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Western Norway
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MASTER'S THESIS

Preparatory Education of Crews and
Passengers for evacuation in Cold
Climate (Arctic and Antarctic)

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MASTER OF MARITIME OPERATIONS

Maritime Studies

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01 May 2020

I confirm that the work is self-prepared and that references/source references to all sources used in the work are provided, cf. Regulation relating to academic studies and examinations at the Western Norway University of Applied Sciences (HVL), § 12-1.

ABSTRACT

Due to the ongoing climate change, melting ice has opened the door for increased cruise traffic in the polar regions. In the past decades, we have seen a prolific increase in Polar Cruise Tourism, and thereby, more humans are able to visit the Polar Regions. As a result of this, the IMO implemented the Polar Code in 2017 to better prepare seafarers in polar waters in order to ensure maritime safety. Several researches have been carrying out work, after the Polar Code came into force, to evaluate its realization concerning the harsh climatic conditions of the Arctic and Antarctic. Based on the Polar Code requirements, the crew's preparedness for evacuation and survival in negative temperatures due to remoteness, is somewhat uncertain. Also, the use of safety equipment in the polar climate still is in the discussion, whether sufficient or not.

This thesis investigates the cruise crew's preparedness for an evacuation in the Arctic and Antarctic, according to the Polar Code. Here, gaps in the existing Polar Code Basic and Advanced Training modules were identified with respect to evacuation needs. Questionnaires and interviews were used as the research method to evaluate the insights of the potential target audiences. The study findings were analyzed and reveal the Polar Code's ineffectiveness with respect to educating the cruise crew for an evacuation, along with the lack of requirement to passenger survival training.

This study recommends specific evacuation training for all the cruise crew members based on the actual needs and, subsequently, the need for improvement in the Polar Code training modules. It also proposes survival training modules for cruise passengers to be developed, for evacuation of a vessel in the Arctic and Antarctic.

Keywords: Polar Code, Training, Education, Crew, Passenger, Evacuation, Arctic, Antarctic, Cruise

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ABBREVIATIONS AND ACRONYMS

AECO	ASSOCIATION OF ARCTIC EXPEDITION CRUISE OPERATORS
GSK	GROUP SURVIVAL KIT
IAATO	INTERNATIONAL ASSOCIATION OF ANTARCTICA TOUR OPERATORS
IASST	INTERNATIONAL ASSOCIATION FOR SAFETY AND SURVIVAL TRAINING
IMO	INTERNATIONAL MARITIME ORGANIZATION
LSA	LIFE- SAVING APPLIANCES
MARPOL	INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS
N.D	NO DATE
NSIDC	NATIONAL SNOW AND ICE DATA CENTER
PILAC	PROJECT ON IMPROVEMENT OF LOCAL ADMINISTRATION IN CAMBODIA
PP	PAGES
PSK	PERSONAL SURVIVAL KIT
PWOM	POLAR WATER OPERATIONAL MANUAL
SAR	SEARCH AND RESCUE
SAREX	SEARCH AND RESCUE EXERCISE
SOLAS	INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA
STCW	INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS
TNA	TRAINING NEED ANALYSIS

Chapter 1. INTRODUCTION

1.1 Background & Demography

Arctic and Antarctic are covered with sea ice and are surrounded by pristine beauty and home of the most endangered species of the polar animals on the earth. The sea ice on the two poles is essential for maintaining the global climate. In the 21st century, they are now in a cataclysmic situation due to thawing ice because of global warming (shown in figures 1 & 2: sea ice anomaly from 2013 to 2020).

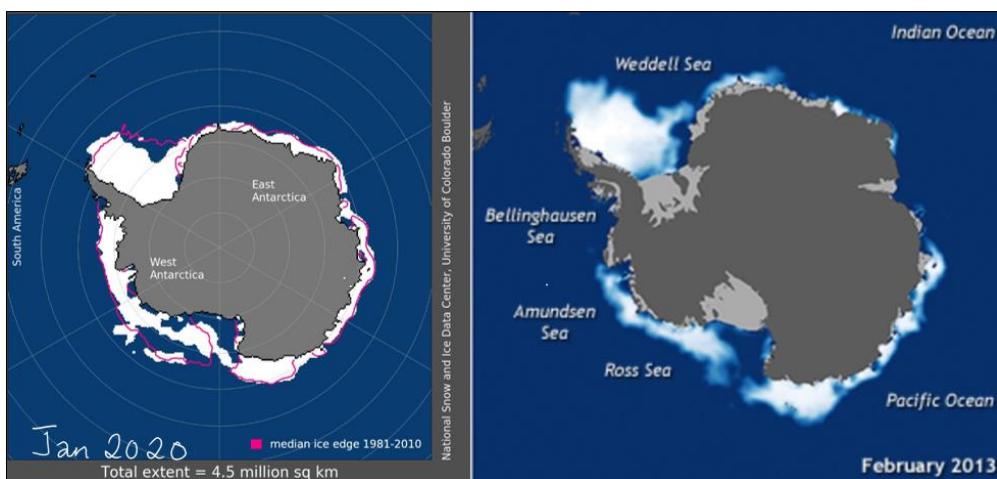


Figure 1. Antarctic Sea Ice Extent Jan 2020 and Feb 2013 (NSIDC, 2020) & (Viñas, 2019)

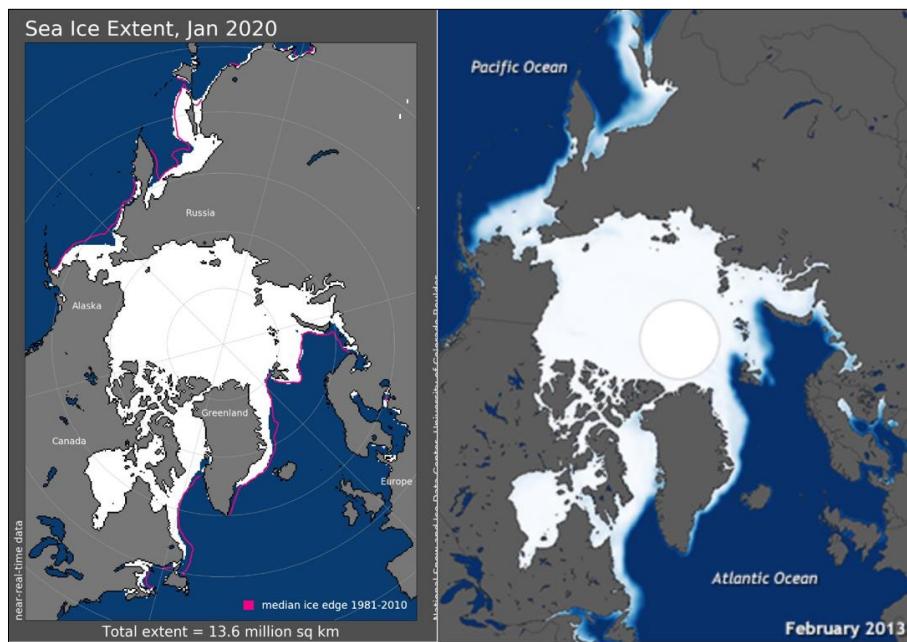


Figure 2. Arctic Sea Ice Extent Jan 2020 and Feb 2013 (NSIDC, 2020) & (Viñas, 2019)

The melting sea ice raises the alarm to the world ecosystem and dwells to answer the question; How will we face climate change? Many researchers are working on measures to reduce the carbon footprint and stop its impact on climate change. On the other hand, some consider melting ice in the polar region as an opportunity for boosting their economy by expanding their business further in the northern seafront, as there are reserves of hidden natural resources under the polar seabed. The Northwest Passage became accessible as a result of climate change that boom the shipping traffic to sail through the Canadian Arctic Archipelago via the Arctic Ocean to the Pacific Ocean, which shortened the traditional distance via the Panama Canal to 1000 nautical miles (“Northwest Passage,” n.d.).

The approach of the Maritime Industries towards climate change has both pros and cons in terms of increased shipping business profit and increased threat to the unspoiled polar region. One of the Industries which benefits with the ice-free passage in the Arctic and Antarctic, offering voyages longer periods of the year is the ‘Cruise Industry’. The Cruise Industry has attracted those who can afford to fulfill their bucket-list, by introducing opulent packages in the unique and mesmerizing polar region. In the past decades, we have seen a prolific increase in Polar Tourism and humans are able to make a mark on charismatic creation.

As per the statistics shared by the manager Eva from “Visit Svalbard”, for the upcoming summer in the Arctic (Kornfeldt, 2020), there’s a three-fold increase in the number of expected cruises and passengers visiting the unknown places that exist in the Arctic (shown in Figure 3). Also, the report from the AECO exhibits the trends of cruise vessels, expedition cruises, and vessels operated by AECO in the past years in the Arctic shows an increase in cruise traffic (Linking Tourism & Conservation, 2019). Below figures show the current statistical trends of Cruise Voyages for the upcoming summer in the Arctic (Figure 3 in next page) as compared to the earlier years (shown in Figure 4 in page 4).

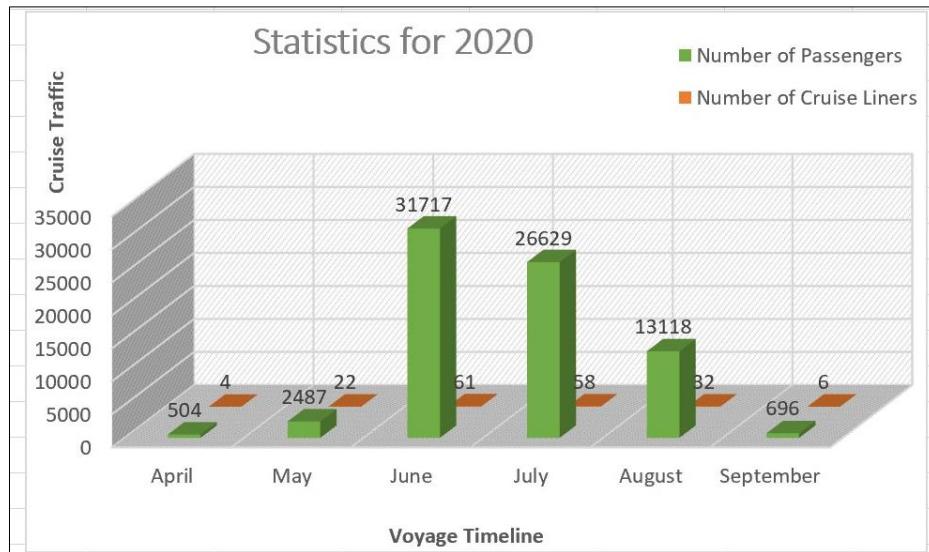
Statistics for the upcoming summer in the Arctic

Figure 3. Arctic Expedition Cruise Liners Planned Voyages in the Arctic (Data received from Kornfeldt, 2020)

Total Passengers -75,151 and Total Cruises – 183

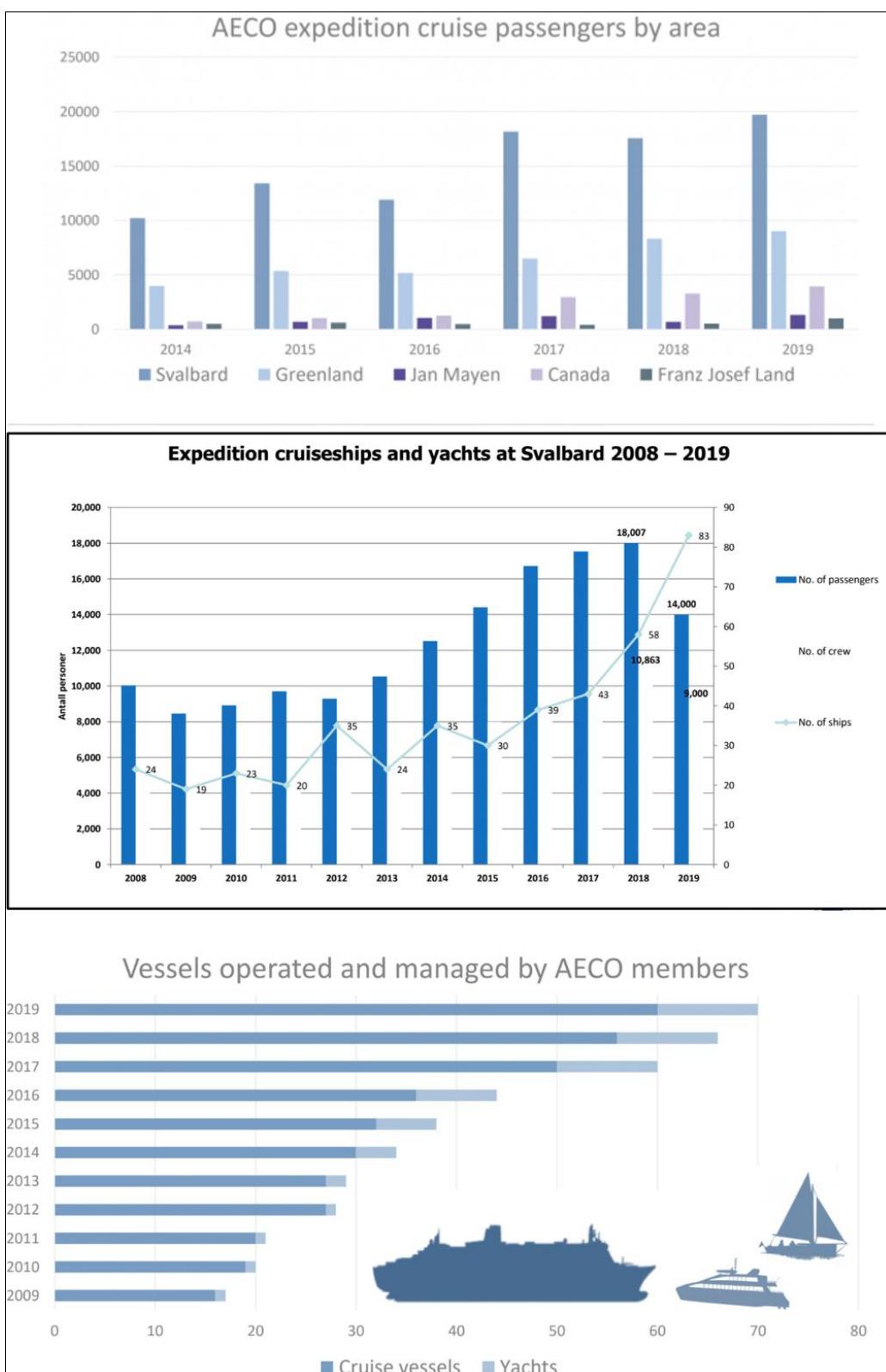


Figure 4. AECO Statistics in the Arctic (Linking Tourism & Conservation, 2019)

The cruise traffic in the Antarctic as per the IAATO report shows, the number of cruise passengers expected to visit in 2019-2020 will be 18,420 (IAATO, 2019).

Figure 5 shows the statistics for Antarctica, and Figure 6 shows passenger ships traffic in Antarctica, recorded on 29 February 2020 (Live Marine Traffic, Feb. 2020).

<i>Table 1. Historical Statistics of Recorded Seaborne Tourism (including Cruise Only)</i>					
Based on data provided by companies who submitted Post Visit Report Forms and from other sources where available.					
Year	No. of operators	No. of ships & yachts	No. of voyages	No. of passengers making landings	No. of cruise only passengers
1992-93	10	12	59	6,704	
1993-94	9	11	65	7,957	
1994-95	9	14	93	8,098	
1995-96	10	15	113	9,212	
1996-97	11	13	104	7,322	
1997-98	12	13**	92	9,473	
1998-99	15	15**	116	9,857	
1999-00	17	21**	154	13,687	936
2000-01	15**	32**	131	12,109	0
2001-02	19**	37**	117	11,429	2,029
2002-03	26**	47**	136	13,263	2,424
2003-04	31**	51**	180	19,369	4,949
2004-05	35**	52**	207	22,297	5,027
2005-06	47**	44**	249	25,167	4,632
2006-07	42**	47**	268	28,622	6,930
2007-08	48	55	308	32,637	13,015
2008-09	44	53	290	26,921	10,652
2009-10	44	51	239	21,622	15,020
2010-11	41	47	223	19,065	14,373
2011-12	36	41	234	21,131	4,872
2012-13	39	45	258	24,892	9,070
2013-14	42	51	283	27,374	9,670
2014-15	37	44	268	26,812	9,459
2015-16	38	48	286	29,960	8,109
2016-17	38	47	298	36,440	7,475
2017-18	44	50	344	42,576	9,131
2018-19	44	56	360	44,600	10,889
2019-20	46***	63***	432***	***59,367	***18,420

** Includes non-IAATO operated yachts (sailing and motor) where the information was available.
 *** Based on pre-season estimates not actual statistics

Figure 5. Statistics for Antarctic Cruise Traffic (IAATO, 2019)

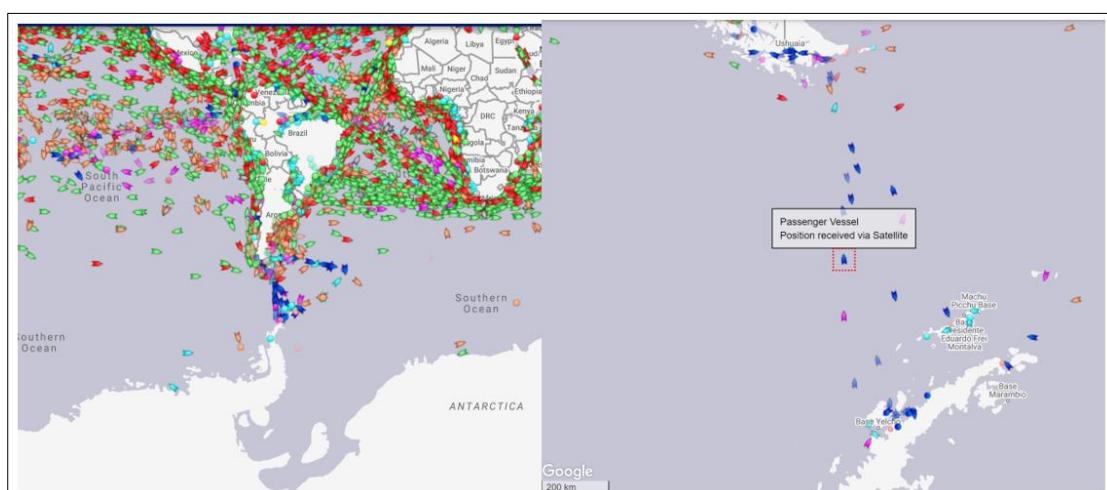


Figure 6. Marine Traffic in Antarctica (Live Marine Traffic, 2020)

1.2 Research Base and Incidents

The increase in cruise traffic adds more challenges and risks associated with maritime safety due to adverse climatic conditions and thousands of human lives involved. Arctic and Antarctic have similarities; with harsh climatic conditions and 24hr lights in the summer as well as differences in the temperature and sea ice. Hence preparedness for safety varies at both the north and south pole, respectively. The Arctic has milder weather in the summer months, which is surrounded by land, and it opens for a more extended cruise period, while Antarctica is colder in comparison, surrounded by oceans due to their geographic location, and hence less accessibility. However, this summer, the highest temperature recorded at the south pole region in February 2020 is 20.75°C (Watts, 2020), higher than usual, which raised concerns about further implications.

Cruise liners plan their voyages in the Arctic and Antarctic regions in the summer months due to extreme weather conditions in winter. At the south pole region, summer from October to February and at the north pole region from June to September. Several challenges that make sailing at both polar regions dangerous and unfavourable where passenger safety is at risk in the remoteness. The Antarctic continent is surrounded all over by oceans that pose a higher risk due to remoteness and longer distance from search and rescue (SAR) activities due to the absence of inhabitants and isolation from the land. Also, unpredictable weather with sudden changes will lead to detrimental effects on the usage of Life-Saving Appliances (LSA) in case of an emergency. The accelerating cruise industry is planning voyages where a large number of passengers involved is lacking maritime safety, ‘Are we prepared for large mass evacuation in an unforeseen scenario or emergency?’

Some of the past incidents reveal how preparedness influences maritime safety. In November 2007, *MS Explorer*, after hitting an Iceberg, sunk in the Antarctica Ocean. It was the first kind of cruise ship built specifically to sail into the icy water of the Antarctic Ocean (Stewart, E. & Draper, D., 2008). Even if it was a specialized ice-strengthened vessel designed for polar travel, and at the time of the incident, ice was milder and calm weather, the vessel was still not fortified to save her from that unfortunate event (Stewart, E. & Draper, D., 2008). In 1989, *Maxim Gorky*, a Russian

liner ran into an ice-floe near Spitzbergen, and even if the vessel was equipped with modern devices, she failed to operate in that situation (Lohr, 1989). SAR resources found it challenging to reach the incident place by breaking three nautical miles wide ice, as mentioned by the Norwegian Coast Guard vessel Senja's commander (Lohr, 1989). The Norwegian Coast Guard evacuated all the 900+ passengers and crews (Lohr, 1989). In the report, they highlighted that evacuation by lifeboats and abandoned passengers from the ship onto the ice floe faced many challenges due to bad weather (Lohr, 1989). Some mentioned lifeboats were hanging in the air and not able to be lowered down, and passengers were waiting to get rescued onto the ice for a long time (Lohr, 1989). Even though this incident happened 30 years ago, it still precludes the preparedness of SAR and maritime safety.

Recently, the expedition cruise *Akademik Ioffe* ran aground in August 2018 in the Canadian Arctic Northwest passage, where quick rescue access was possible in that remote area. Weather conditions were also friendly at the time of this incident that saved lives of the onboard passengers (High North News, 2018). In March 2019, the '*Viking Sky*' Cruise (The Barents Observer, 2019) lost power in a heavy storm near the west coast of the Norwegian Sea. All those who were sailing were rescued, and they mostly were elderly. In this case, they received the response rapidly, and many of them were airlifted by the rescue team located at the nearby ports. Others stayed onboard until the engines were started again. However, such a rapid response might not be expected if the cruise vessel with thousands of passengers gets stuck in the Arctic or Antarctic due to remoteness and harsh climatic conditions.

One of the spokespersons commented in the article (The Barents Observer, 2019), that they also underscored the support of the Red Cross Team, who gave shelter to the evacuated passengers, and that it would be challenging to rescue all persons onboard a cruise ship in the Arctic or Antarctic where hardly few or no inhabitant resides. "In that situation, rescuing hundreds of passengers from a cruise ship, we are not still prepared". After digging into all the above past incidents, it intimidates cruise industry safety and underlines the need for preparedness considering various challenges in the Arctic and Antarctic.

The most critical challenges in the Arctic and Antarctic are SAR and unfavourable climatic conditions. The remoteness of the polar region, as shown in the search and rescue (SAR) maps below (Figures 7 and 8), convolutes search and rescue operations. Nonetheless, the intensity of the incident is sporadic, but consequences are austere, so considering this, our task is to be better prepared for future unforeseen events and save lives.

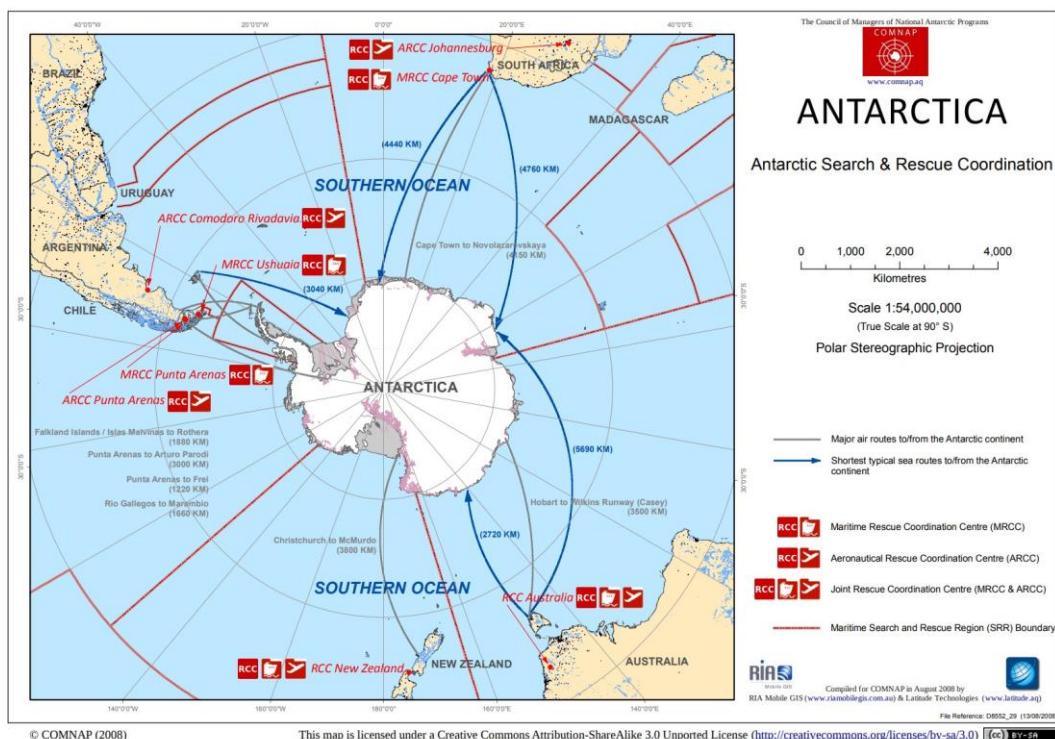


Figure 7. Antarctic SAR (COMNAP, 2008)



Figure 8. Arctic SAR (“Arctic SAR,” n.d.)

1.3 Regulations

SOLAS or MARPOL or STCW are the international conventions for the safety of life at sea and pollution prevention and training for the Crews involved, respectively (SOLAS, 1974; MARPOL 1973; STCW 1978). These conventions were implemented after the major incidents that happened in past maritime history like the '*Titanic*' catastrophe in 1912. The IMO - International Maritime Organisation responsible for maritime safety regulates maritime safety with the help of these conventions for future events. At the advents of Climate Change, IMO implemented the Polar Code on 1 January 2017 for ships operating in Polar Waters. Under this code, requirements concerning ship construction, design, emergency preparedness, ice navigation, etc. are discussed. As an amendment to the Polar Code, the Standards of Training, Certification, and Watchkeeping (STCW, 1978) requirements for the master, chief officers, deck officer, and navigational officers need to be certified with Polar Code Basic and Advanced Trainings as per regulations mentioned in Chapter 12 (IMO, 2017).

Cruise Crews are well trained as per the SOLAS and STCW convention to evacuate and abandon the ship in an emergency in case of open or other waters (IMO, 2017).

And with the Polar Code implementation, IMO implemented regulations for every vessel to comply with regarding design, navigation and Life-Saving appliances (LSA) in Polar water etc. As per Polar Code Chapter 8, crews need to be certified to operate Life-Saving equipment and to help the passengers to evacuate in polar water (IMO, 2017).

Some studies drew attention to the practicality of the Polar Code Training that needs to go beyond the specified requirements and is being regarded as a significant concern of safe maritime operations in ice infested polar waters. A survey on the deck officer certification as per the Polar Code requirements reveals the lack of unified training curriculum or hours among the Maritime Education and Training, that pose a gap in the standardized training. The survey outcomes also reveal the inefficiency of the Polar Code training to fulfil the practical on-hands experience to get the feel to be qualified (Southwell, 2018).

Still, many argue (Kristiansen, 2019) that the implementation of the Polar Code suitability is confined, where it says the minimum days to evacuate should not be less than 5 days. Moreover, according to the Joint Rescue Team (The Barents Observer, 2019), LSA equipment, such as lifeboat or life-raft hasn't been tested and survival of older people in the lifeboats for 5 days is a question of discussion. The Joint Rescue Team mentioned (The Barents Observer, 2019) that most of the Passengers who opt for cruise ship, are belong to the elderly, that they want to spend their years of saving in a relaxed environment. Evacuating them in such a climatic condition should be in hours not in days as they won't be able to survive such a long period in the LSA.

In the case of *Costa Concordia*, which ran aground, reveals that Passengers were unsure about muster points and safety guidelines due to no evacuation drill had taken place onboard ("Costa Concordia," n.d.). That raised confusion between passengers; as a result of which evacuation was difficult. In this event though, the crew was trained, but the passengers were not, and guidelines for awareness about safety tools weren't clear. As per regulation, Cruise liners need to conduct a safety drill within 24hr of departure. While in the case of *Costa Concordia*, she ran aground immediately after leaving port, and until then, no safety drill had been done. With

this, a new regulation came wherein every Cruise liner needs to conduct safety or muster drill before it departs from the Port (CLIA, 2020).

Similarly, the *MS Explorer* incident raised the concern of ships' capability to sail in Polar water, even with ice class rating 1A and being specialized in sailing in polar water (Stewart, E. & Draper, D., 2008). The Polar Code enforcement has led to greater maritime safety to counteract the challenges with weather and remoteness; however, the practicality of the training of the crew concerning evacuation has not been discussed. These incidents question the effectiveness of the Polar Code regarding training of crews relating to evacuation.

1.4 Motivation for Research

As per SARex3, the report concludes regarding the limitation of the Polar Code (Gudmestad, et al., 2018):

1. Personal Survival Kit (PSK) and Group Survival Kit (GSK) equipment are not capable enough to survive for five days.
2. Mass Evacuation using Helicopter is limited.
3. Crew Training for survival is needed.

Considering practical lessons learned from the SARex Exercises - SARex (Solberg, et al., 2016), SARex2 (Solberg, et al., 2017), and SARex3 (Solberg & Gudmestad, 2018), there is a need for training crews for survival and mass evacuation.

Considering the facts about the cruise ship and climatic condition, I decided to look at the practicality of Polar Code Training with respect to evacuation. The thesis focuses on the preparedness of cruise crews for evacuation and survival, and the requirements by the various training institutes concerning implementation of the Polar Code. Training gives a better understanding of the real situation in a virtual way. The various institutes are authorized to train the crews on implementation of the Polar Code, where trainers are the experienced mariners like Captain, Master Mariner, Chief Officer who have sailed in ice or polar waters. In this, I will study how those training courses from various institutes cover the evacuation training and analyse the gaps and identify training needs for the passengers.

1.5 Purpose of Study and Research Question

My thesis focusses on Cruise liners and their Crews who get trained at Training Institutes as per Polar Code, and Passengers who need to get some safety training. As a result of which, I am researching what is missing in the existing polar code training courses. It represents the base of my master thesis wherein my research theme is ‘Preparatory education of Crews and Passengers for evacuation in the cold climate (Arctic and Antarctic)’.

Based on this my research question is

‘How to prepare Cruise liner Crews and Passengers for evacuation in Cold Climate (Arctic and Antarctic)?’

The research progresses by collecting insights from potential users and followed by analysis to present the findings.

1.6 Limitations

This thesis’ analysis is based on the responses from qualitative and quantitative studies. The target groups for the research are Cruise Industry, Crew, Training Institute, and Passengers. While collecting the data, the responses received from Passengers were fewer, due to data protection, and ethical concerns from cruise liners who were not allowed to share the details of their passengers. Also, the cruise liners responses were few due to their unavailability to participate in the survey. Hence the analysis was done based on the fewer responses, assumptions, literature search and past incident studies. Passengers commented on the emergency and concluded regarding the needs for future training along with responses collected from crews and training institutes.

In this thesis study, the methodology used discussed in chapter 3 is limited to survey responses received, which were obtained via email, social media like LinkedIn, and Facebook. Also, to validate quantitative data, qualitative interviews were conducted. However, the counts for this were minimum due to the unavailability of potential respondents and key responsible personnel.

To gain real practical experience of Polar Code training from the user point of view so that I would better understand the feasibility of Basic or Advanced Polar Code Training, wasn't possible during the period of preparation of the thesis.

1.7 Thesis Structure

My research study unfolds into 6 chapters, which explain and discuss how my research question is analysed and answered.

Summary of Chapters included in the research are as follows.

Chapter 1 gives a Practical background with demographic details, challenges, regulation, and the Purpose of this research based on the Polar Code and Cruise industry's importance.

Chapter 2 discusses the theoretical background of the Polar Code, Crew Training, and Training Institute and how Polar Code certification helps Crews during evacuation. It explains the needs of passenger safety, considering some of the incidents that have happened in the past. It explains and discusses applicable theories.

Chapter 3 takes you into the methodology used to support the research study by Questionnaire and Interview methods and why the method selected is explained. It gives the basis of a study on how data is collected and what is the limitation of those methods.

Chapter 4 explains the results of the survey & interviews and analyses the responses.

Chapter 5 focuses on the result obtained from the methods and how it answers the research question.

Chapter 6 Conclude the thesis by discussing what improvement is required considering crews' training and proposes further training for the passengers. Future scope of this research is addressed with the help of the analysis result.

Chapter 2. THEORETICAL BACKGROUND

2.1 The Polar Code



Figure 9. Relationship between Polar Code and Target groups (IMO, 2017)

Figure 9 illustrates the relationship of the Polar Code with training institutes, cruise, and crew. And below, figures 10, 11 & 12 show what is included in the Polar Code and respective regions where the Polar Code applies (IMO, 2017). The masters, officers in charge of a navigational watch, and chief mates have to complete the training as per the Polar Code regulation for passenger ships, i.e., certification in Basic Course in open water operations (ice concentration less than 1/10) and Advanced Course in other ice-covered water operations (ice concentration more than 1/10).



Figure 10. Polar Code (IMO, 2017)



Figure 11. Polar Code extent in the Arctic Water 60°N (IMO, 2017)

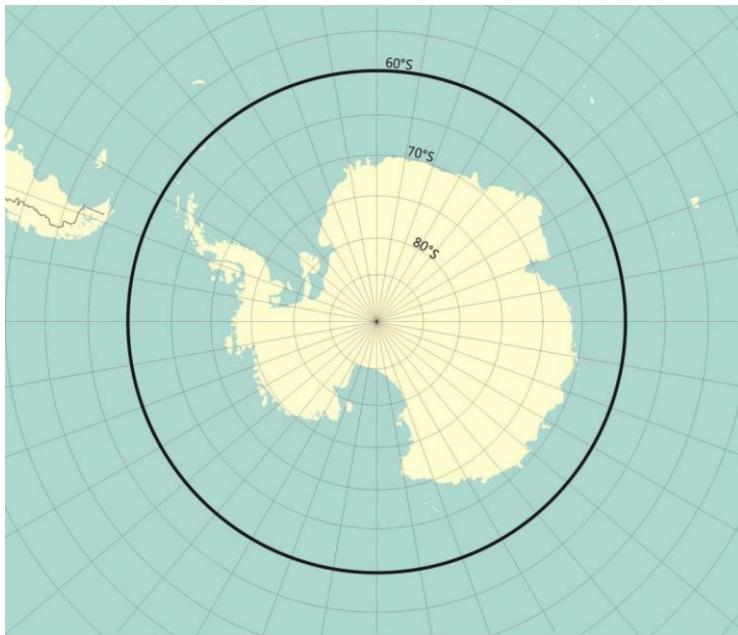


Figure 12. Polar Code extent in the Antarctic Water 60°S (IMO, 2017)

The IMO implemented the Polar Code that entered into force on 1 January 2017 and was adopted on 1 July 2018. The Polar Code is an amendment of SOLAS & MARPOL for ships in polar waters for the safety of life at sea (SOLAS, 1974) and the prevention of pollution from ships (MARPOL, 1973). As per IMO's regulation, every ship crew that intends to undertake a voyage in polar waters, which surround the north and south pole regions, must comply with the Polar Code. On one hand, the Arctic

and Antarctic have similarities like the exotic and endangered environment and polar animals. On the other hand, there are differences in polar sea ice - in the Arctic, a significant amount of multiyear ice is available in the summer months, while in the Antarctic, there is less multiyear ice. Therefore, operational characteristics are analysed individually considering the differences.

2.1.1 Regulation concerning Evacuation

The Standards of Training, Certification, and Watchkeeping (STCW) Chapter V (STCW, 1978) and the Polar Code – Chapter 12 describe the requirements to training, considering the international convention on the standards of training and certification of seafarers (IMO, 2017). According to this, masters, chief mates, and officers in charge of a navigational watch in open water must have certification of Basic Polar Code Training and Advanced Polar Code Training, including training for transfer in ice. IMO Canada provides guidelines for the Instructors of the course as per the requirements of the Polar Code (Master Mariner Canada, 2017). However, the Polar Code mainly focuses on the training concerning ship structure, design, construction, ice navigation, and little about evacuation. With this, it is challenging to determine how well the training covers evacuation needs.

The Polar Code training gives guidelines considering STCW Code Part A-V/4-1/2 and SOLAS Chapter XIV (STCW, 1978; SOLAS, 1974). The Polar Code specifies training requirements in the Basic and Advanced modules. One section focuses on the training of the crew's preparedness for evacuation. As per this section, the crew needs to be trained to operate Life-Saving Appliances (LSA) to abandon the ship into the water or onto the ice. Furthermore, the crew needs to be trained to take care of passenger's safety and survival means, including maintaining Personal Survival Kit and Group Survival Kit (PSK & GSK). The Polar Code Chapter 8 explains the requirement of Life-Saving Appliances (LSA), where the goal is to escape, evacuate, and survive safely. Paragraph 8.2.2 of this chapter explains functional requirements for an evacuation. According to this, life-saving appliances must be operational during the maximum expected time of rescue, considering harsh and changing weather conditions. Similarly, Paragraph 8.2.3 specifies the guidelines pertaining to

survival such as by providing appropriate thermal protection or survival support in the event of abandoning ship for the maximum time of rescue (IMO, 2017).

Chapter 12, *Manning and Training*, explains about the goal in Paragraph 12.1:

“To ensure that ships operating in polar waters are appropriately manned by adequately qualified, trained and experienced personnel.” (IMO, 2017)

The functional requirements to achieve this goal are mentioned in Paragraph 12.2 (IMO, 2017). According to this, the companies planning voyages in polar waters shall ensure completion of the Basic and Advanced training modules by the onboard ship masters, chief-mates, and officers in charge of a navigational watch as per the regulation of the provisions per Chapter V of the amended STCW Convention and the STCW code to fulfill abilities that are appropriate to duties and responsibilities (IMO, 2017). The STCW convention set out requirements in regulation V/4, and the STCW code provides details in Section A-V/4, which was accepted on 1 July 2018 (STCW, 1978).

According to Paragraph 12.3.4, every crew member shall be familiar with the procedures and equipment operations as per Polar Water Operational Manual (PWOM) Chapter 2 relevant to their assigned duties (IMO, 2017).

2.1.2 Training Institutes

The crews from the various cruise line companies have to comply with the Polar Code requirements discussed above in section 2.1.1 by getting certified in Basic or Advanced Polar Code training modules accordance with the STCW provisions. This training is provided by private training institutes authorized to train and have training modules prepared per IMO Canada guidelines (Master Mariner Canada, 2017). The training is offered by an experienced master mariner, captain, or certified personnel experienced in sailing in polar waters.

Since 2018, after the implementation of the Polar Code, many institutes introduced Basic and /or Advanced Polar Code Training modules for eligible crews; these modules, are based on IMO course guidelines. For a vessel planning voyages in ice

infested water or polar waters, it is mandatory to train its crews; however, the Polar Code itself does not mention any specific requirements concerning cruise vessels. It needs to be investigated whether regulation for passenger ships aligns with that for cruise vessels. To be eligible for an Advanced Polar Code module, the person must have experience from polar waters for two months, which is practically difficult, as mentioned by Naoki Saito, Manager from ClassNK in the IASST Conference 2018 (IASST_NK Saito, 2018).

Training institutes such as Force Technology - Denmark, Aboa Mare Maritime Academy and Training Center - Finland, Makarov Training Centre - Russia, or Maritime Institute Willem Barentsz (MIWB) - Netherlands are some of the authorized institutes for the Polar Code Training Module across the globe. Here, cruise liners can register their crew members to get trained for the Polar Code Basic and/or Advanced modules, depending on their duties. Figures 13 & 14 in next pages, give a brief overview of the training content from Maritime Institute Willem Barentsz (MIWB) for Basic and Advanced training modules. The training institutes provide the necessary details regarding course theoretical and practical contents, course duration and entry standards which helps cruise liners to select the appropriate course based on their requirements. However, the training cost is also an important criterion, which some of the cruise liners keep in mind while selecting training institutes. Perhaps they have to make a trade-off between which one is better in terms of safety compliance and the cost.

Basic Training Ice Navigation in Polar Waters

This course provides training to officers in charge of a navigational watch to operate ships in polar waters and to address those additional provisions as required by the Polar Code, in order to take into account the climatic conditions of polar waters and to meet appropriate standards of maritime safety and pollution prevention.

After this course

This course provides you with the most important practical knowledge and theoretical background to successfully navigate in ice covered areas.

- > Voyage planning and reporting
- > Icebreaker assistance
- > Vessel performance in Polar Waters/low air temperature
- > Crew preparation, working conditions and safety
- > Pollution prevention in Polar Waters

Polar Waters include both Arctic and Antarctic Waters as defined in SOLAS and MARPOL regulations.

Course content

The objective of this course is to familiarize the participants with navigating in ice covered areas including its special problems. Countries having to deal with ice navigation, urge to implement IMO guidelines in a course and certify participants. For those regularly sailing in ice covered waters demands become more and more stringent, especially the polar regions press for better education concerning this kind of specialized navigation.

The theoretical part of this course will cover:

- > Ice nomenclature, characteristics and detection
- > Regulations and standards
- > Vessel characteristics
- > Manoeuvring in ice

Practical content

The lectures will take place in a classroom and will make use of practical examples. In addition simulator training is incorporated in the course. The simulator exercises create situations that provide an opportunity to acquire the required skills as specified in the regulations.

Course duration

The duration of the course is 2,5 days, from Monday until Wednesday. The course schedule can be found at miwb.nl/basic-ice.

Certification

The training programme has been approved by the Netherlands Shipping Inspectorate. Upon successful completion of the course a certificate for basic training for ships operating in polar waters will be issued.

Entry standards

This course is meant for masters, chief mates and officers in charge of a navigational watch in ships operating in polar waters, with a valid CoC.

Figure 13. Basic Polar Code Training Brochure (NHL Stenden, 2019)

Advanced Training Ice Navigation in Polar Waters

This course provides training to masters and chief mates of ships operating in polar waters and to address those additional provisions as required by the Polar Code, in order to take into account the climatic conditions of polar waters and to meet appropriate standards of maritime safety and pollution prevention. Polar Waters includes both Arctic and Antarctic waters as defined in SOLAS and MARPOL regulations.

After this course

This course provides you with the most important practical knowledge and theoretical background to successfully navigate in ice covered areas.

Course content

The theoretical part of this course will cover:

- > Regulations, standards and shipboard documentation
- > Vessel characteristics
- > Manoeuvring in ice
- > Planning
- > Icebreaker operations
- > Crew preparations, working conditions and safety
- > Simulation

Practical content

The lectures will take place in a classroom and will make use of practical examples. In addition simulator training is incorporated in the course.

The simulator exercises create situations that provide an opportunity to acquire the required skills as specified in the regulations.

Course duration

The duration of the course is five days, from Monday until Friday. The course schedule can be found at miwb.nl/advanced-ice.

Certification

The training programme has been approved by the Netherlands Shipping Inspectorate. Upon successful completion of the course a certificate for advanced training for ships operating in polar waters will be issued.

Entry standards

Trainees must have completed an approved basic training for ships in polar waters and meet the standard of competence specified in section A-V/4, paragraph 1 of the STCW Code, and have at least two months of approved seagoing service in the deck department, at management level or while performing watch-keeping duties in an operational level, within polar waters or other equivalent approved seagoing service.

Figure 14. Advanced Polar Code Training Brochure (NHL Stenden, 2019)

2.1.3 The Cruise Industry

Due to global warming, the Arctic and Antarctic sea ice has been melting, and many people wish to explore and visit these unique areas, which are now accessible with the help of cruise ships. Cruise liners attract hundreds of passengers by offering an incredible and beautiful once-in-a-lifetime experience of the polar regions. Due to severe weather conditions and the ice-covered oceans in the Arctic and the Antarctic, the cruise ships plan their voyages in the summer months. During this period, the sea ice has melted, or is considerably reduced, and climatic conditions are predictable and favourable to passenger safety. The Norwegian cruise liner 'Hurtigruten' is famous for its trips in the Arctic and the Antarctic, and it's one of the most desirable cruise liners considering passenger safety. Cruises like Princess, Seabourn, and P&O Australia (which comes under the branch of Holland America Line) are known for their international expedition trips with polar expeditions also in their list. All these cruise liners' primary responsibility is passenger safety, along with excellent customer service. They claim they take the utmost care by keeping their crews well-trained to avoid any emergency.

Some past incidents have, however, raised the question of adequate crew training, e.g., when Viking Cruise liner '*Viking Sky*' was stuck in the Norwegian storm in March 2019. If they were well trained to perform their job, why did they continue sailing rather than seeking harbour? Helicopters were used for evacuation as the weather prohibited use of lifeboats. However, this remains a topic of discussion wherein some have posed the question that in case a similar situation would occur in the Arctic or the Antarctic; whether they would have had to wait for rescuing vessel in such cold climatic conditions where survival is even more difficult? (The Barents Observer, 2019). Nevertheless, these incidents are examples that show the need to gear up better for maritime safety and hence the need for better crew preparedness to encounter future such incidents.

2.1.4 Crews

Seafarers, as per the STCW convention and code for manning and training, are certified and educated for the safety of life at sea (STCW, 1978). In line with the

STCW, the Polar Code emphasizes that the crew's education must comply with the requirements to be adequate in polar waters. The crews in the cruise industry that are planning voyages in the polar regions have specific training requirements. Hence, they must be certified with the Polar Code Basic or Advanced training courses. Every crew member has to be certified with respect to their specific job requirements. The training is meant for masters, chief mates, and officers in charge of a navigational watch with additional requirements for the advanced module.

In historical times, not every crew member was trained to operate life-saving appliances, which made them incompetent at the time of an emergency. Crew members are responsible for muster training and drill exercises, where they guide the onboard passengers on how to use safety equipment and follow emergency evacuation procedures. In some cases, due to lack of proper training, crew members find it challenging to manage the passengers in case of an emergency evacuation, as seen in the case of *Costa Concordia* ("Costa Concordia," n.d.). The Polar Code prepares the crews based on their operational ability with respect to ice navigation, communication, etc., but how effectively they get educated with respect to evacuation, is uncertain. The crews also need to handle panicked passengers and their questions, which would be reduced if the passengers were trained enough or made aware of evacuation needs beforehand. The SARex3 study mentioned the necessity of increased competence of the crew in evacuating all passengers to lifeboats or life-rafts, which would contribute to survival up to 5 days per the Polar Code requirements (Solberg & Gudmestad, 2018).

2.2 Passengers

Many of us wish to explore the exotic and incredible experiences on planet 'Earth,' and thus, the Arctic and Antarctic are on our bucket-list. However, not everyone can afford these unforgettable experiences, so only those who are financially well off can manage to plan it. The Association of Arctic Expedition Cruise Operators (AECO) (Kornfeldt, 2020) & International Association of Antarctica Tour Operators (IAATO) (IAATO, 2019) statistics (figure 15) reflect favourable cruise choices of passengers. They book their experiences with cruise liners like Polar Quest, Oceanwide, Quark

Expeditions, Hurtigruten, or Royal Caribbean, or at least are planning to do so in the future. In the era of affordable offers on cruises, many people are now able to plan and accomplish their dream.

IAATO Cruise Only Tourism - Peninsula Region - 2019-2020						
Vessel	Vessel Registry	Operator/ Charterer	Country	Est. # Voyages	Est. # Average Load	Est. # of Passengers
<i>Amsterdam</i>	Netherlands	Holland America Line	USA	1	1300	1300
<i>Azamara Pursuit</i>	Malta	Celebrity Cruise Lines/Royal Caribbean/Azamara Cruises	USA	1	620	620
<i>Celebrity Eclipse</i>	Malta	Celebrity Cruise Lines/Royal Caribbean/Azamara Cruises	USA	2	2550	5100
<i>Coral Princess</i>		Princess Cruises	USA	3	2000	6000
<i>Volendam</i>	Netherlands	Holland America Line	USA	1	1350	1350
<i>Zaandam</i>	Netherlands	Holland America Line	USA	3	1350	4050
			Totals:	11		18420

Planned Expedition in the Arctic	
Cruise Liner	Number of Passengers
Lindblad	126
Hurtigruten	180
Quark Expeditions	122
Hurtigruten	180
Polar Quest	53
Polar Quest	12
Hurtigruten	108
Quark Expeditions	122
Hurtigruten	180
Hurtigruten	108
Polar Quest	53
Polar Quest	12
Hurtigruten	108
Oceanwide	170

Figure 15. Favorable Cruise Liners Statistics (Kornfeldt, 2020; IAATO, 2019)

The demographic index suggests that most of the people who are interested in such experiences are elderly, which presents a challenge from an evacuation perspective. The ‘*Viking Sky*’ cruise incident in the Norwegian Sea shows that if a similar incident were to happen in the Arctic or the Antarctic, it would add rescue limitation when passengers are elderly (Solsvik, 2019). In the case of younger passengers, they can, with initial training, be capable enough to protect themselves in an emergency without any additional crew help. Also, in case of *Akademik Ioffe*, the passengers were rescued by rescue team from another vessel when the ship grounded in Canadian Arctic. It is difficult to imagine an efficient evacuation scenario in the Arctic or the Antarctic (High North News, 2018) unless another ship is in the area.

Considering the case of *Costa Concordia*, a lack of safety guidelines created a confusing situation where the passengers were not aware of safety equipment (“*Costa Concordia*,” n.d.). The effectiveness of personal protective kits like PSK & GSK varies with duration of survival and so do the required contents of emergency food or thermal protective aids etc. Based on the SARex exercises, most of the rations are insufficient for 5 days of rescue operation (Solberg & Gudmestad, 2018).

Some institutes like Meriturva have survival training courses for passengers going on expedition trips where they provide training for a group on request and give lessons about evacuating, surviving, and rescuing people from the vessel in an emergency (Meriturva, 2020). Well-trained passengers can assist and help crews during an evacuation. However, passengers seldom follow such external training or are merely unaware of it, as they think the risk of an emergency happening is low, and they forget that the consequences can be life-threatening. National Geographic Orion in Antarctica shown below in figure 16 is an example of the expedition cruise in the Antarctic.



Figure 16. National Geographic Orion in Antarctica (Vaya, 2020)

2.3 Training Need Analysis Theory

This thesis emphasizes ‘Preparedness’ for ‘Evacuation’ by means of ‘Training’.

“Preparedness refers to a very concrete research-based set of actions that are taken as precautionary measures in the face of potential disasters or emergency. These actions can include both physical preparations (such as emergency supplies depots, adapting measures to survive and rescue) and trainings for emergency action. Preparedness is an important quality in achieving goals and in avoiding and mitigating negative outcome.”
 (“Preparedness.” n.d.).

“Evacuation is the urgent immediate egress or escape of people away from an area that contains an imminent threat, an ongoing threat, or a hazard to lives or property.” (“Emergency Evacuation.” n.d.).

According to Dessler et al. (1999), “Training is the process of teaching employees the knowledge or skills they need to better perform their current jobs. That is training aims to help employees meet the goals of the company as well as their own goals.” (Babaita, 2011, pp. 212)

Hence, as an organization responsible for maritime safety, the International Maritime Organization (IMO) implemented the Polar Code to mitigate the negative outcomes of unforeseen situations in the Polar regions. Emergency evacuation preparedness training helps crew members to better perform their assigned duties.

Following the above definitions of preparedness of the crew for evacuation, the theory of Training Needs Analysis (TNA) helps to identify the gaps in the existing Polar Code training.

“The process of identifying gaps between the employee training and training needs is called the Training Needs Analysis (TNA)” (“Training Need Analysis” n.d.).

As mentioned in the article, Essay UK, training develops the personal skills to expand knowledge and prepare better for a new task (Essay UK, 2018). Similarly, IMO identified and implemented the crew's training requirements under the Polar Code in

the Polar regions. Still, the effectiveness of this depends on “self-efficacy” when the crew is sufficiently competent to receive training.

“Self-efficacy” is, *“how well one can execute courses of action required to deal with prospective situations”*, according to psychologist Albert Bandura (Bandura, 1982).

In this research, the TNA theory is used to identify the training needs for the crews and the passengers based on the research methods explained in chapter 3. With this theory, the gaps in the existing training modules are analysed using the TNA model (PILAC, n.d.).

The TNA model (Figures 17 and 18) shows how the crew’s performance is influenced by training using real situation. A competent crew helps the cruise liner to better prepare for future scenarios, and hence the performance of the organization is also improved. The technique used to identify requirements and gaps with respect to methods is based on qualitative and quantitative research. The questionnaire and interview techniques used to collect the data are discussed in the Methodology section in chapter 3. It supports the TNA model by identifying actual needs using a survey and by interviewing target groups, and by presenting reliable result findings through analysis of the collected data.

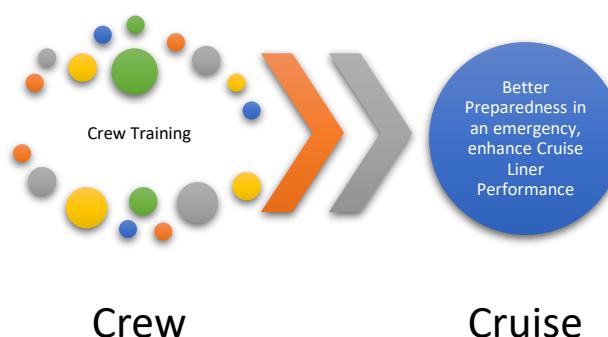


Figure 17. Training Need Analysis Theory



Figure 18. Training Need Analysis Framework (PILAC, n.d.).

This research uses the problem statement and hypothesis below to answer my research question:

Objective: Training of crew members and passengers for evacuation.

Problem Statement: Identify the evacuation preparedness of crews and passengers.

Hypothesis: Effectiveness of Polar Code Training of the Crews during an evacuation.

The TNA framework (PILAC, n.d.) involves identifying the gaps in the existing training with the support of data collected by quantitative and qualitative methods. Once data collection is completed, the second step is to analyse the responses and present the results based on the analysis. The last step in the TNA framework is to implement the outcomes that governs the effectiveness of training. This process is repeated to identify the future needs of an assigned task to improve the personal skills essential to perform the specified task, thereby achieving self-efficacy and better company goals.

Chapter 3. METHODOLOGY

3.1 Overview and Selection

This chapter gives an overview and explanation of the methods used to identify the gap in the existing training and describes the collection of data for an analysis of the research question mentioned below.

'How to prepare cruise liner crews and passengers for evacuation in cold climates (Arctic and Antarctic)?'

To investigate this question, both qualitative and quantitative data were collected. The methodology used is as follows:

- ‘Document analysis’ including review of training manuals from different institutions and companies.
- ‘Questionnaires’ - survey related to the research question were posed to a number of participants in the form of multiple-choice questions or open-ended questions.
- Qualitative analysis involving an in-depth understanding of the situations which are being investigated were conducted.

This method was time-intensive and therefore limited to a small sample.

Moreover, it is challenging to extrapolate the findings from those samples to a broader group.

3.1.1 Reason for Selection of Methods

Collection of qualitative data in the form of open-ended questions was consolidated with collection of quantitative data to make the most efficient use of available time. Quantitative data collection is quicker than qualitative data collection. However, the former involves a large sample of participants for the findings from the analysis to be generalized to a broader group. It also only addresses answers to the specific questions which need to be analysed using numerical or statistical analysis. The methodology used in this research for collection of quantitative data was to use a questionnaire where a number of respondents such as multiple cruise line companies, crews, researchers, and training institutes participated. The participants were selected

based on the purposive sampling method discussed in section 3.2.1. The qualitative interviews were also conducted in order to align the results obtained from the quantitative questionnaires. In order to get answers to my research question, the Questionnaire method was selected after taking into account the reasons mentioned above concerning the advantages and disadvantages of data collection.

3.1.2 Limitations

The methodology used in this research has certain limitations as it seeks responses from personnel who are familiar with the theme of the research and hence, raises the concern of consent to analyse the data collected. Also, it requires a large number of participants' involvement to collect individual opinions based on their experiences. With this, it was challenging to get timely answers to all questions in the questionnaires, as the responses are influenced by the individual's or company's personal matters. Therefore, this limits the analysis of my data and consequently, its conclusion. Furthermore, in-depth research that involves approval is beyond the scope of this thesis due to the limited time assigned to this thesis.

In closing, a quantitative analysis based on the questionnaire methodology was most appropriate to investigate the research question, as it was the most relevant method for analysis, considering the time constraints.

3.2 Quantitative Research

Quantitative research deals with the numbers which are derived from the data collected from a specific target audience that supports or refutes a hypothesis.

Aliaga and Gunderson (2002) define “Quantitative research is an inquiry into a sociable problem, describes phenomena by gathering numerical data that are analyzed using mathematically structured methods e. g. in particular statistics”. (Bobby, 2018).

As mentioned by Bryman and Bell (2007), quantitative research is implemented to get the reality of the purpose of the dissertation rather than an abstract meaning (Bobby, 2018).

Therefore, the quantitative research method is used in this research to get the research objective by investigating the target audience directly. These samples are selected based on a judgment that resolves the purpose of the research, which is known as Purposive Sampling - a type of Non-Probability Sampling method.

The data collection was done by the survey method using a questionnaire to dig deeper into the research objective. It collects the essential insights based on the Training Needs Analysis (TNA) framework discussed earlier in chapter 2.

As Zikmund (2003) defined, “Survey as a method of gathering primary data based on communication with a representative sample of individuals.”

The survey method has an advantage, as mentioned below:

As per Zikmund (2003), Surveys provide a quick, inexpensive, efficient, and accurate means of assessing information about a population.

The survey methodology using a questionnaire helps to collect primary data, which is quick and effective. The questionnaires are divided into four groups and distributed among the respective target audiences. With this, a representative sample of the individuals identified were the Cruise Liners, Crews, Training Institutes, Passengers, and Researchers. The details are explained in section 3.2.1.

3.2.1 Target Group selection and distribution of the questionnaire

Survey target groups (figure 19) were identified based on the following factors:

- 1. Geographical Areas: Arctic and Antarctic (Polar Regions)***
- 2. Cruise Liners' management responsible for the crew training in that area for an expedition.***
- 3. Researchers currently researching on the Polar Code.***
- 4. Crews experienced in Polar Cruise shipping and certified with Polar Code Basic or Advanced Training modules.***
- 5. Passengers experienced with Polar Cruising in the Arctic or Antarctic.***
- 6. Authorized Training Institutes for Polar Code Training***

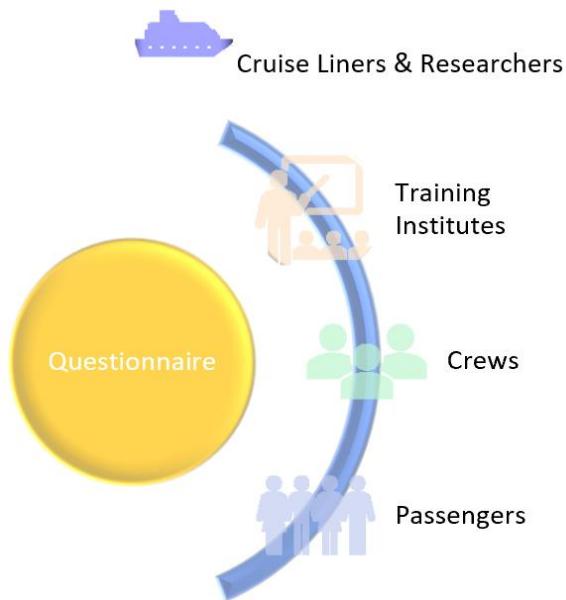


Figure 19. Survey Target Audience

Based on these factors and the purposive sampling method, a number of respondents were identified by researching social media profiles (LinkedIn, Facebook and Instagram), and email addresses of IASST members referenced from the IASST conference on the Polar Code (IASST, 2018). The contact details of the cruise liners were found from the cruise association's websites – AECO for the Arctic and IAATO for the Antarctic (AECO; IAATO, 2020). Some of the contact details were found by searching on LinkedIn with the keywords - ‘Polar’ or ‘Polar Code’ for the respective target population and sending a direct LinkedIn request with an overview of the research needs. The authorized training institutes were searched on Google with the keyword - ‘Polar Code Training.’ The use of social media was beneficial where passengers were identified based on the reviews given to Cruise Liners on Facebook and searching with hashtags like #Arctic or #Antarctic Cruise or #Polar expedition on Instagram. The participant samples were selected from these resources, underpinning their reliability considering the research purpose. The survey was designed online using ‘Survey Monkey’ and divided into four categories based on the chosen samples, which helped to narrow down the research details and deduce the needs of the research (Survey Monkey, 2020).

An informed consent document was created to give an overview of the research objective, the reason for the participation, and how the data privacy of a personal will be managed. An informed consent attached in **Attachment 1** was distributed to all selected participants with the survey questionnaire links via email. Table 1 lists the links to the survey questionnaires distributed among the target groups. The survey was open for four weeks from 1st to 28th of February 2020 to maximize the number of responses.

Table 1. Survey Links

Training Institutes	https://www.surveymonkey.com/r/XKNQYTY
Cruise Liners	https://www.surveymonkey.com/r/XP557GG
Crew	https://www.surveymonkey.com/r/XK5H7KW
Passengers	https://www.surveymonkey.com/r/X8Y5DNS

3.2.2 Data Collection- Survey (Questionnaire)

Questionnaire: A total of 24 questions were formulated based on the individual target groups. Some questions were multiple-choice while some were open-ended to collect deep insights into the questions. Multiple-choice questions limit the respondent's answers to the available choices, whereas open-ended questions allow freedom to express a more detailed understanding of a subject context.

Tables 2, 3, 4, & 5 list the questions asked, and responses are discussed in chapter 4. Answers to the questionnaire with more details of individual respondents can be found in **Appendix B**.

Table 2. Questionnaire A. Cruise Liners/ Researchers

1	Different training centres offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.
2	How often are evacuation drill exercises conducted on-board?
3	How well did trained crews perform in past evacuation drill exercises?
4	How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?
5	What are the limitations of evacuation training under the Polar Code?
6	Is all crew member certified for operating Life Saving Appliances?
7	How often do crews need to be trained to ensure safety?
8	Will you recommend that there be a special training module for lifeboat/life-raft captains?

Table 3. Questionnaire B. Training Institutes

1	Is present Polar Code training sufficient enough for ship evacuation and passenger safety?
2	How do you conduct Polar Code training?
3	How many hours are assigned for evacuation training?
4	Do you think the assigned time for evacuation training covers all the important aspects?
5	How do you assess the crew's competence for attending the Polar Code training?
6	Do you offer Passenger Safety training?
7	Considering passenger safety, what would you recommend for a passenger training module?
8	Will you recommend that there be a special training module for lifeboat/life-raft captains?

Table 4. Questionnaire C. Crew

1	Is present Polar Code training sufficient for ship evacuation?
2	Polar Code training offered by different Institutes; how does it help to strengthen/enhance evacuation skills?
3	What challenges have you faced in passenger behaviour during the evacuation drill exercise?
4	How frequently do you participate in safety training?
5	What improvement would you recommend for the Polar Code training?

Table 5. Questionnaire D. Passenger

1	Many Cruises plan voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?
2	A Personal Protection Kit is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?
3	How do you prefer to receive Passenger Safety Training?

3.3 Qualitative (Interview)

Qualitative interviews were conducted to support the quantitative data and validate the results obtained from the survey. However, the number of interviews conducted depended on the availability of individuals and their approval. The interviews were conducted in a semi-structured form and were a follow-up of the questions asked in the survey. As interviewees were spread geographically, it was difficult to conduct face-to-face interviews. Even though a face-to-face interview provides the most accurate results, it would have been more time-consuming. Telephonic interviews

have an advantage over face-to-face interviews, in that it is possible to access interviewees located in various places and, they are cost and time effective. The downside of telephonic interviews is, that to record interviews or take notes, consent is required from an interviewee and that chances that they might not be comfortable to record their audio are very high. In this research, telephonic interviews were conducted considering their advantages, and notes were taken during the interviews. The answers were condensed from the transcribed notes concerning the research and used in the data analysis to support the quantitative data. Six participants (including persons from each target group) participated in the interviews. Chapter 4 will discuss details of interviews and participants' insights concerning Polar Code Training.

3.4 Document Analysis

The Training brochures from institutes which offered the Polar Code Training, were studied to understand the theoretical content of the course. Some of them are copied below in figures 20 & 21. The detailed training module were not accessible due to data protection from the respective institutes.

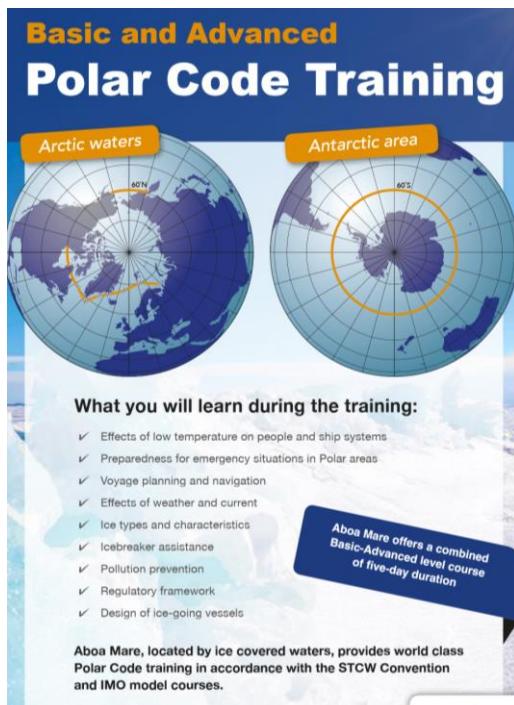


Figure 20. Polar Code Training Flyer, Aboa Mare (Aboamare, 2018)

Polar Code Basic and Advanced Course information

The Basic& Advanced Course covers all training requirements in the IMO Polar Code, which were mandatory as of 1 July 2018. This courses meets IMO STCW 2010, Table A-V/4-2. The course is taught by highly professional and experienced mariners, Icebreaker Masters experienced in Arctic ice and Masters/Chief Engineers of ice-classed cargo ships.

Objectives	Course Details
<ul style="list-style-type: none"> - Polar Code Regulations & Standards - Ice Dynamics - Arctic Meteorology - Low Air Temperatures - Vessel ice classes and Characteristics - Maneuvering in ice - Crew Preparation - Survival/First Aid in Cold Climate 	<ul style="list-style-type: none"> - Ice Nomenclature - Satellite Imagery - Vessel Performance in Polar Waters - SAR in the Arctic/Antarctic - Voyage Planning and Polaris - Ice Breaker Operations - Working Conditions & Safety - Environment/MARPOL
Virtual Reality Simulation Exercises/full size simulators	
<ul style="list-style-type: none"> - COURSE TYPE(S): Deck - PRICE: 2200EUR - LENGTH: 4 Days - APPROVAL: 90North Ice Consulting AB - TRAINING METHOD: Lecture and Simulation - SIMULATION: Yes - INSTRUCTORS: 90North Ice Consulting in cooperation with Viking Ice Consultancy. - EQUIPMENT: Full Mission Bridge, and VR. - PREREQUISITES: For Advanced must have Basic STCW certificate. - CAPACITY: 30 for Basic and 16 for Advanced - MINIMUM ENROLLMENT: 7 for Basic, 6 for Advanced and 5 for Combi. (The course is subjected to being cancelled if minimum enrolment is not met) 	

After successfully passing the test, trainees will obtain an STCW Polar Code Basic and/or Advanced certificate issued by the Swedish Maritime Administration, which is recognized by all flag states. Mariners will satisfy the training requirements of IMO STCW, Table A-V/4-1 for Basic and Table A-V/4-2 for Advanced Polar Code.

This course is geared to Masters, Chief Mates, and Officers in charge of a navigational watch on board ships operating in polar waters and for shore staff that would like to have more understanding about the trade area for Polar waters.

2 weeks prior to the course start date, if minimum enrollment is not met the course is subjected to be canceled.

Figure 21. Brochure, 90 North Ice Consulting (90northiceconsulting, 2020)

Chapter 4. RESULT & DATA ANALYSIS

4.1 Result

This chapter presents the findings from the survey and interviews. These were used to collect quantitative and qualitative data, as discussed in chapter 3. As per the TNA framework discussed in chapter 2, section 2.3, the first step is to understand and identify the gaps in existing Basic and Advanced training modules per Polar Code requirements discussed in chapter 2 for evacuation needs. Hence, quantitative data were collected by asking questions relevant to the target groups in the form of ‘Questionnaires’ as explained in chapter 3, section 3.2.2. Table 6 illustrates selected target groups, number of questions asked, and respondents for the survey which was distributed via email, Facebook, Instagram, and LinkedIn. The cruise liners responses were not considered for the data analysis.

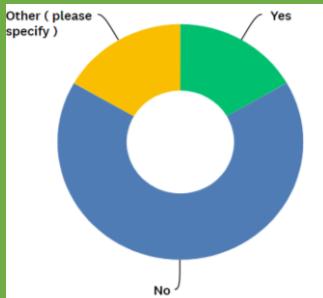
Table 6. Survey Target Group and Respondent

Target Group	Questions	Respondents
Training Institutes	8	6
Crew	5	6
Passengers	3	5

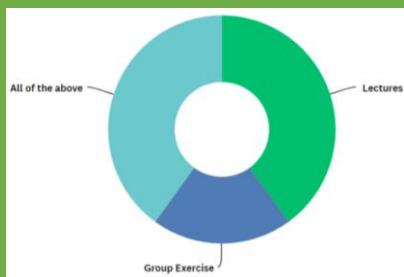
Total responses received for the survey: 21 including Cruise Liners

4.1.1 Summary of Questionnaire Responses from Survey Monkey (details in appendix A & B)

I. Training Institutes

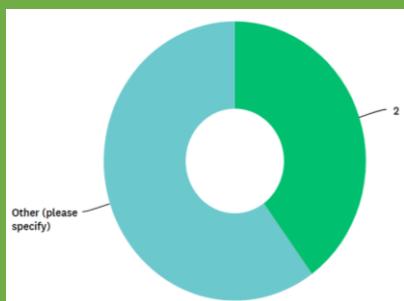
Responses	Summary
<p>Question1</p> 	<p>It shows, based on the 6 responses from training institutes, that Polar Code training is not sufficient, considering ship evacuation and passengers safety.</p>

Question 2



Training institutes conduct Polar Code training mostly in the form of Lectures, Simulator and Group exercises.

Question 3



With reference to this, majority of institutes did not mention the exact number of hours for evacuation training while some offer training for 2 hours.

Question 4

it's balance between time and subject
No idea; but it seems to be a time-consuming training that needs to be conducted in as realistic as possible settings
We have a special course for practical survival and hypothermy, we dont have Polar Code course as it is in the code. Our course is 8 hours all practical including firefighting in cold climate.
No I don't, the realistic time needed should be established at the vessel it's self under realistic circumstances (carrying personal survival kits)
No the assigned time is only used for the theoretica part of the evacuation.
Actually, yes. But due to technical progress and amendments' of human lives saving requirements the aspects and the assigned time should be corrected.

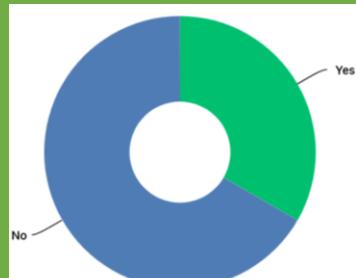
They highlighted that the assigned time does not cover the practical needs of the evacuation training.

Question 5

- asking personal experience and type of ship
Not involved. For lifeboat crews there is no formal assessment even regarding normal conditions; and this will be all over Europe. Assessing the competence is most likely a very difficult topic. Notably when done in a research setting this is most difficult to assess and test as (of course) all trained people will know more after a course than before. Such studies to be indeed relevant need a good and relevant research question and sufficient power.
All the tasks must be performed to pass.
We only deliver courses to Captains and nautical officers (basic and advanced course). We do not assess crews.
For the basic course we have a written assessment, for the advanced course we have simulator assessments.
Most part of training courses participants has the real interest to the polar code training. They understand the importance of this training.

Data results shows that Training institutes' assessment method is not standardised. Some use written exams and some highlighted loopholes where assessing crew's competence is very difficult with respect to the Polar Code training.

Question 6



Majority of the training offered by authorised training institutes is only specific to crews per Polar Code requirements. Data indicates only few offer training modules for Passenger Safety.

Question 7

it's very close to crowd and crisis as well it's should be kind of ships specific
Realistic training as groups
Evacuation exercise and jumping and swimming in cold water, climbing to lifedraft and operating it.
Passenger safety course (delivered on board) I would recommend
Awareness of the cold environment
The lectures. The demonstrations of life saving procedures and the life saving appliances using. The training drills.

Training institutes suggested that a passenger training module may involve awareness of Life-Saving Appliances and cold environment, and physical exercises with realistic training.

Question 8

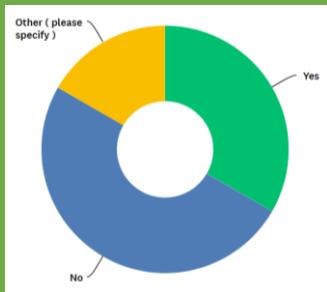
No, It could be covered by Survival Craft course
Yes
Practical traing, Yes of course!
A special module in the Proficiency in Survival craft other than fast rescue boats would be recommended by me.
No, but it is more important that the whole crew is aware of the impact to survive in a lifeboat/liferaft
No. The standard SOLAS training requirements are enough.

Training institutes has mixed opinions, where some agree and others not for special training module for lifeboat/life-raft captains.

II. Crew

Responses

Question 1



Summary

The majority of crews who attended the Polar Code training from the institutes, highlighted that it is not sufficient enough for ship evacuation. The justification for this question, was answered in question 2 below.

Question 2

Understanding the challenges of equipment and weather
It does not
Heightened awareness of dangers including the remote nature of Polar environments.
It could be helpfully if based on standard program
More Training for the key crew.
Not at all

With reference to responses from 6 participants, many mentioned that it is not sufficiently helpful considering evacuation needs.

Question 3

Getting equipment to the passengers. PSK and GSK
Language barrier; Physical disabilities
Enthusiasm and participation.
Closing of fire screen doors
The crowd and crises With are evacuation for passengers and crew.
During passenger drills it's typical that they have even problems to find their musterstation or boat. Proper clothes are often missing especially during good weather.

Respondents indicate different challenges during evacuation drill exercises, such as handing PSK & GSK, language barriers, crowd & crisis management, difficulties in finding muster stations and lack of enthusiasm.

Question 4

Weekly
As a Safety officer at list one's a day
Daily, Weekly, and Monthly.
Every days
Every week
Weekly

All the crew members participate actively in the safety training. Most of them participate weekly.

Question 5

More focus on the equipment
A proper guide line to be created for evacuating passenger vessels in polar waters
Require additional on board assessments for ice navigation.
To implement official position on board as training officer for polar code only
More of learning evacuation, nature, rules in polar waters
Special needs to handle passenger a long time in a boat like in antarctica. To be rescued will take a long time (see sinking if explorer).

They recommended a need of proper guidelines for evacuating passengers and special needs to handle passenger for a long time in polar regions.

III. Passengers

Responses

Question 1

Very good. Carried out just as we left the port. It was thorough with us putting on life jackets, checking them, given information on the muster points and the life boats for an emergency evacuation
Very good
I have been on 2 Arctic cruises and 2 Antarctic cruises all with the same company. The muster drill training was carried out thoroughly and to the same very high standard on each trip. My only concern was that at the end of the training where we were on deck with the lifeboats it was difficult to hear the crew member speaking, however the training was complete at this stage. If they are to address a large group of passengers whilst outside it would be better to use a megaphone to ensure they are heard.
The muster drill training was well performed. I would rate it highly.
I have been on multiple polar cruises, and every time the muster drill has been clear and informative. They explain the procedures to the entire group, then send us to our cabins for the start of the drill. We get to practice heading to our muster stations, and there is time for questions afterward.

Summary

All the respondents were satisfied with standard muster drill training offered by cruises and understand its importance. However, one of them indicates its limitation if there are needs to address a large group of passengers.

Question 2

I am unsure of the meaning of this question. If you mean the life jackets they were quite fine to me. We were also given a thick waterproof jacket for warm on all zodiac cruises and for personal use on board if we wanted. I don't know of any other personal protection kit. We were advised of warm clothes prior to arriving for the cruise and I was personally conscious of always having woolen underclothes and waterproof clothes. I personally carried an emergency blanket (small aluminum sheet) in my jacket pocket at all times when on landings.

No one will carry it around the boat! Waste of money and effort.

I personally had no issue with it, although they are obviously bulky during an evacuation. However some of the elderly / less able passengers had difficulty with the straps, so needed help to ensure they were fitted correctly.

Is this the life vest? I think they were fairly standard. Likely would not fit a small child, but there were not many small children on my trip. One size fits all seemed to make the process quicker to hand to everyone, and will fit most people.

I don't know what a Personal Protection Kit is. We were never given anything other than a life vest and instructions about how to get to our muster stations.

These responses indicate that many passengers are unaware about the PPK and some mentioned associated problems such as life vest unsuitability for kids and difficulty in using it by elderly or less able passengers.

Question 3

It could have been a good idea to have emailed us a sheet on safety training however the muster drill we received on board was very good and I had no problems with it.

Practical like muster rolls.

This was done as a group (compulsory attendance) with the assistance of video presentation and crew demonstrations, with crew present to address questions. I think this was a very good way to do it as it ensured ALL passengers received the training. This was followed by a drill, ensuring all passengers participated. Again I feel this was vital and is the correct thing to do. It is also important to ensure information is available for different languages, and that the demonstrations are visually clear particularly for this reason.

I liked receiving the training in person on the boat. I don't think I would have paid appropriate attention to a video. And it is easy to understand when doing a full walk through.

It would be nice to have a pamphlet before boarding (sent via email), a pamphlet in our cabins, and the safety drill that they do. Having information in multiple places increases the likelihood that the passenger is comfortable with the evacuation process.

Some prefer to have a pamphlet covering safety training before boarding which can be provided via email to increase their awareness about the evacuation process. While some mentioned the need of safety training in different languages.

4.1.2 Interview

The qualitative telephonic interviews conducted were semi-structured which was a follow-up of the quantitative questionnaire survey (Interviewee list in table 7). All 6 participants (2 from Cruise liners group) participated in the interview via phone.

Table 7. Interviewee List

Participant Group	Gender	Age
Crew1	Male	40
Crew2	Female	34
Training Institutes	Male	51
Passenger	Female	48

4.1.2.1 Interview details

i. Crew1

The interviewee has 21 yrs. sea-going experience as a Safety, Third, and Chief Officer. He has 10 yrs. experience on-board Passenger Ship, Polar Expedition vessel,

and ice navigation in the Arctic and Antarctic. He briefly introduced his experiences during emergency evacuation and rescue operations in polar waters. There were no standard questions asked; rather, questions were based on the survey questionnaire and follow-up of his experiences with respect to the Polar Code.

Following points highlighted in the interview with respect to Polar Code training during an evacuation:

- No specific guidelines concerning cruise ships.
- Polar Code mainly focuses on ice navigation and nothing about evacuation.
- Lifeboat/life-rafts usability has limitations in the Arctic or Antarctic considering sudden weather changes.
- No predefined instructions for Immersion Suit such as how to put it on, where to wear or where to keep it.
- Mass evacuation not considered.
- Embarkation space challenges exist in case of a larger number of passengers and crew helping them to wear Personal Protective Equipment. This will raise concern, when we consider SOLAS evacuation time 30 min.
- Survival in the Antarctic cold water is difficult.
- Medical fitness of the passengers adds extra risk in the evacuation process.
- The Drake passage in the Antarctic slow down operation for immediate medical assistance as it takes 2 days to cross it.
- No onboard medical examination; passengers' fitness is checked before boarding and passengers are rejected if not found fit, by cruise line companies.
- The regulation concerning extra supplies for food and water.
- Need Regulation for Zodiac usage as a rescue means.

ii. Crew2

She has several years of experience from the polar regions on expedition cruises such as Oceanwide and National Geography as chief mate, and officer. She is certified with the Basic and Advanced Polar Code training modules.

She explained about onboard actual safety training for evacuation:

- Crew basic safety training onboard involves nominal training every week, which is deeply related to ship and lifeboat information for the specific crew. Deck people are unaware if not explained.
- Muster drill – a crew member explains about survival in cold water, PSK & GSK, and Immersion Suit usage to passengers.

Regarding the challenges of the Polar Code training:

- Specific to Cruise ships, no clear guidelines on how to do evacuation and management; unclear about its applicability.
- If they need to abandon the ship, “how to evacuate onto the ice”?
- “Which kind of Ice can I evacuate to? Whether it’s strong enough to lower down the lifeboats and evakuates the passengers onto it.”
- Training institutes offer Polar Code training applicable to Cargo Ships not specific to Cruise Ships.
- No guidelines for Group Survival kit usage.
- Practical training is needed for the crew. Inexperienced crew is not aware of survival importance.

From the Passengers point of view challenges during an evacuation are as follows:

- Onboard instructions are not enough.
- Passengers don’t follow crew instruction, not trusting officers. The elderly requires more attention, medical fitness is of concern, and there are language barriers to explain the evacuation safety guidelines.
- In an emergency, it is difficult for elderly to wear immersion suits.
- Require general awareness about Life-Saving Appliances (LSA) and PSK & GSK.

iii. Training Institute

He is a Master Mariner and experienced in the polar shipping. Responsible for training as per the Polar Code Modules.

- From his point of view, the Polar Code Module covers all the requirements as per the Polar Code for evacuation. As the crew is already certified with STCW training, in this module, they only give theoretical knowledge about LSA equipment, survival needs, and rescue means.
- Polar Code Training limitation: No practical training provided concerning evacuation.

iv. Passenger

She has been to 4 expedition trips with the Oceanwide Cruise liner in the Arctic and Antarctica. She was happy with the safety guidelines, training, and muster drills provided onboard during her trips. She participated in private survival training but mentioned, it would be difficult if survival training is mandatory for every passenger who book their voyages with cruise liners' due to additional cost involved and lack of outcomes. She pointed to the medical fitness of the elderly, where cruise liners should ask for a Medical fitness certificate before boarding the cruise for their and other passengers' safety.

4.2 Data Analysis

According to the TNA framework, the next step is to analyse the collected data. Statistical Data Analysis is done based on Hypothesis Testing. Data collected from quantitative methods are of nominal level, which involves both closed and open-ended questions. With the hypothesis testing, the null hypothesis H_0 , and the alternative H_a hypothesis are proposed, based on the research question. In chapter 2, a method was identified, which is used here to define the null and the alternative hypothesis. The null hypothesis is proved or disapproved, based on the sample data collected by a quantitative survey and supported by reliable insights from qualitative interviews.

The hypothesis to prove or disapprove

H_0 – Null Hypothesis

Polar Code training of crews is effective during an evacuation.

H_a – Alternative Hypothesis

Polar Code training of crews is not effective during an evacuation.

When statistical testing is used with respect to the hypothesis, certain assumptions are required to be considered to confirm the validity of the result obtained. Related to this research, below are assumptions to trust the results obtained:

1. ***The Target groups are focused, using purposive sampling that are directly related to the outcome of the result.***
2. ***Qualitative interviews were done with participants involved in the activity; this helps to analyse the hypothesis.***
3. ***The samples are small but accurate results are generated, that are not influenced by persons not related to the research goals.***

If the responses are in favour of Polar Code training concerning to evacuation, then it supports the null hypothesis, else favours the alternative hypothesis. The questions were categorized with respect to the target groups and generalized into probable results.

The Questions were categorized into four sets as shown below in table 8:

Table 8. Statistical Data Analysis

Analysis	Polar Code Training	Findings
	Effectiveness/ Patterned Questions	
Set A	Adequate for crew Competence with respect to evacuation	Figure 22 & 26 Statistical Graph
Set B	How well Crew are trained with Polar Code Training	Figure 23 & Table 9
Set C	Limitation/Challenges	Figure 24
Set D	Improvement	Figure 25

With reference to the above table 8, the below analysis is done. It presents the findings as per the defined sets, which proves or refute the null or alternative hypothesis based on the responses and supporting justification from a qualitative interview.

Set A: Polar Code training effectiveness of crews' competence for evacuation

The data in figure 22 presents the findings for the Polar Code Training effectiveness in preparing crews for emergency evacuation as asked in question - Q1 of the survey questionnaire to *Institutes* and *Crew* target groups.

Total Responses from the *Crew* and *Institutes* are 12. The *crews* and the *training institutes* responses play a crucial role in deciding the effectiveness pertaining to evacuation needs because they are directly involved in the actual Polar Code training. The crews are the ones who will gain expertise from the authorized training centres depending on how institutes have designed and offered that course, considering its focus being mainly on the evacuation preparedness.

Figure 22 shows, that more than 66 % of *training institutes* and 50 % of *crews*' responses considered the Polar Code not being effective in terms of evacuation training. This reflects the Polar Code training effectiveness with respect to *crew* and *training institutes* which favours the alternative hypothesis. Furthermore, Set B, C, and D give support to these findings, where responses are analysed based on the outcomes of the training that is being tested when crews perform their duties onboard, based on the target group's experiences.

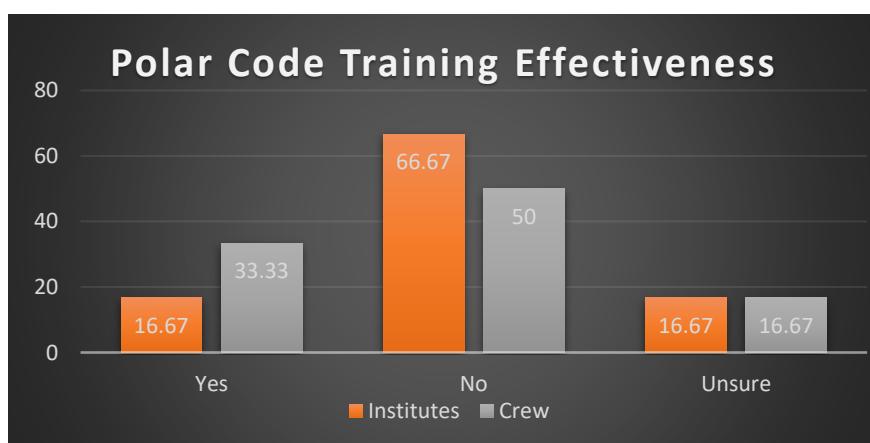


Figure 22. Statistical Data Analysis for Polar Code Training (Survey Monkey, 2020)

Set B

To identify the competence level of the crew, the below relevant (A) questions (Figure 23) were asked in the survey. The *Training Institutes* and *Crew* target groups were asked “patterned questions” to find out whether the training fulfils the actual requirements of the evacuation that reflects their real situations.

The questions which will answer the competence level, where A is “Applicable”

Questions →	Q2	Q3	Q4	Q5
Institutes	A	A	A	A
Crew	A		A	

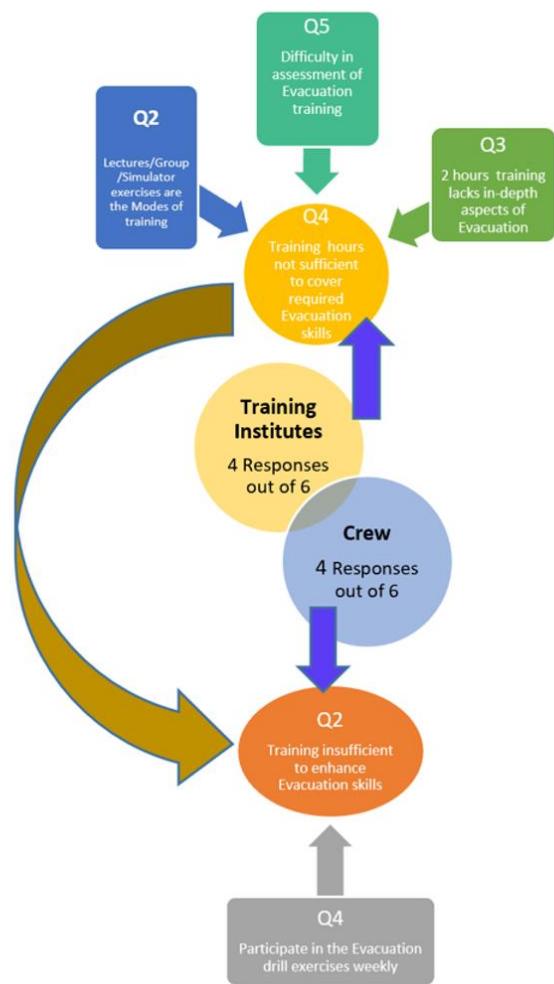


Figure 23. Responses of “Patterned Questions” for Crew Competence Analysis based on Polar Code Training (Survey Monkey, 2020)

In case of the *Training Institutes*, they were asked questions relevant to different modes of training in question 2 (Q2); and the assigned hours to cover the evacuation training and whether it is sufficient in questions 3 & 4 (Q3 & Q4). Consequently, the assessment of the crews who had participated in the Polar Code training was analysed in question 5 (Q5), which indicates the crew's competence in performing task. However, it is observed from the *training institute's* responses that they do not follow any standardised methods, and some are lagging in real assessment considering these challenges. Also, from the survey responses, it reflects that the evacuation time lacks to cover in-depth aspects of the evacuation training.

The survey data shown in figure 23, demonstrates the relation between the opinions of the *Training institutes* and the answers to the below questions when asked to the *Crew* groups. The *Crew* were asked about how often they participate in the evacuation drill exercises in question 4 (Q4). The *crew* were asked about the improvement in their skills for attended Polar Code training offered by a different institute in the question 2 (Q2). As shown in the *Training institute* responses in figure 23, evacuation training missing real intensity and that is reflected in the responses from the *Crew*, wherein the data indicates Polar Code training is not helping to improve their skills pertaining to the evacuation.

Moreover, dependent questions in the Sets C and D (shown in figures 24 and 25) were asked to each target groups to cover the opinions about limitations and improvements in the Polar Code training. It illustrates the challenges and suggested improvements of the Polar Code training concerning evacuation. Thus, the survey questions cover the holistic approach to identify the gaps in the existing Basic and Advanced Polar Code Training modules.

Set C

Limitation/ Challenges		
Crew	Q3	Passengers/Equipment/Language/PSK & GSK/Physical Disabilities/Enthusiasm/Muster Station-Passenger Drill

Figure 24. Dependent question – Limitation / Challenges for Polar Code Training (Survey Monkey, 2020)

Set D

		Improvement Suggestions			
Crew	Q5	Equipment/guidelines/official/evacuation rules/passenger handling			
Passenger	Q1	Muster Drill Helpful			
	Q2	Missing Awareness about PSK & GSK, LSA, LifeVest not suitable for Kids			
	Q3	Brochure of Training guideliness with Safety Procedure via email before trip			
Institutes	Q6	Passenger Safety Training not offered			
	Q7	Priiminary Evacuation Exercises/LSA and cold climate awareness/ Realistic training in groups			
	Q8	LSA training not required			

Figure 25. Dependent questions – Improvement Suggestions for Polar Code Training (Survey Monkey, 2020)

Statistical Method for Hypothesis testing: Fisher's Exact Test

The sample size of the population is small; hence the Fisher's Exact Test is used to evaluate whether the null hypothesis or the alternative hypothesis is valid.

In this test, based on the 2x2 contingency matrix shown in Table 9, the probability value, the **p-value**, is calculated. The significance level (α) of the null hypothesis is tested as follows (Agresti & Franklin, 2013):

If the **p-value** is smaller than 0.05 (α value), then the null hypothesis is rejected. Thus, the alternative hypothesis is accepted. This means that a 5% error is sufficient to decide whether the null hypothesis is rejected. If the value of $p < \alpha$, the result is statistically significant.

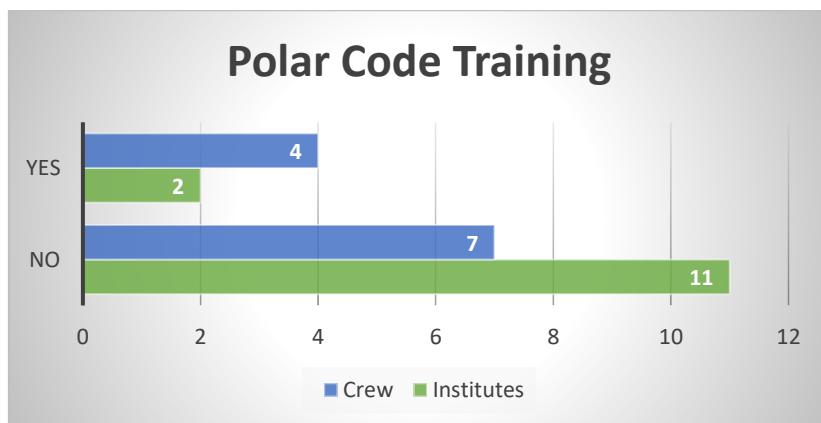


Figure 26. Responses for Polar Code Training based on questions (Training Institutes Q1, Q4 & Q5, and Crew Q1 & Q2) (Survey Monkey, 2020)

Table 9. Fisher's Exact Test 2x2 Contingency matrix (Vassarstats, 2020)

Responses		No	Yes
Training Institutes (X)		11	2
Crew (Y)		7	4
	X		
	0	1	
Y	1	11	2
0	4	7	
Totals	15	9	24
		Fisher Exact Probability Test:	
		P	one-tailed 0.021368959483106367
			two-tailed 0.0327433032709646

Considering this, the **p-value** calculated using an online Fisher's Exact Test Calculator based on 'yes/no' responses from the *Training Institutes* and the *Crew* target group (as per figure 26 and table 9) is found to be:

Exact two-tailed probability (p): 0.03, thus $p < 0.05$ (Vassarstats, 2020).

This shows that the Probability value (**p-value**) is smaller than 0.05 (α value) and hence **the null hypothesis is rejected**. The alternative hypothesis is accepted, and the result is statistically significant based on the Fisher's exact test (Agresti & Franklin, 2013).

The responses from the *crew* and *training institute* groups favour the alternative hypothesis concerning to the Polar Code training effectiveness discussed in Set A and Table 9. Based on the data analysis with respect to the questionnaire categorised into patterns (figure 23) and the Fisher's Exact test (table 9), it shows that the null hypothesis fails, and the alternative hypothesis is proven. The dependent questions explained in the Set B shows reasoning where the pattern result indicates *crews* and *training institutes* target group opinions.

Additionally, the interview comments from focussed target groups validate the finding of the data analysis from the survey result:

1. Interviewed *Crew* members both mentioned the inadequacy of Polar Code training, as it doesn't provide enough awareness about safety procedures needed at the time of the evacuation onto the ice. They highlighted the need for proper instruction for immersion suits handling, no one is aware about the GSK kit and how to use it. They claimed the training mostly focuses on ice

navigation and nothing about evacuation details. They mentioned cruise management unaware about Polar Code applicability.

2. The *Institutes'* offered training mostly focuses on ice navigation, communication, etc., with just 2 hours of theoretical lessons on the evacuation, which hardly covers necessary details where more practical understanding is required.
3. From the passenger safety point of view, crew highlighted the need for basic awareness training for passengers as shown in the Set D above. The interviewed *passenger* also recommended training but was unsure if it needs to be done privately. *Crew and Passengers* highlighted the challenges of handling Immersion suits in case of elderly.

A document review of the training brochures from the *training institutes* highlighted the eligibility requirement for the Advanced module of Polar Code training discussed in chapters 2 & 3. To be eligible for the Advanced module, one should have two months of sea-going experience in polar waters. Also, the Basic and Advanced Training modules mention Crew Preparation as well as working conditions and safety, but it is uncertain if it suffices the actual needs of the evacuation preparedness within two hours of training.

The detailed discussion about the findings from data analysis are given in chapter 5.

Chapter 5. DISCUSSION

In this chapter, the results from the data analysis findings are discussed. It is the third step of the TNA framework that helps in assimilating the research needs and thereby answering the research question in chapter 6.

The data analysis from chapter 4 section 4.2 presents findings on ‘how does the Polar Code – Basic and Advanced training modules help in crew preparedness for an evacuation’. According to the SARex2 exercise, risk analysis findings highlighted the need for training for both Crew and Passengers in order to evacuate safely. The SARex exercises were conducted in Arctic waters to simulate practical evacuation situations based on real-life circumstances. Table 10 below shows the risk analysis findings of the exercise that suggested training as risk mitigation measures for the proposed evacuation scenarios (Solberg, et al., 2017). The objective of the SARex exercise was the evacuation of a cruise ship in Arctic waters after an accident. In this case, the passengers had performed evacuation from a cruise ship using lifeboats/life-rafts and survival suits and, the focus was on survival for at least five days (Solberg, et al., 2017).

SARex2 Findings (Solberg, et al., 2017)

Table 10. SARex2, Risk Analysis Findings (Solberg, et al., 2017)

Phase one: Alarm to muster station						
Hazard code	Hazard	Cause	Possible consequences	Pre risk reducing measures risk	Risk reducing measures	Post risk reducing measures risk
1.1	Passengers attend wrong muster station or cannot find the muster station	- Lack of information before starting the cruise - Poor information regarding evacuation routes onboard - Lack of clear thinking from the passengers due to dangerous/ stressful situation	- Delay on evacuation - Passengers do not reach the correct muster station	Probab.: 3 Conseq.: B	- Proper passengers' training programs (e.g. via e-learning) - Better crew training - Posters showing the evacuation routes	Probab.: 2 Conseq.: B
1.4	Inadequate passenger evacuation equipment (e.g. survival suits, inappropriate/ not woolen clothing, PSK, GSK, etc.)	- Lack of clear thinking from the passengers due to dangerous/ stressful situation - Captain/ crew error of not checking PSK and GSK availability - Polar Code risk assessment does not require PSK/ GSK	- Reduced survival period of the evacuated passengers	Probab.: 4 Conseq.: D	- Better crew training - Polar Code requirements - Woolen underwear fit with the survival suits - Survival suits, PSK/ GSK adequate and easy accessible	Probab.: 3 Conseq.: B

Phase two: Boarding (Lifeboats and Life rafts)						
Hazard code	Hazard	Cause	Possible consequences	Pre risk reducing measures risk	Risk reducing measures	Post risk reducing measures risk
2.1	Passengers not capable of evacuating without assistance	- Minor or major injuries - Elderly or people with movement problems that need assistance for evacuating to lifeboat or life raft - Complicated boarding procedure	- Delay on evacuation - Some passengers are not evacuated - Chaotic situation	Probab.: 5 Conseq.: B	- Proper passengers' training programs (e.g. via e-learning) with special information for elderly or people with movement problems - Better crew training - Easy accessible evacuation routes and procedures for all the passengers	Probab.: 3 Conseq.: B
2.2	Panicked passengers	- The evacuation situation is considered stressful for the passengers	- Minor or major injuries - Overcrowded lifeboats and life rafts	Probab.: 5 Conseq.: A	- Proper crew training for crowd control situations - Clear and easy evacuation procedures that will reduce passengers' panic	Probab.: 3 Conseq.: A
2.4	Not enough officers for boarding in each lifeboat/ life raft (at least one is recommended to lead each evacuation mean)	- Poor crew training - Many officers are unable of evacuating	- Lack of experience and leadership during all the stages of survival - Reduced survival period of the evacuated passengers - Possible loss of human lives	Probab.: 5 Conseq.: B	- Proper passengers' training programs informing them how to get organized in the lifeboat/ life raft (e.g. via e-learning) - Better crew training	Probab.: 4 Conseq.: A
2.6	PSK/ GSK not brought along in lifeboat/ life raft by the evacuated passengers	- Lack of information before starting the cruise - Lack of clear thinking from the passengers due to dangerous/ stressful situation		Probab.: 3 Conseq.: C	- Proper passengers' training programs (e.g. via e-learning) - Proper crew training in order to make sure that the passengers have their survival equipment	Probab.: 2 Conseq.: C

The table 10 findings based on the risk analysis show the necessity of training while evacuating under the prescribed conditions. The risk matrix in table 10 indicates training as a mitigation measure. It helps to reduce risks due to hazards - 1.1, 1.4, 2.1, 2.4 & 2.6 mentioned in the exercise phases when 'alarm to muster station' and 'boarding lifeboats/life-rafts'. (Solberg, et al., 2017).

As a follow-up of above SARex2 findings, this research study has identified the gaps in the existing Basic and Advanced Polar Code training modules. The results from the quantitative and qualitative data analysis presented in chapter 4 section 4.2, show the Polar Code Basic and Advanced training modules are not satisfying the real intent of evacuation training. The Classification Societies have emphasized in the SARex2 report that Polar Code training should not focus only on masters, chief mates, and officers in charge of navigation but also on engineers and 1st officers who are also responsible for evacuation in case of emergency (Solberg, et al., 2017).

The interview participant from the *Crew* target group mentioned in the interview that many crew members are inexperienced and do not understand the significance of

Polar Waters and how an accident could lead to an unimaginable catastrophe. At the time of a muster drill, often passengers are not aware of the location of muster stations, which will make evacuation operation time consuming and more stressful. The same was highlighted in the SARex2 exercise (table 10 under *hazard code 1.1*), where Passenger Training would represent a significant risk-reducing measure in the scenario of assembling at specified muster stations (Solberg, et al., 2017). In addition to this, the language barrier is also highlighted in the interview and in the survey, where many onboard passengers find it hard to understand the crucial guidelines for safety equipment and procedures that are required in case of an evacuation. These were also addressed in the SARex2 exercise under *hazard code 2.1 and 2.2* mentioned above in table 10, as passenger behaviour can lead to possible consequences of delay in the evacuation process or a case of injury (Solberg, et al., 2017).

One of the *crew* participants mentioned in the interview about the difficulties in keeping the immersion suit at the designated location. He mentioned that if they keep it far away from the muster station, then passengers will take time to go there and come back to the muster station with an immersion suit. As passengers need crew members assistance to put on their immersion suits, keeping the suits near to the muster station is recommended. However, this raises another concern of space limitation at the muster stations. If many people gather at the same location, it is not easy for one to put on the immersion suit within a specified time. Moreover, with a mass evacuation situation, where 1000 passengers are present on a cruise ship, this situation will be a nightmare for the onboard crew members with a minimum competence from Polar Code training concerning evacuation. As per the data analysis findings in chapter 4 section 4.2, theoretical lessons on evacuation are covered within two hours and there is no training on practical skills related to evacuation. The SARex2 risk analysis indicates that the insufficient crew training may lead to risk of not enough crew officers to lead the evacuation using lifeboats or life-rafts (mentioned in table 10 under *hazard code 2.4*) (Solberg, et al., 2017).

Data analysis findings in chapter 4 section 4.2 show that the Polar Code training of the crews is not sufficient (from the evaluated data, refer figure 23). If we are considering the situation of the polar regions where weather is very uncertain; to

prepare for such evacuation scenarios, in addition to theoretical lessons, the crew members require practical understanding of every details about safety escape, evacuation, and survival. The crew needs to be trained with all the essential details, like how to use Personal/Group Survival Kits and pass the same to the passengers to let them be aware of the usage, and operational do's and don'ts. Survey data reveals that many passengers are not aware of PSK/GSK, even if they have fortunately not been needed, but as per the muster drill requirements, safety crews have provided the guidelines which seem in this case not to be a sufficient requirement. The SARex2 also reports the inadequacy of PSK/GSK under *hazard code 1.4 and 2.6* in table 10, where all the contents in that kit are not suitable for all age groups and for the required minimum survival rescue time of 5 days (Solberg, et al., 2017). Also, to use the items in the PSK/GSK, like tents, it is not possible to use it with gloves, which means bare fingers go well but lack of gloves creates the problem of frostbite in cold weather of less than minus 10°C (Solberg, et al., 2017).

The training institutes courses' contents have shown the limitations in terms of educating crew with respect to evacuation. From the data analysis findings in chapter 4 section 4.2, it was reflected that the assigned time of evacuation training does not cover the real scenarios. Furthermore, it was also highlighted in the interview with the *training institute* group member, that they cover only the theoretical part related to evacuation in the Polar Code Basic and Advanced modules. According to a document review of the brochures from the training institutes, the review reflected the missing detailed content specific to the evacuation. This shows a gap in actual in-depth understanding of the evacuation procedures which was also mentioned by one of the crew members in the interview: the crew is unaware about GSK usability and the kind of ice suitable for evacuating passengers onto, or how to lower down a lifeboat in case of abandoning a ship.

Other aspects pointed out in the interview with the *passenger* having been to the Arctic and Antarctic expedition cruises. She had experienced how the medical fitness of some passengers influences the onboard activities and other passengers. She mentioned how crew had taken immediate precautionary measures when one of the passengers was not able to walk due to illness, and that it was tough for them to

provide any external medical care due to remoteness in the Antarctic. However, the crew managed to treat him with the onboard facilities. Due to this, she emphasized the needs for medical fitness certificates where the crew can be trained to overcome the risk of an uncertain situation which they are not able to manage without any external assistance. Also, as highlighted in the *crew* interview, the Drake passage in the Antarctic adds extra risk in an emergency rescue situation with respect to provide immediate medical assistance, as it takes 2 days to cross in order to reach to the appropriate rescue hospitals.

According to Training need analysis (TNA) theory, gaps in the existing training are identified with the help of qualitative & quantitative data based on the hypothesis discussed in chapter 2 and proven in the chapter 4. It exhibits that at present; we are not meeting the real requirements of evacuation needs for harsh climate, human behaviour, and applicability of safety equipment by the training modules. The cruise liner management are complying with the functional requirements of the Polar Code but not what is needed concerning to the real scenarios in the polar waters. Data analysis result presented in chapter 4 section 4.2, and the SARex2 findings call for in-depth training of all the crew, in particular the designated officers, along with passenger training. These result findings, as a last step of Training Need Analysis (TNA) Framework, need to be implemented for future maritime safety by ensuring better crew preparedness and thereby, improve the safety performance of the Cruise liner companies.

The last chapter 6 will discuss the answer to the research question which was identified in chapter 1 and further scope of this research study.

Chapter 6. CONCLUSION

This chapter concludes the research study by answering the research question mentioned below.

'How to prepare cruise liner crews and passengers for evacuation in cold climates (Arctic and Antarctic)?'

The Polar Code Basic and the Advanced training modules for crew training considering evacuation needs should not be limited to the theoretical approach. When the crew members reflect on the applicability of the learning from the virtual training into real scenarios, the assessment should prove the effectiveness of the Polar Code training in an actual situation.

Based on chapters 4 & 5, these are the findings which need to be taken care of in order to move forward for better human and maritime safety concerning crew preparedness for an evacuation:

- Crew Training should not be limited to masters, chief mates, and officers in charge of navigational watch. However, training should go beyond these groups by training all the crew members present at the voyage, to prepare for any unforeseen situations. Specialized training needs to be arranged by individual cruise liners to train their crew members specific to 'Evacuation'. It will help crew members to be specific about how to respond in that quickly changeable weather in the Arctic/Antarctic. Cruise management should effectively plan and check useful guidelines and procedures for the applicability of the Polar Code training concerning evacuation needs.
- It is necessary developing a survival training module for cruise passengers concerning use of safety equipment, muster drill importance, and awareness about a cold-weather survival. The training needs to be arranged either by private institutes who are responsible for crew training or as mandatory training when passengers book their trips with cruise liner companies.
- Training Institutes need to plan in-depth training concerning evacuation needs beyond theoretical lessons. They should manage their training module

considering the seriousness or practicality, based on the changing and harsh climatic conditions, focusing on real scenarios.

- IMO Polar Code training concerning Basic and Advanced modules needs to include the actual requirements during an evacuation. According to the identified findings for crew preparedness in this research, the applicability should be related to Cruise Ships and training guidelines should be updated. The training should focus on essential needs that cover practical evacuation skills and handling of PSK & GSK and Life-Saving Appliances usage.

These findings given above answer my research question concerning the preparedness of the Crew and Passengers of the cruise liners in the Arctic and Antarctic.

Furthermore, the hypothesis of the effectiveness of the Polar Code training of Crew for an evacuation deduces that it needs to be improved based on the above statements and assumptions made in my research.

The survey counts and interviews were not large enough. However, they were much focussed, and do, therefore, justify the epistemological needs of the research.

Therefore, the findings are valid and reliable to support the answer of the research study.

Further Work:

This thesis concluded with recommending in-depth training of the entire Crew involved in the muster list along with additional survival training requirements for the Passengers. Below is a possible scope in terms of Passenger Training:

1. E-training Module

Necessary safety guidelines, procedures, and equipment awareness should be provided with the help of a short training module that serves the purpose of evacuation awareness and will mitigate the risk of misunderstanding due to the language barriers.

E-training should cover the usage of PSK and GSK, how, when, and why these are required. Also, provide guidelines for the access to muster stations and do's and don'ts with respect to cold climate (Arctic/Antarctic).

Passengers should have an interactive training module, where they can ask questions if they are uncertain. This training module should be a part of their trip and should represent a mandatory requirement to be fulfilled prior to boarding any expedition cruises to the polar regions. Cruise liners can collaborate with training institutes to design a short training module or build this inhouse with respect to a company policy.

Cruise liner management needs to make sure the medical fitness of the passengers; they can ask for medical fitness certificates before confirming seats to any of the Polar Expedition Cruises.

Also, it came into notice during the research that many passengers overlook the actual content in the cruise liners' brochures, and they book Cruises where often no dedicated language assistance is available. To avoid this, while booking, cruise liner companies can ask passengers for their language and plan to assign dedicated Crew to support the emergency requirements accordingly.

2. *Safety Leaflet*

All the necessary safety procedures/guidelines, and details of cruise muster stations should be printed in a Safety Leaflet with an utmost visual understandable mode in a leaflet form. At the time of boarding, a crew member can distribute this safety leaflet to all passengers on board that ensures them to be aware about possible measures needed to be taken in case of an emergency evacuation, even if they miss to remember muster training details. Thereby, passengers can comfortably and safely continue their planned expedition and enjoy the mesmerizing nature and beauty of the surreal Arctic and Antarctic.

With this conclusion and future scope of the research theme, I complete my final work for my master thesis.

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APPENDIX A – Survey Questionnaire

	Respondent	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8
Management	Cruise Liners/Researchers	Different training centers offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.	How often are evacuation drill exercises conducted on-board?	How well did trained crews perform in past evacuation drill exercises?	How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?	What are the limitations of evacuation training under the Polar Code?	Is all crew member certified for operating Life Saving Appliances?	How often do crews need to be trained to ensure safety?	Will you recommend that there be a special training module for lifeboat/liferaft captains?
		80% competency	Weekly	Well, without any assistance	Very likely				
		50% competency	Monthly	Good, with little assistance	Somewhat likely				
		30% competency	Quarterly	Not Good, require supervision	Somewhat unlikely				
		10% competency	Yearly	Other (please specify)	Very unlikely				
Employee	Training Institutes	Is present Polar Code training sufficient enough for ship evacuation and passenger safety?	How do you conduct Polar Code training?	How many hours are assigned for evacuation training?	Do you think the assigned time for evacuation training covers all the important aspects?	How do you assess the crew's competence for attending the Polar Code training?	Considering passenger safety, what would you recommend for a passenger training module?	Do you offer Passenger Safety training?	Will you recommend that there be a special training module for lifeboat/liferaft captains?
		Yes	Lectures	2		Yes		Yes	
		No	Group Exercise	3		No		No	
		Other (please specify)	Simulator Training	1					
		All of the above	Other (please specify)						
Customer	Passengers	Is present Polar Code training sufficient for ship evacuation?	Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?	What challenges have you faced in passenger behavior during the evacuation drill exercise?	How frequently do you participate in safety training?	What improvement would you recommend for the Polar Code training?			
		Yes							
		No							
		Other (please specify)							
		Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?	A Personal Protection Kit is provided on a Cruise as its initial safety measure. What do you think about its feasibility and suitability during an evacuation concerning age and individual conditions (for example, your size or any special needs)?	How do you prefer to receive Passenger Safety Training?					
		Sufficient							
		Insufficient							
		Other (please specify)							

APPENDIX B – Survey Responses

Open 1 Draft 0 Total responses 21 1 Average completion rate 100% 1

Recent

Q Search recent surveys

OPEN
Training Institute Response
Created: 01/18/2020 | Modified: 03/02/2020 6 Responses 100% Completion rate

OPEN
Crew Response
Created: 01/18/2020 | Modified: 02/25/2020 6 Responses 100% Completion rate

OPEN
Passenger Response
Created: 01/18/2020 | Modified: 02/18/2020 5 Responses 100% Completion rate

OPEN
Cruise Liner Response
Created: 01/18/2020 | Modified: 02/16/2020 4 Responses 100% Completion rate

Training Institutes Response

Respondent #6 ▾

Q1

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

Yes

Q2

How do you conduct Polar Code training?

All of the above

Q3

How many hours are assigned for evacuation training?

2

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

It's balance between time and subject

Q5

How do you assess the crew's competence for attending the Polar Code training?

- asking personal experience and type of ship

Q6

Do you offer Passenger Safety training?

Yes

Q7

Considering passenger safety, what would you recommend for a passenger training module?

It's very close to crowd and crisis as well

It's should be kind of ships specific

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

No,

It could be covered by Survival Craft course

Respondent #5 ▾**Q1**

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

Other (please specify)

Other (please specify):

I have only indirect understanding of the training and have never been involved as teacher or student

Q2

How do you conduct Polar Code training?

Respondent skipped this question

Q3

How many hours are assigned for evacuation training?

Other (please specify):

I am not involved in specific polar training; involvement is in lifeboat crew medical training; which includes many items regarding the effect of hypothermia

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

No idea; but it seems to be a time-consuming training that needs to be conducted in as realistic as possible settings

Q5

How do you assess the crew's competence for attending the Polar Code training?

Not involved. For lifeboat crews there is no formal assessment even regarding normal conditions; and this will be all over Europe. Assessing the competence is most likely a very difficult topic. Notably when done in a research setting this is most difficult to assess and test as (of course) all trained people will know more after a course than before. Such studies to be indeed relevant need a good and relevant research question and sufficient power.

Q6

Do you offer Passenger Safety training?

No

Q7

Considering passenger safety, what would you recommend for a passenger training module?

Realistic training as groups

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

Yes

Respondent #4 ▾

Q1

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

No

Q2

How do you conduct Polar Code training?

Group Exercise

Q3

How many hours are assigned for evacuation training?

Other (please specify)

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

We have a special course for practical survival and hypothermy, we dont have Polar Code course as it is in the code. Our course is 8 hours all paractical including firefighting in cold climate.

Q5

How do you assess the crew's competence for attending the Polar Code training?

All the tasks must be performed to pass.

Q6

Do you offer Passenger Safety training?

Yes

Q7

Considering passenger safety, what would you recommend for a passenger training module?

Evacuation exercise and jumping and swimming in cold water, climbing to lifedraft and operating it.

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

Practical traing, Yes of course!

Respondent #3 ▼**Q1**

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

No

Q2

How do you conduct Polar Code training?

Lectures

Q3

How many hours are assigned for evacuation training?

Other (please specify)

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

No I don't, the realistic time needed should be established at the vessel it's self under realistic circumstances (carrying personal survival kits)

Q5

How do you assess the crew's competence for attending the Polar Code training?

We only deliver courses to Captains and nautical officers (basic and advanced course). We do not assess crews.

Q6

Do you offer Passenger Safety training?

No

Q7

Considering passenger safety, what would you recommend for a passenger training module?

Passenger safety course (delivered on board) I would recommend

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

A special module in the Proficiency in Survival craft other than fast rescue boats would be recommended by me.

Respondent #2 ▾

Q1

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

No

Q2

How do you conduct Polar Code training?

Lectures

Q3

How many hours are assigned for evacuation training?

2

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

No the assigned time is only used for the theoretica part of the evacuation.

Q5

How do you assess the crew's competence for attending the Polar Code training?

For the basic course we have a written assesment, for the advanced course we have simulator assesments.

Q6

Do you offer Passenger Safety training?

No

Q7

Considering passenger safety, what would you recommend for a passenger training module?

Awareness of the cold environment

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

No, but it is more important that the whole crew is aware of the impact to survive in a lifeboat/liferaft

Respondent #1 ▾**Q1**

Is present Polar Code training sufficient enough for ship evacuation and passenger safety?

No

Q2

How do you conduct Polar Code training?

All of the above

Q3

How many hours are assigned for evacuation training?

Other (please specify)

Q4

Do you think the assigned time for evacuation training covers all the important aspects?

Actually, yes. But due to technical progress and amendments' of human lives saving requirements the aspects and the assigned time should be corrected.

Q5

How do you assess the crew's competence for attending the Polar Code training?

Most part of training courses participants has the real interest to the polar code training. They understand the importance of this training.

Q6

Do you offer Passenger Safety training?

No

Q7

Considering passenger safety, what would you recommend for a passenger training module?

The lectures. The demonstrations of life saving procedures and the life saving appliances using. The training drills.

Q8

Will you recommend that there be a special training module for lifeboat/liferaft captains?

No. The standard SOLAS training requirements are enough.

Crews Response

Respondent #6 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

Yes

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

Understanding the challenges of equipment and weather

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

Getting equipment to the passengers. PSK and GSK

Q4

How frequently do you participate in safety training?

Weekly

Q5

What improvement would you recommend for the Polar Code training?

More focus on the equipment

Respondent #5 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

Other (please specify)

Other (please specify):

More or less

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

It does not

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

Language barrier; Physical disabilities

Q4

How frequently do you participate in safety training?

As a Safety officer at list one's a day

Q5

What improvement would you recommend for the Polar Code training?

A proper guide line to be created for evacuating passenger vessels in polar waters

Respondent #4 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

Yes

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

Heightened awareness of dangers including the remote nature of Polar environments.

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

Enthusiasm and participation.

Q4

How frequently do you participate in safety training?

Daily, Weekly, and Monthly.

Q5

What improvement would you recommend for the Polar Code training?

Require additional on board assessments for ice navigation.

Respondent #3 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

No

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

It could be helpfully if based on standard program

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

Closing of fire screen doors

Q4

How frequently do you participate in safety training?

Every days

Q5

What improvement would you recommend for the Polar Code training?

To implement official position on board as training officer for polar code only

Respondent #2 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

No

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

More Training for the key crew.

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

The crowd and crises With are evacuation for passengers and crew.

Q4

How frequently do you participate in safety training?

Every week

Q5

What improvement would you recommend for the Polar Code training?

More of learing evacuation, nature, rules in polar waters

Respondent #1 ▾

Q1

Is present Polar Code training sufficient for ship evacuation?

No

Q2

Polar Code training offered by different Institutes, how does it help to strengthen/enhance evacuation skills?

Not at all

Q3

What challenges have you faced in passenger behavior during the evacuation drill exercise?

During passenger drills it's typical that they have even problems to find their musterstation or boat.
Propper clothes are often missing espacially during good weather.

Q4

How frequently do you participate in safety training?

Weekly

Q5

What improvement would you recommend for the Polar Code training?

Special needs to handle passemger a long time in a boat like in antarctica. To be rescued will take a long time (see sinking if explorer).

Passengers Response

Respondent #5 ▾

Q1

Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?

Very good. Carried out just as we left the port. It was thorough with us putting on life jackets, checking them, given information on the muster points and the life boats for an emergency evacuation

Q2

A 'Personal Protection Kit' is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?

I am unsure of the meaning of this question. If you mean the life jackets they were quite fine to me. We were also given a thick waterproof jacket for warm on all zodiac cruises and for personal use on board if we wanted. I dont know of any other personal protection kit. We were advised of warm clothes prior to arriving for the cruise and I was personally conscious of always having woolen underclothes and waterproof clothes. I personally carried an emerency blanket (small aluminium sheet) in my jacket pocket at all times when on landings

Q3

How do you prefer to receive Passenger Safety Training?

It could have been a good idea to have emailed us a sheet on safety training however the muster drill we received on board was very good and I had no problems with it.

Respondent #4 ▾

Q1

Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?

Very good

Q2

A 'Personal Protection Kit' is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?

No one will carry it around the boat! Waste of money and effort.

Q3

How do you prefer to receive Passenger Safety Training?

Practical like muster rolls.

Respondent #3 ▾**Q1**

Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?

I have been on 2 Arctic cruises and 2 Antarctic cruises all with the same company. The muster drill training was carried out thoroughly and to the same very high standard on each trip. My only concern was that at the end of the training where we were on deck with the lifeboats it was difficult to hear the crew member speaking, however the training was complete at this stage. If they are to address a large group of passengers whilst outside it would be better to use a megaphone to ensure they are heard.

Q2

A 'Personal Protection Kit' is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?

I personally had no issue with it, although they are obviously bulky during an evacuation. However some of the elderly / less able passengers had difficulty with the straps, so needed help to ensure they were fitted correctly.

Q3

How do you prefer to receive Passenger Safety Training?

This was done as a group (compulsory attendance) with the assistance of video presentation and crew demonstrations, with crew present to address questions. I think this was a very good way to do it as it ensured ALL passengers received the training. This was followed by a drill, ensuring all passengers participated. Again I feel this was vital and is the correct thing to do. It is also important to ensure information is available for different languages, and that the demonstrations are visually clear particularly for this reason.

Respondent #2 ▾**Q1**

Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?

The muster drill training was well performed. I would rate it highly.

Q2

A 'Personal Protection Kit' is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?

Is this the life vest? I think they were fairly standard. Likely would not fit a small child, but there were not many small children on my trip. One size fits all seemed to make the process quicker to hand to everyone, and will fit most people.

Q3

How do you prefer to receive Passenger Safety Training?

I liked receiving the training in person on the boat. I don't think I would have paid appropriate attention to a video. And it is easy to understand when doing a full walk through.

Respondent #1 ▾

Q1

Many Cruises plan the voyages in the Arctic or Antarctic. How do you rate the muster drill training offered by cruises before departure?

I have been on multiple polar cruises, and every time the muster drill has been clear and informative. They explain the procedures to the entire group, then send us to our cabins for the start of the drill. We get to practice heading to our muster stations, and there is time for questions afterward.

Q2

A 'Personal Protection Kit' is provided on a Cruise as the initial safety measure. What do you think about its feasibility and suitability during an evacuation, concerning age and individual conditions (for example, your size or any special needs)?

I don't know what a Personal Protection Kit is. We were never given anything other than a life vest and instructions about how to get to our muster stations.

Q3

How do you prefer to receive Passenger Safety Training?

It would be nice to have a pamphlet before boarding (sent via email), a pamphlet in our cabins, and the safety drill that they do. Having information in multiple places increases the likelihood that the passenger is comfortable with the evacuation process.

Cruise Liners Response

Respondent #4 ▾

Q1

Different training centers offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.

80% competency

Q2

How often are evacuation drill exercises conducted on-board?

Weekly

Q3

How well did trained crews perform in past evacuation drill exercises?

Well, without any assistance

Q4

How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?

Very unlikely

Q5

What are the limitations of evacuation training under the Polar Code?

different scenarios

Q6

Is all crew member certified for operating Life Saving Appliances?

only the crew dedicated to LSA is training

Q7

How often do crews need to be trained to ensure safety?

Weekly bases

Q8

Will you recommend that there be a special training module for lifeboat / liferaft captains?

I do believe we already have sufficient training to cover those emergencies

Respondent #3 ▾

Q1

Different training centers offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.

30% competency

Q2

How often are evacuation drill exercises conducted on-board?

Other (please specify)

Q3

How well did trained crews perform in past evacuation drill exercises?

Good, with little assistance

Q4

How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?

Somewhat likely

Q5

What are the limitations of evacuation training under the Polar Code?

you would want to practice in real life under expected conditions as per operating envelope, not on a simulator

Q6

Is all crew member certified for operating Life Saving Appliances?

Yes, if familiarized.

Q7

How often do crews need to be trained to ensure safety?

few times per week, pending on which safety you are referring to

Q8

Will you recommend that there be a special training module for lifeboat / liferaft captains?

no, everybody should be able to perform that function

Respondent #2 ▾

Q1

Different training centers offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.

80% competency

Q2

How often are evacuation drill exercises conducted on-board?

Weekly

Q3

How well did trained crews perform in past evacuation drill exercises?

Well, without any assistance

Q4

How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?

Very unlikely

Q5

What are the limitations of evacuation training under the Polar Code?

Weather/ice impact

Q6

Is all crew member certified for operating Life Saving Appliances?

Depending if size of the ship

Q7

How often do crews need to be trained to ensure safety?

Weekly/as required

Constant

Q8

Will you recommend that there be a special training module for lifeboat / liferaft captains?

Why not

Respondent #1 ▾

Q1

Different training centers offer Polar Code training related to ship evacuation. Please assess the competence acquired by the crew.

80% competency

Q2

How often are evacuation drill exercises conducted on-board?

Monthly

Q3

How well did trained crews perform in past evacuation drill exercises?

Well, without any assistance

Q4

How likely is it that trained crews fail to perform a designated task in evacuation drill exercises?

Somewhat unlikely

Q5

What are the limitations of evacuation training under the Polar Code?

The GSK and PSK are proven to be inadequate. Otherwise the training is totally adequate.

Q6

Is all crew member certified for operating Life Saving Appliances?

No, only the crew with duties on the muster list to operate specific LSA

Q7

How often do crews need to be trained to ensure safety?

Weekly

Q8

Will you recommend that there be a special training module for lifeboat / liferaft captains?

Yes

APPENDIX C – Feedback for Research and Survey

1. AECO denied sharing Survey between their members, as they found this research will not contribute in their subject of interest as mentioned by communication manager Edda Falk.
2. Researcher has shown interest to know the outcomes of this thesis, as it will helps them to figure out their future research. Feedback from IASST member.

APPENDIX D – TransNav Journal - Paper

TransNav Journal: <http://www.transnav.eu/>

Effectiveness of the Polar Code training of cruise liner crew for evacuation in the Arctic and Antarctic

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ABSTRACT: In the past decades, we have seen a prolific increase in Polar Cruise Tourism, and thereby, more humans are able to visit the Polar Regions. As a result of this, the IMO implemented the Polar Code in 2017 to better prepare seafarers in polar waters in order to ensure maritime safety. Several researches have been carrying out work, after the Polar Code came into force, to evaluate its realization concerning the harsh climatic conditions of the Arctic and Antarctic. Based on the Polar Code requirements, the crew's preparedness for evacuation and survival in negative temperatures due to remoteness, is somewhat ambiguous. Also, the use of safety equipment in the polar climate still is in the discussion, whether sufficient or not.

This paper investigates the cruise crew's preparedness for an evacuation in the Arctic and Antarctic, according to the Polar Code. Here, gaps in the existing Polar Code Basic and Advanced Training modules were identified with respect to evacuation needs. Questionnaires and interviews were used as the research method to evaluate the insights of the potential target audiences. The study findings were analyzed and reveal the Polar Code's ineffectiveness with respect to educating the cruise crew for an evacuation, along with the lack of requirement to passenger survival training.

This study recommends specific evacuation training for all the cruise crew members based on the actual needs and, subsequently, the need for improvement in the Polar Code training modules. It also proposes survival training modules for cruise passengers to be developed, for evacuation of a vessel in the Arctic and Antarctic.

Keywords: Polar Code, Training, Education, Crew, Passenger, Evacuation, Arctic, Antarctic, Cruise

1 INTRODUCTION

Since the past decades, the Earth's average temperature is rising alarmingly.

Consequently, the world has been experiencing global warming in terms of natural disasters and melting glaciers in the

north and south pole regions of the planet.

Sea ice in the Arctic and Antarctic has been melting dramatically as observed in the past few years, which raises concerns regarding survival for many of its inhabitants. Many researchers are working on measures to reduce the carbon footprint and stop its

impact on climate change. The approach of the Maritime Industries towards climate change has both pros and cons in terms of increased shipping business profit and increased threat to the unspoiled polar region. Some consider melting ice in the polar region as an opportunity for boosting their economy by expanding their business further in the northern seafront, as there are reserves of hidden natural resources under the polar seabed. One of the Industries which benefits with the ice-free passage in the Arctic and Antarctic, offering voyages longer periods of the year is the ‘Cruise Industry’. The Cruise Industry has thereby attracted hundreds of passengers who can afford to fulfill their bucket-list, by introducing opulent packages in the unique and mesmerizing polar region.

In the past decades, we have seen a prolific increase in Polar Cruise Tourism and humans are able to make a mark on charismatic creation.

The increase in cruise traffic, however, adds increased challenges and risks associated with maritime safety due to adverse climatic conditions and thousands of human lives involved. Several challenges that make sailing at both polar regions dangerous and unfavorable where passenger safety is at risk in the remoteness. In particular, unpredictable weather with sudden changes will lead to detrimental effects on the usage of Life-Saving Appliances (LSA) in case of an emergency. The accelerating cruise industry is planning voyages where a large number of passengers involved is lacking maritime safety, ‘Are we prepared for large mass evacuation in an unforeseen scenario or emergency?’ Some of the past incidents and near disasters unveil how lack of preparedness influences maritime safety.

At the advents of Climate Change, IMO implemented the Polar Code on 1st January 2017 for ships operating in Polar Waters. The Standards of Training, Certification, and Watchkeeping (STCW) Chapter V [5] and

the Polar Code - Chapter 12 describe the requirements to training, considering the international convention on the standards of training and certification of seafarers [2]. According to this, masters, chief mates, and officers in charge of a navigational watch in open water must have certification of Basic and/or Advanced Polar Code training [2]. IMO Canada provides guidelines for the Instructors of the course as per the requirements of the Polar Code [3].

The Polar Code enforcement has led to greater maritime safety to counteract the challenges with weather and remoteness; however, the practicality of the training of the crew regarding evacuation has not been discussed. This question the effectiveness of the Polar Code regarding training of crews relating to evacuation. This paper focuses on the preparedness of cruise crews for evacuation and survival in relation to implementation of the Polar Code. In this paper we study how the Polar Code Basic and Advanced Training modules offered by various authorized institutes cover the evacuation training needs and analyze gaps along with identifying training needs for passengers.

2 METHOD

To investigate the gap in the existing Polar Code training, qualitative and quantitative data were collected using the Interview and Survey -Questionnaire methodology. The participants were selected based on a purposive sampling method that served the purpose of this study. Accordingly, the respondents identified were among the Crews, the Training Institutes and the Passengers categories. The questionnaires were divided into three groups and distributed among the respective target audiences.

The survey target groups were identified based on the following factors:

1. Geographical Areas: Arctic and Antarctic (Polar Regions)
2. Crews experienced in Polar Cruise shipping and certified with Polar Code Basic or Advanced Training modules.
3. Passengers experienced with Polar Cruising in the Arctic or Antarctic.
4. Authorized Training Institutes for Polar Code Training

Questionnaire (Survey): A total of 16 questions (both open and close-ended) were formulated for the individual target groups [6].

Total responses received for the survey were 17 and 4 telephonic interviews were conducted.

The collected data were analyzed based on Hypothesis Testing. During hypothesis testing, a null H_0 hypothesis and an alternative H_a hypothesis are proposed. The null hypothesis is proved or disapproved based on the sample data collected in the survey, supported by reliable insights from qualitative interviews.

The hypothesis to prove or disapprove were formulated as follows:

Null Hypothesis (H_0): Polar Code training of crews is effective during an evacuation.

Alternative Hypothesis (H_a): Polar Code training of crews is not effective during an evacuation.

3 DATA ANALYSIS

The survey questions were categorized to be relevant for the target groups. The analysis of data collected was then done; if the response supported the Polar Code training concerning evacuation, then the response supported the null hypothesis else favored the alternative hypothesis.

Set A: Polar Code training effectiveness with regards to crews' competence during evacuation.

The collected data from the survey include the findings with respect to Polar Code Training effectiveness in preparing the crews for emergency evacuation as asked in question - Q1 of the survey questionnaire to *Institutes* and *Crew* target groups.

The total responses from the *Crew* and *Institutes* are 12 [6]. The *crews* and the *training institutes*' responses play a crucial role in evaluating the effectiveness pertaining to evacuation, because they are directly involved in the actual Polar Code training. The crews are the ones who will gain expertise from the authorized training centers depending on how institutes have designed and offered that course, considering its focus being mainly on evacuation preparedness.

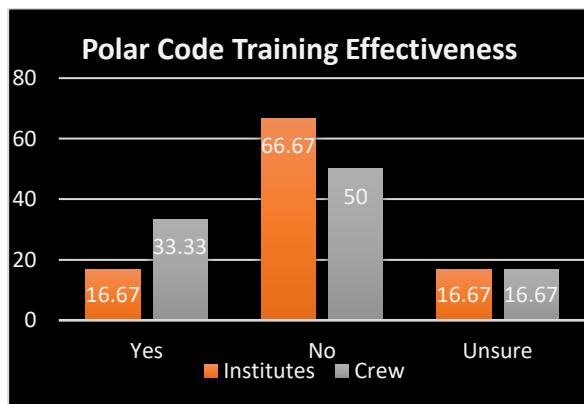


Figure 1. Statistical Data Analysis for Polar Code Training [6]

Above data in Figure 1, indicates that more than 66% of *training institutes* and 50% of *crews*' responses considered the Polar Code not being effective in terms of evacuation training. This reflects the Polar Code training effectiveness with respect to *crew* and *institutes* which favors the alternative hypothesis. Furthermore, Set B, C, and D give support to these findings, where responses are analyzed based on the outcomes of the training that is being tested when crews perform their duties onboard, based on the target group's experiences.

Set B:

To identify the competence level of the crew, relevant (A) questions (Figure 2) were asked

in the survey. The *Training Institutes* and the *Crew* target groups were asked “patterned questions” to find out whether the training fulfils the actual requirements during an evacuation, that reflects their real situations. The questions were phrased such that they will answer the competence level, where A is “Applicable”.

Questions →	Q2	Q3	Q4	Q5
Institutes	A	A	A	A
Crew	A		A	

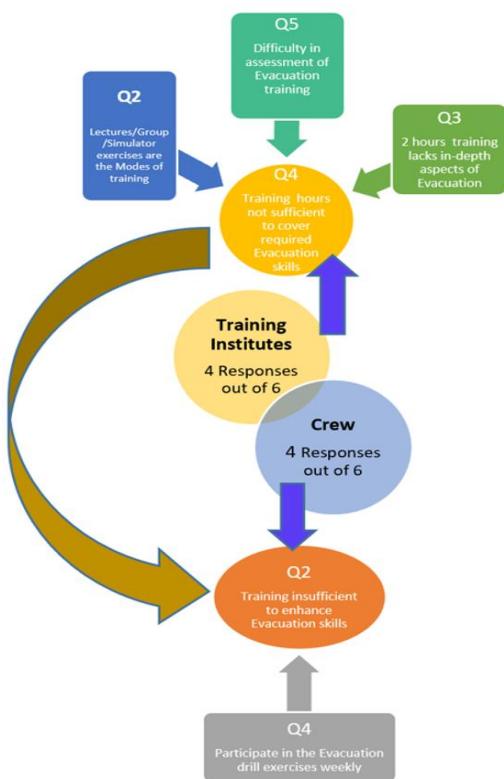


Figure 2. Responses of “Patterned Questions” for Crew Competence Analysis based on Polar Code Training [6]

In the case of the *Training Institutes*, they were asked a question relevant to different modes of training (question 2, Q2); and questions regarding the assigned hours to cover the evacuation training and whether the time assigned is sufficient (questions 3 & 4, Q3 & Q4). Consequently, the assessment of the crews who had participated in the Polar Code training was analyzed in question 5 (Q5), which would indicate the crew’s competence in performing the task. We observed from the *institute*’s responses that

they do not follow any standardized training method, and some are lagging assessment considering these challenges. Also, from the survey responses, it reflects that the training for evacuation is insufficient to cover in-depth aspects of the evacuation.

The survey data shown in Figure 2, demonstrates the relation between the opinions of the *institutes* and the answers to the questions when asked to the *Crew* group. The *crew* were asked about how often they participate in an evacuation drill exercises in question 4 (Q4). The *crew* were, furthermore, asked about the improvement in their skills when attending Polar Code training offered by different institutes in question 2 (Q2). As shown in the *Training institute* responses in Figure 2, evacuation training is missing real intensity and that is reflected in the responses from the *Crew*, wherein the data indicates that Polar Code training is not helping to improve their skills pertaining to evacuation.

Set C and D: Furthermore, dependent questions in Sets C and D were asked to each target group to cover the opinions about limitations and possible improvements in the Polar Code training. The answers demonstrate the challenges and suggested improvements of Polar Code training concerning evacuation as shown in Figures 3 & 4. Thus, the survey questions cover the holistic approach to identify the gaps in the existing Basic and Advanced Polar Code training modules.

Set C

Limitation/ Challenges		
Crew	Q3	Passengers/Equipment/Language/PSK & GSK/Physical Disabilities/Enthusiasm/Muster Station-Passenger Drill

Figure 3. Dependent question – Limitation / Challenges for Polar Code Training [6]

Set D

	Improvement Suggestions
Crew	Q5 Equipment/guidelines/official/evacuation rules/passenger handling
Passenger	Q1 Muster Drill Helpful
	Q2 Missing Awareness about PSK & GSK, LSA, LifeVest not suitable for Kids
	Q3 Brochure of Training guidelines with Safety Procedure via email before trip
Institutes	Q6 Passenger Safety Training not offered
	Q7 Preliminary Evacuation Exercises/LSA and cold climate awareness/Realistic training in groups
	Q8 LSA training not required

Figure 4. Dependent questions – Improvement Suggestions for Polar Code Training [6]

4 STATISTICAL METHOD FOR HYPOTHESIS TESTING: FISHER'S EXACT TEST

The sample size of the population is small; hence the Fisher's Exact Test is used to evaluate whether the null hypothesis or the alternative hypothesis is valid.

In this test, based on the 2x2 contingency matrix shown in Table 1, the probability value, the *p-value*, is calculated. The significance level (α) of the null hypothesis is tested as follows [1]:

If the *p-value* is smaller than 0.05 (α value), then the null hypothesis is rejected. Thus, the alternative hypothesis is accepted. This means that a 5% error is sufficient to decide whether the null hypothesis is rejected. If the value of $p < \alpha$, the result is statistically significant.

Considering this, the *p-value* calculated using an online Fisher's Exact Test Calculator based on 'yes/no' responses from the *Training Institutes* and the *Crew* target group (as per Figure 5 and Table 1) is found to be:

Exact two-tailed probability (*p*): 0.03, thus $p < 0.05$ [7].

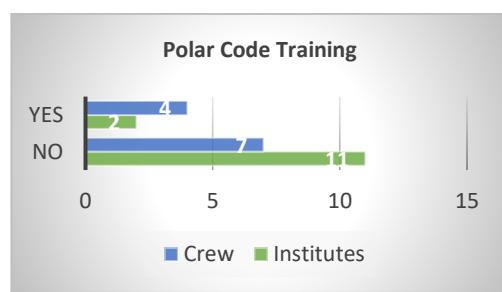


Figure 5. Responses for Polar Code Training based on questions (Training Institutes Q1, Q4 & Q5, and Crew Q1 & Q2) [6]

Table 1. Fisher's Exact Test 2x2 Contingency matrix [7]

		Responses		Totals	Fisher Exact Probability Test:
		No			
Training Institutes (X)	No	11	2	13	one-tailed 0.021368959483106367
	Yes	7	4		
X	0	1		11	P two-tailed 0.0327433032709646
Y	1	11	2		
0	0	4	7		
Totals	15	9		24	

This shows that the Probability value (*p-value*) is smaller than 0.05 (α value) and hence (according to the Fisher's Exact Test), the null hypothesis is rejected. The alternative hypothesis is accepted, and the result is statistically significant based on the Fisher's exact test [1].

The responses from the *crew* and *training institute groups* favor the alternative hypothesis concerning to the Polar Code training effectiveness discussed in Set A. Based on the data analysis with respect to the questionnaire categorized into patterns (Figure 2) and Fisher's Exact test (Table 1), it shows that the null hypothesis fails, and the alternative hypothesis is proven. The dependent questions explained in Set B shows the reasoning, where the pattern result indicates the *crews* and *training institutes* target groups' opinions.

Furthermore, the interview comments from focused target groups validate the finding of the data analysis from the survey result:

1. Interviewed *Crew* members mentioned the inadequacy of Polar Code training, as it doesn't provide enough awareness about safety procedures needed at the time of the evacuation onto the ice. They highlighted the need for proper instruction for immersion suits handling, no one was aware about the Group Survival Kit (the GSK) and how to use it. They claimed that training mostly focuses on ice navigation and nothing about evacuation details. They mentioned that the cruise management was unaware about Polar Code's applicability.

2. The *Institutes'* offered training mostly focuses on ice navigation, communication, etc., with just two hours of theoretical lessons related to evacuation, which hardly covers the necessary details as more practical understanding is required.

3. From the passengers' safety point of view, the *crew* highlighted the need for basic awareness training for passengers as shown in Set D above. The interviewed *passenger* also recommended training but was unsure how the training should be carried out. *Crew* members and *Passengers* highlighted the challenges of elderly handling immersion suits.

A document review of the training brochures from the *training institutes* highlighted the eligibility requirement for the Advanced module of Polar Code training. To be eligible for the Advanced module, one should have two months of sea-going experience in polar waters. Also, the Basic and Advanced training modules mention Crew Preparation as well as working conditions and safety, but it is uncertain if two hours of training suffices the actual needs of the evacuation preparedness.

5 RESULTS

The results from the quantitative and qualitative data analysis show that the Polar

Code Basic and Advanced training modules are not satisfying the real needs for evacuation preparation. The gaps in the existing training modules are identified based on the hypothesis testing and the alternative hypothesis is proven. It exhibits that at present; we are not meeting the real requirements of evacuation needs for harsh climate, human behavior, and applicability of safety equipment by the training modules. The cruise liner management are complying with the functional requirements of the Polar Code but not what is needed concerning to cover the real scenarios in the polar waters.

The gap identified in the existing training modules from this study should be viewed as a follow-up of the SARex2 findings [4]. According to the SARex2 exercise, risk analysis findings highlighted the need for training for both Crews and Passengers in order to evacuate safely [4]. As mentioned in the SARex2 report by a person representing a Classification Society, training should not focus only on masters, chief mates, and officers in charge of navigation but also on engineers and first officers who are in addition to normal duties responsible for evacuation in case of emergency [4]. Data analysis result and the SARex2 findings [4] call for in-depth training of all the crew, in particular the designated officers involved in possible evacuation, along with passenger training.

5 CONCLUSIONS

The Polar Code Basic and the Advanced training modules for crew training, when considering evacuation, should not be limited to a theoretical approach. When the crew members reflect on the applicability of the learning from the virtual training into real scenarios, the assessment should confirm the effectiveness of the Polar Code training in an actual situation.

These are the findings which need to be taken care of in order to move forward for

better human and maritime safety concerning crew preparedness for an evacuation:

- Crew Training should not be limited to masters, chief mates, and officers in charge of navigational watch. However, training should go beyond these groups, by training all the crew members present at the voyage, to prepare for any unforeseen situations. Specialized training needs to be arranged by individual cruise liners to train their crew members specific on 'Evacuation'. It will help crew members to be specific about how to respond in quickly changeable weather situations in the Arctic/Antarctic. Cruise management should effectively plan and develop guidelines and procedures for the Polar Code training concerning evacuation.
- It is necessary to develop a survival training module for cruise passengers concerning use of safety equipment for muster drill, and awareness about cold-weather survival. The training needs to be arranged either by the private institutes who are responsible for crew training or as mandatory training when passengers book their trips with cruise liner companies.
- Training Institutes need to plan in-depth training concerning evacuation needs, beyond theoretical lessons. They should focus their training module considering practical aspects, based on the changing and harsh climatic conditions, focusing on real scenarios.
- IMO Polar Code training regarding Basic and Advanced modules needs to include the actual requirements during an evacuation. According to the identified findings for crew preparedness in this research, the applicability should be related to Cruise Ships and training guidelines should be updated. The training should focus on essential needs that cover practical evacuation skills and handling of Personal and Group Survival

Kits (PSK & GSK) and Life-Saving Appliances usage.

6 FURTHER WORK

The study concluded with recommending in-depth training of the entire Crew involved in the muster, along with additional survival training requirements for Passengers. Below is a possible scope in terms of Passenger Training:

- E-training Module

Necessary safety guidelines, procedures, and equipment awareness should be provided with the help of a short E-training module that serves the purpose of evacuation awareness and would mitigate the risk of misunderstandings due to the language barriers.

The E-training should cover the usage of PSK and GSK; how, when, and why these are required. Also, the training should provide guidelines for the access to muster stations and do's and don'ts with respect to cold climate (Arctic/Antarctic).

Passengers should have an interactive training module, where they can ask questions if they are uncertain. This training module should be part of their trip and should represent a mandatory requirement to be fulfilled prior to boarding any expedition cruises to the polar regions. Cruise liners can collaborate with training institutes to design a short training module or build such inhouse with reference to company policy.

- Additional information needed prior to boarding the cruise.

Cruise line management needs to make sure about the medical fitness of the passengers; they can ask for medical fitness certificates before confirming seats to any of the Polar Expedition Cruises.

Also, it came into notice during the research that many passengers overlook the actual content in the cruise liners' brochures, and

they book Cruises where often no dedicated language assistance is available. To avoid this, while booking, cruise liner companies can ask passengers for their language and plan to assign dedicated Crew to support the emergency requirements accordingly.

- Safety Leaflet

All the necessary safety procedures/guidelines, and details of cruise muster stations should be printed in a Safety Leaflet with an utmost visual understandable mode in a leaflet form. At the time of boarding, a crew member should distribute this safety leaflet to all passengers on board: This would ensure that all passengers be aware about possible measures needed to be taken in case of an emergency evacuation, even if they miss to remember muster training details.

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ATTACHMENT

1. Ethical Consent

Informed Consent

We will appreciate if you are interested in taking part in the research project “(Preparatory Education of Crews and Passengers for evacuation in Cold Climate (Arctic and Antarctic))”

This is an inquiry about participation in a research project where the main purpose is to collect quantitative and qualitative data. In this letter, I will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

It is a research project (Master Thesis) where I am collecting data to analyse the valuable insight of the Management (Cruise Liners, Training Institutes), Employee (Crew) and Passengers who have, had or will have planned voyages in the Arctic or Antarctic.

The collected data will be used to identify how well Polar Code Training prepares the crews for evacuation and the need of training for potential Passengers. A statistical analysis of the answers to this questionnaire will help to understand the results more reliably and will hopefully help to propose future developments related to Polar Code training for evacuation in an emergency.

As a part of my master's thesis, the project objective (research question) is 'How to prepare cruise liner crews and passengers for evacuation in cold climate (Arctic and Antarctic)?'

Who is responsible for the research project?

Western Norway University of Applied Sciences, Haugesund, Norway is the institution responsible for the project.

Why are you being asked to participate?

I am asking a set of questions to the Cruise Liners, Training Institutes, Crews and, Researchers and to Passengers so that I will have samples based on different perspectives, and the results will be driven by the users to whom the results are impacting most or those directly influenced by Polar Code training.

What does participation involve for you?

The methods used in this project are based on the use of a Questionnaire by sending an Online Survey and by conducting a few Interviews with some of the personnel to validate the results obtained from questionnaire responses.

The questionnaire involves a set of questions that can be answered from the choices suggested or by giving short explanations. This survey will take approx. 15 minutes and your answers will be recorded electronically.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Thesis Supervisor: *Prof. Ove Tobias Gudmestad* will have access to the personal data

Informed Consent

- Online Survey Provider: *Survey Monkey*

Participants will not be recognizable in any publications to this project.

What will happen to your personal data at the end of the research project?

The project is scheduled to end on *03 June 2020*.

The collected data will be anonymised at the end of the project.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with *Western Norway University of Applied Sciences, Haugesund, Norway*, and *NSD – The Norwegian Centre for Research Data AS* has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- Student responsible: *Mona Chaure*, by email: (581035@stud.hvl.no) or by telephone: +47 45517860, or via Supervisor: *Prof. Ove Tobias Gudmestad*, by email: (ove.t.gudmestad@uis.no) or by telephone: +47 48100259
- NSD – *The Norwegian Centre for Research Data AS*, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Mona Chaure

Student

Ove Tobias Gudmestad

Thesis Supervisor

I have received and understood information about the project '*Preparatory Education of Crews and Passengers for evacuation in Cold Climate (Arctic and Antarctic)*' and have been given the opportunity to ask questions. I give consent:

- to participate in *an interview*
 to participate in *an online survey*

I give consent for my personal data to be processed until the end date of the project, approx. *03 June 2020*

(Signed by participant, date)