding of public security, terrorism and counterterrorism issues in democratic countries,

including theoretical and empirical research as well as public and academic debates. Students will learn to draw on interdisciplinary social and organizational theories, perspectives and concepts, and develop skills to critically analyze and discuss a range of problems related to this field, including:

- National and international security and counterterrorism
- Causes of terrorism and recruitment to terrorist organizations
- The concepts and rhetoric of public security and terrorism
- The roles and practice of the police, military and intelligence organizations in counterterrorism.
- Consequences of terrorism for democracy, rule of law and the community
- Consequences of counterterrorism for democracy, rule of law and the community
- Methods and sources in the study of public security and terrorism.

Table 15. Program structure and courses

Term	**10 Credits**
1. Term	SPME310S Qualitative and Quantitative and Methods KL300S Operational Leadership, Public Security and Crisis
2. Term	SPSTA5000 Terrorism, Security and Democracy SPPO301S Governance SPPO304S Politics and Regimes in the High North
3 & 4. Terms	Elective Course Master thesis 50 Credits

Master of societal security (UIT & UIS)

This program is a full-time study with a standard study period of two years at both universities. The study program at both universities provides a broad presentation of how safety and preparedness considerations can be safeguarded in society. However, the direction of study from UIT is towards the particular challenges associated with the Arctic environment, climate and infrastructure for safety and emergency preparedness. On the other hand, the study from UIS has direction towards extraordinary events both natural and man-made threats such as terrorism. Both studies focus on different methods to assess and analyze threats, risk, vulnerability and emergency preparedness. At the same time, education emphases on crisis management and how to handle several challenges in the crisis situations. In addition, the studies provide methods that shed light on complex causes and events, thus helping individuals and organizations learn from experience and exercises.

Table 16. Program structure and courses

Term	UIT-10 credits	UIS- 10 credits
1. Term	SVF-3201 Risk and social security SVF-3205 International emergency preparedness and environmental protection in the High North SVF-3003 Qualitative research methods	MSA115_1 Risk and social security MSA125_1 Crisis management MEN215_1 Qualitative research methods
2. Term	SVF-3204 Risk assessment and management SVF-3202 Crisis handling SVF-3004 Quantitative Research Methods	MEN255_1 Management and regulation of HSE (Elective) SAM500_1 Infrastructure and vulnerability SAM510_1 Risk based management MSA265_1 Energy, societal safety and sustainable development (Elective) MSA270_1 Prevention and response in humanitarian crises (Elective)
3. Term	Three Elective Courses	MSA280_1 Science theory with ethics (Elective) MEN115_1 Qualitative Methods (Elective) MSA280_1 Decisions in crises (Elective)
4. Term	Master Thesis	Master Thesis

Professional University Colleges

The third source for obtaining generic education within emergency management is via professional university colleges. We have listed the four colleges that offer formal civilian and/or military education.

The Norwegian Police University College (PHS)

The police has the cross-sectoral leadership role in all operations where health and life are threatened. The organization both initiates and directs all rescue operations, armed actions, as well as joint operations that include the Armed Forces. On this basis, it is normal to consider the police as the key actor in Norway's emergency management system.

The Norwegian Police University College (PHS) is a public university college located in Oslo, Kongsvinger, Stavern and Bodø. It offers education for the police force of Norway, including a three-year basic education and a possible expansion with a Master's degree. PHS offers courses at both tactical and operational levels related to the emergency response system, crisis planning and functional management. The PHS also conducts research in relevant areas including law, police science, criminology, psychology and sociology. Unlike other public colleges, it is owned by the Norwegian Ministry of Justice and Public Security.

The bachelor program in policing has 180 credits and consists of five main areas. The focus is on experience and research-based knowledge, digital competence and ethics throughout the entire

education. The master's programs in policing have 120 credits and is organized into eight subjects. The table below presents the content of programs.

The Nordic Master of Police Management is a new master. The Master's program is aimed at police officers in Norway, Denmark and Sweden. The program is part-time over three years and has a tuition fee totaling NOK 150,000. The education will contribute to raising the managerial competence in the police.

The purpose of the Master of Political Science is to increase the analytical and research competence within the police. The program is a part-time study over four years and is organized into nine topics that build on each other. Each of the four study years is estimated at approx. 840 hours of study work.

Experience-based master's degree in investigation is offered to meet the need for practice-related and knowledge-based academic specialization and subject management. The program is part-time over three years, holds seven courses and is estimated to include approx. 840 hours of study work each year.

Table 17. PHS Degree Programs

Bachelor	**Credits**	**Master**	**Credits**
Topic 1 Police and society **Learning criminology sociology** **Professional ethics** **Administrative law**	27 22	Topic 1: Introduction to Political Science Police and media The complex police role International police cooperation and globalization of crime	15
Topic 2. Method **Theory of science and research method** **Digital police work in Dissertation**	 67	Topic 2: Theory of science, research ethics and research methodology Topic 3: Police activities and practice Central theories, concepts and strategies in prevention and control of crime and order problems	15 15
Topic 3. Order and preparedness **Order service** **Road Traffic Law** **Psychology** **Communication and conflict management**	 20	Perspectives on intelligence, investigation and readiness Ethics, legal certainty and privacy related to police activities Topic 4: Police as a knowledge-based organization: intelligence, analysis and evaluation	 15
4. Preventive tasks **Prevention of crime prevention** **Preventive police work** **Legal topics**	 44	Strategic analysis and intelligence as management tools and decision support Intelligence methodology, processes and products Evaluation traditions in police operations The police's use of research findings, statistics and intelligence products	
5. Investigation **Criminal law and criminal proceedings** **Report and investigation** **Crime Technique**		Ethics and regulation Topic 5: Optional subject Topic 6: Method Course 7 & 8: Master's thesis 30	15 10 30

The Norwegian Defense University College (NDUC)

The Norwegian Defense University College (NDUC) offers higher military, related management education in Norway. NDUC consists of five departments with the different tasks (Forsvaret.no). Following are the five departments:

1) *The Norwegian Defense College (NONDC)* gives key personnel defense knowledge and insight into defense, security and political factors that affect the Norwegian society. The Norwegian Defense College offers master's degrees in crisis management, national emergency management and military joint operations. These are more relevant to the strategic levels than the tactical.

2) *The Norwegian Defense Command and Staff College (NORDCSC)* qualifies personnel for staff service and executive positions on an intermediate and higher level in the war and peace organization. NORDCSC contributes to professional qualification of staff within strategy, operations and staff service.

3) *The Norwegian Institute for Defense Studies (IFS)* conducts research within the areas of military theory and strategic studies, Norwegian security policies, defense politics, defense analysis and international conflict and cooperation reviews.

4) *The Norwegian University of Sport And Physical Education/Defense Studies (NUSPE/DI*) is the Norwegian Armed Forces' center for physical training and conducts studies on survival and physical capacity. This is more suitable for personnel at tactical level.

5) *The Norwegian Defense Centre of Skills and Education (Fokus*) is located in 13 different locations in Norway close to the Armed Forces military units. The target groups are personnel serving their conscript time, staffs, officers and civilian employees in the Armed Forces.

The Royal Norwegian Naval Academy (Sjøkrigsskolen)

The Royal Norwegian Naval educates officers for the Royal Norwegian Navy. The RNoNA has a status of an independent institution under the Norwegian Act on Universities and University Colleges. It has been accredited to develop study programs at the undergraduate level, to award bachelor's degrees, and to evaluate degrees from other institutions. Programs in nautical science and naval engineering include all necessary IMO regulations to achieve full certification at the highest nautical and naval engineering levels. All bachelor programs at the RNoNA are accompanied with theoretical and practical leadership education and training, where leadership traits and skills are repeatedly trained during specially designed exercises.

The Naval Academy together with the Coast Guard's Competence Center offer specialized courses and training programs for the Navy's vessels. The RNoNA and the Navy Training Establishment have several simulator centers for naval training on individual, team and tactical levels.

In Norway, the Royal Norwegian Navy (RNoNA) provides management education and maritime SAR competence at sea. Personnel on board the Coast Guard's vessel are trained and educated for operations in demanding seas. In case if emergency at sea, the Coast Guard's vessel that arrives at the accident site will normally take over the role of On Scene Coordinator (OSC). The Table 18 summarizes the programs and courses offered by professional colleges in Norway.

Table 18. List of generic education from professional colleges and courses within emergency management

Institutions
Norwegian Police university college
Bachelor in policing Master in Police Science Nordic Master of Police Management Functional management for incident commanders
Police Operational Education
Two years Program for Staff Management National preparedness and crisis Education in emergency planning forensic investigation of accidents and extraordinary events
Naval Academy
Bachelor of Leadership, with specialization in Naval engineering Bachelor of Leadership, with specialization in Nautical science Bachelor of Leadership, with specialization in Special operations
Bachelor of Leadership, with specialization in Logistics and resource management
Norwegian defense university college
Crisis management National emergency management and military joint operations
Leadership (sjefskurset)
Strategic crisis management course United Nations Field Crisis Management Course
Norwegian fire school
Incident management course Plot management course Introductory course on handling of acute pollution Emergency Operator course Unified Management System Forest fire Preparedness Education Emergency Management Basic course in fire and rescue service
The National Education Center for Social Security and Emergency Planning (NUSB)
Risk and crisis communication Municipal emergency duty Security risk analysis and terrorism: Analysis of intended unwanted actions Security at major events Community preparedness Municipal Social Security and Emergency Forum Media management and custody of people in a crisis Liaison in security and emergency preparedness

Sector-Specialized Education

Sector specialized education and training within the emergency management field varies for the different institutions, shipping companies and other companies that have their own specialized emergency system. For example, in the Norwegian oil and gas industry, supplementary courses have been prepared and implemented. In this subsection, we present sector specialized education and training offered by the various private and public organizations involved in emergency operations such as coordination centers, maritime industry, fire brigade, police, coast guard and navy (military), and health personnel.

Joint Rescue Coordination Center (JRCC)

The two main rescue centers in Norway have about fifty employees, with the majority of rescue leaders responsible for coordination at operational level. JRCC is responsible for mobilizing collective rescue management under the police officers in Stavanger and Bodø, where cooperation is central and has the supervisory responsibility for local rescue services. JRCC runs its own courses and internships programs for rescue leaders. Norwegian joint rescue coordination (JRCC) provides a program that includes 41 subjects. The program principally focuses on theoretical teaching and practical training. The purpose of the course is to give the individual minimum knowledge to start OJT (On-The-Job Training) and to hold senior role as deputy rescue leader in the shifts.

The main topics that program covers are as following:

- Tasks and responsibilities of JRCC
- Principles of rescue cooperation
- IAMSAR – IMO – GMDSS – SOLAS – MAS (introduction of international standards, regulation and conventions)
- Planning and coordination of local rescue centers
- Air and sea rescue coordination and procedure
- Navigation at sea and preparation of the MSP courses (Maritime Search Planning)
- Map reading and alarm system
- Information on emergency network
- Cooperation of JRCC with armed forces
- Exercise planning and training desk exercises

Most of the training is given on the job, and some at the training desk. The personnel will have a background from military, merchant fleet or air force, and are familiar with much of the systems and procedures. JRCC (Bodø) in Norway participates in various national and international exercises such as Dynamic Mercy, Arctic Zephyr, Exercise Barents, Health emergency exercise (Svalbard), Exercise Nord, and Barents Rescue, In addition, they contribute to table top exercises with the oil rigs and installations, the cruise industry, etc.

Military

The Norwegian military a leading institution in operations in cold weather, which is an advantage for operating in the Arctic region. The center of excellence for cold weather operation (COE-CWO) tailor education and support training of headquarters and units from the operational to the tactical level. Yet, there is no specialized course for operation in remote areas. Personnel from military have their own regulation book that complies with national and international standards. However, all the organizations dealing with SAR operations need to be familiar with IAMSAR guidelines.

The navy provides professional maritime competency at tactical level in Norway. Personnel on-board a naval vessel is trained and educated for operations in turbulent environments. In case of an incident at sea, a coast guard vessel will if present become the on-scene coordinator (OSC). During the formal education in military/navy, students get the opportunity to learn about basic emergency operations and later on, they practice the theories during many internal and small exercises.

All naval officers in Norway undergo special training to handle stressful condition which they practice in simulated and live environments. The Navy has advanced simulation centers where they run training, retraining and mission rehearsal. Commanders are trained in simulations to increase their knowledge and skills in decision-making and team cooperation with a specific focus on the managerial competences on board a vessel during crisis.

The officers on coastguard vessels in Norway have special training in handling demanding operations. The captain of one of the coastguards described the training and familiarization in the direction of demanding operations as follows:

> *"During training they have many tests that they must pass. They must be a good leader for the others (like participating in the first line) who provide first aid or*

smoke dumps, so first they have to do it themselves to be professional in it. If they fail, they will not go on. Once we have these exercises then we start quite calm, but then we increase the pace. We will see if the person is able to cope with stress and prioritize the right ones Measures, that's the most important thing. He will be tested this way several times throughout the career. In terms of navigation or other operations at sea, we will see again if he manages the stress and the workload in the right way "(Interview with captain on Coast Guard vessel)

The military plays a key role in airborne rescue missions, with the 330 helicopters for evacuation and with 337 squadron for the Coast Guard helicopters. To follow up the pilots there are exams every six months focusing on the handling of the helicopter and its procedures.

The Industry

Many of the industries have their own crisis response organization that may support the professional units. Also, companies with high risk involved have their own first line response units. The Shipping companies must have a shore-based emergency response group that communicate with their vessel in distress, help out with supporting the professional agencies, support next of kin and take care of passengers and information to media.

The offshore oil companies are obliged to have significant resources related to emergency preparedness for rigs and offshore installations. This applies to both standby vessels and SAR helicopters, where medical personnel are also available. The preparedness vessels have the same type of basic education as for naval officers and security personnel. In addition, emergency personnel on vessels, rigs and helicopters have advanced courses in safety, first aid, emergency management, etc., which are largely offered by private course providers (see below).

Rescue Companies

At sea, professional and voluntary resources in the NSSR represent a very central role in preparedness along the coast. The mission of the rescue company is to save lives, protect the coastal environment in Norwegian waters, as well as outreach efforts with protective measures to improve safety at sea. The NSSR is a member of the International Maritime Rescue Federation (IMRF), working closely with IMO. IMRF acts as an umbrella for maritime SAR devices by sharing information and experiences. The rescue company has its own seagoing school, among

other things related to security personnel and safety crew on board. Besides the regular maritime safety course, they also offer courses in the OSC role.

Table 19. Sector specialized Courses

JRCC	Police	Norwegian coastal administration	Norwegian civil defense	NOFO
Diverse customized courses	• Cooperation course in water rescue	• Arctic shoreline response • Team leader course shoreline • Shorelines clean up and assessment technique courses • Courses in management of operations • Courses for efforts leading at sea • Coordination course	• Unified management system • Cooperation at the site • Cooperation on contaminated site of injury • Psykisk- og sosial omsorg ved hendelser ulykker • Leader development program • Information course • Information course • Strategic crisis management course	• Oil spill contingency course • Oil spill price ship crews • NOFO remote measurement course

Private Safety and Security Course Providers Within SAR, Pollution, Fire and Violent Action

In order to ensure safety on board, the crew must have undergone both formal education and obtained certificates through exercises that meet current standards and regulations. For vessels and other floating objects, this Standard Minimum Competence Requirements applies to the STCW Convention of the International Maritime Organization IMO. A maritime officer must have certificates based on higher education within nautical or ship-technical operations, and professional practice. Standard education and training within SAR and emergency response are based on course models and certification requirements set by IMO. Training is carried out in simulators and safety centers approved by the country's maritime authorities. In Norway, Norwegian Maritime Directorate is responsible for that.

The International Convention for the Safety of Life at Sea (SOLAS) requires ships to have a 'SOLAS Training Manual' on board, including safety and training releases, and how to handle safety equipment properly. It is important for the crew to log training and exercises that are being carried out. All merchant ships have a security management system (SMS). This includes manuals that contain procedures and contingency plans in the event of an emergency situation. Both on land and persons with safety responsibilities on vessels need training and should participate in major exercises to learn the use of the equipment, as well as improve the knowledge of relevant procedures.

Companies (ship-owners) with operational responsibility for vessels play an important role in emergency response operations and are entitled to their own emergency response. Shipping companies must have their own emergency response service. This service is mandatory for passenger ships and offshore vessels and is recommended for all other types of vessels. Some companies offer emergency response courses for shipping companies.

There are several course providers for crews, officers, operators and companies within safety and security as well as oil response. Among others, DNV-GL, NOFO, Flack Nutec, and NOSEFO are the leading providers. Following are some example of courses.

Table 20. Example of courses offered by private providers

Courses	**SAR**	**Fire**	**Pollution**	**VA**
Basic safety training: personal survival techniques, fire prevention and firefighting, first aid and personal safety and social responsibilities	X	X		
Advanced safety training: survival craft, fire management and medical first aid	X	X		
Basic safety training for all fishing vessel personnel	X	X		
Ship Security Officer: Port Facility Security Officer - PFSO. Person responsible for development, implementing, revision and maintenance of PFSP management system in a port, and functions as a contact with those responsible for ship owner's security				X
Crisis management and human behavior: The course is conducted in accordance with STCW convention regulation V/2, section A-V/2, table A-V/2 and consists of theoretical and practical training within the areas of passenger management, safety training for crew in passenger areas, crisis handling and human factors, passenger safety, securing cargo and ship's hull openings.	X	X		
Basic oil response: Prevention of spreading oil in the waters and recovery			X	
Crisis management basic course: Organization of emergency preparedness, effective management in an emergency situation, cooperation – responsibility and roles, mental reactions and stress management, behavior in the emergency response room	X	X	X	X
Crisis management basic course: Organization of emergency preparedness, effective management in an emergency situation, cooperation – responsibility and roles, mental reactions and stress management, behavior in the emergency response room	X	X	X	X

SWEDEN

The Swedish structure for civil emergency planning is coordinated by the MSB (Myndigheten för samhällsskydd och beredskap), which holds the mandate for a holistic and all hazards approach to emergency management. The Civil Protection and Preparedness Authority, MSB, is a government agency with the task of developing society's ability to prevent and deal with accidents and crises. The work is done with many others - municipalities, county councils, authorities and organizations. When a serious accident or crisis occurs, they provide support to those who are responsible. The Swedish emergency preparedness system aims to protect life and health, critical infrastructure and fundamental values from all types of hazards and risks through a comprehensive, risk-based, emergency preparedness program including prevention, planning, preparedness, response and recovery.

Many of society's activities are highly interdependent. For example, society would not continue to function effectively without electricity, telecommunications and IT. To ensure that emergency management takes this interdependence into account, the planning and resource allocation for peacetime emergency preparedness is built upon a system wherein the various stakeholders take joint responsibility for the strengthening of Sweden's overall emergency management capacity within, and across sectors.

The essential principles governing the Swedish system are as follows. The principle of responsibility assumes that the party responsible for a certain activity under normal conditions should also have the responsibility in a crisis. This responsibility includes cooperation and coordination with other actors to ensure that the collective resources of society are protected and utilized effectively (Kaneberg, Hertz, & Jensen, 2016). The principle of proximity indicates that crises should be handled where they occur and by those who are closest to them. The principle of parity implies the localization and organization of activities that, to the greatest extent possible, should be the same during a crisis as they are under normal conditions (Kaneberg et al., 2016).

Ensuring responsibility and coordination for structures is the concern subsumed by geographical responsibility, under which the municipalities, the county administrative boards and the government are responsible for their respective geographical areas and for the necessary planning (Kaneberg et al., 2016). This responsibility includes disseminating general information to the public and the media. The principle does not entail any right or decision over the actions of other

parties within the area. The responsibility for crisis management and operational measures of a national character rests only with the central authorities. Sector responsibility allows authorities and organizations within a particular sector of activity to have responsibility within their own areas. A number of public-sector authorities, including the county administrative boards, are specifically responsible for emergency preparedness and for coordination across the various sectors of society (FOI, 2014).

MSB organizational structure

The responsibility for MSB is managed by three different levels of government – national, regional, and local. The Ministry of Justice has overall political responsibility for MSB. In order to assure that the Government Offices have a coordinated ability to handle cross-sector emergencies when they occur, the Crisis Management Coordination Secretariat at Government Offices is responsible for everyday management (msb.se).

Crisis management at the Government Offices is based on a joint cross-sector approach. Every government office is responsible for planning and handling crises within its own area of responsibility. Authorities and agencies at the national level are also assigned complementary tasks by the government during major emergency situations (msb.se).

Every government agency is responsible for MSB in its own area of expertise, and the MSB has the task of coordinating the various stakeholders. This responsibility applies to measures taken before, during, and after the occurrence of emergencies and disasters. All Swedish authorities are obliged to carry out risk and vulnerability analyses in their own areas.

The regional level

At the regional level the county administrative boards are responsible for the coordination of MSB activities such as exercises, risk and vulnerability analysis. They also act as a clearinghouse between public and private partners. During a crisis, the administrative boards coordinate the relevant measures with relevant actors. The county administrative boards have overall responsibility for reporting the need for host nation support in the event of a major emergency. Additionally, the county administrative boards also coordinate contact with the mass media during major emergencies, crises, and disasters (msb.se).

The local level

Swedish municipalities have a large degree of autonomy and play an important role in civil emergency planning and preparedness. During a major emergency the municipal executive board is the highest civilian authority within the municipality and is responsible for all civilian command and crisis management at a local level. In this role, municipalities are supported and assisted by the county administrative board (msb.se).

Civil-military cooperation

The overall aim of civil-military cooperation is to achieve close cooperation as well as a mutual exchange of information in order to handle different kinds of emergencies more efficiently. Civil-military MSB cooperation is carried out at all administrative levels and includes planning, international activities, training and exercises. At the national level the MSB and the Swedish armed forces headquarters coordinate civil-military activities (msb.se).

Volunteers

There are 19 voluntary defense organizations who are involved in both civil and military aspects of MSB. They are all independent and non-profit associations. In cooperation with the authorities, these voluntary defense organizations inform, recruit and train volunteers for emergency preparedness and wartime situations (msb.se).

Current Educational Programs and Courses

The programs within emergency response in Sweden should try to meet the obligations stated in the principles above. In this report, we focus on the generic and sector specialized educations. Following we have presented the courses and program within the two sectors, *generic education* and *sector-specialized education*.

Generic Education

Tertiary Vocational Education

A student in a vocational program in secondary school is able to apply for what is called Qualified Vocational Education or "*Kvalificerad Yrkesutbildning*" (KY) (government.se). Higher vocational education programs provide vocational education and training at the post-secondary level but are separated from higher education. To be included in higher vocational education, programs must meet the needs of the labor market for qualified labor or contribute to the development or retention of qualified professional expertise in niche occupations, such as air craft occupations or ship officers (government.se). Education providers are institutions or establishments such as universities, local authorities or private training companies. Program length varies, although most are between one and three years in duration. They span over a number of different fields. The relevant ones are international shipping, ship engineering and navigators, and logistics.

The emergency management education at this level is first and foremost given to officers at merchant fleet but there is limited emergency management education within logistics and freight forwarder programs. This kind of education falls under tactical and operational level of emergency management. Ship engineering and navigation includes training and navigation in simulations and on board a vessel, advanced fire fighters' courses, maritime safety, ship assistance, and thermal hazard on board. The safety courses are based on the International Maritime Organizations STCW.

The freight forwarder's study is to coordinate cross-border transportation so that they can be done smoothly and without delay and with profitability. There are some additional courses for emergency logistics. Logistics and transportation program focus on green logistics and environmental friendly transportation. Overall, the programs involve limited courses with focus

on emergency management and coordination. In Sweden there are around 11 schools giving this type of education and training (myh.se).

University Programs

There are broad range of universities in Sweden as a second source of generic education for competence development. In Sweden, the Riksdag (parliament) and Government have overall responsibility for higher education and research, which means that they make decisions about targets, guidelines and the allocation of resources. Education and research are the remit of the Ministry of Education and Research. As of 1 January 2013, the Swedish Higher Education Authority (Universitetskanslersämbetet) and the Swedish Council for Higher Education (Universitets- och högskolerådet) are the central government agencies responsible for matters relating to higher education. The teaching model applied at Swedish universities and university colleges is based on the motto 'freedom with responsibility' (government.se). This means that students have somewhat less teacher-led time than is usual elsewhere, mainly pursuing their studies on their own or in groups.

On 1 July 2007, a new higher education system came into effect in Sweden (Swedish national agency for higher education). Higher education became divided into three levels: basic level (*grundnivå*), advanced level (*avancerad nivå*), and doctoral level (*forskarnivå*). The new changes also included removing several professional / vocational degrees (*yrkesexamina*) as well as redefining other pre-existing degrees. Sweden currently has 15 universities and 15 university colleges owned by state. In addition, there are three private higher education institutions (Government.se).

There are very a few Universities in Sweden offering emergency management courses or programs. However, universities in Sweden cover relatively similar courses within emergency management field and most of courses give 7.5 to 15 credits. The table below lists the name of institutions and the degree levels, it also includes some relevant single courses within emergency management field.

There are over 20 Universities and University Colleges in Sweden provide nursing education. A few large universities also provide doctoral education. Two universities, Orebo and Lund provide specialized nursing program for emergency situations. Apart from health education there are

some bachelor and master's degrees that to some degree relate to tactical level of emergency management. However, there is no specialized courses within societal security or safety in Sweden as it is in Norway. Following, we present relevant programs and their focal area.

Table 21. List of universities and colleges offering emergency management programs/courses

Institutions	Bachelor	Master	Single course/postgrad.
Lund University	Fire protection engineering Nursing	Fire safety engineering Nursing emergency care	Disaster Risk Management and Climate Change Adaptation Risk Management and safety engineering
WMU		Maritime affairs	Maritime Safety & Security PhD
Umea	Nursing		Crisis Management and Peacebuilding Crisis management system (single course)
Jönköping	Nursing	Nursing	Leadership in crisis management (single course)
Luleå	Fire protection Nursing		
Chalmers University of Technology	Maritime engineering Marine engineer Ship officer	Ship officer	Maritime management
Orebro		Nursing in emergency care	

Bachelor Level

Bachelor in Fire Safety Engineering at Division of fire safety (Lund)

The Division of Fire Safety in Lund University is responsible for education and research in Fire Safety Engineering and Risk Management. The scope of what they do is to a large extent interdisciplinary, and they are responsible for essential parts of the Fire Protection Engineering program on bachelor level, the Risk Management and Safety Engineering program, and the Fire Safety Engineering program on masters level. In addition, they are responsible for the education of PhD students in the research field of fire safety engineering.

Table 22. Courses for bachelor in Fire Safety Engineering.

Course	Contents	Credits
Consequence analysis	Environment and safety legislation, including EU directives. Knowledge of chemical preparations. Dangerous properties of chemicals. Condensed toxic gases. Estimation of the consequences of undesirable leakages of gases and liquids. Introduction to the theory behind, and the application of, geographic information systems in the Rescue Service.	7.5
Fire chemistry and explosions	Heat transport, Fire chemistry, Ignition sequence, Combustion gases	15
Fire detection and suppression	Design of active systems, detectors, extinguishing media, and extinguishing devices, sprinkler systems, water mist, and a selection of other active systems	15
Fire dynamics	Qualitative description of a fire sequence. Ignition, flame spreading. Various ways of categorizing a fire. Computing pressure, rate and mass airflow through openings. Gas temperatures. Energy balance, rate of heat transfer, correlations for computing gas temperatures. Fully developed fires, ISO 834, temperature calculation. Smoke filling. Computer modelling. Sub-models for computer models. Model constraints. CFD models.	15
Safety evaluation	Assessment of personal safety in the event of fire at an actual site. Recommendations for improvement, as well as the safety-related consequences of these recommendations, shall be included. time-management and time-planning activities	15
Human behavior in fire	Theories of human behavior in fire, both fire setting and evacuation behavior,	8
Risk engineering	Introduction to Fire Theory and Fire in an Enclosure Fire Protection, Risk, The Role of the Fire Engineer in the Community	9
Simulation of fire enclosures	Introduction to Computational Fluid Dynamics (CFD), Time and length-scales in fires, Turbulence models, Numerical methods, Large eddy simulation (LES), Combustion models, Radiation models, Heat transfer models, Creation and processing of CFD models	9

Bachelor in fire protection (Luleå)

The Faculty of Fire Engineering at Luleå University of Technology consists of the natural sciences, fire engineering as well as special courses that provide knowledge about the risks in a modern society. The education provides knowledge from several perspectives, identify risks, prevent accidents and damage limitation. Specialization in fire protection education at Luleå University of Technology is has behavioral science elements in addition to the technical courses.

Table 23. Bachelor courses in fire protection

Courses	**credits**
Structural Engineering	7.5
Societal planning for risks and crises	7.5
Environmental engineering, polluted soil	7.5
Building materials	7.5
Risk and Safety - Basic Course	7.5
Physical chemistry	7.5
Applied risk management	7.5
Risk and fire chemistry	7.5
Chemical principles	7.5
Psychological aspects of leadership and risk management	7.5
Risk management	7.5
Distributed decision-making and cultural meetings	7.5
Fire dynamics I	7.5
Fire engineering calculations	7.5
Fire extinguished structural element	7.5
Fire dynamics II	7.5
Applied fire dynamics	7.5

Bachelor studies for naval officers and sea captains (Chalmers)

In Gothenburg there is the largest port in the Nordic countries, and many Swedish shipping companies have their seat there. Chalmers University has close cooperation with shipping stakeholders, both internationally and nationally (Chalmers.se).

Among the courses, there are navigation, vessel control, mechanical engineering and electrical engineering, healthcare, safety, maritime law, shipping technology and more. To create realistic practical exercises, tools such as machine simulator, navigation simulator, radio simulator and maritime safety rig are used. Training includes a number of certificates and special permits that may be required for work on board ships. During the training you will be able to specialize in different segments such as offshore vessels, tankers or passenger ships.

This program includes four basic safety and security courses. The courses contents are listed in the table below.

Table 24. Courses for bachelor of naval officers and sea captains

Advanced Fire Fighting	**Explains how organization, procedures and technical systems are used for firefighting on board.**
Basic Security	Apply survival techniques in case of abandonment of ships such as: - Handle personal life-saving equipment - Take action to take when you get into the water Apply basic fire protection and firefighting measures such as: - Apply suitable extinguishing equipment according to the type of fire. - Perform search and rescue exercises in a smoke-free environment Use locating equipment including communication, signaling and pyrotechnic equipment. Describe basic knowledge of shipping impacts on the marine environment and the effects of operational and accidental pollution.
Basic Shipping Protection (awareness)	Describe basic knowledge of threat pictures and maintenance of maritime protection (maritime protection awareness).
Basic medical care	Apply first aid in case of accident or illness on board. Apply First Aid on Survivors
Rescue craft and emergency vessels (non-emergency preparedness vessels)	Handle rescue craft after abandonment of ships such as: - Take command of a rescue boat. - Handle a machine in a rescue or rescue boat.

Master Level

There are limited programs offered at Swedish universities and college that can be suitable for competence development at operational and strategic level. There are not any courses at bachelor degree, however, some master programs can be relevant**.**

Master of Risk Management and Fire Engineering at Division of fire safety (Lund)

Master in fire engineering is very similar to the bachelor of fire safety that Lund university offers but more advanced. It includes fire dynamics, human behavior in fire, risk assessments and simulation training that is not provided at bachelor level.

Table 25. Courses for master's in risk management and fire engineering

Course	Contents	Credits
Consequence Analysis	Similar to bachelor level but more advanced	7.5
Human Behavior in Fire	Similar to bachelor level but more advanced	8
Simulation in Fire	Introduction to Computational Fluid Dynamics (CFD) Time and length-scales in fires Turbulence models Numerical methods Large eddy simulation (LES) Combustion models Radiation models Soot models Heat transfer models Creation and processing of CFD models	9

Master in Disaster Risk Management and Climate Change Adaptation (Lund)

The Master program in Disaster Risk Management and Climate Change Adaptation has support from important national and international institutions, e.g. UN agencies, the Red Cross/Red Crescent movement, NGOs, and national authorities. The program contributes to meeting the need for qualified professionals who can:

- Contribute to resilient and sustainable societies through use of interdisciplinary concepts, methods and tools within disaster risk management and climate change adaptation such as risk assessment, capacity assessment, preparedness and contingency planning, and risk-based land use planning.
- Work with capacity development and project management for disaster risk management and climate change adaptation in local, national and international organizations or agencies.
- Utilize and contribute to research in this field.

The program offers a mix of practical and theoretical learning with a strong focus on group work and interaction between students and teaching staff, as well as with important factors within this field of study.

Table 26. Program structure and courses

Course	Contents	Credits
Societal Resilience	Critical thinking in relation to societal safety and sustainability	7.5
Foundations for Risk Assessment and Management	risk management, including risk analysis, risk evaluation and risk treatment, detailed treatment of the risk concept, general risk theory, risk analysis methods within safety, health, environment and society	7.5
Direction and Coordination in Disaster Management	direction, coordination, command & control and collaboration decision making under uncertainty, including the time dimension Treatment of leadership with special focus on trust and norms Brief treatment of methods for evaluating and analyzing preconditions for direction and coordination	7.5
Capacity Development	Capacity development has been identified as the tool and process to substantially, reduce disaster losses and creating sustainable development. Theoretical approaches and challenges to capacity development, change processes and project management. Different models how to analyze and assess capacity at various levels, and how to design and review capacity development projects. The course is to a large extent based on different case studies and real capacity development projects for disaster risk reduction.	7.5
Risk Based Land Use Planning	Comprehensive planning, knowledge of how different types of risks can be addressed (land based).	7.5
Climate Smart Risk Reduction	Achieving sustainable development through managing risk and thereby confronting the root causes of poverty and vulnerability. Climate change is seen as eroding livelihoods and economic bases, along with social change, and being the cause of the shifting frequency and intensity of certain hazards, such as extreme weather systems, heavy rainfall, droughts, sea level rise, and floods, with direct implications for disaster risk.	7.5
Risk perception, Communication & Human behavior	Role of human factors in crisis situation, human behavior in risky condition	7.5
Preparedness and Planning	Aspects of emergency preparedness are introduced and discussed, e.g. people's needs and behavior in disaster situations; risk, vulnerability, and needs assessments as input to preparedness planning; preparedness and contingency planning processes; early warning systems; simulation exercises; and coordination systems/processes.	7.5
Humanitarian logistics disaster relief and logistics in developing countries	Actors, activities and resources involved in disaster relief and logistics in developing countries; designing, managing and measuring supply chains; sourcing and procurement; outsourcing and cooperation with logistics service providers, coordination needs and means; infrastructure, transportation	7.5
Elective		15
Thesis		30

Master of Maritime Management (Chalmers)

The program provides theoretical and practical knowledge in project management, quality, risk and safety management. These courses are generic and are included in Chalmers Master's

programs in international project management, supply chain management, quality and operations management. The program also gives master's level standard's skills within the areas leadership and communication, marine environmental protection and energy management from courses developed by professional researchers at Chalmers Department of Shipping and Marine Technology. Finally, the program also puts emphasis on business acumen with courses as business development and business strategy management.

Master's Program in Crisis Management and Peacebuilding (Umeå)

Master's Degree Program in Crisis Management and Peacebuilding provides knowledge about crisis management and peacebuilding at national and international level. The main perspective is governance under uncertainty caused by crisis, disasters and conflicts. Focal areas are, analyze and manage uncertainty in light of knowledge about crisis management systems, legal norms, power relations and planning for societal reconstruction. The program can be attended for one year for the degree of Master of Science 60 credits or for two years for the degree of Master of Science 120 credits. In both cases the first year starts with mandatory courses such as Crisis Management Systems in Comparative Perspective, Global and Regional Governance, and Reconstruction after Crisis and Disasters.

Maritime affairs (WMU)

World Maritime University offers a postgraduate program in Maritime Affairs, leading to a Master of Science or a Postgraduate Diploma, in the following specializations:

- Maritime Education & Training
- Maritime Energy Management
- Maritime Law & Policy
- Maritime Safety & Environmental Administration
- Ocean Sustainability, Governance & Management
- Port Management
- Shipping Management & Logistics

WMU and DNV GL Maritime Academy Partner on Postgraduate Diploma in Maritime Safety and Security

On 9 March 2017, the World Maritime University (WMU) and DNV GL Maritime Academy launched a new Postgraduate Diploma in Maritime Safety and Security (MSS) to develop the vital understanding of all aspects of safety and security required in complex maritime industry. For any organization dealing with activities at sea, ensuring safety and security is an essential element of maintaining a solid reputation and retaining profitability. The MSS diploma covers topics of critical importance regarding the quality, safety and security of shipping operations, as well as their environmental impact. The programme examines the contemporary maritime transport system, the fundamentals of shipping operations, examines the environmental aspects and related liabilities of shipping security, explains the IMO's approach towards the "human element", and elaborates on the main legal conventions and codes, including the Maritime Labour Convention 2006.

The five MSS modules cover:

1) Maritime Transport and Shipping Operations
2) Safety and Environmental Protection Issues
3) Maritime Safety: Requirements and Implementation
4) Legal and Operational Aspects of Maritime Security
5) Leadership and Best Practices in Port Management

The 11-month program is offered by distance learning utilizing a state-of-the-art e-learning platform.

Master's Program in Crisis Management and Peacebuilding (Umeå)

Master's Degree Program in Crisis Management and Peacebuilding provides knowledge about crisis management and peacebuilding at national and international level. The main perspective is governance under uncertainty caused by crisis, disasters and conflicts. Focal areas are, analyze and manage uncertainty in light of knowledge about crisis management systems, legal norms, power relations and planning for societal reconstruction. The program can be attended for one year for the degree of Master of Science 60 credits or for two years for the degree of Master of Science 120 credits. In both cases the first year starts with mandatory courses such as Crisis Management Systems in Comparative Perspective, Global and Regional Governance, and Reconstruction after Crisis and Disasters.

Single Course in Leadership in Crisis Management (Jönköping)

The course provides an understanding of strategic focus areas for crisis leadership and exposes the candidates to techniques and processes to construct and evaluate crisis management plans designed to prevent and respond to crisis events for human service organizations including healthcare and social services. Theories and practices of strategic and operational planning for crisis management, leadership and collaboration, crisis support and ethical concerns in relation to leadership and crises are discussed and analyzed. The course contents are (ju.se):

- Crisis management theory
- Collaboration theory
- Leadership theory
- Crisis management plans

Single Course in Crisis management system in comparative perspective (*Umeå*)

The course will develop knowledge and skills that provide a basis for positions in crisis management at municipal, regional, national and international level. The course will also prepare students for in-depth studies at the research level. The studies include advanced literature studies, exercises in research work, scientific analysis and empirical case studies (umu.se). The course contents are:

- Crisis management at local, regional, national and international level
- Theories of crisis management
- Crisis preparedness planning and decision making
- Analysis of crisis management in various types of crises

Professional Universities and Colleges

In Sweden there are a few professional universities and university colleges that provide courses and training for competence development within emergency management. In this section we have listed the relevant courses, training programs and exercises.

Police

Police training is available in five locations in Sweden, at Umeå University, Södertörn University in Huddinge outside Stockholm, University of Borås, Linnaeus University in Växjö and at Malmö University. Police education comprises a five-term full-time studies. The program integrates different areas of knowledge. Theoretical studies are varied with practice through exercises, field studies and skills training. Police education is problem-based, which means that students will learn how to analyze problems, seek knowledge, see causal relationships, find solutions and make decisions and

evaluate their efforts. The studies include law, criminology, health sciences, behavioral sciences, social work and political science. The studies are based on police work and the police's duties, regulations and methods. Issues about human rights, ethics, values and treatment are integrated throughout the education period in order to raise awareness of norms and values. Great emphasis is placed on increasing self-knowledge and ability to make decisions in different situations. Among others, the following courses are relevant for competence development within emergency management.

Table 27. Program structure and courses

Time (week)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Term 1: Police work bases	The police's role and mission in society					Criminology					Law I							Group process and work			
Content	Emergency care, Mental and physical preparation for the police profession (MFFP), Communication & physical methods in police conflict management (KFK), Police work in traffic environment, Police data system. The distance education also includes Radio and tactical connections as well as weapons and tactics.																				
Term 2: Police work A	Order and Security I includes preliminary investigation and coercive measures and field studies																	Law II			
Content	Emergency care, Weapons and tactics, Mental and physical preparation for the police profession (MFFP), Communication & physical methods in police conflict management (KFK), Police work in traffic environment, Police data system, Radio and tactical connection – skill-trained elements that run in parallel with the above steps during the semester																				
Term3: Police work B	Order and security II include criminology, Police meeting and work with people in vulnerable life situations												Police work in crowded environment								
Content	Emergency care, Weapons and tactics, Mental and physical preparation for the police profession (MFFP), Communication & physical methods in police conflict management (KFK), Police computer system, Radio and tactical connection, police work in traffic environment – continuous steps that run parallel to the above steps during the semester																				
Term 4: Police work C1	In-depth crime investigation with a focus on violence in close relationship										Investigation of death		Aspirant training for 6 months in the Police Authority								
Content	Weapons and tactics, Mental and physical preparation for the police profession (MFFP), Communication & physical methods in police conflict management (KFK) incl. work with crowds (AMF) Police work in traffic environment, Police data system, Radio and tactical connection - ongoing steps in parallel with the above steps during the semester																				
Term4/5: Police work C2	Aspirant training for 6 months in the Police Authority																	Work Police professional development			

Sweden has also police training at distance in Umeå, Borås and Växjö. The education structure differs in terms of the elements of physical gatherings. Umeå University itself carries out all parts of the education while Linnaeus University in Växjö conducts training in at the Police Authority. Umeå University is responsible for conducting the theoretical and practical training during the distance education. The students come from all over Sweden and are not divided into geographically based study groups. Linnaeus University is responsible for the implementation of the theoretical part of the education during the distance education periods, as well as for theoretical and practical training at the campus. The skills training is conducted the Police Authority's competence center for two days every two weeks. The students are therefore divided into geographically based study groups for that purpose. The skills training for these groups is currently being carried out in Vänersborg, Linköping / Katrineholm, Falun, Skåne, Söderhamn and Gotland.

Police education at the five universities have its primary operational base within first-cycle education and continuing professional development on commission from the Swedish Police. The main field of police work is relatively young and there is no professorship or third-cycle education linked to the education at the moment.

Universities conduct both continuing and further training on behalf of the police authority and tailor-made training to organizations. Some examples of such authorities and organizations are Customs, the Swedish Tax Agency, municipalities, the National Food Administration, the Swedish Armed Forces and the insurance company.

Since the need for education may look different the universities tailor courses based on needs and can implement them in Växjö, at a distance or elsewhere that suits the student. Many of the courses include local studies as well as distance education with the help of a web-based learning platform.

The Swedish Marine Police

The Swedish Marine Police (*sjöpolisen*) have around 12 boats in total at their disposal. Most common types are high-performance RIBs, capable of speeds up to 60 knots, or CB90-class boats 15-metre patrol vessels, capable of speeds of up to 40 knots. There are about 80 marine police officers in total, half of which work only during the summer. The marine police coordinate with

several other agencies and organizations, like the Coast Guard, Customs Service and the Sea Rescue Society (polisen.se). Sjöpolis's tasks are to:

- Prevent and intervene against naval navy, cruelty violations and negligence in maritime traffic.
- Prevent and intervene against thefts of boat engines, boats and other water vehicles.
  - Exercise hunting and fishing supervision.
  - Participate in rescue efforts and investigate accidents on the lake.
  - Investigate violations of the Fisheries Act.
  - Responsible for the search for missing persons in the marine environment.
  - Just like other police officers intervene against all crimes, whether on land or at sea.

There are about 60 seafarers in Stockholm (including Gotland) and 20 in Västra Götaland (including Halland). Half of them work as shipping polices only during the summer.

Swedish Defense University

Swedish Defence University was established as a national university on January 1, 2008, with the right to issue academic degrees (fhs.se). This implies that they can now offer civilian university study programs to a greater extent than before. The Swedish Defence University (SEDU), (Försvarshögskolan in Swedish) has existed in its present form since 1997. The University's roots can be traced back as far as the establishment of the Artillery College at Marieberg in Stockholm in the 19th century. The University's task is to contribute towards national and international security through research and development. Research is carried out in diverse, but inter-related subject areas and subsequently disseminated to other interested sectors of society both nationally and internationally. The University trains and educates military and civilian personnel in leading positions, both nationally and internationally as part of the contribution to the management of crisis situations and security issues. Following we present the relevant courses offered by SEDU within emergency and crisis management.

Master of Defense and Security Systems Development

This program is an interdisciplinary, international Master's program at the intersection of social sciences and engineering. The program has been developed in close collaboration with public

authorities and companies in the defense and security sector in order to provide knowledge about how technical systems are integrated with people and organizations in order to deal with a complex threat environment.

Table 28. Program structure and courses

Course	Content	Credits
Introduction to Engineering for Social Scientists	The course is intended to provide basic knowledge on statistics and probability theory	15
Theory for system science for security and defense	The course contributes theoretical knowledge of systems theory and sociotechnical defence and security systems	15
Methods in Systems Science for Defence and Security	The course provides knowledge about development work capacity, based on a scientific approach and with an independent ability to analyse, reflect and critically evaluate of work	15
Concept Development and Systems Engineering	The course builds on and applies systems theory and modelling and simulation methods. Its purpose is to take a more in-depth look at concept development and systems engineering for developing capabilities in the defence and security sector.	10.5
Strategic Management of Capability Development and Defence Acquisition	The course describes how Sweden and other countries organise and plan their innovation, the long-term supply of defence materials and capability development. Capability development also demands collaboration with other countries. The course therefore deals with the importance and impact of defence exports, defence materials collaborations, offset, the transfer of technologies, and international standardisation work.	7.5
Master's thesis in Systems Science for Defence and Security		30
Threat and Risk Management	The course explores how threat and risk analysis is conducted and discussions on the role of these analyses as an element of risk management. The course also addresses understanding and communicating risk as a means for critically reviewing the benefits of implemented assessments.	7.5
Logistics Supporting Defence Systems	The course builds on the Concept Development and Systems Engineering and is a specialization in the field of logistical support to ensure the availability and maintenance of defense systems.	7.5
Weapons Effect and Protection Against Weapons Effect	The course deals with protection principles in a broad sense, according to models such as the survivability onion and kill chain. Perspectives on protection in addition to physical measures are addressed.	7.5

International Crisis Management Course

The purpose is to present a broad view of different aspects of Peace Support Operations (PSO) from the perspectives of the international community, the United Nations and the contributing

nations, and to learn from experiences of past international Peace Support Operations. The aim of the course is to provide the participants with a fundamental and comprehensive understanding of the systems and components of contemporary crisis management. The focus will be on the system of cooperation on all levels, effective and legitimate planning and execution of crisis management, and the role of various functions and actors (fhs.se).

Senior Course on Crisis Management and Civil Emergency Planning

The course offers participants a comprehensive overview of strategic Crisis Management (CM) and Civil Emergency Planning (CEP) with the objective of increasing the participants' knowledge and understanding of the various parts and linkages and to provide analytical tools for effective and legitimate crisis management with a focus on civil emergency planning and strategic risk- and crisis communication.

The course methodology is a combination of lectures, facilitated discussions, and scenario-based learning. The extensive use of facilitated discussions and various forms of group work in scenario-based learning modules requires active participation to support learning objectives.

The course is part of the Swedish contribution to Partnership for Peace (PfP) and is primarily open for PfP and NATO member countries. If the number of participants from mentioned countries is not filled, applicants from other countries may be considered.

Invited participants are leaders and decision-makers from governments, agencies, organisations, and private actors engaged in crisis management and civil emergency planning regarding societal security.

The objectives of the Senior Course on Crisis Management and Civil Emergency Planning (CMCEP) are:

- To engage leaders and decision-makers in the readiness for and the response to crises and emergency situations through strengthened strategic risk- and crisis communications capabilities.
- To shape and strengthen the strategy around the use and contribution of strategic risk- and crisis communications as a part of decision-making and as an essential part of crisis management and civil emergency planning.

Senior Course on Security Policy in Europe

The course focuses on a range of security aspects that are of importance for the actors in the European region and its neighborhood. The course also gives the participants an overview and understanding of policies, strategies and priorities in Europe by examining trend analysis, policy documents and different strategies.

The course offers the participants a comprehensive overview of the subject matter in order and increases the understanding of various aspects and linkages. The course combines experiences from different actors with theoretical views on the subject and scenario-generated learning.

Participants are parliamentarians, diplomats, academics, civil servants, NGO`s and military personnel who deal with security policy, defense policy and societal security related issues on a senior level. The course also provides the participants with an opportunity for international networking.

The primary course content includes the following general themes:

- The New Global Security Environment
- The Global Trends and Security Policy in Europe
- New Threats: Terrorism, Climate Change, Cyber Threats, Transnational Organized Crime
- Current European security policies and priorities
- Security and Defense Policy Strategies
- Achieving European security goals in a globalized world
- EU, NATO/PfP, the UN and OSCE
- Major actors: The United States, Russia, East Asia and China
- Development in the Middle East, Central Asia, Arctic, Mediterranean Area and the Transatlantic Link
- Human Security Perspectives

Sector Specialized Programs

The Swedish Maritime Administration (SMA) is responsible authority for Maritime and Aeronautical Search and Rescue Services in Sweden (sjofartsverket.se). The Maritime Administration is a business unit responsible for developing transport and shipping policies in line with the parliament (Riksdagen) and government decisions. They monitor the development of shipping in relation to the transport policy goals, provide advice and support within the area of

expertise and work to reduce shipping's negative environmental impact. The objective of the Swedish Maritime Administration is to ensure search and rescue of people in distress at sea and emergency transportation of patients from ships at sea. Maritime Search and Rescue including medical evacuation from ships shall be performed on 24-hour basis, within areas specified in the Civil Protection Act. SAR operations can commonly be divided into three functions, SAR-Management, Mission Co-Ordination and Mobile Facilities.

SAR-Management: SAR Management has overall responsibility for the Swedish SAR-organization. It deals with policy-related issues, organizes co-operation with other Swedish organizations involved with Rescue Service, participates in international activities such as exercises, organizes international co-operation and is responsible for drawing up agreements, both national and international, involving SAR organization. SAR Management also supervises the JRCC (Joint Rescue Co-Ordination Centre) and evaluates SAR-missions of interest, in accordance with the quality assurance plan of the Swedish Maritime Administration.

Mission Co-Ordination: Joint Rescue Co-Ordination Centre, JRCC, is responsible for Mission Coordination. The Swedish JRCC, Sweden Rescue, is located in Gothenburg together with the Swedish Coastguard and the Defence Forces Navy Control.

Mobile Facilities: Mobile Facilities includes the operational tasks performed by the units within the SAR mission as a whole.

Medical Advice – Telemedical Assistans Service (TMAS): The Swedish Maritime Administration handles medical advice to vessels at sea according to an agreement with the University Hospital in Gothenburg, Sweden. The function is called Telemedical Assistans Service (TMAS) and is coordinated by the Joint Rescue Co-ordination Centre (JRCC) in line with the ILO convention.

MSB - Swedish Civil Contingencies Agency

MSB educates people who has the before mentioned roles, organizations and authorities at national and international level (msb.se). They do this because community actors should have a good ability to limit and handle the consequences of an emergency event. They should be able to

lead and make decisions within their own areas of responsibility and coordinate their actions with other actors. Following we have presented the relevant courses offered by MSB.

Table 29. Program structure and courses

Course	Contents
Fire and rescue	Unloading on passenger cars, as well as from alternative options Fuel / hybrid vehicles like electrical and hybrid operations get acquainted with custom methods for unloading and risk assessment The importance of risk assessment Systematic emergency care Personal and wildlife rescue Handling of chemicals / hazardous substances Water lifesaving by person Fire and extinguishing techniques Practical application of door shift technology Crisis support
Ship fire extinguishing in port	Fire protection on board, fire hazards, special hazards Fire and security plans Firefighting on ships, fire extinguishing methods and tactics Loading dangerous goods Support and aids (RIB) Experience from occurrences in the area
Collaboration and management	Forms for actors' common management of social disturbances Responsibilities and roles linked to a focus and coordination function, central terms. Current IT support systems, communication systems, equipment, technology and premises, analysis models, documentation, visualization. Information sharing and scenarios Collection and sharing of information, world surveillance, crisis communication, position images and collective scenes, basis for agreements for coordination, documentation, legal aspects, evaluation and experience feedback
Social protection and preparedness	EU Civil Protection Mechanism, such as ERCC, Host Nation Support (HNS) The Swedish model for preventing, managing and learning social emergency Focus on social protection and preparedness, society protection values, risks and threats, actors' tasks, roles and responsibilities Rules, the society's three administrative levels, basic principles, geographical area responsibility Common grounds for cooperation and management at social disturbances - starting points and approaches Protection of socially responsible activities, risk and vulnerability analyzes (RSA) Working methods and forms of cooperation at local, regional and national level Common grounds for cooperation and management at social disturbance approach Total Defense, Civilian Collaboration Private - public collaboration Collaboration with individual individuals as well as organized and spontaneous emerging volunteers in social disturbances Nordic and European cross-border cooperation within social protection and preparedness

	Agreements in the Nordic countries
Joint collaboration	starting points, approaches, working methods and knowledge goals in Common grounds for cooperation and management at social disturbances shared learning, measurable learning, goals and quality assurance
Society emergency preparedness	Social crisis preparedness - common grounds for collaboration and management - legal grounds and regulations - responsibilities and roles - the overall ability of society - the social protection values - threats and risks The Swedish total defense - military defense - Civil defense The role of business and voluntary organizations in crisis preparedness and total defense Bilateral and multinational cooperation agreements within the framework of emergency preparedness and total defense Provide and receive support, Host Nation Support Leadership Communication - strategic communication - risk and crisis communication Crisis and disaster psychology
Shared scenarios	Working methods that promote information sharing Demand, make available, create and receive information, proactivity, routines and contact routes. Accelerated events respectively slow progress, the consequences of different ways of working for information sharing. Examples of using different technology support. Provisions concerning publicity and confidentiality Publicity and confidentiality laws, similarities and differences in regulations for different actors, information sharing and confidentiality, impact at height readiness, information security. Create and document scenes and aggregates Working method, practical application, content of the position image, different forms of documentation, analysis.
Security officer	information security, physical protection, security testing, security-protected procurement with security safeguards as well as education and control
Crisis communication	The grounds of crisis communication Press ethics - Information law Messages and audiences Media's role in crisis Credibility - Confidence crises The image of a crisis: around the world and news coverage Communication planning before, during and after the crisis Common grounds for cooperation and management at social disturbances Coordination of information
Oil damage protection	Oil characteristics, oil change processes and oil dispersion Oil's environmental impact

	Socio-economic effects Laws and regulations Economics and documentation on an initiative Environmental goals Focus and Action Plan Cooperation and contingency planning Waste disposal Oil emissions and measures Occupational Safety Practical handling of equipment Staff work (part of staff, expert) State reinforcement resources Resource planning Basis of inventory
Chief of staff	How to act as chief of staff in emergencies Start-up, organization and management of staff Staff work, staff preparedness, staff discipline and staffing Perseverance in a staff Practical application of staff work Common grounds for cooperation and management in social disturbances
Rescue leaders	Staff function, structure and work routines, such as a wiring support at different types of rescue efforts are being studied. Also, other authorities management system in connection with a rescue operation treated
Exercise planning	Systematic work with exercise planning Exercise documentation Planning organization and roles in it Implementation organization and roles in it Anchoring work with local practice leader, commitment description Work with goal formulations Work with abilities associated with events Organization and dimensioning of opposition Work with game support systems Work with special modules (media, public, social media, etc.) Work with local leaders and coordinators Examples of suitable exercise formats Method and structure for planning and implementing different types of exercises based on purpose and goals

Rescue Companies

Swedish Sea Rescue Society is responsible for 70 percent of all sea rescues in Sweden and does not receive government funding. Membership fees, donations and voluntary work finance the society. The Swedish Sea Rescue Society has more than 111 000 members. Despite this, or possibly as a result of this, the Society has doubled the number of sea rescue stations in recent years, tripled the number of rescue volunteers available and built 70 modern rescue vessels. This

expansion has enabled Swedish Sea Rescue Society to meet its goal of departing within 15 minutes or less from the time an alarm is received. Crews live close to stations and conduct training several times a month. The volunteers work as carpenters, doctors, fishermen, salesmen, plumbers, teachers and many other occupations.

The company provide training at local level. In addition, they arrange joint in cooperation with the Maritime Safety School at Öckerö and the Maritime Administration's Rescue School at Arkö.

Table 30. Maritime safety school courses

Intrinsic safety Course aims at maximizing the survival chances of our own and crew members in the event of a serious accident.
Basic SAR Basic rescue training in maritime rescue following the Swedish Maritime Administration's guidelines and targets. The course aims at establishing a level of competence so that our volunteer seafarers can perform their tasks as they face and do this safely.
Healthcare All volunteer seafarers receive a basic education that includes D-CPR, L-ABCDE, spine board management and hypothermia management.
Vessel officer class VIII The course is not just about navigation and radar but much about the naval law and the master's responsibility. In addition to the master, it is desirable that volunteer seafarers have, to the greatest extent possible, undergone this training to enhance the safety of our boats.
Machine Commander Class VIII Our requirement regarding the theoretical competence in machine science is that at least one person in each crew must have completed the education, in order to handle any technical problems that arise
Operation rescue boat The training is given to the various boat classes we have in our rescue fleet, giving the volunteer seafarers a basis for continuing training at their own rescue station.
Rescue Management Course Rescue Management Course is a foundation for our masters who hold leadership, familiarize themselves with their crew, to handle stress in normal and pressured conditions.
Environmental Rescue Some of our rescue stations have environmental protection trails, in order to make a first connection to the environment in case of an accident. Volunteer seafarers at these stations have the opportunity to educate themselves in environmental improvement.

RUSSIA

In the Russian Federation, all issues related to emergency prevention and response on shore are organized within the Unified State System of Emergency Prevention and Response (USSoEPR). The USSoEPR structure consists of the territorial and functional subsystems, and has five territorial levels: federal, inter-regional, regional, municipal, and facility-level (Resolution 794, 2003). Functional subsystems of USSoEPR are created by the federal executive bodies for organizing work for population in the field of their activities and their assigned sectors.

Northwestern Federal District is one of the eight federal districts of Russia located in the Arctic region. It consists of 11 federal subjects: Arkhangelsk region, Vologda region, Kaliningrad region, Republic of Karelia, Komi Republic, Leningrad region, Murmansk region, Nenets autonomous okrug, Novgorod region, Pskov region, Saint-Petersburg. Its population was 13,616,057 (83.5% urban) according to the 2010 Census living in an area of 1,687,000 square kilometers.

The main principles of the emergency response system are:
Humanism and compassion which considers the priority of life saving and preservation of health, environmental protection in case of any emergency.
Unity of command means that one person in command has the main management functions.
Justified risk and safety precautions in emergency response.
Emergency organizations permanent readiness for immediate response to emergencies.

Current Educational Programs and Courses

The programs within emergency response in Russia should try to meet the obligations stated in the principles above. In this report, we focus on the generic and sector specialized educations. Following we have presented the courses and program within the two sectors, *generic education* and *sector-specialized education*.

Generic Education

Tertiary Vocational Education

Vocational education is the basic approach to prepare navigators, mechanics and other middle managements who determine the level of technical and operation safety.

The Russian vocational schools that offer training in emergency response at sea are based in the Russian Arctic Zone, in particular, the regions of Arkhangelsk, Murmansk, and Republic of Karelia. The schools for vocational education offer different majors some with duration of 46 months and others with 34 months depending on the specialization.

Students receive training in operation of vessels; safety of navigation; pollution prevention; international and domestic shipping legislation; shipping traffic control; ships and shipborne power installations service and maintenance. Also, students receive skills in ensuring shipping safety and ship's survivability; emergency/accident response and ship abandonment; operation of lifeboats, life rafts and other rescue equipment; safe loading operations and planning thereof; cargo securing and cargo in-transit service, and unloading. Ensuring ship's survivability encompasses a set of measures to be undertaken by the crew or the emergency response teams to fight flooding, fire, hull and systems damage. Navigation and Ship Power Plants Operation are the majors designed to equip learners with skills in operating a series of dedicated systems for general safety control and emergency source detection at the earliest possible stage

A course unit/module being delivered by all the vocational schools is Navigation Safety Assurance, that is designed to provide training for emergency response at sea, it includes a module called Onboard Health and Safety and Transportation Security, which in turn in splits into Ship and Port Security; Water Search and Rescue; and Prevention of Environmental Pollution from Ships. Further, learners receive training in sea survival and operation of emergency gear. The contents of the module cover emergency response scenarios; passenger safety in emergency; and initial actions to be taken in cases of collision and running aground.

The vocational major in Navigation incorporates the training program of Civil Ship Crews Training, which includes a set of various professional disciplines. This program is designed to equip learners with skills in using means of protection against weapon of mass destruction (WMD); ensuring ship's and the survivability its systems during combat operations; monitoring air, coastal and marine environment; evasive steering and general avoidance of the enemy attack. Upon completion of the training program, learners are expected to have the knowledge of:

- Basic actions to be taken to protect vessels that are sailing solo or as part of convoys.
- Solo and convoy-sailing ships' signals communication and recognition.
- Protection from nuclear, chemical, biological weapons, and incendiary substances.

The following five institutions offer the above described programs in Russia:

- Arkhangelsk Marine Fishery School (an Arkhangelsk-based campus of Murmansk State Technical University)
- Mesyatseva Marine Fishery School in Murmansk (a vocational school under Murmansk State Technical University)
- Petrozavodsk Inland Water Navigation School (the Belomor-Onega campus of Admiral Makarov State University of Maritime and Inland Shipping)
- The Kotlas Campus of Admiral Makarov State University of Maritime and Inland Shipping
- Voronin Institute of Arctic Marine Shipping (a campus of Admiral Makarov State University of Maritime and Inland Shipping)

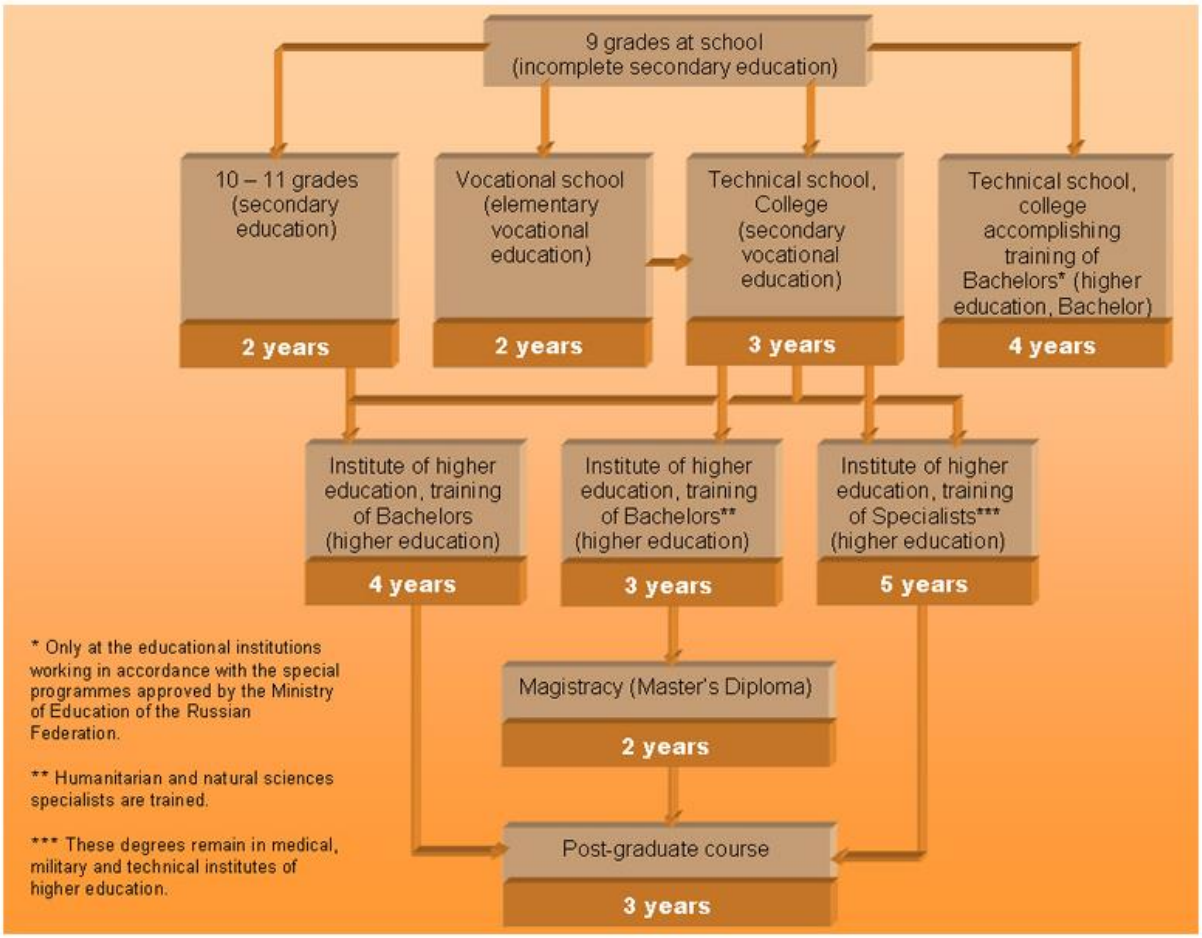
University Program

In Russia, universities are the main source of obtaining generic education for competence development. Universities in Russia are the higher education institutions with activities aimed at developing education, science and culture by performing fundamental scientific research and training at the levels of higher, post-higher and further education within a wide range of natural sciences, humanities and other directions of science, and technology. In September 2003, Russia jointed the Bologna process, and the national reform of the entire higher education system started.

There are three levels of higher education:

- Basic higher education (bachelor's degree) lasts within 4 years. This is equivalent to the B.Sc. degree in the US or Western Europe.
- After graduating from bachelor's degree program students are admitted to enter the Specialist Degree Diploma (1 years) and Magistr's (Master's) degree (2 years) programs;
- Academic degrees: Kandidat Nauk degree (the first level, equivalent to Ph.D.) and Doktor Nauk degree (the second, highest level, equivalent to German Habilitand).

Unlike bachelor's degrees, specialist degrees are more focused on practical work in industry according to the selected discipline. These programs are offered to individuals who have education equivalent to Russian general secondary or vocational education. The course lasts for a minimum of 5 years. Based on the examination results and thesis defense, a specialist degree certificate specifying the qualification (e.g., "Teacher," "Information Security Specialist," etc.) may be issued. Graduates of a specialist degree may work in industry or further their studies on a master's or other postgraduate course (NarFu.ru)



Higher education is under the jurisdiction of the Ministry of Education of the Russian Federation which is responsible for developing and maintaining state educational standards. The evaluation of Quality Assurance Systems and the accreditation of the universities are handled by a National Accreditation Agency (NAA). Only accredited higher education establishments have the right to issue state diplomas and degrees ensuring full vocational and academic rights and are covered by international agreements on mutual recognition and validation of educational documents.

Currently, 21 state universities have educational programs in Technosphere Safety and Emergency in the northwest of Russia. The content of bachelor, master and PhD degree education and competences to be developed are approved in accordance with the State Educational Standard (SES). SESs are obligatory and have code numbers.

The universities in Russia cover relatively similar courses within emergency management field and most of them are 5 credits courses. However, a few universities are offering 3 credits for each course.

The table below list the name of institutions and the degree levels, it also includes some relevant single courses within emergency management field.

Table 31. List of universities offering emergency management programs

Level Institutions	**Bachelor**	**Master**	**PhD**
Admiral Makarov State University of Maritime and Inland Shipping	• Ship navigation	• Management of waterways and hydrographic support for shipping	
Emperor Alexander I Saint-Petersburg State Transport University	• Safety of technological processes and production	• Dangerous technological processes and productions	
Kaliningrad State Technical University	• Safety of technological processes and production • Protection in emergencies	• Emergency Safety (in marine industry)	
Murmansk State Technical University	• Engineering • protection of environment	• Ecological safety of water objects in the Arctic	
Northern (Arctic) Federal University named after M.V. Lomonosov	• Safety of technological processes and production • Engineering safety • Protection in emergencies • Fire safety		

Peter the Great St. Petersburg Polytechnic University	• Safety of technological processes and production • Engineering safety Fire safety • Protection in emergencies	• Nuclear, radiation and chemical safety • Management of integrated security systems and life support • Security management and emergencies protection Fire safety	• Emergency Safety by industry
Saint-Petersburg Electrotechnical University	• Engineering • protection of environment		
Saint–Petersburg Mining University	• Engineering • protection of environment		
Information Technologies, Mechanics and Optics (ITMO)		• Ecology and Technical Sphere Protection	
Saint-Petersburg State Technological Institute	• Engineering • protection of environment		• Safety in emergencies • Fire and industrial safety
Saint-Petersburg State University of Architecture and Civil Engineering	• Engineering ecology and municipal facility	• Life safety Technosphere	
Saint-Petersburg State University of Aerospace Instrumentation	• Engineering • protection of environment		
Saint-Petersburg State University of Civil Aviation	• Safety of technological processes and production		
Saint-Petersburg State University of Industrial Technologies and Design	• Engineering • protection of environment	• Environmental protection of clusters	
Saint-Petersburg University of State Fire Service	• Fire safety	• Fire safety	• Safety in emergencies • Fire and industrial safety
Syktyvkar State University	• Safety of technological processes and production	• Safety in emergencies	
State Marine Technical University	• Engineering protection of environment		
Ukhta State Technical University	• Exploitation and maintenance objects of Arctic shelf oil and gas complexes • Safety of technological processes and production	• Development and exploration hydrocarbon fields with horizontal wells in conditions of the Arctic shelf	
Vologda State University	• Protection in emergencies		
Vyatka State University	• Safety of technological processes and production	• Safety of technological processes and production	

Most of the universities provide technical education in Safety (bachelor's and master's degrees). Four universities provide research programs (PhD). Some universities like the Admiral Makarov State University of Maritime and Inland Shipping, the Murmansk State Technical University, the Saint-Petersburg University of State Fire Service have specialized degree, such as Fire Safety, Seaway navigation, Application and operation of technical systems of surface ships and submarines.

Not only bachelor and master programs of safety, but also other bachelor programs like marine engineering have some courses and trainings related to emergencies. There are courses in medical care and safety management and organizational theory that focus on the accident tactics and human factors in the maritime context. In addition, there are basic and advanced safety training courses.

Following, we present description of the programs by levels and specializations within these programs.

Bachelor Level

Some universities provide traditional education and wide range of post-graduate training and run retraining courses. The PDP Institute of Admiral Makarov SUMIS delivers additional professional training for crew members of marine vessels and rivercraft, specialists of inland water transport, onshore staffs, emergency and oil spill response personnel, operators and engineers of vessel traffic control system, sea and river pilots, ship and port facility security specialists, maritime industry and oil-and-gas extraction industry professionals, including offshore operations.

The following courses are provided:

- Training of marine ship crew after prolonged break in service (Regulation I/1).
- Training for Naval graduates after prolonged break in service.
- GMDSS Restricted Operator short term course for certificate revalidation, Bridge team and resources management.
- Basic safety training (8 days),
- Basic firefighting training 5 days (38 hours), updated firefighting training 1 day (8 hours),
- Basic training in operation of rescue boats/rafts and guard boats (other than high-speed boats) 4 days (32 hours),

- Updated training in operation of rescue boats/rafts and guard boats (other than high-speed boats) 1 day (8 hours).

The center of the maritime conventional training at MSTU provides additional paid educational trainings for offshore and onshore specialists of shipping and fishing companies, and free of charge basic simulator training for graduating students:

- GMDSS Operator course.
- Bridge team and resources management.
- Training of officers (for students with basic education).
- Updated education of persons responsible for transport safety in the infrastructure institution,
- Updated training of persons involved in the rapid intervention teams.
- First aid course.

The duration of a bachelor study in Russia is 4 years within the intramural form of study, 5 years within the extramural form of study. The first two-year study includes modules in natural sciences, mathematics, socioeconomics, humanities and a few specialty-oriented modules. The next two years of study consist of advanced profession-oriented modules, subjects in natural sciences, electives from special socio-economics modules and practical training, final research, graduation thesis and final exams. According to the standard, the theoretical studies should last about 26-30 hours per week. The content of courses is approved in accordance with the SES.

Technosphere Safety

In this program, the following competences area are considered:

- Labor protection at the enterprise; legislative and other normative legal acts on labor protection
- Prevention of occupational injuries and diseases, prevention of fire
- Safety issues instructions.
- Analysis of fire safety state at the enterprise contribution through research, management, production and technological activities to the protection of people and territories in emergencies
- Control of the current environmental legislation, instructions, standards and regulations
- Ecological examination

Safety of technological processes and production

General competences to be developed include the identification of high-risk environment zones, development of new methods and systems for the human protection in emergency situations, development of projects in order to protect territories and respond to accidents and disasters.

After graduating, there are possibilities to work as an inspector of fire protection supervising activities, to hold the positions at the regional offices of EMERCOM including the position of a duty officer in the crisis management center.

Ship navigation (Admiral Makarov SUMIS)

This program focuses on navigation, shipping safety, vessel operating, hydrological provision, maritime law, psychological basics of crew management, risk management in shipping, etc.

Engineering protection of environment

The program enables students to ensure safety in areas with a high density of industrial and economic activities and anthropogenic impact on natural systems; to promote environmental risk management; to protect the environment in all spheres of activities as well as on the international level.

The following subjects are incorporated in the specialization: labor safety; basics of electrical safety; electromagnetic fields and radiation; radiological safety; safety of technological processes; fire and explosion safety; ecology; protection of the environment; economics and management in the technosphere activities; supervision and control in the sphere of safety; safety in emergency situations.

Bachelor of Protection in emergencies

This program educates students to organize monitoring of hazardous objects; to carry out activities aimed to prevent and control emergencies and disasters; to develop documentation on civil defense and emergency; to provide protection in emergencies; to analyze technology-related risks; to improve sustainability of organizations in emergency situations; to develop projects to protect population and territories in emergencies, etc.

One of the focuses is the management of business activities in acute emergencies. The program gives the understanding on how the information about risks can be used in the social planning and decision-making processes.

Bachelor of Management of waterways and hydrographic support of shipping

The following subjects are incorporated in the profile: transport economics; transport law; the system of digital liaising; infrastructure; organization of transportation by water transport; commercial work of water transport; foreign trade operations; management of the fleet; management of ports; transport energy, etc.

Master Level

Over the period of their study within 2 years, master program students learn to implement the results of scientific research/projects, solve tasks in the context of high uncertainty both in civil and military sectors, provide team working and decision making, evaluate the quality of work and performance, the costs and results of an activity, develop innovative projects and programs, use PMI project methods and understand the key concepts of project risks, decomposition and hierarchical structure of operations, and resource models.

Ecological Safety of Water Objects In the Arctic (MSTU)

The program provides the knowledge on the installation, testing, adjusting of protection means; the operation of integrated protection and safety control system; the control of used protection tools and decision-making; taking protection measures and response to emergencies, etc.

Safety of Technological Processes And Production

The program includes studies in technology and production safety and emergency regulations, controlled integrated safety systems for risk assessment, production safety, environment safety and labor protection, management of the innovations in technical, socio-economic and natural systems.

The following core courses are taught within the program: economy and safety management; information technology security; methodology of scientific activities in industrial safety; design and management of security systems; risk management and modeling; safety monitoring; tools

and systems for the protection; operational safety; updated methods of protection of biosphere, etc.

Master of Engineering within the Protection of the Environment

Ecology and environment protection is a specialization that develops necessary competencies for ecology-oriented decision-making in the sphere of natural resource use and other sectors of national economy, management of cleaner production in manufacturing, determination of better ways for development and efficient management of natural resources.

The purpose of the specialization is to prepare qualified professionals for the benefit of the ecologically safe development of the economy able to solve practical and theoretical ecological issues in research and practice sphere and teacher's activity.

Master students can take positions in federal and regional nature protection and management of natural resources agencies, in manufacturing, consulting, private companies, research institutes dealing with environment protection, in project organizations and other structures that carry out ecological activities, research and conduct ecological policy.

Master of Dangerous Technological Processes And Production

This program focuses on:

- project work in the field of human protection from man-made influences.
- development of safety requirements.
- safety control operation: selection of methods to protect humans and environment and response to emergency situations in special conditions, preparation of safety instructions;
- monitoring of danger sources; safety assessment, environmental impact assessment.

The following core courses are incorporated in the program: information technologies in safety; risk management and modeling; safety monitoring; basics of environmental protection; ensuring environmental safety in the field of professional activities; safety expertise; updated regional issues to ensure the necessary environment quality; environmental risks, etc.

The specializations "Nuclear, radiation and chemical safety", "Management of integrated safety systems and life support", "Safety management and protection in emergencies", "Fire safety" within the program "Technosphere Safety" are 60 credits courses. The students are educated in

safety management to respond to different kinds of emergencies and to interact effectively with emergency organizations. As a part of the specializations, the students conduct research in the field of safety, risks analysis and management, legislation, etc.

The specialization “Fire safety” aims providing students with theory and practice of fire safety and risks management, and also is developed for re-training (or skill upgrading) of the enterprises staff responsible for fire safety.

Table 32. Program structure of master of Dangerous technological processes and production

Courses	**Nuclear, radiation and chemical safety**	**Management of integrated safety systems and life support**	**Safety management and protection in emergencies**	**Fire safety**
Foreign language in professional sphere	X	X	X	X
Monitoring and expertise of safety	X	X	X	X
Information technology security and the basics of patent protection	X	X	X	X
Systems to ensure nuclear, radiation and chemical safety	X			
Risk management, system analysis and modeling	X	X	X	X
Response to emergency situations at radiation and chemically dangerous objects	X		X	
Protection of population and territories in case of accidents at radiation and chemically dangerous objects	X		X	
Resistance to stress and emotional stress in emergencies	X			
Ensuring nuclear, radiation and chemical safety in emergency situations / regulation in the field of nuclear radiation and chemical safet	X			
Basis and the technical means of warning and evacuation / theoretical basis of reliability of complex technical systems	X		X	
Electromagnetic safety / Radiation ecology	X			
Organization of integrated safety systems activity		X		
Occupational risk management and medical support		X		
Management of civil protection / Radiation, chemical and biological protection		X	X	
Management of industrial and fire safety		X		

Ecological safety / Environmental assessment, impact assessment on the environment and certification		X		
Effectiveness assessment of safety systems in emergency			X	
Security management of natural and technical systems /Management ensuring radiation, chemical and biological protection in emergency			X	
Supervision in the field of civil defense and protection of population and territories from emergencies / Regulatory security in emergency			X	X
Legislative and technical basis of fire safety				X
Engineering and technical means of fire safety				X
Fire hazard of building structures and materials /Fire safety of fuel and energy and transport complex				X
Algorithms for the construction and operation of fire safety systems				X
Medical and psychological aspects of fire safety /Fire safety of public and industrial constructions				X
Automatic firefighting equipment / Fire safety of electrical installations and technological processes				X
Low current safety systems				X

Methods and Devices For The Remote Monitoring Of Atmospheric Parameters

The area of professional activities includes the provision of safety, minimizing the anthropogenic load on the environment, the well-being through the use of modern technologies, methods and monitoring.

The following basic training courses are incorporated in the program: risk management, system analysis and modeling; technical means of ensuring safety; safety monitoring; engineering methods of the atmosphere and hydrosphere protection; safety of power systems; protection in emergencies; industrial toxicology; etc.

Environmental Protection of Clusters

The program aim is to form develop cultural and professional competences within industrial and use of natural resources. According to the curriculum, it includes courses within industrial ecology (classification of emission sources, the procedure for establishing the sanitation

standards, etc.); environmental monitoring; basic concepts of hazard analysis; detailed analysis of risks; methods and tools for safety; risk factors and quality indicators of risk; technologies of environmental protection.

Ecology and Technical Sphere Protection

This program educates the specialists in development of optical digital devices and systems for environmental monitoring. The graduates gain engineering qualification and are experienced in techniques and facilities for environmental monitoring, development and operation of computer-based systems, in working with spatially distributed and related metric information, providing data visualization (including mapping), data analysis, modeling and control.

Master of Safety in Emergencies

This program aims to provide knowledge of safety to minimize anthropogenic impact on the environment for well-being using the equipment and analysis.

The students learn methods of qualitative and quantitative analysis of reliability and risk; risk management methods; industrial safety and expertise; operating hazardous production facilities; methods of ensuring industrial safety; construction material classification by flammability, spread of flame, toxicity of combustion products; tools and techniques for fighting fires; emergency classification; risk management; OSH management system; etc.

Master of Life Safety in Technosphere

This program enables to organize and manage occupational safety; to rescue people in emergency situations; to operate data processing systems; to examine equipment (check the compliance with regulations); develop technologies and projects in power industry, oil and gas sector, metallurgy, mechanical engineering and other industries; to design safety products for environment and people in industries.

Development and Exploration Of Oil And Gas Fields With Horizontal Wells In Conditions Of The Arctic Shelf

This program is aimed to train specialists who are able to assess opportunities for improvement of working conditions and to suggest engineering solutions for ensuring safety at oil and gas industry installations on the Arctic shelf.

Sector Specialized Education

Police Training

Educational institutions of the Ministry of the Interior of the Russian Federation, in the North-West for police training are the following:

Saint-Petersburg University of the Ministry of the Interior of Russia: training of operatives, psychologists, specialists for public order maintenance, local police inspectors, road safety inspectors, criminal law experts, investigators, international law experts, IT security experts, international specialist, economic security specialists, retraining of police officers.

Saint-Petersburg military institute of the internal military forces: legality of the national security, psychology of official activities (psychologist)

Saint-Petersburg Suvorov Military School of the Ministry of the Interior of Russia: secondary education and supplementary educational programs (3 years) for underage boys (14-15 years old).

Vologda Institute of Law and Economics of the Federal Service for Execution of Sanctions: law enforcement, police studies, psychology of official activities.

Training Within Oil Companies

In most cases, oil companies prefer outsourcing education and training of their specialists. As an example, the oil company Lukoil transfer its training facilities to state educational organizations of secondary vocational education located in the regions where Lukoil is presented. The training in the vocational schools is conducted under the Lukoil's authority and is aimed at:

– training of workers in new professions.
– training of high skilled workers.
– training in secondary professions.

– training in industrial safety, labor and environmental protection.

– bachelor programs with due consideration of employer's requirements.

– employer sponsored courses.

– training of shop-floor personal.

Also, Lukoil established a special training center in Astrokhan to train the personal in industrial safety and emergency issues. The training courses are presented below:

Table 33. Special training and courses at Astrokhan

Courses	**Hours**
Helicopter escape training at sea, local waters and at land	16
Basic safety training (Rule VI/1 of STCW 78) / Basic safety retraining (every 5th year)	58 / 16
Firefighting (extended course) (Rule VI/3 of STCW 78)	38
First aid rendering (Rule VI/4 of STCW 78)	30
Operation of rescue boats/rafts and guard boats (other than high-speed boats) (Rule VI/2-1 of STCW 78)	32
Basic training of part time rescue organizations	125
Special training of part time rescue organizations	21
Industrial abseiler	216
Work rules in breathing apparatus	16
Basic offshore safety induction and emergency training / BOSIET, OPITO	21,5
Further offshore emergency training / FOET, OPITO	9
Helicopter underwater escape training / HUET, OPITO	8
Oil spill response at industrial enterprises, on rivers and local waters	86
Oil spill prevention and response (tactical level, on scene commander)	70
Training of specialists involved in emergencies and oil spill response and sea (tactical level, participant)	114
Basic first aid course by industrial accidents	10

The similar oil spill response training using updated simulators is provided at the higher education organizations like Admiral Makarov SUMIS. Some private oil spill equipment manufacturer also has got licenses to train specialists in oil spill response at sea. For example, the private company Komposit located in Bryansk provides some courses in basic training of rescuers, training of specialists and on scene commander in case of oil spills, breathing apparatus specialists training, etc.

Regional and EMERCOM Training Centers

On the regional level, rescue personnel trainings are provided by regional training centers for civil defense, emergency preparedness and fire safety (post-secondary professional education)

within 239 and more hours with further advanced training. Such regional training centers are located in all northwest regions of Russia. The free training in these training centers is given as a rule only for regional rescuers and firefighters.

There are also 21 EMERCOM training centers in Russia, such centers are located in the northwest of Russia in Nizhny Novgorod, Syktyvkar, Vologda and provide basic professional training within approximately 336 hours for fire fighters and rescuers working in EMERCOM.

Table 34. EMERCOM training and courses

Courses	**Training scientific rescue center in Vologda (EMERCOM)**	**Regional training for civil protection, emergencies and fire safety in Arkhangelsk**
Firefighting using breathing apparatus	X	X
112 call center dispatch	X	X
Firefighter	X	X
Firefighting: On scene commander		X
Diver	X	
Slingsman	X	X
Response to oil and oil products spills	X	
Direct deployment from helicopter	X	
Basics of Search and Rescue	X	X
Specifics of SAR in the Arctic	X	
Training of rescuers of different qualification	X	X
Labor safety	X	
Fire safety	X	X
Operation of small-size boats	X	
Rescue at sea		X

All officials involved in civil defense and emergency response must be trained in relevant full-time tuition or correspondence and distance learning courses within 36, 72 and 108 hours according to their qualification levels in compliance with the orders № 646 and № 19 of EMERCOM.

Civil defense and emergency preparedness courses are obligatory for federal, municipal and regional authorities, managers of the companies involved in civil defense, persons responsible for civil defense, fire safety and population evacuation in organizations, rescue services chiefs, school teachers of principles of personal and social safety.

On the regional level, the civil defense and emergency preparedness courses are provided in regional training centers for civil defense, emergency preparedness and fire safety; on the municipal level, such trainings must be organized in training offices.

Rescue Coordinators - SAR

Only former captains can be appointed as SAR coordinators in Maritime Rescue Coordination Centers/Subcenters who already have necessary advanced training in Global Maritime Distress & Safety System. The additional course includes air coordination and is organized in MRCC by invited lecturers from for example the Saint-Petersburg State University of Civil Aviation.
Also, the course “Further training of specialists involved in maritime accidents response” for rescue coordinators is organized at the Admiral Makarov SUMIS. The program is provided within 80 hours and includes the legislation issues in SAR, tactical communication, SAR management and response, reports writing.

SAR coordinators have to confirm their qualification every 5th year.
Air coordinators can be trained in higher educational institutions like the State University of Civil Aviation in Saint-Petersburg within 5 years. Air coordinators have to pass advance training every second year with certificate confirmation. The mandatory requirement according to ICAO is advanced knowledge level of English.
Air coordinator courses can be provided by educational institutions mentioned above for aviation specialists within 510 hours.

Training vessels and simulator centers

In order to ensure safety on board, the crew must have undergone both formal education and obtained certificates that meet current standards and regulations. For vessels and other floating objects, this Standard Minimum Competence Requirements applies to the STCW Convention of the International Maritime Organization IMO. A maritime officer must have certificates based on higher education within nautical or ship-technical operations, and professional practice. Standard education and training within SAR and emergency response is based on course models and certification requirements set by IMO. Training is carried out in simulators and safety centers approved by the country's maritime authorities. In Russia, Rosmorrechflot is a responsible organization.
The International Convention for the Safety of Life at Sea (SOLAS) requires ships to have a SOLAS Training Manual on board, including safety and training releases, and how to handle safety equipment properly. It is important for the crew to log training and exercises that are being

carried out. All merchant ships have a security management system (SMS). This includes manuals that contain procedures and contingency plans in the event of an emergency situation. Both on land and persons with safety responsibilities on vessels need training and should participate in major exercises to learn the use of the equipment, as well as improve the knowledge of relevant procedures.

Companies (ship-owners) with operational responsibility for vessels play an important role in emergency response operations and are entitled to their own emergency response. Shipping companies must have their own emergency response service, which is mandatory for passenger ships and offshore vessels, and is recommended for all other types of vessels. Some organizations offer emergency response courses for shipping companies.

Table 35. Emergency responses courses by private companies

Courses	**SAR**	**Fire**	**Pollution**	**Violent action**
Basic safety training: personal survival techniques, fire prevention and firefighting, first aid and personal safety and social responsibilities	X	X		
Advanced Firefighting	X	X		
Proficiency in survival craft and & rescue boats	X	X		
Training of Ship Security Officer: Training program-ISPS and transportation security				X
Medical First Aid and Medical Care	X	X		
Basic oil response: Prevention of spreading oil in the waters and recovery (for tankers)			X	
Radar observation and plotting	X		X	X
ARPA (operational use of automatic radar plotting aids): Maneuvering and ship handling	X			
ECDIS (operational use of electronic chart display and information systems)			X	
Ships carrying dangerous and hazardous substances in solid form in bulk and in packaged form (for carrying dangerous cargo)		X	X	
Bridge team and resources management	X	X	X	X
GMDSS (General Operator's Certificate) **Radio communications operational**	X	X	X	X

Note: There are several mandatory courses obligatory for masters within safety and security as well as oil response to be renewed each 5 years.

Among the training vessels are the Kotlas, owned by Arkhangelsk-based office of Maritime Rescue Service. The Kotlas simulator training ship meets the standards of STCW 78 (Ch.6); SOLAS 74 (Ch. XI-2); and International Ship and Port Facility Security Code. It is intended for ship crew members to undergo the simulator training prescribed by relevant programs. Upon successful completion such training, the trainees are issued with due certificates. The training being delivered on board the Kotlas incorporates initial safety training; firefighting (extended course); operation of rescue boats/rafts and guard boats (other than high-speed boats); first aid; first medical aid and health care services; training for safety responsible officers; basic and specialized safety training for seamen. The training center provides training for ship crews, specialists of Maritime Rescue Service and other seafarers.

Maritime rescue service has other training centers, one of them located in Moscow is the only state one which provides professional training, further training, courses, retraining of divers and other professions related to emergency response in the Maritime rescue service.

The main disciplines taught at the center are training of divers, training of vessel crews to respond to marine and river accidents, oil spill, simulator training. The core portfolio of the Simulator Center at the Maritime Rescue Service being diver training, this simulator center delivers training in maritime and river accident response to crews; oil spill response; and general simulator training.

Another simulator ship is the Belokamenka, owned by Arkhangelsk Trawler Fleet. Onboard the Belokamenka, testing takes place of crew members' knowledge of how to ensure ship's survivability. Here the employees of maritime, river, and fishing fleets undergo re-training and proficiency testing.

There exists a dedicated simulator center for Global Maritime Distress and Safety System, where captains/masters and radio officers undergo training and testing of their skills in shipboard marine radio equipment operation, and a navigation simulator center for certified officers.

The centers deliver a total of 10 further training programs and 40+ simulator training exercises. All of them are certified by Federal Agency for Maritime and River Transport (Rosmorrechflot). The course units they comprise deal with the issues such as crowd handling; safety training for passenger service personnel; emergency handling and human behavior in emergency; passenger

safety; hull impermeability; initial safety training; firefighting (extended course); operation of rescue boats/rafts and guard boats (other than high-speed boats); first medical aid.

The training at the Navigation Simulator Center at Northern Shipping Company, JSC focuses on radar installations operation; use of automatic navigational radar plotting system; and use of electronic cartographical navigational information system.

Military

Military pilots can receive higher education at the Syzran Military aviation school, Military-space academy named after A. Mozhaysky and others.

- Educational organizations of the Navy of the Russian Federation in the North-West of Russia are: Naval academy named after admiral of the Fleet Nikolay Kuznetsov
- Rescue and Underwater technology Research Institute of the Navy Academy in Lomonosov,
- Navy Academy in Kaliningrad
- Training center of the Navy Academy in Sosnovy Bor,
- Nakhimov Navy School in Saint-Petersburg.

This training and education are not linked with civil emergency training.

PART II. COMPETENCE NEEDS REVEALED WITHIN THE MARPART PROJECT

In this part we present the competence needs that are revealed by MARPART2 report 1 and SARINOR (wp7) project. We present them according to the level of command and the roles of key personnel.

Tactical Level

OSC and ACO

The MARPART2-Report 1 revealed that in some incidents such as Maxim Gorkiy the On-Scene Coordinator (OSC) had to plan extensively and prepare for all possible situations while heading to the emergency site. Due to the lack of information, the emergency team on "Senja" had to improvise and prepare for all possible situations. The case showed that pre-planned managerial roles and responsibilities can be completely different when facing a real accident. The important competences include the abilities to take the overall responsibility and to make decisions about the action plan. Because of the quickly changing working conditions, including lack of information exchange between departments that are supposed to collaborate and weather conditions influence the current action plan, coordinators may have to rearrange their roles and procedures. Sometimes that means assigning people new roles or assigning several people the same role. Especially in case of joint operations, all sides should manage issues like resource coordination effectively. This makes the frequent communication between the parties very crucial.

Lack of coordination between countries was identified when planning how to deploy the rescue equipment and other resources (MARPART2-report1). Even if countries are cooperating, through memorandum of understandings and international agreements, they are still planning their national resources by taking a national perspective only.

If the accident happens in a remote area and the only available rescue unit is another vessel, it might be difficult to get all the passengers from the sinking vessel on to the rescuing vessel, especially if the sinking ship is a passenger's vessel with over 2000 people on board. Therefore, SAR in an arctic climate requires special competences. Communication skills are critical in an arctic context, both as to maritime radio and satellite communication, and knowing the language

and culture. It is important that all actors know the tools for communication and understand each other. Regarding OSR there is a lack of knowledge and experiences of handling major oil spills in an Arctic context. In case of violent action, Arctic states will face difficulties because the specialized trained forces for interrupting a violent action are based further south. The time it will take for them to reach the arctic regions might reduce the effectiveness of the rescue operation. Another aspect is that these types of forces do not have much cross-regional or cross-country team training.

Communication and information sharing are important between RCCs, industry and crew. For on-scene coordination the management demands establishing good operational communication under complex conditions. There may be language barriers. There may be strong wind that reduces communication between a life raft and a vessel. Communication and knowing "the big picture" is the key issue (Observation report from AECO TTX 2017). In the case of "Maxim Gorkiy", the Russian helicopters could not participate in the SAR rescue operation because of language problems and cultural differences. The case shows that language skills have an important role for coordination of resources (Andreassen et al., 2018).

According to the legislation of the Russian Federation, aircrafts and sea vessels use different frequency bands and can't communicate directly. Therefore, the communication between the rescue helicopter and the vessel including these as OSC is provided following the chain «vessel — rescue coordination center — air traffic authorities — aircraft/helicopter» and backwards. Emergency information transfer through this chain is very complicated, takes much time and doesn't meet the requirements of the 1979 SAR Convention (Report, 2016).

The masters of the vessels which can be appointed as OSC aren't usually experienced in coordination of large-scale SAR operations. In case of emergency, the detection of missing persons may be done by thermal cameras.

For on scene coordination it is crucial to understand the importance of sufficient communication, how to deal with tasks connected to interaction with other actors. The demanding competence is to raise communication and situational awareness, and it is much about knowing who the main contact is at: shipowner, operator, sub-charger, flag-state. There is a need to communicate consistently and efficiently (AECO Exercise report 2017).

The knowledge on how to establish a search and rescue area is important in order to coordinate the aircraft and helicopters of search and rescue and of the media. It's necessary with many aircrafts and helicopters included to have a helicopter control officer (ACO) sitting on board the ship, who does the coordination, tells the helicopters where to fly, and which height to fly, etc. The ACO coordination competence is complex and important. The ACO also makes a plan for which helicopter is going in for refueling and which one is coming out again.

Management on Board

The captain of the vessel in distress has a challenging task with diverse responsibilities during incident. As long as the ship is manned and intact, he is in charge of the operation onboard. It is pointed out that it is difficult for the captain to speak to RCCs and CROs separately (MARPART2-Report1).

In case of emergencies it is important to choose the right time for evacuation. Sometimes it may be crucial not to evacuate too early because it is more difficult to survive in lifeboats, and in rafts, and so on in the Arctic ocean. Hypothermia is the problem to survive in the lifeboat and in the rafts, so the period when the people are in a lifeboat should be as short as possible. Therefore, one of the important competence for the management on board is to decide upon the safety conditions on a distress vessel is.

For the management on board it is important to know well own contingency plans, procedures, as well it is important to have actually exercised it. The management needs to know the overall search and rescue organization, the distress and emergency plans. The captain needs to have the overall oversight on how everything works and to know which specific roles has the crew members. The evacuation leader needs to know the plans, where the people are, the overview of all the passengers who's going to be evacuated, and how many can be in a lifeboat. “Counting heads” is a crucial role here to be sure that all the passenger is actually dispatched in lifeboats and no one is missing. The member of the safety manning in charge on board a life raft has similar demands.

It is also important to know the procedures and plans for rescue and to know how to communicate with helicopters if they are in-coming. It is crucial to know that is the information the helicopter needs for going in for a pickup or where is the best place on the ship to have a

helicopter to do the pickup because of the mast, antennas, etc. on board the ship. Management on board needs to know and have been exercised the procedures for communications with helicopters and plans how the operation is being organized. Moreover there is a demand to know what are the next steps in the operation after evacuation and how to be reorganized for the next phase.

The professional firefighters from a shore base play an important role in case of fire on board. The Maritime Incident Response Groups (MIRG) crew and commander or team leader must cooperate closely with the crew. For the crew, such as smoke divers, it is important that to know how to apply the expertise in rescue services they have gained from their firefighting courses and work experience to perform MIRG tasks in a shipboard environment and ensure their occupational safety. For the team leader it is also important to know the basics of the national and international maritime SAR systems, leadership skills, SAR command and control system, and the principles and organisation of vessel cargo transport, as well as which information sources to consult in the event of an accident. Knowledge how to utilize fire and rescue services units as part of maritime SAR as a whole. Possible challenges with communication, both technical and coordination, exist in all levels of the command chain in MIRG operations. The MIRG operation commander is in the center of all communication and therefore must have excellent coordination and leadership skills. Training with foreign MIRG teams and familiarizing with their SAR system, firefighting procedures, and communication and coordination systems is essential in order to achieve efficient coordination in multinational operations. Especially for the MIRG teams in Northern Norway, it would be beneficial to train with Russian and Swedish fire and rescue services, considering that their systems are different and joint operations in Barents and Norwegian seas are quite possible.

The international exercises like Barents Rescue 2015 emphasized how to generate cooperation between public authorities and volunteer organizations and private sector actors. This reminded the authorities of the possibility to use the capabilities and capacity of other actors in the case of a large-scale emergency. This area demands more training and exercises.

Knowledge and cohesion of a ship's crew is very important to quickly extinguishing, because the design of any vessel involves the rapid spread of the fire to compartments and cabins. In every room of the vessel are stationary fire-extinguishing systems that meet certain requirements.

Operational Level

Mission Coordination

Mobilizing all the available resources are crucial in emergencies. For the mission coordination it is crucial to have oversight, to know all resources involved both at sea and on shore. Different involved agencies and companies should be informed of what's happened and be asked back for information which can help in planning the rescue operation. Through the mission coordination role, the JRCC will be the institution coordinating what's going on scene.

Getting access to necessary information and dependable means of communication are crucial for any SAR operations. Currently, the challenge may be connected to the problem of intensive load on communication lines, and therefore the principle of information priority has become important in emergency management, especially in the High North where the satellite communication can be limited. Additionally, the language problems of different nationalities can cause challenges. However, the personnel at rescue centers seldom experience language problems. Yet, when it comes to interaction with ship crew, aircraft and helicopters directly, the language skills have a potential for improvement.

The MARPART-2 report 1 showed that dealing with media is very challenging. It is more efficient to inform the public about the operations that are going on, than give opportunity for speculation. Media can be very aggressive in some cases. Strategy should be on keeping good relations with the media. The competence includes a lot of ethical issues, like avoiding giving out names of passengers, the operator and vessels names before the relatives has been informed. It is important to go out with press releases as soon as possible in coordination with other parties involved.

Resilience and robustness are critical. The RCC must plan for a long operation, taking into consideration adding and substitute personnel due to fatigue and complex nature of operation. Maintaining a continuous coordination of resources and efforts is essential. Putting additional resources on board available SAR equipment might be necessary. RCC must continuously gather information, bring up satellite feeds, weather forecast and ice drift models and provide the information to captain and others on-scene. The managing would include many issues to plan contacts with hospitals and other land-based rescue teams. When passengers are scattered on

various rescue units and heading to different locations, an important issue is who is taking the responsibility for head-counting.

In the Nordlys Fire case, the mission coordination was well handled. Swift and decisive coordination hindered a much worse outcome from the crisis (Kriseinfo). However, some points were raised by DSB which can contribute to even better mission coordination. There was some confusion as to the ownership of the crisis after the captain and the fire services had completed their duties. Questions such as who was responsible to make the decision for where a burning ship should dock and who had the authority to permit rescue personnel to enter the ship were raised (SMP). These questions highlight competence needs in mission coordination, of a better understanding of roles and responsibilities.

A notable feature of the Russian OSR system is that its organizational structure changes drastically in the emergency mode. In the steady-state mode, the Russian OSR system functions as a contingency bureaucracy ready to provide its services if an emergency occurs. The need for fast, coordinated response is what pulls an OSR system towards a simplification of structure and a reduction in bureaucratic procedures in the emergency situation. As a result, in emergency situations the emergency response and fire safety commission will function – it integrates all actors. In the Russian system, coordination demands an interplay between formal and informal mechanisms. The formal coordination is primary in the system. It defines the structure, roles and functions of the interacting organizations, and establishes the operative coordination procedures and patterns of interaction in an emergency situation. Informal coordination is common among the actors, who are well known to each other. Incentives for informal coordination are increased by organizational interdependence which is based on the commonality of purpose. Informal contacts help actors to solve practical challenges both in their daily activity and in emergency situation, thus functioning as important complementary coordination tools. By compensating for the shortcomings of the formal mechanisms, informal coordination contributes to the effectiveness of the Russian OSR system. Informal contacts (through personal phone contacts, direct requests, correspondence, and electronic mails) are especially important in emergency situations (Ivanova and Sydnes, 2010).

Mutual dependence may be high among organizations in the OSR system. Key actors have a common purpose and rely on each other’s inputs to provide effective OSR. This motivates for

effective coordination because the organizations are dependent on each other's resources. On the other hand, interdependencies hinder coordination.

Only former masters can be appointed as SAR coordinators in the MRCC and MRCS passed the advanced training courses in Global Maritime Distress & Safety System. It means that they have good experience in shipping and English communication. During the international exercises, the SAR coordinators are usually satisfied with the joint activities, because the actors provide support for rescue activities as requested. However, the ceasing of the exercises indicates that there are some challenges in the cooperation between different actors and the leadership.

One of the Exercise Barents objectives is to improve the clearance procedure for emergency resources to cross borders. Within the Exercise Barents 2016, the clearance procedure to enter the territory of the Russian Federation lasted about one and half hour. One of the reasons was the intention from the Air Traffic Control Center to provide all the information about air clearance direct to the colleagues in Norway omitting the reports to the Murmansk MRCC. According to the authorities of MRCC, the analysis of this issue is to be conducted within the exercise final review because that intention contradicted the International Agreements.

Rescue helicopters play a key role in emergency response in the High North. But a survey of SAR indicates limited availability of fixed wing aircraft and helicopters in Russia. The regions in Russia have different experiences concerning the involvement of helicopters depending on their available resources, location, etc. In the Murmansk region, the helicopters of the Northern Fleet are used to conduct SAR at sea. The challenge is that the military resources don't report to MRCC and should not provide any information of its resources available. In the Arkhangelsk region, the regional rescue authorities have come to an agreement with a private aviation enterprise to perform SAR activities for fee. However, this practice is quite new in Russia and needs a proper legislative base. The helicopter resources are sufficient enough if an emergency situation occurs within 400 km of the coastline, but the level of difficulties would increase if it would take place further from land and/or involve many casualties.

Strategic Level

In search and rescue regions there are agreements of host nation support (HNS) between border countries to assist each other. Such organization provides opportunity to obtain additional resources from other countries. However, there are regional and situational peculiarities may challenge mass rescue situations in all stages. Due to the lack of capacities, the problem, which is not easy to solve, there is a need for governmental efforts. At this level it is important to have a complete overview over the range and bases for helicopters and ships and assist with arrangements to provide these resources to the incident sites. The most important demand here would be the capacity to reach out to the distress position and back to a safe place with the rescued people.

The AECO TTX, Sarinor and SAREX Svalbard projects have highlighted that efforts in developing adequate personal and collective rescue equipment are needed. The SOLAS minimum requirements are expecting passengers to survive five days on rescue equipment from ship which is currently impossible. There is a need for developing of management that sees opportunities in the innovation perspectives regarding survival equipment and survivor's recovery. It is important to establish a network of response actors, industry and regulatory bodies and forums for information sharing.

Rescue coordination centers (RCC) provide information to higher authorities, a governmental organization or ministry. There is a need for more educational activities and exercises between different national organizations, but also between Arctic states. In Sweden there is a need to gather and share experiences among national emergency organizations in general and international in particular. In Sweden, many authorities are going through organizational changes and becoming more and more centralized. This might impact the regional level in a negative way, much due to loss of contact with local actors and too big areas of responsibility. Therefore, there is a need for frequent regional exercises, testing the effectiveness of the regional strategic level management. Moreover, there is need for a better multi-sectoral and multi-national collaboration approach. Resulting in more key actors knowing about each other and sharing more resources and tasks.

There is a need to develop more national educational activities, involving all relevant key actors and focusing on the arctic context and to set up new rules for the communication procedures. In

the arctic region it is even more important to give as much of the information as possible, regardless of missing information. This may speed up the time for the emergency response once more information is provided.

Unlike Norway, the management model in Sweden, with many different actors involved and responsible for specific areas, might reduce the effectiveness of an oil spill response. The Violent action training and exercises are expensive, and more joint training should be emphasized.

In Russia, the main maritime SAR strategy is based on surface vessels. However, long distances in the Arctic and hard weather conditions demand quicker response that only aircrafts can provide in some circumstances. According to experts, it is necessary to develop the system which involves air support in case of any evacuation in the Arctic. All the attempts by vessel crew of showing improving initiative that are coming from the bottom of the hierarchy to the vessel owners and heads of regional and federal ministries and departments fail. Their proposals to enhance and improve the existing security systems are mostly ignored or realized within a very long period of time due to bureaucratic procedures of consideration and coordination.

Large-scale accidents will correspond to the federal level according to the Russian legislation. The coordination and emergency organizations to be involved will include federal resources from Moscow which don't have experience to cope with emergencies in arctic conditions.
The mass rescue evacuation needs high level skills form paramedics to triage, provide first aid, evacuation and right treatment. Regional SAR exercises don't provide medical part though it's very important to render medical aid as soon as possible in case of hypothermia which is highly possible in the cold climate conditions. Usually, the exercises, in particular the Arkhangelsk region tabletop exercises, are conducted at daytime and in good weather conditions. But the specialists note that it's necessary to equip the involved SAR helicopters with thermal scanner, high-capacity hoist, night viewing camera, searchlight, and video camera in order to improve tactical capacities during the nighttime and bad weather conditions.
The OSR preparedness system in Russia includes only federal and regional services and organizations unlike Norway where each municipality has the Inter-Municipal Committee for acute pollution (IUA) which has a public responsibility within a given time to respond to an acute pollution from usual activities in the municipality, such as oil spills.

The issue of commercialization of oil spill response services results from federal policy. Lack of funding may obstruct the ability of response providers to improve their capacity and forces them to seek additional sources of income, leading to competition for resources and clients.

Early notification is essential in order that the strategic level can assess the situation and plan a safe approach. The reluctance to call early for help whatever the reason, be it company policy, salvage claims or just lack of understanding of what is available, may incur serious delays which will affect the success of the operation.

Common characteristic of all preparedness institutions is the complex organization of interaction with similar units and subdivisions of the Ministry of Defense and the Federal Security Service of the Russian Federation. There is no separate subdivision responsible for providing assistance to civil ships in these agencies. Existing units provide assistance to military and civil ships on the basis of special instructions that often considered an official or professional secret. That's why specialists and personnel of public or civil institutions often have to address their requests to their chief or head of regional level as minimum when help is needed from the side of the Ministry of Defense and FSS. Such organization/way of interaction is very time consuming and it causes a problem in the provision of assistance to people in distress in the High north sea areas.

PART III. A COMPARISON OF THE EDUCATIONAL PROGRAMS AND COMPETENCE NEEDS

In this part, we summarize the competence themes related to key personnel at sea in Norway, Sweden and Russia. Further, we discuss the need for emergency preparedness courses and training schemes at different levels.

Competence Themes Related to Key Personnel at Sea

Integration Between Different Levels Of Management

This report has indicated that there is a competence need in connection with the ability to mobilize and coordinate all the available resource and communicate and interact with other levels frequently. Vocational education is important to prepare specialists only on the tactical level. The gaps in the current vocational training programs come down to the fact that training is conducted only at the level of operation, which alone may not guarantee the competent response to emergencies at sea where a broad range of skills and cooperation between different types of personnel is needed.

Another gap is that the training programs do not prepare the crews for Samaritan vessel management to interact with other emergency services in case of large-scale accidents.

As previously mentioned, there is a potential that regional agencies face difficulties due to incongruous regional divides. This illuminates the demand for interdisciplinary educations and exercises to develop management competence for complex emergency response.

Large Scale Incidents Management Competence

The programs and courses have to focus on large-scale incidents and complex operations. Nautical and officer's educations do not include comprehensive platform for students to be prepared at distress situations. The majority of the educational programs are generic and there is no particular course for maritime emergency preparedness. Moreover, the universities like vocational education offer very limited knowledge for Samaritan vessel management. In common situations, a coast guard vessel is Samaritan vessel, however there might happen that a commercial vessel is close to the vessel at distress and can start rescue operation until a professional vessel arrives. Nevertheless, there is no course or programs related to this kind of operations. Moreover, in part to we explained that in some cases the leadership of large-scale incidents were challenging. It has been observed that in some situation it was not clear who has

the overall responsibility of large-scale operation. This would be a critical issue in multiple scenarios in case of violent action and mass evacuation.

Due to the risk associated with evacuation exercises, in addition to the big costs of full-scale exercises, there are too few full-scale exercises in a realistic environment. Practices should be carried out far from land when the weather is demanding, in the dark, or when ice and other challenges make implementation more demanding.

Arctic and Maritime Context Knowledge

In the arctic region, organizations depend on specialized equipment and adaptations to an Arctic climate. It is important to develop training platforms that provide the necessary knowledge of technology that is not in daily use. How to report using online services, with the use of services requiring high bandwidth capacity should be part of the training. This will also be in line with the Polar code requirements of adequate competence.

The result from the literature review, inventory of homepages and interviews shows that, at the moment, there are few educational activities within emergency management field that specifically designed for an arctic context. The current programs and courses are providing very basic knowledge on complex emergencies in demanding climate. Among fire engineering and protection programs, there is no course on maritime emergencies. There has been no course focusing on collaborative rescue operation or act as Samaritan vessel. Apart from the compulsory certificates for captains and officers regarding safety issues there is a critical educational gap related to the coordination roles both as mission coordinator and the on-scene coordinator role in emergencies.

The Norwegian Fire School offers some courses for on-scene commanders, which are shore based but still may be useful for other emergency units. Even though the course might be valuable, the probability of a fire fighter to be the OSC in maritime emergency operation is very low. The bachelor program in policing has almost no management course and it only focuses on tactical level, however, there are additional courses as incident commander. The Norwegian Naval Academy has theoretical education and practical training in virtual and live environments for OSC. Nevertheless, this education and training does not cover all the important aspects of OSC role in emergency operations from a managerial point of view.

The bachelor in policing in Norway is mostly relevant for land-based emergencies at tactical level. Unlike Norway, Sweden does not have a police academy. The policing education in Sweden is offered in different state universities which also offer distance programs. Further exercising is done at police training center in Sweden. There is neither managerial courses nor maritime related course during police education. Swedish Defense University has more courses suitable at tactical level of emergency operation. The military education especially in Sweden has basic courses within safety and security at tactical level related to emergency operations. In general, there is a limited focus on maritime emergency management. Apart from naval academy the rest of universities and university colleges focus on land-based incident.

Joint-Team and Partnerships Competences

Overall, the educational programs at tactical level lack the special courses for large-scale operations with cooperation between different emergency services. The specialized maritime universities provide special courses to prepare for emergencies at sea but "civil" universities train students only in emergency response at land. There isn't a special course for firefighting at sea, for example. And if the maritime universities have quite strict requirements for higher education students according to the job experience and relevant previous training, the "civil" universities allow all students to enter the master's degree courses without any experience in this field.

The key personnel at different management levels has education and training programs in their respective education and training institutions. However, there lacks a common platform for competence exchange, functional training and exercise in relation to other professionals, in particular between the commercial, military, and similar organizations in neighboring countries. For example, there may be a need for more skill exchange between commercial vessels operating in the High North and SAR institutions. A common platform for the exchange of expertise are lacking today.

The universal international system of rescue equipment standards and training and education of emergency response groups needed for creation of effective emergency service in Arctic context. Emergency response groups staff should be trained and educated according to approved worldwide programs and have unified equipment. It is needed to collaborate and understand each other in joint operations to anticipate and synchronize the others action.

Violent Action Response and Combined Action Competence

Most of authorities provide courses and education for their key personnel at tactical level for various type of emergencies such as fire, oil spill, SAR and violent action (VA) response Nevertheless, VA has received limited attention. The main challenge is that the training programs provided by different emergency organizations and private companies are not linked. For example in Russia, the maritime services provide the programs according to the international conventions and requirements that are approved by Rosmorrechflot. The training programs of firefighters and rescuers are recommended by EMERCON. However, regional emergency services can also develop their own programs according to emergency conditions they work with. In all three countries, private companies offer courses within crisis management and safety for personnel of vessel at distress but they are not very advanced with focus on cooperation.

Education and Training Of SAR Operational Management Across Institutions

Two key roles in SAR emergency operations are OSC on-site and SMC at the rescue centers. The main task of the OSC and SMC is to assess the size of the event, analyze resource need to prevent and avoid an accident event, communication with emergency response devices, participate in the process of resource coordination, logging of data on all activities and facts, and sharing and evaluate data. These skills are usually obtained by internal courses and on the job training especially within the coast guard and RCCs. The courses are very much based on the IAMSAR manuals. In the Norwegian Coast Guard's preparedness manual, there is a chapter related to SAR operations and competence area for OSC.

Educational Gaps and Competence Needs

Regarding gaps in training and education for SAR operations, OSR operations and VA response, similar gaps have been mentioned. There is a need for more training and education particularity designed for the Arctic region and need to learn more about other organizations and exchange best practices, choice of equipment and competences.

As the part 1 revealed, the programs and courses available in the countries are to a limited degree focused on maritime emergencies. There is no tailor-made course for large-scale operations. There are several courses that emphasize risk assessment and evaluations but there is lack on actual emergency operations and collaboration.

As to competence related to the SMC role, there is no comprehensive degree education. The only way to build the competence and obtain knowledge are internal courses, training in simulator and on the job training.

There are no common standards for competence related to the company's emergency preparedness organizations. Probably large variations exist in both the level of competence and scope around this service, and it may be demanding for the company to carry out anything but limited tabletop and feature-specific exercises.

The university sector provides programs for health personnel in all countries. Some of these studies provide education related to on-scene coordination and staff management. However, they are not adapted to a maritime or Arctic context. As it is discussed before, there is no joint staff and top management courses. The required competence for these roles in all three countries are obtained via general management education and limited exercises and training. It is important to involve all stakeholders within private and public sector, voluntary organizations and commercial organizations, and civilian and military institutions within training and exercises at strategic level. There may be a need for a broader range of courses for staff personnel giving competence as to complex emergency operation.

There is need to develop a common position with a particular focus on collaboration in the field of Arctic emergencies. Uniform national and often international education concepts should be developed that provide expertise on the use of resources in an Arctic-maritime context. This includes knowledge about the development of the most important equipment and competency resources in the public sector, as well as capacities for other organizations.
Furthermore, there is a competence need around organization, management and national borders, where the strengthen of the contact with other emergency organizations in the neighboring countries are required. Here, there is a need to create meeting places for relevant all stakeholders in the Arctic.

There is a need for training and exercises in laboratories and simulators with a focus on different tasks and coordination at a strategic level. There should also be several large full-scale exercises that involve the strategic levels. For the innovation process there is a need for enhanced innovation cooperation on Arctic SAR competence both at national and international organizations within the EU, UN, Arctic Council, and Arctic Coast Guard.

Implications and Recommendations

In general, there is a need to increase the content of emergency management competence both in the basic education for seafarers and for emergency preparedness personnel who will operate in the Arctic. Furthermore, providing more focused postgraduate education within emergency preparedness should be highlighted. There is a need for greater coordination and cooperation between the learning communities and the need for greater integration of the field of practice into educational institutions.

The report has emphasized that increased management competence and non-technical skills are needed at all levels of emergency management in case of large-scale incidents. In the following table we have summarized and merged all the identified gap in the report that can be improved and increase management competence in the Arctic sea region.

Table 36. Summary of identified gap within the report and recommendation

Gap	Recommendations
OSC and ACO roles must be trained	The knowledge on OSC and ACO roles should be made more explicit. Common international courses should be created in this area. Detailed procedures for handling roles like OSC and ACO must be developed and trained for all functions.
Exercise that includes health and the human factor	Knowledge on human behavior in crisis situations is lacking in many training programs. Knowledge of mental and physical health under stress as well as practical training tasks in relation to individuals and groups of distressed persons should be stronger in teaching and training both in the field of naval officers and actors in the emergency response system. Training courses for key actors should provide knowledge on how to cope with large-scale accidents including psychological training.
Involvement of auxiliary resources	The education and training programs will be of higher quality about external resources such as the main rescue center, the air force, the coast guard and the navy contribute to the development and implementation of education programs. This will also improve the harmonization of emergency procedures and increase understanding between the emergency organizations as capability understanding is also exchanged.
Evacuation from a vessel and lifeboat	Exercise on evacuation is classified as a high-risk operation. Training on this must therefore be performed in a realistic environment. There is a lack of courses and training opportunities to practice evacuation, especially mass evacuation and survival at sea in Arctic waters.
A tailor-made simulator for Arctic emergency management education	It is especially expensive to carry out physical exercises in the Arctic due to distances and reduced availability. A course program should be developed that simulates the Arctic climate, which covers the needs of coach and captain training within Polar code requirements. An example might be to have tailor-made arctic training schemes in simulators, or as an introductory program on arctic constraints / challenges that key people must practice before embarking on the Arctic.
Knowledge about communication challenges and cultural differences	Communication with emergency actors in other countries is a challenge related to language and other cultural differences. There are also differences in terminology between agencies. Therefore, exercises should be performed in which emergency terminology and different languages are highlighted. Introducing a broad set of Arctic standardized communication rules, terminologies and frameworks to ensure that

	everyone is understood should be considered.
More training in the environment with major challenges (winter, dark, hard weather, ice, international waters)	A long-term training and training program for professionals within the SAR environment should be developed, focusing on how to create common situational understanding, access to and utilization of each other's resources. The goal must be to train and practice in different demanding areas at different seasons, different geographic challenges, including situations where the weather is challenging, in the dark, with ice and other limitations. It is recommended that the size and number of participants in future exercises should be considered so that cooperation between national and international actors can be guaranteed and optimal results gained from the exercise.
Knowledge about emergency response systems of neighboring countries	There is a need to develop the competence of officers in the police, fire and rescue services with respect to the maritime emergency response systems of neighboring countries as well as coordination and communications systems related to international tasks.
ability to change the emergency plans and standard procedures	The competences for planning should allow the ability to change the emergency plans and standard procedures quickly and effectively. The pre-planned management roles and responsibilities can be completely different when facing a real accident, therefore both knowledge of other roles in the emergency preparedness system and ability to change the role are important.
Improvisation under stress	Practicing new role assignments for coordination and decision-making competences should be highlighted at all management levels
Knowledge of contingency plans	Practice and gain knowledge of contingency plans, procedures and skills to use them by actually exercising them and testing the effectiveness.
Legislation about emergency operations	Updating information regarding legislation and plans related to emergency operations in order to improve interaction between key actors should be given. It is recommended to develop clear guidelines for responsibility and task allocation between actors.

Based on the identified gap and the recommendations, we present a proposal for professional colleges and universities, training centers and emergency preparedness actors who are responsible for developing competences. The proposal is categorized according to the levels:

- Tactical level (The commercial players who may both be at distress and who assist in emergency incidents)
- Tactical level (Professional emergency personnel in public and private emergency organizations
- Operational level (Coordinators and rescue managers locally and regionally)
- Strategic level (The strategic level within each agency and the coordinated ministries and directorates)

Tactical Level, The Commercial Players Perspective

By commercial player we refer to all vessels operating in Arctic waters (fishing, oil and gas, transport, leisure, cruises, research). The employees who should be trained are mainly on-board

safety crew (captain, management team, crew with security responsibility). Other seafarers should also be trained in SAR operations in Arctic waters, learning about how to use relevant SAR equipment, resources and technology is included. The most relevant guidelines and regulations are the Polar Code, SOLAS, STCW, STCW-F; The ISM Code, and the IAMSAR manuals.

A differentiated course program based on the Polar Code should be given to officers and other safety staff on board larger vessels operating in the Arctic environment, with their own modules for icy waters. Such a program should be given officers on board and the company's emergency response organization. Important topics will be: evacuation, survival in cold climate and medical treatment, use of collective rescue equipment in an Arctic environment, crisis management, safeguarding the OSC role of deck officers. There should be separate course units for larger passenger vessels, rigs and installations.

Some of the identified training and exercise needs are evacuation, human survival and first aid, interaction with professional SAR actors in realistic surroundings. Emphasis should be placed on joint exercises between vessels / rigs and both private and public emergency actors.

Tactical Level, Professional Emergency Response Perspective

This group includes all emergency units operating in the Arctic (rescue helicopters, coast guard, coastal administration, navy, rescue company, SAR vessel, patrol aircraft). Personnel who need to be trained are mainly on board vessels and other entities (captain, security personnel, crew responsible). The most relevant guidelines and regulations are the Polar code, STCW, SAR, IAMSAR, Arctic SAR Agreement.

Common education packages for sea and aircraft related to OSC and ACO roles, mass evacuation situations, crisis management, co-operation and logistics should be developed. A coordination manual based on the IAMSAR manuals should be made as the basis for this training. Standard programs for simulator training, table top and full-scale exercises should be prepared as key personnel will participate with special focus on collaboration and testing of equipment, including communication tools.

Operational Level, SAR Coordination Perspective

This group includes all SAR organizations (The Main Rescue Center, the traffic centers, the coast guard, the navy, the SAR air units, hospitals, the Governor, the police, participants in collective

rescue management). The staff who should be trained are the coordinators, personnel on-board of vessel (captain and the ship management team), including those responsible for coordinating activities with land-based centers. The most relevant guidelines and regulations are the Polar code, STCW, SAR, IAMSAR, Arctic SAR Agreement, instructions for various agencies.

A joint, qualifying management program should be developed for mission coordinators. The education program should have the following elements: SAR capabilities, situational understanding, SAR procedures and available SAR resources, how to build infrastructure (e.g., Telecom) to be used in a large-scale event, health and human behavior, how to build trust and coordinate with a focus on human factors, cultural and language differences, and issues related to logistics. A systematic program for training, table top and full-scale exercises based on real events should be established. Exercise and exercises should focus on using existing systems and opportunities, but also as a platform for knowledge sharing. It is very important to carry out realistic exercises under Arctic conditions for this category of personnel.

Strategic Level, Government Officials And Decision-Makers Perspective

This group includes SAR government officials and decision-makers at the strategic level (ministries, directorates, county governors, maritime authorities, responsible for co-operation with other countries). Key actors are decision makers with responsibility for developing the SAR system. The most relevant guidelines and regulations are the Arctic SAR Agreement, bilateral SAR agreements. Strategies for the various SAR agencies.

Inclusion of relevant actors at seminars, conferences, meetings with SAR relevant focus groups; project development and involvement of actors in council, steering groups, project management positions, so that competence sharing is ensured through international exchange and participation in the IMO and other relevant initiatives from organizations. There should be a focus on Table-top and full-scale exercises with the need to activate the strategic level (police, the Governor, the military, training in international waters). Furthermore, there should be the integration of representatives into exercises such as observers, listeners, and ideas for scenarios, as well as active participation in exercises both in the pre- and post-phase, such as briefing and debriefing. Courses and training should discuss the roles as strategically leading actors that ministries and agencies have, with particular emphasis on major operations that require joint and foreign country support.

Table 37. Course proposal for competence development

Course	Proposed content
Tactical Level	
Course packages for officers on larger units (over 100 on board) in areas with a risk of ice and icing	• Construct Situational Understanding • Support during mass evacuation situations • Crisis Management • Cooperation Coordination • Survival in cold climate and medical treatment • Evacuation solutions and their limitations • Health and human behavior • Briefing and debrief associated with exercises • Procedure Understanding • Knowledge of infrastructure (communication, technology, observations, traffic and networks)
Course in the OSC role for the captain and deck officer	• OSC and ACO responsibilities • Members / support during mass evacuation situations • Crisis Management • Cooperation and Coordination • Construct Situational Understanding • Access to information sources
Training packages with simulator training for officers aboard vessels and rigs in areas with limited infrastructure in the Arctic	• OSC and ACO roles • Members / support during mass evacuation situations • Crisis Management • Cooperation Coordination • Survival in cold climate and medical treatment • Evacuation • Construct Situational Understanding • Health and human behavior • Briefing and debrief associated with exercises
Joint national and multinational skills packages for ship managers and other officers who will be responsible for OSC and ACO roles	The purpose is to increase the competence and understanding of the OSC and ACO roles, as well as clarifying expectations for the role. • OSC and ACO roles • Members / support during mass evacuation situations • Crisis Management • Co-ordination between countries and SAR resources, how to recruit others resources • Survival in cold climate and medical treatment • Evacuation solutions and their limitations • Construct Situational Understanding • Briefing and debrief associated with exercises • Procedures and Guidelines across nations including understanding of their practice • Knowledge of infrastructure (communication, technology, observations, SAR resources, traffic and networks) • Technological aids, limitations and possibilities • Access to information sources (weather, wind, driveway, ...) • Capacities, possibilities and limitations • "Best practice" between nations • Culture and Languages (English and Russian) Improvisation in emergency situation
Operational Level	

Joint training programs for operational rescue leaders and members of local and collective rescue management, as well as managers in SAR sea units	• SMC role • Members / support during mass evacuation situations • Crisis Management • Co-ordination of how to recruit others resources and expertise • Survival in cold climate and medical treatment • Evacuation Solutions • Construct Situational Understanding • Briefing and debrief associated with exercises • Procedures and Guidelines across organizations, including understanding of their performance • Knowledge of infrastructure (communication, technology, SAR resources, traffic and networking) • Technology aids • Access to information sources (weather, wind, driveway) • Capacities, possibilities and limitations regarding resources • "Best practice" exchange between the agencies • Cultural and language differences
Full-scale exercises in realistic surroundings in winter conditions	• Co-ordination, how to request other people's resources and expertise, contact with emergency services, including health and medical corporations • Survival in cold climate and medical treatment • Evacuation solutions and their limitations • Construct Situational Understanding
Mass evacuation exercises onboard major passenger ships	Implemented with representative passenger group. Should consider whether this can be an exercise where several nations cooperate. • Co-ordination, how to recruit others resources and expertise • Survival in cold climate and medical treatment, Dehydration, hypothermia, psychology • Evacuation solutions and risks • Construct Situational Understanding • OSC and ACO roles • Members / support during mass evacuation situations • Organization building, procedures and guidelines across organizations
Strategic level	
Annual dialogue conferences on maritime emergency management	Dialogue conferences contribute to increased competence transfer between different environments performing SAR tasks. • Evacuation note after exercises and events • cross-sectoral Table-Top exercises • Discussion opportunities and limitations in different scenarios (SAR, OSR,VA) • Developing shared mental model by reviewing existing procedures and plans Exercises out of the usual scenarios, more focus on Violent Action and coordination between land and sea
Joint Analysis Center for evaluations and best practice training schemes	• Reporting and comparative analyzes • Exchange of experience across borders • Networking and meeting places • Gap analyzes • Develop requirements for joint exercises between the SAR organizations • Certification of SAR personnel • Supervision Local Rescue Management
National education strategies for key personnel	• Competence requirements / certification • Primary and further education • Simulation resources and exercise arenas
Annual full-scale exercises with all levels involved	Use of collective rescue equipment in an arctic environment

CONCLUSIONS

In this report, we have compared the competence need of emergency key personnel at different decision level in three Arctic states; Norway, Russia and Sweden. In the report, the competence needs are reflected on based on major hazard and accident types such as search and rescue, oil spill response and violet action in the demanding sea areas.

The analyzes in this report indicate that there are significant gaps when it comes to key personnel competence demand and educational programs. The vessels of opportunity or samaritan vessels may require more professional training and preparedness in emergency operations. This applies to training related to safeguarding and evacuation tasks, survival in cold waters and coordination of rescue operations. Thus, officers on board merchant vessels operating in the Arctic should receive extensive training and exercises. This is especially true for vessels with a large number of passengers such as cruise ships, offshore platforms.

The report illuminated that today's training programs are largely internal and have a limited focus on maritime cross-sectoral coordination and international collaboration. There is a need for a more comprehensive educational platform for various players including decision makers involved in emergencies. Not the least, insight into equipment required by the various organization, operational terminology, plans and procedures as well as organizational design are required. Systematic training in simulators, table top exercises, and preferably annual full-scale exercises in realistic surroundings may provide an adequate competence exchange platform and a “best practice” development arena.

A joint educational program at management level should be created. This program may integrate the courses and workshops that are currently provided by various specialized professional colleges and the universities. It is necessary that these are linked to systematic training and education packages based on experiences from real events and previous exercises.

National and preferably international education concepts should be developed that provide expertise on how to coordinate and apply resources in an Arctic-maritime context according to the SAR, OSR and violent action scenarios. This includes knowledge about the development of the most important equipment and competence resources in the public sector, as well as capacities for other emergency organizations and operators in the Arctic environment, including

industry actors such as the oil and gas sector can provide. There is a need to create meeting places for relevant stakeholders and key emergency personnel. Frequent workshops, seminars, periodic exercises should be developed for collaboration across country's boundaries in emergencies, where there is a need to strengthen contact with the emergency preparedness units in the neighboring countries. Apart from SAR, there are limited international preparedness and collaboration for other types of maritime emergencies such as OSR and VA.

The report also revealed that despite of substantial demand for competence development at strategic level, the courses offered by educational institutions are limited. It is important that this level is also included in full-scale exercises.

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