International law issues of chemical weapons dumped in the Baltic Sea after WW II
An examination of the respective roles of applicable legal regimes, competent institutions and the precautionary principle for arguing for necessary measures to be taken including remediation to be considered*

*Hans Henri Karu***

Abstract

The ever-growing prevalence of the precautionary principle and awareness of the vulnerability of human beings and of the environment gives rise to stronger arguments for protecting and preserving the environment. In this article, the author argues, that an environmental problem emanating from the mid-1940s, that was legal at the time and even considered to be best practice, namely the dumping of chemical weapons in the Baltic Sea after WW2, needs to be re-evaluated in the face of the progress of the recent decades. As the problem constitutes significant pollution and includes risks of serious harm and damage not only to the marine environment, but also to humans and our many legitimate uses of the sea, then more needs to be done by exercising abundant caution. Especially, as there are many scientific uncertainties not only regarding the exact locations and fate of the chemical weapons in the Baltic Sea, but also how it affects the whole ecosystem. By looking at the respective roles of applicable legal regimes, competent institutions and the precautionary principle for arguing for necessary measures to be taken including remediation to be considered, it will be shown, that the logic behind the original conduct of dumping, that is "out of sight, out of mind" does not pass anymore.

Introduction

The harmfulness of chemical warfare agents (CWA) and the suffering that their use has brought cannot be overstated. This is evidenced by the international community's success in eliminating this entire category of weapons, from their development and production to their use, by concluding the Chemical Weapons Convention (CWC) and through its implementing body, the Organisation for the Prohibition of Chemical Weapons (OPCW). Even though the CWC has 193 Member States and the OPCW has made great progress by verifiably destroying 96% of the chemical weapons stockpiles declared by possessor States, the problem of sea-dumped chemical weapons after WW2 will remain haunting both the current generations and generations to come. Especially if necessary measures are not continued to be taken and further ones considered, including remediation, given the plethora of risks and uncertainties that arise from the problem. For these purposes, 'Chemical warfare

* A shortened version of a Master's Thesis of the same name. Research done for the Master's Program in Public International Law at Utrecht University and supervised by Prof. Fred Soons.

** Utrecht University – LLM Public International Law (Environment and Law of the Sea track), University of Abertay Dundee – LLB(Hons) Law.

agents represent environmental legacy contaminants as production and subsequent dumping of CWA typically occurred decades ago.'[1] It is essential to note, that the CWC does not cover the chemical weapons dumped at sea before 1 January 1985.[2] As well as that dumping chemical weapons in the Baltic Sea in the mid-1940s was legal at the time, even considered to be best practice and that the original conduct preceded any legal regime under which it became highly regulated or illegal. For example under UNCLOS or with the wide-range ban on dumping of hazardous waste at sea stipulated under the 1974 Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft[3] and the overarching ban in place in the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. This is why it is important to analyse the current conduct and the law applicable to this problem, with a specific focus on applicable legal regimes and competent institutions.

Therefore the research question is, that through which applicable legal regimes and competent institutions has the problem of dumped CWAs in the Baltic Sea after WW2 been tackled and on what basis, including the application of the precautionary principle, can a responsibility to take necessary measures, as well as to consider remediation, be established and what are the respective roles and considerations in this regard? In Chapter One the background information and facts will be stated, including what happened and what is the significance and extent of the problem and associated risks. Chapter Two will involve looking at the competent institutions and applicable legal regimes, to which extent do they address the issue and what has been done and is being done. Chapter Three puts forward the role of precautionary approach and its constituent elements, as found in relevant documents and cases, including an analysis on how does it apply to the issue and how can it be instrumentalized for arguing for responsibility to take necessary measures and consider remediation as an alternative course of action. In Chapter Four the aforementioned findings will be synthesised, such as considerations on responsibility for current conduct, due diligence and arguments for required measures to be taken and remediation considered, what those exactly entail and what legal questions and problems arise, as well as suggestions for a way forward with a focus on competent institutions. The research methodology to be applied is doctrinal research, however in addition to analysing the law applicable to the problem, it will also involve a synergy between scientific findings and law, as this is necessary to show the gravity of the problem and strengthen the case for the application of precautionary principle and action to be taken on the basis of it.

1. Background information and facts connected to the problem

1.1 Generally on the history

Chemical weapons were produced in mass quantities during WW I and WW II. Chemical warfare agents were not used in European battles in WW II, despite Hitler's plans to use them, as the Allied warnings of retaliation prevented their use.[4] Nonetheless, during WW II Germany

[1] Hans Sanderson and others, 'Environmental Hazards Of Sea-Dumped Chemical Weapons' (2010) 44 Environmental Science & Technology, p. 4389.

[2] Found in Art. III (2) and Art. IV (17) of the CWC.

[3] Superseded by the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

[4] Geoffrey P. Glasby, 'Disposal of chemical weapons in the Baltic Sea' (1997) 267–273, Volume 206, Science of The Total Environment, p. 268.

produced approximately 65 000 tonnes, Britain produced almost 55 000 t and the Soviet Union also produced a large, unspecified amount of chemical warfare agents.[5] At the end of the war around 296 000 t of chemical weapons were discovered in Germany by the Allies, this counts for all types of munitions and the varying weight of their casings.[6] In fact, it is not possible to specify an accurate net weight of the warfare agents alone because the quantity of chemical warfare agents varies for the individual types of munitions, depending on their purpose; the figure accounted for both intact munitions with chemical warfare agents, as well as empty shells; also, the information about the composition of the various munitions cargoes is highly inadequate.[7]

The various methods undertaken to get rid of these weapons included destruction by incineration, burying in flooded mines, dumping at sea or transporting them abroad for study or stockpiling. However, it was decided that the bulk of the munitions should be disposed of by dumping at sea.[8] Originally the idea was to dump these weapons in the Atlantic Ocean at a depth of 4000 m, 200 nm NE of the Faroes, however the dumping was not conducted in such a way, as for example the Soviet fleets did not even have special ships for this purpose and therefore dumped the material in the Baltic Sea.[9] In addition to the Government of the U.S.S.R, the dumping of captured German chemical warfare agents at sea was done by decision of the Potsdam conference and included the other Allied military administrations, i.e. the USA and the UK.[10] When it comes to France, it is stated that they have not submitted any official reports on chemical warfare materials found in their occupation zone.[11] It should be noted that dumping ammunition and other military equipment at sea was common practice amongst States after WW II, both in Europe and worldwide.[12]

1.2 Dumping in the Baltic Sea and in close proximity in the Skagerrak

Even though considerable amounts of chemical weapons were dumped in the areas of the Atlantic Ocean, the Mediterranean Sea, the Black Sea, the North Sea, and the Baltic Sea, the focus of this research is on the last mentioned area. The verified quantities of chemical munitions that were dumped in the Baltic Sea are as follows, approximately 32 000 t in the Bornholm Basin (dumped 1945–1948, smaller amounts in 1959–1965), approximately 2 000 t in the Gotland Basin (dumped in 1947) and approximately 5 000 t in the Little Belt (dumped in 1945).[13] The 34 000 t of chemical weapons (containing about 12 000 t of CWA) in the Bornholm Basin and Gotland Basin were dumped there in 1947 and 1948 on orders of the Soviet Military Administration in Germany (SMAD).[14] Whilst a large part of the stocks found in the Soviet occupation zone were dumped there, the U.S. and British authorities

[5] Ibid.
[6] Ibid.
[7] HELCOM, 'Report on chemical munitions dumped in the Baltic Sea' Report to the 16th Meeting of Helsinki Commission (1994) HELCOM CHEMU, 1994:43, p.9.
[8] Cf. Glasby (n 4).
[9] Ibid.
[10] Nicole Höher and others, 'Toxic effects of chemical warfare agent mixtures on the mussel Mytilus trossulus in the Baltic Sea: A laboratory exposure study' (2019) 112–122, Volume 145, Marine Environmental Research, para. 1.
[11] HELCOM, 'Chemical Munitions Dumped in the Baltic Sea' Report of the ad hoc Expert Group to Update and Review the Existing Information on Dumped Chemical Munitions in the Baltic Sea (2013), HELCOM MUNI, Baltic Sea Environment Proceedings, p. 28.
[12] Cf. Nicole Höher and others (n 10).
[13] Cf. HELCOM 1994 (n 7), p. 12. Dates updated from 2013 HELCOM Report.
[14] Ibid., p. 9.

dumped chemical warfare materials in areas of the Skagerrak instead.[15]

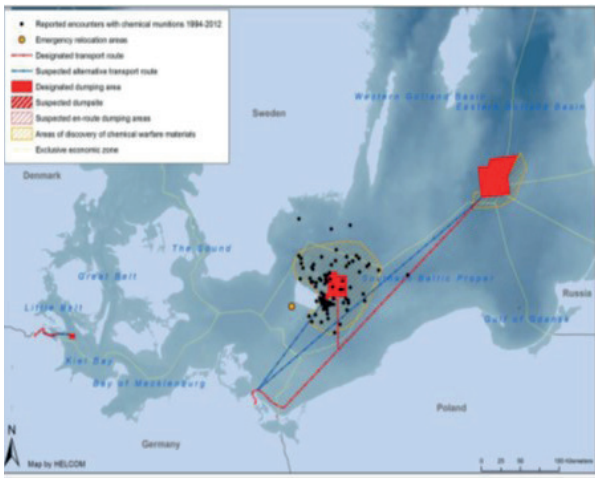

Figure 1 showing various dumping grounds and transport routes with regards to chemical weapons in the Baltic Sea.[16]

Recent archive investigations as part of the 2013 HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission) Report re-confirms that a total of 40,000 tonnes of chemical warfare materials were dumped in the Baltic Sea, but that the amounts of chemical warfare agent mixtures contained in them was 15,000 tonnes, which is slightly more than estimated earlier in the 1994/1995 HELCOM Report.[17] The 2013 HELCOM Report points out, that despite some clarifications, there remains uncertainty on the amounts and locations of dumped chemical warfare materials, as: 'Rarely is gapless and precise information available from official correspondence that must have accompanied the activities of trafficking chemical warfare materials over land, in harbours and at sea.'[18] For example, there are also witness reports of additional dumped chemical weapons, which have not been confirmed from other sources.[19]

In addition approximately 20,000 tonnes of chemical munitions were dumped by sinking 9 vessels west of Måseskär lighthouse in Skagerrak.[20] Whilst the dumping sites in Skagerrak are not at the heart of the Baltic Sea and hence will not be the primary focus of this research, it is still of importance, as it connects the North Sea and the Kattegat sea area, which in turn leads to the Baltic Sea. It is also of use for making a comparison between the Skagerrak and the Baltic Sea, when it comes to original conduct of the dumping and the availability of information. In Skagerrak the positions of the wrecks and information about ship loadings are relatively exact, whilst in the Baltic Sea it is held, that part of the chemical weapons were thrown overboard during transport to the dumpsites, considerably adding to the uncertainty regarding the exact scale and locations of the dumped CWAs.[21] Adding to the aspect of the CWA being scattered throughout the Baltic Sea is the fact, that the materials in wooden crates did not stay contained within the planned 3 nautical mile radii, as they floated and drifted as far as the Swedish coast.[22] As well as the fact, that: 'Navigation was by dead reckoning and was in error on days with poor visibility.'[23]

1.3 Important characteristics of the Baltic Sea

There are numerous unique characteristics of the Baltic Sea, which make looking at this problem in connection with it interesting, but also speak towards the sensitivity of the Baltic Sea and seriousness of the problem. The Baltic Sea is relative-

[15] Cf. HELCOM 2013 (n 11), p. 28.
[16] Ibid., Figure 14, p. 31.
[17] Ibid., p. 85.
[18] Ibid.
[19] Cf. HELCOM 1994 (n 7), p. 11. See further on witness reports on p. 11–12.
[20] Ibid.
[21] Cf. Höher and others (n 10).
[22] Cf. Glasby (n 4), p. 269.
[23] Ibid.

ly shallow, with an average depth of 52 metres[24], which means that there is a high risk of interaction of CWAs with legitimate uses of the seas. Therefore, 'The impaired quality and utilization of the sea floor affects various sectors, such as fishing, mining of natural resources, installing of underwater pipes and cables, construction of off-shore facilities (e.g. wind power stations), maritime traffic and tourism.'[25]

For example the experiences of the Nord Stream pipeline laying project between 2005 and 2011 substantiated the claim that chemical munitions pose a threat to developments even outside the limits of 'foul grounds' and munitions dumpsites marked on navigational charts.[26] Whether it be laying sea cables or pipelines or constructing offshore wind farms, 'The increasing amount of activity on the seafloor also increases the risk of coming into contact with chemical warfare agents.'[27] Furthermore, side scan sonar images from Gotland have revealed, that there are bottom trawling scars on the seabed, despite the prohibition of the fishing activities in the area.[28] This poses two problems, firstly, it could be responsible for dispersing munitions and contaminated sediments and secondly, it poses considerable risk for fisherman to come into contact with CWAs through by-catch.[29]

The relative shallowness of the Baltic Sea means that taking further action is made possible or at least not completely unrealistic thanks to this factor. Other characteristics, sadly, do not have such a positive side to them and speak more towards the seriousness of the problem. It is a semi-enclosed basin with less than 5% seawater exchange rate with the North Sea.[30] Due to the narrow connection to the North Sea and the limited water exchange, the Baltic Sea acts as a sink for chemicals of all kind, including CWAs.[31] Furthermore, every decade or so there is a major storm that introduces in excess of 100 cubic kilometres of North Sea water into the Baltic within several days.[32] During such events, the anoxic basins of the Baltic (including the Gotland and Bornholm Basins), which comprise 5% of the total area of the Baltic, are flushed and the sediment of the surrounding areas are extensively reworked, meaning that the toxic materials within these bottom waters would have been dispersed throughout the Baltic every decade or so.[33]

To make matters worse, it should be noted, that the Baltic Sea is already subject to an existing environmental degradation linked with nutrient overload that caused reduction of dissolved oxygen and has resulted in a massive "dead zone".[34] By most recent accounts, this covers an area of 70,000 square kilometres (with the total area of the Baltic Sea being 377,000 square kilometres) — roughly the size of Ireland and the current stress on the sea is "unprecedented".[35] It is held to be 'extremely vulnerable to human induced pollution and disturbances.'[36] Further factors, that make the Baltic Sea a particularly fragile ecosystem are, that it's a relatively young sea

[24] Michał Czub and others, 'Deep Sea Habitats in the Chemical Warfare Dumping Areas of the Baltic Sea' (2018) 616–617 Science of The Total Environment, para. 1.
[25] Cf. Höher and others (n 10).
[26] Cf. HELCOM 2013 (n 11), p. 74.
[27] Ibid.
[28] Jacek Beldowski and others, 'Chemical Munitions Search & Assessment—An evaluation of the dumped munitions problem in the Baltic Sea' (2016) 85–95, Volume 128, Deep Sea Research Part II: Topical Studies in Oceanography, para. 3.1.
[29] Ibid.
[30] Cf. Glasby (n 4), p. 269.
[31] Cf. Höher and others (n 10).
[32] Cf. Glasby (n 4), p. 269.
[33] Ibid., p. 269–270.
[34] Ibid., para. 1.1.
[35] Daniele Selby and Erica Sanchez, 'The Baltic Sea Now Has A Suffocating 'Dead Zone' The Size Of Ireland' (*Global Citizen*, 2019) <https://www.globalcitizen.org/en/content/baltic-sea-dead-zone-low-oxygen-levels/> accessed 14 February 2019.
[36] Oceana Report, 'Baltic: Conservation proposals for ecologically important areas in the Baltic Sea' (2011) p. 6.

'…characterized with special biodiversity and simple systems where each species plays an important role in maintaining the structure and dynamics of the whole system.'[37] Also, that one species disappearing 'may cause irreversible damage to the whole network because no other species may have the same ecological requirements to replace the vanished one.'[38]

1.4 Overview of the types of warfare agents dumped and the risk to the marine environment

Before moving on to analysing the main associated risks from sea-dumped chemical weapons in the Baltic Sea in more detail, it is important to give an overview of the types of warfare agents dumped. In the largest dumping area of the Baltic Sea, the Bornholm Basin, these are held to be mustard gas, viscous mustard gas, Clark I, Clark II, Adamsite, chloroacetophenone and with less certainty also phosgene, nitrogen mustard, tabun.[39] 'Their toxicity depends on their long-term stability and their hydrolysis characteristics in seawater.'[40] Mustard gas, chloroacetophenone phosgene, nitrogen mustard and tabun 'break down in sea water at varying rates to less toxic, water soluble compounds and do not pose long-term threats to the marine environment.'[41] The most problematic agents that persist in the marine environment for a long time can be split into two. Firstly, viscous mustard gas, which together with sand and mud particles from the seafloor forms lumps, further hindering the release of the mustard gas.[42] Secondly, Clark I and II and Adamsite which hydrolyze to form compounds that contain arsenic.[43]

It is also important to note that the various munitions and containers containing CWAs are now in varying stages of decomposition. Whilst some have remained intact, others are leaking contents into the environment '…at a rate that cannot be estimated given present knowledge on the quality of material used to make them, posing a risk for the Baltic Sea ecosystem.'[44] In addition to the variability of the materials used for the storage of CWAs, there are numerous environmental conditions determining the corrosion process at the dumping sites, such as oxygen concentrations and salinity.[45] It has been estimated, that munitions in '…the Baltic Sea may be degraded in the period between five to hundreds of years.'[46] Therefore suggesting that we are at a critical timeframe to take further measures before all of the munitions rust through.

CWAs can cause both acute toxic effects, as well as chronic toxic effects, on this point a 1975 Stockholm International Peace Research Institute study stated that: 'The hazards of chemical warfare agents are by no means adequately described simply by their acute effects.'[47] The first major risk arising from sea-dumped chemical weapons, that will be covered, is that relating to the threat to the marine environment. 'Fish, marine mammals and sea birds may come into direct contact with the chemical warfare materials themselves (e.g., leaking munitions or lumps of chemical warfare agent) or via contaminated food.'[48] This will likely result in 'chronic toxic

[37] Ibid.
[38] Ibid.
[39] Cf. HELCOM 1994 (n 7), p. 12.
[40] Cf. Glasby (n 4), p. 270.
[41] Ibid.
[42] Ibid.
[43] Ibid., p. 271.
[44] Cf. Beldowski and others (n 28), para. 1.
[45] Cf. Höher and others (n 10).
[46] Nico van Ham, 'Investigations of risks connected to sea-dumped munitions' (2004) NAIV, volume 44 – Tine Missiaen and Jean-Pierre Henriet (eds) As found in: Alexander Lott (n 220), p. 59.
[47] Cf. HELCOM 2013 (n 11), p. 64.
[48] Ibid., p. 81.

effects which manifest as behavioural changes and superficial injuries'.[49] Mainly sediment active species (for example sole) and omnivorous fish (for example cod), are held to be potentially at risk, whereas more pelagic species would be at lower risk.[50]

Primarily cod has been the subject of studies, as: 'There is a potentially significant overlap between the dump site, fertile fishing grounds and the breeding grounds of cod (Gadus morhua) east of Bornholm…'.[51] Since cod is an economically and ecologically important fish species to the Baltic Sea, suggests, that it might be particularly at risk from dumped CWAs.[52] Whilst studies on cod health parameters have revealed no major overall differences between CWA dumpsites and reference areas, some of the indicators measured in cod did show responses in dumpsites of chemical munitions (mainly east of Bornholm).[53] These could reflect negative effects of CWA on the health status, however, this could also relate to the stagnation and anoxic conditions of the water during parts of the sampling period, therefore further adding to the scientific uncertainty.[54]

There is a significant problem in the fact that the evaluation of the environmental risk of CWAs is mostly limited to model-based assessments and very few experimental studies have been done.[55] For example '…mussels caged within the Bornholm dumping site showed a higher degree of stress as assessed by lysosomal membrane stability compared to a reference site.'[56] Furthermore, '…studies conducted in the Mediterranean Sea have shown that leaked organoarsenic-based CWAs are likely to cause dermal blistering and induce DNA- and histopathological damage in fish.'[57] A paramount hindrance to further impact models or risk assessments is, that there is a lack of studies on the impact of CWAs and their degradation and transformation products, especially as 'evaluations of single and mixture effects of CWAs on model organisms are rare'.[58] This information is needed to understand the impacts of these compounds on Baltic Sea biota, in order to help estimate the environmental risks.[59]

One such recent exposure experiment, from March of 2019, looking specifically at the toxic effects of chemical warfare agent mixtures on the mussel Mytilus trossulus in the Baltic Sea has proved bioaccumulation of oxidized CWAs into marine organisms, impairments on mussels by oxidized CWAs at the subcellular and functional level and that effects occurred even at lowest exposure concentrations.[60] Since this was the first study proving bioaccumulation of oxidized CWAs into marine organisms, it goes to further show, that even though around 70 years have passed since the original dumping, there are still significant scientific uncertainties regarding the effects on the marine environment. This is further evidenced by the fact, that even though this

[49] Ibid.
[50] Hans Sanderson and others, 'Screening level fish community risk assessment of chemical warfare agents in the Baltic Sea' (2008) 846–857, Volume 154, Journal of Hazardous Materials, para. 5.
[51] Ibid., para. 1.
[52] Ibid.
[53] Cf. Beldowski and others (n 28), para. 3.5.2.
[54] Ibid.
[55] Cf. Höher and others (n 10).
[56] Jacek Beldowski and others, 'Arsenic concentrations in Baltic Sea sediments close to chemical munitions dumpsites' (2016) 114–122, Deep Sea Res. Part II Top. Stud. Oceanogr, as found in cf. Höher and others (n 7).
[57] Camilla Della Torre and others, 'DNA damage, severe organ lesions and high muscle levels of As and Hg in two benthic fish species from a chemical warfare agent dumping site in the Mediterranean Sea' (2010) 2136–2145, Sci. Total Environ and Camilla Della Torre and others, 'Environmental hazard of yperite released at sea: sublethal toxic effects on fish' (2013) 246–253, J. Hazard Mater. As found in: cf. Höher and others (n 10).
[58] Cf. Höher and others (n 10).
[59] Ibid.
[60] Ibid.

recent study could be considered to have provided ground-breaking findings, it still states how much more there is in relation to it that should be looked into. It is pointed out, that future studies should for example focus on both single and mixture effect analysis of CW components, as well as research the potential metabolites of the used compounds in order '…to increase knowledge about toxicity and toxic mechanisms of CWA compounds and their corresponding negative health effects on marine species.'[61]

1.5 Risk posed to humans by CWAs

Having previously covered some aspects of what problems sea-dumped CWAs pose to humans under the part on the Baltic Sea's unique characteristics, it is now important to provide some further considerations of this second major risk in addition to the previously covered risk to the marine environment. It is evident, that there are informational uncertainties regarding the exact contents, locations, etc. of the dumped CWAs, as well that it poses problems for various legitimate uses of the sea. Of these, further reference needs to be made to the risk of coming into direct contact with CWAs, most of all this affects fishermen. The 2013 HELCOM Report lists other groups of people who may be at risk of coming into contact with CWAs, such as: offshore construction and maintenance workers, sub-surface entrepreneurs and workers, harbour staff and workers, rescue and emergency services, recreational divers and beach visitors.

Before moving onto the risk to fishermen, some reference needs to also be made to the potential risk of seafood consumers eating contaminated fish. Catches contaminated with warfare materials are destroyed and even if some fish showing biomarker responses slips through together with regular catch, then it is unlikely that it would go unnoticed in the sorting stage and reach the consumers.[62] In a study in 2009 it was still considered, that the fishing limitations in the dumpsites should not be relaxed, as 'Under a worst-case scenario consumption with respect to cancer health endpoints, a maximum of 0–1 fish meals per month caught from the primary and secondary dumpsites, respectively, is recommended, based on the presence of organoarsenic CWAs alone.'[63]

The study calls for a further empirical site-specific risk assessment and states uncertainties 'concerning human exposure to Yperite and speciation of As in the environment and in fish from a CWA dumpsite, as well as the carcinogenesis of arsenicals.'[64] Even though wide scale contaminated seafood reaching consumers is unlikely, there is still some risk, bearing in mind the limitations of the studies and uncertainties about the problem overall, as well as the fact, that fishing has taken place nearby the dumpsites, as evidenced by the earlier mentioned bottom trawling scars.

Fishermen have been the main group affected by chemical warfare agents since dumping activities were concluded, since the highest risk is fishing inside or near to the former dumping areas, this risk is now lessened thanks to those areas being marked on the official sea charts.[65] However, there is also a risk when fishing outside the marked dumpsites, due to the former practice of en route dumping and other ways in which the CWAs have ended up elsewhere.[66] Most of the occasions, that fishermen come into contact with CWAs is through trawling up

[61] Ibid., para. 5.

[62] Cf. HELCOM 2013 (n 11), p. 80.

[63] Hans Sanderson and others, 'Human health risk screening due to consumption of fish contaminated with chemical warfare agents in the Baltic Sea' (2009) 416–422, Volume 162, Journal of Hazardous Materials, para. 5.

[64] Ibid.

[65] Cf. HELCOM 2013 (n 11), p. 71.

[66] Ibid.

lumps of sulphur mustard, often still with the explosives attached to it, in which case the CWAs need to be emergency-relocated.[67] Even though sulphur mustard mixtures represent about 63% of all materials dumped near Gotland and Bornholm, it accounts for 88% of all reported fishing incidents, probably due to the formation of persistent lumps.[68] For example the officially reported chemical warfare material catches by fishermen in the waters around Bornholm between 1994 and 2012 total some 5.4 tonnes of warfare agent mixtures by net weight.[69] Furthermore, 'Between 1968 and 1984, 202 catches amounting to 395 tonnes of seafood had to be destroyed.'[70]

Danish statistics are seen to be reliable due to Danish regulations, as there are compensation systems and obligations to report incidents in place and in case chemical munitions are trawled up outside the areas marked on sea charts, then fishermen are normally compensated for damaged gear and contaminated discarded catch.[71] Unfortunately other Baltic states do not have such systems and obligations in place and consequently most incidents have been reported by Denmark.[72] It is also said, that: 'As there are uncertainties associated with the reporting of incidents, the figures do not necessarily reflect the actual situation.'[73]

[67] Ibid.
[68] Ibid., p. 85.
[69] Ibid., p. 72.
[70] Ibid.
[71] Ibid., p. 73.
[72] Ibid.
[73] Ibid.

2. Competent institutions and applicable legal regimes

2.1 United Nations General Assembly Resolution

To set things into perspective, the starting point shall be the United Nations General Assembly Resolution A/RES/65/149 adopted in 2010 on 'Cooperative measures to assess and increase awareness of environmental effects related to waste originating from chemical munitions dumped at sea'. It starts by noting and recalling the various developments in the field of environmental law, such as the relevant provisions of the 1992 Rio Declaration, the relevant international and regional instruments from UNCLOS to the Helsinki Convention and even takes note of the efforts of HELCOM. The UNGA notes, that 'Member States, international and regional organizations and civil society have undertaken activities to discuss the issues relating to waste originating from chemical munitions dumped at sea and to promote international cooperation and exchange of experience and practical knowledge'.[74]

It acknowledges the concerns about the potential long-term environmental effects, the potential impact on human health and the importance of raising awareness of the environmental effects relating to the problem. Furthermore, the UNGA invites Member States and international and regional organizations to keep the issue under observation and to cooperate and voluntarily share relevant information on this issue.[75] The Secretary-General is invited to seek the views of Member States and relevant regional and international organizations on issues relating to the environmental effects connected to the problem,

[74] United Nations General Assembly Resolution, 'Cooperative measures to assess and increase awareness of environmental effects related to waste originating from chemical munitions dumped at sea' (2010) A/RES/65/149.
[75] Ibid.

'…as well as on possible modalities for international cooperation to assess and increase awareness of this issue'[76] This Resolution, adopted under Lithuania's initiative and by consensus, goes to show the seriousness of the problem, as well as contributed towards making it more visible and prompting broader engagement in relation to it.

2.2 Convention on the Protection of the Marine Environment of the Baltic Sea Area and the Helsinki Commission

Having referred to the extensive HELCOM reports on the problem on numerous occasions in Chapter One it is only fair to come to it next under this Chapter. HELCOM is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention.[77] The Contracting Parties are Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. Under Art. 4(1) of the Convention, it is stated, that it applies '…to the protection of the marine environment of the Baltic Sea Area which comprises the water-body and the seabed including their living resources and other forms of marine life.'

Since it covers the whole of the Baltic Sea Area bounded by the parallel of the Skaw in the Skagerrak[78], means that all of the CWA dumpsites in the Baltic Sea Area fall under the geographical scope of the Helsinki Convention and HELCOM. As the full name of the Helsinki Convention suggests, the main goal of the legal regime and its governing body is to take various relevant measures '…to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance.'[79] In fact, it makes direct reference to harmful substances in Art. 5 of the Convention and states, that the Contracting Parties undertake in accordance with the provisions of this Convention and by implementing the procedures and measures of Annex I, '…to prevent and eliminate pollution of the marine environment of the Baltic Sea Area caused by harmful substances from all sources.' Furthermore, one of the duties of the Commission is to promote in close co-operation with appropriate governmental bodies and where appropriate also with other competent regional and other international organizations, '…additional measures to protect the marine environment of the Baltic Sea Area…'[80] mainly through scientific, technological and statistical information and research.

Therefore it is no surprise that it is the HELCOM, which created the ad hoc Working Group on Dumped Chemical Munition (HELCOM CHEMU)in 1993, which resulted in a 1994 Report and the Final Report in 1995 (the aforementioned 1994/1995 HELCOM Report). The Helsinki Commission decided at its 2010 Ministerial Meeting to establish the ad hoc Expert Group to Update and Review the Existing Information on Dumped Chemical Munitions in the Baltic Sea (HELCOM MUNI), the resulting Report being the aforementioned 2013 HELCOM Report. The 2013 HELCOM Report is held to be a regional fulfilment of UN General Assembly Resolution A/RES/65/149.[81] These reports could be held to constitute the most comprehensive work done regarding the problem, as they bring together relevant information from various fields, experts

[76] Ibid.
[77] Helsinki Convention (1992). All information on HELCOM and the Helsinki Convention taken from the official website at: <http://www.helcom.fi/> accessed 31 May 2019.
[78] Art. 1 of the Helsinki Convention.
[79] Art. 3(1) of the Helsinki Convention.
[80] Art. 20(e) of the Helsinki Convention.
[81] Cf. HELCOM 2013 (n 11), p. 11.

and sources. Since the 2013 HELCOM Report is the most up-to-date one, then it is important to analyse its findings, especially as it re-adjusted the formerly drawn conclusions and recommendations of the 1994/1995 HELCOM Report.[82] Having covered the various risks to the marine environment and to humans in some detail in the previous Chapter, the focus here is on specific recommendations for current and further efforts to tackle the problem, which HELCOM has divided into three groups, called Investigate, Manage and Inform respectively.

Under the Investigate group, HELCOM encourages and recommends the Contracting Parties, firstly, to carry out, support and facilitate archival research.[83] Which is likely to reveal 'new or additional information on the dumping of chemical warfare materials and the possible co-disposal of conventional munitions in the Baltic Sea'.[84]

Secondly, to carry out, support and facilitate technical research.[85] Technical research will further help to decrease some of the scientific uncertainty, by gathering 'precise, site-specific data on the types, quantities, status and spreading of sea-dumped warfare materials and their constituents in the Baltic Sea.'[86]

Finally, '…to share detailed information on the findings both within and outside the Baltic Sea region taking into account the UN General Assembly Resolution A/RES/65/149.'[87] Research transfer is needed to increase the overall knowledge regarding the issue and sharing information inter-regionally helps towards well-informed risk assessments.[88] 'Likewise, single findings of warfare materials should be cross-checked with historical references.'[89] In relation to the dumpsite off Måseskär bordering the Helsinki Convention Area, HELCOM has called for further national and/or international studies because of the scarcity of information and has suggested, that this could be done in cooperation with OSPAR.[90]

As a part of the five recommendations under the Manage group, HELCOM recommends the Contracting Parties '…to support and facilitate the development of suitable analytical methods and improving analytical capabilities.'[91] What is meant by this, is that 'further development of chemical analytical methods is needed as well as updating the ecotoxicological and physicochemical properties assessments.'[92]

Secondly, '…to support and facilitate the development of suitable guidelines for carrying out surveys and testing methods.'[93] Guidelines for periodical surveys 'both in known and suspected dumpsites are necessary in order to establish trends and foresee possible changes in the environment in these areas.'[94]

Thirdly, '…to support and facilitate the development of suitable instruments and methods for site-specific risk assessments.'[95] Doing so helps with 'taking into account the threats to humans and the marine environment, including possible acute, chronic and long-term effects.'[96]

Fourthly, '…to transfer procedures and experiences for intentional recovery that exist under the provisions of current international legal instruments.'[97] Due to '…the increasing use of

[82] Ibid., p. 86.
[83] Ibid., p. 87.
[84] Ibid.
[85] Ibid.
[86] Ibid.
[87] Ibid., p. 87–88.
[88] Ibid.
[89] Ibid.
[90] Ibid., p. 85.
[91] Ibid., p. 88.
[92] Ibid.
[93] Ibid.
[94] Ibid.
[95] Ibid.
[96] Ibid.
[97] Ibid.

the seafloor, the intentional recovery of chemical warfare materials, where applicable, might no longer be excluded as a site-specific management option…'.[98] This needs to be done in accordance with nationally accepted guidelines or the results of risk assessments.

The final HELCOM recommendation to the Contracting Parties under the Manage group is: '…that response teams should be deployed and that on their advice re-location of caught chemical warfare material may be considered as an acceptable emergency measure.'[99] This is due to the continuing risks associated with unintentional catches of chemical warfare materials for the crews of fishing vessels operating in the vicinity of dumping areas.[100] On this point, it is worthwhile mentioning that HELCOM has had detailed guidelines for fishermen in place since 1995, based on recommendations elaborated by HELCOM CHEMU (Annex 3 of the final report of the HELCOM CHEMU).

Last but not least, the Inform group of a further five recommendations, as part of which HELCOM recommends the Contracting Parties: '…to consider this report as a step in an on-going process and to establish a working process for periodical updates after significant new information becomes available.'[101] Updating the HELCOM Report will become necessary 'with regard to on-going national and international activities and projects.'[102]

Secondly, '…to support and facilitate the development and operation of such information portals and other relevant measures to increase public awareness.'[103] Public awareness needs to be furthered by providing 'up-to-date information on sea-dumped warfare materials, including white phosphorus in the Baltic Sea region, and on-going activities', bearing in mind UN General Assembly resolution A/RES/65/149. This includes specific local information '…in areas of concern for the possible occurrence of white phosphorus.'[104]

Thirdly, '…to support and facilitate such national centres (what is meant by this is: national centres or responsible organizations for the collection of information on sea-dumped warfare materials- HHK).'[105] This also includes 'the coordination of response and training activities for the decontamination of vessels and equipment, as well as the treatment of affected people.'[106]

Fourthly, '…to carry out, support and facilitate the update and development of suitable guidelines for all potentially affected groups.'[107] The increasing use of the seafloor by the several groups shortly referred to in Chapter One, means that there are several possibly affected groups that run the risk of potential contact with sea-dumped chemical and conventional munitions. Therefore, in the affected areas 'contingency measures for dealing with both chemical and conventional warfare materials should be in place.'[108]

Finally, '…to update sea charts to reflect the extensions of primary and secondary dumpsites, and to ensure that no information is lost on nautical charts when the transition to Electronic Nautical Charts is made.'[109] This helps negate some of the risk for the various groups operating in the affected areas, especially as 'technical investigations have provided and are still provid-

98 Ibid.
99 Ibid., p. 88–89.
100 Ibid.
101 Ibid., p. 89.
102 Ibid.
103 Ibid.
104 Ibid.
105 Ibid.
106 Ibid.
107 Ibid.
108 Ibid.
109 Ibid., p. 90.

ing information on the actual positions of sea-dumped chemical munitions.'[110]

As can be seen, the recommendations of HELCOM are extensive and cover most of the aspects one could think of in relation to the problem. Whilst this goes to show the competence and considerable efforts of HELCOM to tackle the problem, it also goes to prove the various uncertainties and shortcomings that still exist. Additionally, in Chapter Four, when discussing the specificities of what actions should be taken and considered, HELCOM's position regarding this will be discussed further. At this point it suffices to say, that HELCOM has stated, that even though some dumped chemical munitions were recovered in the 1960s, '…in 1995 HELCOM recommended that chemical munitions should not be recovered due to their degraded state and the lack of suitable technological solutions for safely removing and destroying them.'[111] It is still considered, that the risks associated with handling them in any way, including through recovery are still high.[112] However, it needs to be borne in mind that technology and our understanding of the problem has developed greatly since 1995.

2.3 United Nations Convention on the Law of the Sea

Moving onto UNCLOS, it is interesting to see what this applicable legal regime provides in relation to the problem of sea-dumped chemical munitions, especially as it is considered the "constitution of the oceans". Having stated at the start of this article, that the original conduct of dumping chemical munitions at sea happened nearly 40 years prior to the conclusion of UNCLOS, was not illegal at the time and even considered best practice, then it is not necessary to enter into a discussion on what UNCLOS says on the original act of dumping per se. The focus here will be on what UNCLOS provides in relation to dealing with this problem nowadays, from which maritime zones are affected to the applicable provisions on marine protection and various cooperation clauses. To shortly state, which maritime zones are relevant, then we can see in Figure 2, that mainly EEZs, but also territorial seas are affected by the problem, keeping in mind the locations of the chemical weapons in the Baltic Sea, as shown in Figure 1 earlier. Of further note, is the fact that all of the problem areas are characterised by their proximity to designated HELCOM Baltic Sea Protected Areas, with the dumpsite in the Little Belt potentially falling straight under one of them.

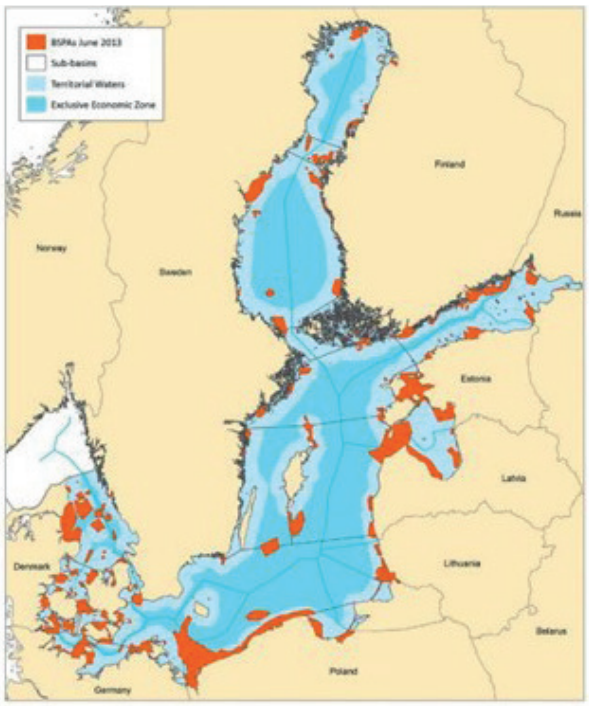

Figure 2 showing maritime zones and HELCOM Baltic Sea Protected Areas.[113]

[110] Ibid.
[111] Ibid., p. 86.
[112] Ibid.

[113] Atlas of Marine Protection, Denmark, Figure 1 <http://www.mpatlas.org/region/country/DNK/> accessed 22 June 2019.

UNCLOS's legal framework relating to marine protection is covered mainly under Part XII, titled the Protection and Preservation of the Marine Environment. Art. 192 states the general obligation to protect and preserve the marine environment. Art. 194(1) sets out, that States shall take, individually or jointly, all measures consistent with this Convention, '…that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities…' and to endeavour to harmonize their policies.

Art. 194(2) provides, that all measures necessary need to also be taken 'to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment', as well as, that pollution arising from such activities or incidents 'does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention.'

Art. 194(3) states, that the measures taken pursuant to this Part shall cover all sources of pollution of the marine environment. 'Including, *inter alia*, those designed to minimize to the fullest possible extent, 'the release of toxic, harmful or noxious substances, especially those which are persistent, from land-based sources, from or through the atmosphere or by dumping'[114]

Having established in Chapter One, that the Baltic Sea is a fragile ecosystem, then it is important to say, that this Part of UNCLOS also includes measures necessary 'to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.'[115]

Now it is important to look at what UNCLOS states in relation to cooperation in this area. Article 197 provides a general duty to cooperate on a global/regional basis, whether directly or through international organisations to formulate and elaborate further rules, standards and recommended practices for the protection and preservation of the marine environment, taking into consideration characteristic regional features. Having stated earlier, that the Baltic Sea is a semi-enclosed sea, it also fits within the definition of an "enclosed or semi-enclosed sea" under Art. 122. Therefore, Article 123 provides for the cooperation of States bordering enclosed or semi-enclosed seas, either directly or through an appropriate regional organization. Most importantly, for the purposes of this research, they shall coordinate: 'the implementation of their rights and duties with respect to the protection and preservation of the marine environment'[116]; 'their scientific research policies and undertake where appropriate joint programmes of scientific research in the area'.[117] As well as, to endeavour: 'to invite, as appropriate, other interested States or international organizations to cooperate with them in furtherance of the provisions of this article.'[118]

Furthermore, under Art. 198 States shall immediately notify other States it deems likely to be affected, as well as the competent international organizations, in case of imminent or actual damage to the marine environment. In such cases, States need to jointly develop and promote contingency plans against pollution under Art. 199, whereby 'States in the area affected, in accordance with their capabilities and the competent international organizations shall cooperate, to the extent possible, in eliminating the effects

[114] Art. 194(3a) of UNCLOS.
[115] Art. 194(5) of UNCLOS.
[116] Art. 123(b) of UNCLOS.
[117] Art. 123(c) of UNCLOS.
[118] Art. 123(d) of UNCLOS.

of pollution and preventing or minimizing the damage.'

The keywords in Art. 199 are "in accordance with their capabilities", as this refers to a duty of due diligence. On this point on dumped chemical weapons and nuclear waste in the Arctic Ocean, it has been stated, that recovery of such materials '…could thus be required under the UNCLOS only if it would be technically and financially feasible as well as safe for the concerned States.'[119] Part XII, Section 2 also provides under Art. 200 for States to cooperate 'for the purpose of promoting studies, undertaking programmes of scientific research and encouraging the exchange of information and data acquired about pollution of the marine environment.' and under Art. 201 for scientific criteria for regulations. These provisions will be shown to be of further relevance and applied to the problem at hand in Chapter Four.

2.4 Chemical Weapons Convention and the Organisation for the Prohibition of Chemical Weapons

The next logical step, since the problem involves the sea and chemical weapons, is to look at the Chemical Weapons Convention and the Organisation for the Prohibition of Chemical Weapons. However, these are of less relevance than one might think, because of the chemical weapons having been dumped in the Baltic Sea decades before the cut-off-date of 1985. 'At the same time, the Convention leaves for the Member States the decision whether they declare sea-dumped chemical weapons to the OPCW.'[120] Therefore, there are some considerations regarding the role of the OPCW that should still be put forward, as it is after all the organisation with the most expertise on chemical weapons in general.

It is important to state, that the provisions relating to the cut-off-date, do not preclude the OPCW from acting '…as a venue for voluntary discussions and cooperation between OPCW Member States, the Technical Secretariat, and related international organisations, industries and NGOs, on the issue of sea-dumped chemical weapons.'[121] As well as including governments and academia for these purposes.[122] The OPCW is of the view, that the international organisations should become partners in dealing with the problem, assist in addressing the various risks which research activities and international exchanges have identified and provide support for '…improving national capabilities for response in the case of incidents involving sea-dumped chemical weapons.'[123]

In recent times the OPCW, at the initiative of various concerned States, has for example issued two statements on 'Broadening International Cooperation on Sea-dumped Chemical Weapons and Promoting the OPCW as a Forum for Voluntary Cooperation on the Issue', in 2013[124] and in 2018[125]. In both of them, the OPCW stresses, that: 'The topic of sea-dumped chemical weapons is not new at the OPCW.'[126] It goes on

[119] Jorri Carolina Duursma, 'Legal Responsibility of States' in Duursma EK (ed), 'Dumped Chemical Weapons in the Sea – Options –' (1999) Dr.A.H. Heineken Fondation pour l'Environnement, p. 43. As found in: cf. Alexander Lott (n 217), p. 65.

[120] OPCW, 'Broadening International Cooperation on Sea-dumped Chemical Weapons and Promoting the OPCW as a Forum for Voluntary Cooperation on the Issue' (8 April 2013) RC-3/NAT.14, para. 9.

[121] Ibid.

[122] Ibid., para. 3.

[123] Ibid., para. 7.

[124] Ibid.

[125] OPCW, 'Broadening International Cooperation on Sea-dumped Chemical Weapons and Promoting the OPCW as a Forum for Voluntary Cooperation on the Issue' (28 November 2018) RC-4/WP.3/Rev.2.

[126] Cf. OPCW 2013 (n. 120), para. 8.

to state the various steps the OPCW has taken in relation to the problem, such as, that: 'The First Conference of the States Parties took a decision on declarations related to sea-dumped chemical weapons.'[127] Furthermore, several events on sea-dumped chemical weapons have been attended by the OPCW representatives and organised by the OPCW, as well as: 'Concern on this issue was also expressed in the recommendations of the Advisory Panel on Future OPCW Priorities (agreed upon unanimously).'[128]

Additionally, each State Party shall, in line with Article VII (3), in the implementation of its obligations under the Chemical Weapons Convention 'assign the highest priority to ensuring the safety of people and to protecting the environment, and shall cooperate as appropriate with other States Parties in this regard.'[129]

The OPCW has stated, that taking into account UNGA Resolution 68/258, the Organisation should, in addition to serving as a forum for voluntary consultation and cooperation according to Article VIII (1) of the Convention[130], also 'invite States Parties to support voluntary sharing of information' and 'raise awareness and facilitate cooperation on this issue'.[131] The Scientific Advisory Board of the OPCW has noted in its report SAB-27/1 of March 23, 2018 regarding the challenges of old chemical weapons and verification, that assistance (of the OPCW Technical Secretariat) in identifying and disposing of a small number of items of recovered sea-dumped chemical weapons is expected to be an ongoing need for the Secretariat.[132] Based upon this, further measures 'could be developed and implemented on a voluntary basis by the Technical Secretariat and States Parties'[133]. These include: supporting the implementation of the UN General Assembly Resolution 68/258, sharing information related to disposal, informing the public of the possible hazards, continuing efforts to identify appropriate actions to mitigate such hazards if contact does occur, developing and spreading materials for maritime industries to educate about the potential hazards and considering 'ways to maintain knowledge, expertise and capabilities required to address the issue, as well as enhance national capacities in this regard'.[134]

2.5 The European Union

Since all the States, except the Russian Federation, party to the Helsinki Convention are also part of the EU, then the efforts by the EU should be looked at. In 2005–2008 the EU-funded project 'Modeling of Environmental Risks related to sea-dumped Chemical Weapons'[135] (MERCW) focused on the Bornholm dumpsite and aimed to develop a multidisciplinary approach to the problem.[136] The accompanying scientific publications, which amongst other things developed 'a release and migration model of chemical warfare agents from the dumpsite' and 'an assessment of the environmental threat' have been dealt with to some extent in Chapter One.[137]

In 2011 the EU started another project funded by the European Regional Development Fund within the framework of the Baltic Sea Region Program, the 'Chemical Munitions Search & Assessment'[138] (CHEMSEA), which focused instead

127 Ibid.
128 Ibid.
129 Ibid.
130 Cf. OPCW 2018 (n. 125), p. 2.
131 Ibid., p. 3.
132 Ibid.
133 Ibid.
134 Ibid., p. 4.
135 EU FP6 project, 'Modeling of Environmental Risks related to sea-dumped Chemical Weapons' (2005–2008).
136 Cf. HELCOM 2013 (n 11), p. 26.
137 Ibid. For accompanying scientific publications see: Sanderson and others 2007–2010.
138 EU-funded project, 'Chemical Munitions Search & Assessment' (2011).

on the Gotland dumpsite as well as dispersed unverified and unofficial dumps. It continued and expanded '…on the multidisciplinary approach pursued by the MERCW project in order to perform risk assessments of the dumpsites by means of extended surveys, modeling and biomarker approaches.'[139] Furthermore, it aimed '… at providing risk assessment tools to be used by the maritime administrations of the Baltic countries.'[140] A scientific publication on the CHEMSEA project has also been covered in Chapter One.[141]

2.6 The North Atlantic Treaty Organization

Flowing from the part on the EU, we get to NATO, which has had the issue of sea-dumped chemical weapons intermittently on the agenda. In 2013 NATO launched the project 'Towards the Monitoring of Dumped Munitions Threat'[142] (MODUM) under the NATO Science for Peace and Security (SPS) program, which was undertaken in close cooperation with the CHEMSEA project. The project '…aimed to establish a cost-effective monitoring network to observe munition dumpsites in the Baltic Sea, using Autonomous Underwater Vehicles (AUVs) and Remotely Operated Underwater Vehicles (ROVs)'.[143] Furthermore, the gathered data 'will serve as a basis for a risk management tool for decision-makers to determine their responses in face of the dumped munition sites' and overall, help 'the nations surrounding the Baltic Sea to form a long-term strategy to combat this threat'.[144]

Additionally, NATO has organised various conferences and advanced research workshops on sea-dumped chemical munitions. As well as dealt with the problem in the 1996 NATO report 'NATO and Partner Countries Study Defense-Related Radioactive and Chemical Contamination', which for example found that the large quantities of sea-dumped chemical weapons in the Baltic Sea (together with the Skagerrak and possibly the Arctic Sea) constitutes 'the most outstanding example of cross-border contamination'.[145]

2.7 The International Dialogue on Underwater Munitions

Of importance is also the International Dialogue on Underwater Munitions (IDUM), which '… was established as a series of international conferences rooted in Northern America and is strongly affiliated to its marine research and explosive ordnance disposal industry.'[146] 'IDUM's mission is to promote the creation of an internationally binding treaty on all classes of underwater munitions that would encourage countries to collaborate on underwater munitions policy, research, science, responses and a donor trust fund.'[147]

It works through international diplomacy and via a multitude of national and international programs '…towards better understanding the socio-economic impact of decaying munitions on both human health and the environment.[148]

IDUM receives advice from the International Scientific Advisory Board on Sea-Dumped

---

139 Cf. HELCOM 2013 (n 11), p. 26.
140 Ibid.
141 Cf. and others (n 28).
142 NATO Science for Peace and Security Programme, 'Towards the Monitoring of Dumped Munitions Threat' (2013) NATO Doc. PPC-N 0054 2013.
143 NATO-News, 'Monitoring dumped munitions in the Baltic Sea' (2016) <https://www.nato.int/cps/en/natohq/news_136380.htm> accessed 15 June 2019.
144 Ibid.
145 Martens and others, 'NATO and partner countries study defense-related radioactive and chemical contamination.' (1996) NATO Review 44, p. 11–16. As found in: cf. HELCOM 2013 (n 11), p. 19.
146 Cf. HELCOM 2013 (n 11), p. 20.
147 Ibid.
148 Ibid.

Chemical Weapons in The Hague and has collaborated with the Marine Technology Society Journal to publish three special international issues on the 'Legacy of Underwater Munitions: Science, Technology and Potential Responses'.[149] 'With regard to public awareness, IDUM is working on two international documentaries on sea-dumped munitions and towards the establishment of regional representatives.'[150] Within its framework several conferences have been held from 2007 to 2013.

3. The Precautionary principle

3.1 The precautionary principle as found in relevant international documents

As a starting point for the discussion on the precautionary principle it is important to state in which relevant international documents it can be found. It is largely held, that: 'From 1990 onwards, the number of treaties referring to the precautionary principle increased, as a result of its formulation in Principle 15 of the Rio Declaration.'[151] Regarding this, it has been noted by ITLOS in its *Advisory Opinion on Responsibilities in the Area*, that: 'In the view of the Chamber, this has initiated a trend towards making this approach part of customary international law.'[152] Principle 15 of the 1992 Rio Declaration[153] states, that the precautionary approach shall be widely applied to protect the environment, according to States capabilities and, that 'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.'

Signed by over 170 countries, it was also signed by all the countries and the EU (then EEC) that are also parties to the Helsinki Convention. The precautionary principle forms also part of the Helsinki Convention in its fundamental principles and obligations in Art. 3(2). Which, due to its utmost importance for the purposes of this research, shall be provided here in full:

'The Contracting Parties shall apply the precautionary principle, i.e., to take preventive measures when there is reason to assume that substances or energy introduced, directly or indirectly, into the marine environment may create hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects.'

Since all the State Parties to the Helsinki Convention, except Russia, are also nowadays part of the EU, it is necessary to look at what the Treaty on the European Union (TEU)[154] and the Treaty on the Functioning of the European Union (TFEU)[155] provides. Reference to the precautionary principle is found in both Art. 130r (2) of the TEU and Art. 191 (2) of the TFEU and they use identical language in this respect and state, that the Union (then Community, in TEU- HHK) policy on the environment shall aim at a high level of protection and will do so by bearing I mind the diversity of situations in the Union. 'It shall be based on the precautionary principle and on

[149] Ibid.
[150] Ibid.
[151] Pierre-Marie Dupuy and Jorge E. Vinuales, *International Environmental Law*, (2018) Second edition, Cambridge University Press, p. 71.
[152] *Responsibilities and Obligations of States sponsoring Persons and Entities with respect to Activities in the Area*, Case No. 17 ITLOS (Seabed Dispute Chamber), Advisory Opinion, 1 February 2011, para. 135.
[153] UN Conference on Environment and Development (1992).
[154] Treaty on the European Union, signed in Maastricht on 7 February 1992, OJ C 191, 29.7.1992, p. 1–112.
[155] Treaty on the Functioning of the European Union, as amended by the Lisbon Treaty, signed on 13 December 2007, consolidated version: Official Journal C 326, 26/10/2012 p. 0001 – 0390.

the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.'

Furthermore, on the EU level the European Commission has adopted a Communication on the use of the precautionary principle in 2000.[156] Amongst others, it is stated, that the precautionary principle forms part of a structured approach to the analysis of risk and is especially relevant for the management of risk.[157] It encompasses cases where scientific evidence is insufficient, inconclusive or uncertain '…and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU.'[158]

For implementing an approach based on the precautionary principle, an as complete as possible scientific evaluation needs to be made and the degree of scientific uncertainty identified at each stage and that decision-makers need to be aware of this.[159] Especially, as: 'Judging what is an "acceptable" level of risk for society is an eminently political responsibility.'[160] Action can include initiatives from legally binding measures and research projects to recommendations and the procedure for reaching a decision '…should be transparent and should involve as early as possible and to the extent reasonably possible all interested parties.[161]

'Where action is deemed necessary, measures based on the precautionary principle should be, *inter alia*: proportional to the chosen level of protection; non-discriminatory in their application; consistent with similar measures already taken; based on an examination of the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis); subject to review, in the light of new scientific data and capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment.'[162]

Short reference needs to be made to the fact, that the OSPAR Convention features the precautionary principle in Art. 2 (2a) and the 1996 Protocol to the 1972 London Convention features the precautionary approach in Art. 3 (1). Which is why it is important to mention them to prove the prevalence of precaution in international treaties, even though the 1996 Protocol is of limited use for the purposes of this article. The OSPAR Convention is more relevant, as all of the States in the Baltic Sea Area, except Russia, are either signatories to it or involved by extension through the EU. OSPAR will be of importance through cooperation with HELCOM concerning the Skagerrak or if the decision is made on the EU level to address even more areas facing the problem of sea-dumped chemical weapons.

It is evident that there is no shortage of applicable legal regimes where we can find the precautionary principle, both those directly applicable and those that there's been some reference made to prior in this research. Therefore the exact content and requirements of the precautionary principle needs to be analysed next. It should be noted, that there is an ongoing debate regarding the precise legal implications of precaution, as well as its normative basis.[163] It could be considered and argued to be: 'an ob-

[156] European Commission, 'Commission adopts Communication on Precautionary Principle', 2 February 2000, Brussels, IP/00/96.
[157] Ibid., general and para. 3.
[158] Ibid.
[159] Ibid., paras. 4 and 5.
[160] Ibid., para. 5.
[161] Ibid.
[162] Ibid., para. 6.
[163] Cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 70.

ligation to take action, despite the lack of sufficient evidence about the danger that an activity poses to the environment'; or 'a simple authorisation to take such measures'; or 'a procedural rule shifting the burden of proof (or lowering the standard of proof to facilitate such a shift) when certain activities are potentially harmful to the environment'.[164] This article is not meant to enter into this debate to a considerable extent per se, but instead to state the applicable law in relation to the problem of sea-dumped chemical weapons in the Baltic Sea and analyse to what extent the precautionary principle applies to it.

3.2 The precautionary principle as found in case law

This brings us to looking at how precaution has been dealt with and applied by the relevant Courts and Tribunals, such as the ICJ, ITLOS, CJEU and ECtHR. In the case law of the ICJ we find the first mention of the precautionary principle in the 1995 Order of the *Nuclear Tests*[165] case, however for the purposes of this research, the first ICJ case to be examined is that of the *Gabcikovo-Nagymaros Project*[166] case. In this case Hungary argued: '…that it was entitled to terminate the 1977 Treaty because new requirements of international law for the protection of the environment precluded performance of the Treaty.'[167] Whilst the Court did not agree with this, it stated, that 'The awareness of the vulnerability of the environment and the recognition that environmental risks have to be assessed on a continuous basis have become much stronger in the years since the Treaty's conclusion.'[168]

Even though this article does not involve aspects to do with performance of a treaty or its termination, these statements by the Court are of relevance, as they exemplify, that both new legal and scientific developments regarding the environment can play a significant role in how an environmental problem is looked at and dealt with. As this is definitely the case with developments regarding the chemical weapons having been dumped in the Baltic Sea since mid-1940s, then so could the precautionary principle play a much bigger role in respect of the problem currently, as opposed to for example during its earlier formulations around the 1990s.

Turning to the *Pulp Mills*[169] case, it is interesting to note, that even though both contending Parties, Argentina and Uruguay expressly referred to the general principles of international environmental law that had application in the case, in particular the principles of prevention and of precaution the Court did not find it necessary to dwell further upon them.[170] Since the Court did not even assert or endorse those principles, then Judge Cançado Trindade found it his duty to do so in his Separate Opinion.[171] He starts by stating the two key elements to the configuration of the precautionary principle, which are: '…namely, the awareness of the existence or persistence of risks, and the awareness of scientific uncertainties surrounding the issue at stake.'[172] As well, that both the principle of prevention and principle of precaution '…are

[164] Ibid.
[165] *Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court's Judgment of 20 December 1974 in the Nuclear Tests (New Zealand v. France) Case*, Order of 22 September 1995, I. C. J. Reports 1995, p. 288.
[166] *The Gabcikovo-Nagymaros Project Case (Hungary/Slovakia)*, Judgment of 25 September 1997, Judgment, 1. C. J. Reports 1997, p. 7.
[167] Ibid., para. 111.
[168] Ibid., para. 112.
[169] *Case Concerning Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgment 20 April 2010, I.C.J. Reports 2010, p. 14.
[170] *Pulp Mills* case, Separate Opinion of Judge Cançado Trindade, para. 46, 51 and 67.
[171] Ibid., para. 46.
[172] Ibid., para. 62.

intended to guide or orient initiatives to avoid harm or probable harm to the environment.'[173]

Covering the element of risk, Judge Cançado Trindade states, that care and due diligence in face of surrounding risks is required due to the 'growing awareness of the vulnerability of human beings and of the environment' and that this 'has led to the acknowledgement of the need to take initiatives and decisions, even without a thorough knowledge of the relevant factors in a given situation' in order to protect human life and the environment.[174] Concerning the environment, the precautionary principle entails '… the requirement to undertake complete environmental impact assessments, and the obligations of notification and of sharing information with the local population (and, in extreme cases, even with the international community).'[175]

Having established earlier how many uncertainties there are and that further research is clearly needed, then it should be noted that: 'For an effective implementation of the precautionary principle research is of the essence along the entire trajectory.'[176] It is considered an indispensable tool to '(1) detect dangers in an early stage; (2) assess environmental impacts; (3) overcome or reduce uncertainties; (4) develop and examine alternatives to potential hazards; and to (5) monitor the effects of precautionary action taken'[177]

Despite the importance of research at every stage, it is in the author's view unlikely to reach a quantifiable point, where we could be considered to have all the information necessary regarding the problem, at least before it's too late, given the critical timeframe and maybe never. Given '…the recognition of the limitations in scientific knowledge on ecosystems.'[178] Therefore, giving expression to the precautionary principle is also '…the reckoned need of consideration of alternative courses of action, in face of probable threats or dangers'.[179]

Judge Cançado Trindade makes further reference to two related aspects under the element of probable risk: '…the growing awareness of the vulnerability of human beings and the environment, and the recognition of the need to take precautionary action, prompted by the probability of irreversible environmental harm.'[180]

Moving onto the element of scientific uncertainties, Judge Cançado Trindade reiterates the necessity of precaution in the face of human fallibility and wickedness. As considering the vulnerability of humankind, the risks surrounding everyone, the insufficiencies and uncertainties of scientific knowledge '…and the unpredictability and likely irreversibility of probable environmental harms, we cannot prescind from the precautionary principle.'[181]

Furthermore, he connects this to the ineluctable inter-temporal dimension, which 'is necessarily a long-term one, since the decisions taken by public authorities of today may have an impact on the living conditions of not only present, but also future generations.'[182]

Having referred to the case law of ITLOS shortly at the start of this Chapter through its *Advisory Opinion on Responsibilities in the Area* it is important to state, that this has not been the only time ITLOS has noted the precautionary principle. In the *Southern Bluefin Tuna*[183] cases, both New Zealand and Australia had request-

[173] Ibid.
[174] Ibid., para. 69.
[175] Ibid., para. 71.
[176] Arie Trouwborst, 'Precautionary Rights and Duties of States' (2006) BRILL, p. 174.
[177] Ibid.
[178] Cf. *Pulp Mills* case (n 170).
[179] Ibid.
[180] Ibid., para. 73.
[181] Ibid., para. 89.
[182] Ibid., para. 90.
[183] *Southern Bluefin Tuna Cases (New Zealand v. Japan; Australia v. Japan)*, Provisional Measures ITLOS Case Nos. 3 and 4, Order 27 August 1999.

ed the arbitral tribunal to adjudge and declare, that Japan 'otherwise failing in its obligations under UNCLOS in respect of the conservation and management of SBT having regard to the requirements of the precautionary principle'[184] and 'that the parties act consistently with the precautionary principle in fishing for SBT pending a final settlement of the dispute'[185]. The Tribunal considered, that '…the parties should in the circumstances act with prudence and caution to ensure that effective conservation measures are taken to prevent serious harm to the stock of southern bluefin tuna'[186]. Similarly, in the *MOX Plant*[187] case the Tribunal stated, that 'prudence and caution' require States to cooperate to protect the environment.[188]

Coming to case law on the European level the precautionary principle is dealt with and recognised in an even more concrete way. For example the Court of First Instance (CFI) and CJEU '…have clearly recognised the normative basis of the precautionary principle as a general principle of European law.'[189] Among other factors, this is mainly due to the explicit mention of this principle in the base documents of the EU, i.e. in the TFEU and the TEU.[190] In the case of *Artegodan GmbH and others v. Commission*[191], the CFI held the precautionary principle to be a general principle of Community law, which requires '… the competent authorities to take appropriate measures to prevent specific potential risks to public health, safety and the environment, by giving precedence to the requirements related to the protection of those interests over economic interests.'[192]

Of further note, is that the ECtHR has reversed its long-standing reluctance to accept the precautionary principle in the case of *Tatar v Romania*[193]. It now recognises the importance of the precautionary principle, which 'was intended to apply in order to ensure a level of high protection of health, the safety of consumers and the environment in all Community activities'.[194]

3.3 Application of the precautionary principle to the present problem

As can be seen from the aforementioned, the precautionary principle has two core elements, risk and scientific uncertainty. The element of action to be taken can be considered to simply flow from these two core elements or be considered to constitute a third core element. It is now important to analyse how the precautionary principle applies to the problem of sea-dumped chemical weapons in the Baltic Sea.

First, looking at the core element of risk, the threshold and probability of it needs to be stated: 'threats of serious or irreversible damage' in Principle 15 of the Rio Declaration and, that it 'may create hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea' in Art. 3 (2) of the Helsinki Conven-

184 Ibid., para. 28 (1e) and 29 (1e).
185 Ibid., para. 31 (3) and 32 (3).
186 Ibid., para. 77.
187 *MOX Plant Case (Ireland v. United Kingdom)*, ITLOS Case No. 10, Order 3 December 2001.
188 Ibid., para. 84. As found in: cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 73.
189 *Pfizer Animal Health SA v. Council*, CFI Case T-13/99, Judgment 11 September 2002, paras. 114–115; *Gowan Comercio Internacional e Servicos Lda v. Ministro della Salute*, CJEU Case C-77/09, Judgment 22 December 2010, para. 75. As found in: cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 73.
190 Cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 73.
191 *Artegodan GmbH and others v. Commission*, ECR II-4945.
192 Ibid., para. 184.
193 *Tatar v Romania*, EctHR Application No. 67021/01, Judgments of 27 January 2009 and 6 July 2009. As found in: cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 73.
194 Ibid., para. 120. As found in: cf. Pierre-Marie Dupuy and Jorge E. Vinuales (n 151), p. 73.

tion. Through case law we find further confirmations of the threshold: 'probability of irreversible environmental harm' and 'probable threats or dangers' in Judge Cançado Trindade's Separate Opinion in the *Pulp Mills* case and 'serious harm' in the *Southern Bluefin Tuna* cases at the ITLOS.

Secondly, coming to the core element of scientific uncertainty, it is important to state, that it can be scientific uncertainty in respect of many aspects, like the extent and probability of potential harm for example. We can once again find examples of its threshold from the applicable legal regimes: 'lack of full scientific certainty' in Principle 15 of the Rio Declaration and, that 'even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects' in Art. 3 (2) of the Helsinki Convention. Case law adds further clarification in relation to this: 'the recognition of the limitations in scientific knowledge on ecosystems' and 'the insufficiencies of scientific knowledge — surrounded by uncertainties' in Judge Cançado Trindade's Separate Opinion in the *Pulp Mills* case.

With regards to the element of action to be taken, connected to the element of risk and scientific uncertainty, the wording used for this in the applicable legal regimes needs to be analysed too: 'lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation' in Principle 15 of the Rio Declaration and 'to take preventive measures' in Art. 3 (2) of the Helsinki Convention. Through case law the exact content of action to be taken becomes even clearer: 'requiring care and due diligence', 'the need to take initiatives and decisions', etc. in Judge Cançado Trindade's Separate Opinion in the *Pulp Mills* case; 'require States to cooperate to protect the environment' in the *MOX Plant* case at the ITLOS; 'requiring the competent authorities to take appropriate measures' in *Artegodan GmbH and others v. Commission* at the CFI of the EU.

Bearing in mind the scientific information put forward in Chapter One, it is evident, that the problem of sea-dumped chemical weapons in the Baltic Sea fulfils the criteria for triggering the precautionary principle. Whichever wording for the precautionary principle were to be examined, chemical weapons are by their very nature hazardous, especially as some of them can persist in the marine environment for a long time because of viscous mustard gas forming lumps and others, that form compounds containing arsenic and therefore constitute a threat of serious or irreversible damage. It may most certainly create hazards to human health and interfere with the legitimate uses of the sea by people coming in contact with CWAs through fishing or various offshore activities and projects. The extent of this happening depends on various factors regarding the Baltic Sea and chemical weapons themselves, as well as how the activities in question in the problem areas are conducted, giving rise to the first bunch of uncertainties. There are reasonable grounds for concern, that harm to living resources and marine ecosystems is happening, as many studies have found some type of probable chronic or negative effects and the most recent study from 2019 showed bioaccumulation of oxidized CWAs into marine organisms, which caused impairments.

There is a lack of scientific certainty about many of the threats to the marine environment, especially regarding the extent to which serious harm is happening. This is due to the scientific evidence being insufficient, inconclusive or uncertain, but based on what we know thanks to the pre-existing scientific knowledge there is a probability of irreversible environmental harm. Amongst other considerations, given our limitations in scientific knowledge on ecosystems and uncertainties about the exact locations and fate

of sea-dumped chemical weapons in the Baltic Sea, one could envision the problem being much more widespread and serious than we know based on the in many ways limited studies done on the problem. Furthermore, if populations of fish come into contact with CWAs, then this opens the door for an increased probability of risk to the rest of the food chain, including those of us that consume sea-food.

In Chapter Four the exact content of which preventive measures are required to be taken, as well as which initiatives and decisions need to seriously be considered as alternative courses of action shall be analysed. It is considered, that '…it would seem that essentially every type of environmental measure can be a precautionary measure in the scheme of the precautionary principle.'[195] As well as, that '…apparently action to implement the precautionary principle can take any form as long as it is effective and proportional.'[196] This would suggest that in addition to the need for further research and EIAs to be taken, as well as fishing limitations to be enforced, remediation needs to be considered and possibly taken as this is the main way to address the problem, since there is no other way to reduce or eliminate the on-going pollution from the leaking chemical munitions. In Chapter Four it will be further shown, that this could be done in an effective and proportional way.

4. Responsibility, due diligence, action to be taken and considered, as well as recommendations for the future

4.1 Responsibility of States to take measures to protect and preserve the marine environment and to take measures to prevent and eliminate pollution

It was established in Chapter One, that there are significant risks and many uncertainties connected to the problem of sea-dumped chemical weapons in the Baltic Sea. This was argued to fit into the precautionary principle in Chapter Three, which provided a further element of action to be taken. It therefore becomes necessary to analyse, that on the basis of which relevant provisions of the applicable legal regimes can responsibility be established and what it exactly entails. This will include a discussion on different connected considerations from what action is required and what should be considered, to questions on economic feasibility and balancing of risk between risks arising from leaving the CWAs in place as compared to potential remediation. The final part of the analysis shows who has what role with regards to the problem and recommendations for the future.

The starting point for arguing for responsibility for current conduct in relation to the problem shall be looking at UNCLOS and its applicable provisions. In addition to a general obligation for States to protect and preserve the marine environment under Art. 192, we can also find more specific duties under Art. 194. Art. 194 (1) provides, that all measures consistent with UNCLOS that are necessary need to be taken. By using 'best practicable means at their disposal and in accordance with their capabilities'. This refers to a duty of due diligence and shall therefore be analysed later on in some more detail. Art. 194 (3) gives, that these measures 'shall deal with all sources of pollution of the marine

[195] Cf. Arie Trouwborst (n. 176), p. 179.
[196] Ibid., p. 180.

environment' and shall include those designed to minimize to the fullest possible extent 'the release of toxic, harmful or noxious substances, especially those which are persistent'. Under Art. 194 (5) we find that States shall take measures necessary for protecting and preserving 'rare or fragile ecosystems'.

This raises the question whether only current introduction of pollution to the marine environment by dumping is covered under the relevant provisions or whether the chemical weapons having been dumped in the Baltic Sea in the mid-1940s could be covered too. Even though the dumping happened long ago and was legal at the time, the fact, that it presents an on-going introduction of pollution to the Baltic Sea through the corroding munitions and containers releasing their CWAs warrants the applicability of the relevant provisions on marine protection. In the author's view, this is especially the case since the wording in Art. 194 (1) includes 'pollution of the marine environment from any source' and since the pollution can be prevented, reduced and controlled, at least to some extent. As we know that CWAs are by their very definition harmful and toxic and some CWAs, such as viscous mustard gas and those that form compounds containing arsenic are highly persistent in the marine environment, then this fits the definition in Art. 194 (3a). Furthermore, since the Baltic Sea is a fragile ecosystem and includes species struggling for survival, then it can be said, that even more care and protection in the form of measures needs to be taken.

Through UNCLOS we also find a general duty for States to cooperate under Art. 197 and under Art. 123 concerning more specifically the cooperation of States bordering enclosed or semi-enclosed seas. The specifics of what coordination and endeavours are required under cooperation can be found in Chapter Two. What is important, is that in connection with Art. 198 duty of notification in the case of imminent or actual damage to the marine environment, under Art. 199 the affected States and the competent international organizations shall cooperate 'in accordance with their capabilities, to the extent possible, in eliminating the effects of pollution and preventing or minimizing the damage'. This wording yet again refers to a duty of due diligence and will therefore be returned back to shortly hereafter.

Similarly under the Helsinki Convention on a regional level, we find that States are under a responsibility under Art. 3 (1) to 'individually or jointly take all appropriate legislative, administrative or other relevant measures to prevent and eliminate pollution'. This is done by cooperation through HELCOM as its governing body and the wording once again relates to a duty of due diligence. Art. 5 makes direct reference to harmful substances and provides for the Contracting Parties to implement procedures and measures 'to prevent and eliminate pollution of the marine environment of the Baltic Sea Area caused by harmful substances from all sources.' Nothing in this suggests, that the problem of sea-dumped chemical weapons in the Baltic Sea would not trigger responsibility, especially as chemical weapons are harmful substances, constitute pollution of the marine environment and clearly falls under all sources, despite the chemical weapons being on the seabed since mid-1940s. Additional measures for protecting the marine environment shall be taken in close co-operation with appropriate governmental bodies and possibly together with competent regional and other international organizations under Art. 20 (e). This includes working with relevant scientific, technological and statistical information and promoting scientific and technological research.

The question also arises, whether 'substances or energy introduced, directly or indirectly' under Art. 3 (2) relating to the precautionary prin-

ciple includes chemical weapons dumped in the Baltic Sea. In the author's view it does, despite the chemical weapons being introduced to the marine environment many decades prior to the ratification of the Helsinki Convention, the on-going leaking of the munitions can be held to constitute an introduction of substances to the Baltic Sea. Therefore triggering the application of the precautionary principle in Art. 3 (2) and requiring preventive measures and initiatives to be taken, especially as there are significant risks to all categories stated under Art. 3 (2) for example, hazards to human health and harm to living resources and marine ecosystems.

4.2 Due diligence

Having mentioned, that several provisions in UNCLOS and the Helsinki Convention refer to a duty of due diligence, then it becomes necessary to analyse this slightly further. It needs to be stated, that the focus of this research is on applicable legal regimes and competent institutions, with States clearly being involved in those as Parties. However, the purpose is not to establish State responsibility in strict legal terms, such as negligence for current conduct, as this would need to involve a detailed analysis of what measures and initiatives States have taken, as well as the law on State responsibility and accompanying considerations to argue for ascribing legal responsibility to it in a complete and compelling manner. This would require a lengthy study on its own and/or possibly a panel of experts. Nonetheless, since States are unquestionably of relevance and since due diligence has found its way into this article through the connected consideration on what measures and initiatives could be reasonably expected from States faced with such a problem, then it is important to cover this, as well as shortly make suggestions regarding potential negligence. The primary focus will be on making recommendations for all involved Parties to take required measures and consider further initiatives, in addition to the ones taking place, on the basis of the applicable legal regimes and furthermore on the basis of the precautionary principle.

Due diligence is held to be an obligation of conduct on the part of a subject of law and is normally applied in an assessment 'whether a subject has met that obligation is that of the responsible citizen or responsible government.'[197] Failure in complying with the standard, often called negligence, 'describes the blameworthiness of the subject as one element of ascribing legal responsibility to it.'[198] Through the Commentary to the Draft articles on Prevention of Transboundary Harm from Hazardous Activities[199] we find further information regarding the content of due diligence. In relation to preventing significant transboundary harm it entails 'a duty to take all necessary measures' or 'at any event to minimize the risk thereof.' Amongst other things, this could involve various measures '…as are appropriate by way of abundant caution, even if full scientific certainty does not exist, to avoid or prevent serious or irreversible damage.'[200] A specific articulation of this can be found in principle 15 of the Rio Declaration, which was covered in Chapter Three.

The role played by the precautionary approach/principle in assessing due diligence obligations is considered to be still evolving.[201] Some scholars maintain, as more *de lege ferenda* views, that '…in the field of climate policy, for example, due diligence would require far-reaching measures from States because of the precaution-

[197] Timo Koivurova, 'Due diligence' (2010) Max Planck Encyclopedia of Public International Law, para. 1.
[198] Ibid.
[199] ILC, 'Draft articles on Prevention of Transboundary Harm from Hazardous Activities, with commentaries' (2001) Yearbook of the International Law Commission, vol. II, Part Two.
[200] Ibid., p. 155, para. 14.
[201] Cf. Timo Koivurova (n. 197), para. 18.

ary principle'.[202] It is also of importance, that '…(w)hat would be considered a reasonable standard of care or due diligence may change with time' and therefore '…due diligence in ensuring safety requires a State to keep abreast of technological changes and scientific developments.'[203]

Without delving deep into what measures the various States dealing with the problem have taken, in accordance with their capabilities, it suffices to say, that they are currently under a high standard of due diligence, arising from the obligations to protect and preserve the marine environment, as well as precautionary principle being considered applicable. The question remains in the air, whether current conduct and that from recent times, despite the numerous efforts at various levels, for example through HELCOM on a regional level has satisfied the standard of due diligence or can be considered to be negligence, especially considering how much the scientific awareness has arisen in relation to the seriousness of the problem. There are various separate legal questions connected to this that will unfortunately not be discussed in detail given the purpose and available space in the article.[204]

The author finds it more likely, that negligence can be established in the future in relation to current conduct and that of the upcoming years, if existing measures are not implemented and enforced properly and further measures and initiatives are not taken or at least considered as part of exercising abundant caution. Especially due to the critical time frame regarding the state of corrosion and leakage of the munitions, the fact that we have in the recent years became more aware about the risk of significant or irreversible harm taking place, the consideration of new technological and scientific developments opening new options and environmental concerns gaining prevalence.

4.3 Measures required to be taken

This brings us to looking at which measures and initiatives are required to be continued and implemented and enforced further in relation to the problem. It is a given, that additional scientific studies and evaluations, and increased cooperation and notification must be taken. Having established responsibility to protect the environment and eliminate pollution under several articles of both UNCLOS and the Helsinki Convention at the start of this Chapter, then the recommendations of the 2013 HELCOM Report could be argued to have become requirements and therefore need to be implemented to the fullest extent. The precautionary principle strengthens the argument for protection of the marine environment, humans and their various legitimate uses of the seas in this case. Having covered the recommendations from the 2013 HELCOM Report in full in Chapter Two, then it suffices to say here, that various measures regarding investigating and managing the problem, as well as informing the relevant Parties should be undertaken.

4.4 The need for remediation to be considered and connected aspects

It emanates from the aforementioned articles establishing responsibility in UNCLOS and the Helsinki Convention, as well as the even stronger element of action to be taken in connection with the precautionary principle, that there is the 'the reckoned need of consideration of alternative courses of action' in Judge Cançado Trindade's words in his Separate Opinion in the

[202] Ibid.
[203] Cf. Commentary to the Draft articles (n 199), p. 154, para. 11.
[204] For example whether the failure to enforce fishing limitations in problem areas constitutes a failure of the obligation of due diligence and therefore opens the door to State responsibility for transboundary harm.

Pulp Mills case. This alternative course of action in the present case is the question whether remediation for example in the form of site-specific recovery could take place. It has for a long time been considered by a number of scientists and international organisations to be best to leave the dump sites undisturbed, especially if they are in deep water.[205]

'Although it is nowadays believed that recovery of dumped munition may in some cases be technically feasible, there are serious concerns about the high risks involved both for salvage crews and for the marine environment.'[206] Nonetheless, the risk for the salvage crews and for the marine environment through remediation, including recovery needs to be weighed against the risk of leaving the munitions where they are. Since we know, that there is significant risk for irreversible harm from the chemical weapons, then even if a small percentage of CWAs spreads into the water column during recovery operations, then this is a drop in the ocean compared to the steady release of CWAs that is taking place and will take place otherwise. The risks to salvage crews can be minimized using special technologies for recovery and sarcophaging the munitions where the risk is considered too big, both of which shall be referred to later.

Before moving on further to argue for the option of remediation, including recovery to be strongly considered and analysing some connected questions, the basic remediation scenarios shall be listed. Marc Koch and others have listed 4 potential scenarios of remediation.[207] The first one being the "Permanent disposal scenario" under which no remediation of areas with dumped ammunition is made.[208] Secondly, the "By the way scenario" which means partial remediation of areas with dumped ammunition or contents by chance through fishing or from beaches and the accompanying tackling of dumping sites in the context of concrete building projects.[209] Thirdly, the "Hot spot scenario" which means complete remediation only of areas with high risks and/or significant quantities of ammunition.[210] Finally, the "Full clean up scenario" whereby all known areas with dumped ammunition are completely remediated.[211]

In my view the first option is not feasible, considering the risks and uncertainties connected to the problem, since it does not lead to an improvement. The second scenario, is exactly what it says it is and will take place by the way in any case. The fourth option, whilst if done right could lead to the biggest improvement, it may also create significant pollution due to the extent of remediation efforts that would need to take place and is economically and practically unfeasible. This leaves us with the third scenario, whereby detailed considerations for remediation on a site-specific basis would take place. This would involve a determination of the dumping grounds where there is overlap between the areas with the most polluting types of chemical weapons, such as viscous mustard gas and those that form compounds containing arsenic and areas where we know, that the munitions are still largely intact and accessible. When it comes to the "Hot spot scenario", I have to wholeheartedly agree with Mark Koch and others, that this solution '…with the related securing and remediation of confirmed pinpoint dumping sites

[205] Tine Missiaen and Jean-Pierre Henriet, 'Chemical munition dump sites in coastal environments: a border-transgressing problem' (2015) Renard Centre of Marine Geology, University of Gent, p. 6.
[206] Ibid.
[207] Marc Koch and others, 'Chemical and conventional ammunition in the Baltic Sea' (2014) Marine Biotechnology ERA-NET (ERA-MBT) funded under the European Commission's Seventh Framework Program.
[208] Ibid.
[209] Ibid.
[210] Ibid.
[211] Ibid.

seems to be the most likely realisable alternative from a technical, emission related and economical point of view.'[212] This remediation scenario is considered 'from an ecotoxicological and general risk related point of view' inevitable by Mark Koch and others.[213]

In the author's view the question of recovery should be considered, as the upcoming years present a timeframe, where it would still be possible to bring up some chemical weapons that present the biggest risk on the basis of current knowledge, before they all rust through and release the CWAs into the marine environment. Regarding recovery and technical feasibility, HELCOM itself has stated in their 2013 Report, that '…the option of recovering dumped chemical munitions should no longer be entirely excluded; rather, it should be considered as an option on a site-specific basis…'[214]

This is the case due to '…the advancement of technological options developed in the context of the offshore oil and gas industry over the past decades' and well developed means for safer disposal of chemical warfare materials.[215] This needs to be considered together with the fact that chemical weapons and CWAs have been brought up unintentionally with nets by fishermen. If fishermen, who are for the large part not competent to deal with chemical weapons, despite the guidelines that have been issued to them and the equipment they are supposed to have available on board, when operating in the problem areas, then surely if competent institutions, States and other interested actors put their heads together we could come up with a way to remediate, whilst minimizing the risks that arise. In addition to the aforementioned technological advances thanks to the offshore oil and gas industry, we also have the technology to mine the seabed for resources. If it is possible to do that, in the depths of thousands of metres, then we should be able to also find a way to recover chemical weapons at much shallower waters.

Deciding the method for recovery and the recovery itself will need to involve experts and it would most certainly mean keeping humans at as far of a distance for as many stages of the recovery process as possible, to minimize the risk. This could be achieved with the use of specific robots for this purpose or even a more conventional claw/box like contraption for bringing them up. One could even envision a process for bringing up those chemical weapons that are already leaking CWAs or at high risk of disintegrating, by bringing them up in hermetic containers, potentially together with a part of the surrounding soil (if applicable- for example when they are in a soft soil such as mud). The recoveries would then be lifted into a separate container suitable for these purposes on board of the vessel and most likely taken on land, where the chemical warfare materials would be destroyed in accordance with the CWC. However, in the authors view if the decision is made to recover some of them, then the starting point should be those, for which it makes the most sense to do so on the basis of an expert determination. Those chemical munitions, that fall under the overlap, but for which the risk is considered too high to recover them could be covered with a concrete sarcophagi.[216] It is held, that this '…may have potentially significant advantages over lifting the corroded

[212] Ibid.
[213] Ibid.
[214] Cf. HELCOM 2013 (n 11), p. 86–87.
[215] Ibid.

[216] This could result in the creation of artificial islands, for which the coastal State has the exclusive right in its EEZ under Art. 60 of UNCLOS.

containers and thus might be regarded in some instances as a more preferable'.[217]

Furthermore, it is considered, that sarcophaging would still be a 'highly costly technique in the context of the precautionary approach.'[218] This brings us to economic considerations, as the main reason why we have the technology for offshore oil and gas developments and deep-sea mining, is that even though those require hefty sums as investments, they also bring in profits, if the calculations on economic feasibility are done correctly. However, they are harmful to the marine environment to varying extents. Remediation of sea-dumped chemical weapons on the other hand is the complete opposite, as it involves high costs, with the return being simply prevention of further damage from taking place.

Through Principle 15 of the Rio Declaration and the European Commission Communication on the use of the precautionary principle we find mentions for economic considerations, 'cost-effective measures to prevent environmental degradation' and 'examination of the potential benefits and costs of action or lack of action' respectively. Despite even the limited remediation on the basis of determining hot-spots and most likely a mixture of recovery and sarcophaging to be undertaken being highly costly, it is nonetheless the most cost-effective method to tackle the problem in the face of risk of significant harm to the marine environment and potentially to humans. Focusing on hot-spots '…leads to a reduced but in the general context highly efficient solution attempt that does further result in a significant cost reduction compared to less efficient but more extensive measures.'[219] Given the uncertainty regarding the problem, it would give us at least some peace of mind, that we have done something to the extent that it is reasonable and economically feasible to do so.

A number of other legal considerations arise from considering and undertaking remediation. The first one being the requirement to do environmental impact assessments prior to remediation. The requirement to undertake complete environmental impact assessments flows more generally from the precautionary principle as covered in the *Pulp Mills* case, where it was accorded the status of customary international law. More specifically, under Art. 206 of UNCLOS States shall assess the potential effects of activities on the marine environment, when there are '…reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment'. Of relevance is also Art. 204, which provides for monitoring of risks and Art. 205, which provides for publication of reports. Art. 7 of the Helsinki Convention provides a similar requirement to take environmental impact assessments on the HELCOM level and also connects it to a requirement to '…notify the Commission and any Contracting Party which may be affected by a transboundary impact on the Baltic Sea Area.' Under Art. 194 (2) of UNCLOS 'States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted' as to not cause damage by pollution, including transboundary damage.[220]

[217] Alexander Lott, 'Pollution of the Marine Environment by Dumping: Legal Framework Applicable to Dumped Chemical Weapons and Nuclear Waste in the Arctic Ocean' (2015) 57–69 Nordic Environmental Law Journal, p. 68.
[218] Ibid.
[219] Cf. Marc Koch and others (n. 207).
[220] Article 195 of UNCLOS on the duty not to transfer damage or hazards or transform one type of pollution into another might also be applicable. The 2001 Draft Articles on Transboundary Harm and the 1991 Espoo Convention are also of relevance when it comes to transboundary harm.

This means, that since remediation has some risks attached to it, it opens the requirements of environmental impact assessments to be done and relevant Parties to be notified and consulted. Therefore, remediation can also be argued against on the basis of risk of transboundary harm, but furthermore also on the basis of the precautionary principle. This is why it is so important that the contemplation and potential fulfilment of remediation involve experts and all interested Parties and that it shall be done in a calculated and careful way, so that the risks arising from remediation are minimal as compared to the risks of leaving the chemical weapons as they are.

Another question that arises in connection with remediation through recovery is whether obligations for State Parties under the CWC come into effect, given that a State Party to the CWC is not required to declare or destroy chemical weapons dumped at sea before 1985. On this point the answer from Alexander Lott is the most logical and agreeable, he argues, that since Article I (1a) of the CWC relating to prohibited activities includes the wording "otherwise acquire" and "retain" a State Party would need to destroy the chemical weapons in accordance with Article I(2).[221] Thereby the recovered or discovered chemical weapons would fall under '…Article III(1)(a) and (b) of the CWC, whereby they have to be declared and subsequently destroyed in accordance with either Part IV(A) or Part IV(B) of the Verification Annex'.[222]

This opens the door to many other requirements under the CWC once the chemical weapons have been declared by a State Party, for example to provide the chemical weapons destruction plans under Part IV(A) of the Verification Annex (para. 6) and to 'submit subsequent annual declarations' under Part IV(A) of the Verification Annex (paras. 29 and 36).[223] Furthermore, there is a requirement to provide 'detailed facility information for each of its chemical weapons destruction facilities' in accordance with Part IV(A) of the Verification Annex (paras. 30–32).[224]

4.5 Roles of competent institutions and general recommendations for the future

The final part of this research shall look at which competent institutions have what kind of a role in relation to the problem, as well as general recommendations for the future. Since numerous competent institutions and many States have an extensive role and interest in improving the situation, as well as by extension some NGOs and connected industries, ranging from fishing and salvaging to oil and gas then cooperation is required. This is called for by UNGA Resolution A/RES/65/149. Additionally, all the applicable legal regimes covered to various extents earlier in this article, have provisions relating to cooperation: Art. 197, Art. 123 and Art. 199 of UNCLOS; Art. 7 (3) and Art. 20 (e) of the Helsinki Convention; Art. VIII (1) and Art. VII (3) of the CWC; and Art. 4(3) of the TEU. Whilst EU law has not been covered further, than to demonstrate the prevalence of the precautionary principle, it needs to be stated, that the duty to cooperate and responsibility to take appropriate measures as found in the precautionary principle on the EU level provide in the author's view as solid arguments as those under international law. Relating to competent institutions, as covered in Chapter Two, we find further mentions and efforts of cooperation, for example: HELCOM has called

[221] Alexander Lott, 'Pollution of the Marine Environment by Dumping: Legal Framework Applicable to Dumped Chemical Weapons and Nuclear Waste in the Arctic Ocean' (2015) 57–69 Nordic Environmental Law Journal, p. 64.
[222] Ibid.
[223] Ibid.
[224] Ibid.

for further national and/or international studies and has suggested cooperation with OSPAR; the OPCW has issued two statements on 'Broadening International Cooperation on Sea-dumped Chemical Weapons and Promoting the OPCW as a Forum for Voluntary Cooperation on the Issue' and taken other steps towards cooperation; the EU and NATO have cooperated through the MODUM and CHEMSEA projects respectively; and IDUM has provided a forum for all stakeholders to discuss underwater munitions.

Having established, that the duty to cooperate flows from various applicable legal regimes and that the competent institutions have been willing to cooperate in relation to the problem, then it is of uttermost importance to bring all the stakeholders together in a true spirit of cooperation. Given that States surrounding the Baltic Sea are under a duty to protect and preserve the marine environment both under UNCLOS and the Helsinki Convention, then it would be best for these States to push for all the HELCOM recommendations to be fulfilled, especially for further extensive studies to be done in relation to the problem and to consider options for remediation on the HELCOM level. In the author's view this is the case, given the critical timeframe, the particularly vulnerable situation of the Baltic Sea and the plethora of risks and uncertainties that have been demonstrated to arise from the chemical weapons there. Whilst the OPCW and IDUM have promoted themselves as forums for voluntary cooperation, which should definitely be followed up on by States, competent institutions and other interested actors connected to the problem to share information and discuss the issue of sea-dumped chemical weapons, those seem to be best for a more global and long-term option. It could also be possible to extend the geographical scope regionally to include Norway (given the chemical munitions dumped in the Skagerrak) or even an EU wide effort, since chemical weapons have been dumped from the North Sea and Irish Sea to the Bay of Biscay and the Mediterranean Sea. If that were to be done, then cooperation with OSPAR would become highly relevant.

However, cooperating and taking initiative on the HELCOM level appears to be the most suitable for discussing the problem of sea-dumped chemical weapons affecting the Baltic Sea given the geographical scope of the Helsinki Convention. This is also more likely to result in tangible measures and initiatives faster, including the possibility of taking remediation, which is necessary given the critical time-frame when such measures would still be viable. Nonetheless, cooperation with the other competent institutions mentioned in this article would be necessary and highly beneficial. The OPCW clearly has the knowledge and technological capabilities required for handling and destroying the chemical warfare materials. Similarly, NATO also has important data and technology, especially that relating to AUVs and ROVs. IDUM has amassed a wealth of knowledge in this field, through amongst other things, holding five dialogues on sea-dumped munitions and will most likely have plenty of contacts and expertise on the capabilities and possibilities of the private sector, but also other actors in this regard. The EU will need to be involved in any eventuality, given that it is a party to HELCOM and that 8 of its Member States are facing the problem in the Baltic and that many other EU Member States are facing the problem elsewhere. What measures and/or funds are assigned by the EU to guarantee the high level of protection on the EU level however depends on the current political climate towards environmental problems and the resulting determination of what amount of risk is acceptable. Nonetheless, most of the funds would have to come from the HELCOM Parties.

Conclusion

As has been demonstrated, the problem of dumped chemical weapons in the Baltic Sea after WW II constitutes significant pollution and includes risks of serious harm and damage not only to the marine environment, but also to humans and our many legitimate uses of the sea, ranging from risk to fisherman and beach visitors to risks arising from various offshore activities and projects and even sea-food consumers could potentially be at risk. Even though the chemical weapons have been in the marine environment since the mid-1940s, there are still major scientific uncertainties regarding not only the exact locations and fate of the chemical weapons in the Baltic Sea, but also how it exactly affects the whole ecosystem, its many inhabitants and our uses of the sea. Despite the many scientific studies and projects undertaken by various interested Parties to gain more knowledge about the problem, there exists a responsibility to not only continue to implement and enforce existing measures and initiatives, but to also consider alternative courses of action, such as remediation through a combination of recovery and sarcophaging. The existing measures for example include conducting further research, EIAs and enforcing fishing limitations in the problem areas, but furthermore the recommendations from the 2013 HELCOM Report could be considered to have become requirements. Given that there is a high standard of due diligence, arising from the responsibility to protect and preserve the marine environment under numerous provisions of UNCLOS and to prevent and eliminate pollution of the Baltic Sea Area under multiple provisions of the Helsinki Convention, as well as precautionary principle being considered applicable. Then this means that various measures as are appropriate by way of abundant caution are required to avoid or prevent serious or irreversible damage. Whilst negligence for current conduct was not established in this research, due to the scope and available space, it was nonetheless suggested that it could already be the case and will most likely be the case, if necessary measures are not taken and remediation considered. Further analysis in the form of studies or expert determinations in this regard is needed.

Whilst further scientific research into the problem and other measures are required, then in the author's view this in itself will not lead to a significant improvement with regards to the problem, given the on-going leakage of CWAs to the marine environment and the upcoming years presenting the critical timeframe where remediation needs to be strongly considered and could potentially be taken. We have for some years had the necessary technology for this purpose and whilst it certainly carries risks and costs, these are minimal in the face of the significant risks and uncertainties that arise from leaving the chemical weapons as they are. Moreover, the risks arising from remediation can be lessened by using new technologies and be considered an effective and proportional measure in terms of the precautionary principle by focusing on hotspots where there is an overlap between the areas with the most polluting chemical weapons and those that could still feasibly be remediated. To tackle the problem through the aforementioned measures to be taken and considered, the duty to cooperate and notify remain of importance, as these are called for, amongst others, by the UNGA Resolution A/RES/65/149. Therefore, the States surrounding the Baltic Sea are under a duty to act and cooperate, most suitably through HELCOM, whilst also including the competent institutions mentioned in this article, as well as any other interested Parties. Having referred to some of the respective roles earlier in this research, the exact specificities of these efforts will be determined by the Parties themselves. It

suffices to say, that the logic behind the original conduct of dumping, that is "out of sight, out of mind" does not pass anymore, since our knowledge and awareness have increased in respect of the problem, as well as environmental concerns having gained prevalence and on the basis of the arguments in this article, much more needs to be done about the problem in order to avoid irreversible harm and improve the state of the Baltic Sea for current and future generations.