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Background

The HELCOM Workshop on Blue Carbon in the Baltic Sea region was held online on 17-18 November 2021 as part of the work under the priorities set by the German chairmanship of HELCOM on climate change, notably on strengthening scientific and policy exchange on the effects of climate change in the Baltic Sea region as well as on potential mitigation and adaptation strategies. The workshop was co-organized by Germany and the HELCOM Secretariat. The decision to hold the workshop was taken by HOD 60-2021 (see document 2-1 of HOD 60-2021).

The aim of the workshop was to establish a common understanding of the meaning of blue carbon in the HELCOM area, and to investigate the potential of blue carbon as a climate change mitigation option in the Baltic Sea region. The report of the workshop will be presented at the HELCOM Stakeholder Conference on Climate Change in March 2022 (see document 4-2 of HOD 61-2021), where it will serve as a basis for further discussions.

Action requested

The Meeting is invited to take note of the Report of the HELCOM Workshop on Blue Carbon in the Baltic Sea region.

Report of the HELCOM Workshop on Blue Carbon Potential in the Baltic Sea region

Introduction

0.1 The HELCOM Workshop on Blue Carbon Potential in the Baltic Sea region took place online on 17-18 November 2021. The list of participants is contained in **Annex 1**.

0.2 The Workshop was moderated by Mr. Ulrich Claussen from the German Environment Agency, UBA, and Mr. Jochen Krause, Federal Agency for Nature Conservation, BfN.

0.3 Ms. Petra Kääriä, Ms. Susanna Kaasinen and Mr. Dominik Littfass acted as secretaries of the workshop.

Agenda Item 1 Opening of the workshop

Welcome messages

1.1 Mr. Ulrich Claussen kicked-off the Workshop and welcomed the participants, mentioning that the workshop had its origins in the priorities of the current German chairmanship of HELCOM, and that the outcomes of the workshop will be considered in future HELCOM work. He also highlighted the role of blue carbon for climate change mitigation in the Baltic Sea region.

1.2 Ms. Lilian Busse, HELCOM Chair and UBA Vice President, recalled that exploring the potential of Blue Carbon in the Baltic Sea was one of the priorities of the German chairmanship of HELCOM. She mentioned the Blue Carbon related actions contained in the updated Baltic Sea Action Plan (BSAP), further stressing that climate change action needs to go hand in hand with work on other topics such as eutrophication and marine protected areas. Furthermore, she highlighted the role played by blue carbon at the recently held UN COP 26, mentioning that the issue was addressed in various sessions and side events that emphasized the role of oceans and seas in carbon sequestration as a nature-based mitigation solution.

1.3 Ms. Britta Knefelkamp, BfN Head of Directorate "Marine Nature Conservation", emphasized the particular role blue carbon can play in combining two of the most pressing issues we are facing today, namely climate change and biodiversity loss. She highlighted the potential of seagrass meadows, marshes, and peatlands in particular and of healthy oceans and seas in general for binding CO_2, and therefore having positive effects on society and supporting our efforts on climate change.

1.4 Mr. Rüdiger Strempel, HELCOM Executive Secretary, pointed out that climate change is already tangibly affecting the Baltic Sea and that, besides increasing the overall resilience of climate change to the Baltic Sea, mitigation measures are also needed, further highlighting that blue carbon measures are contained in the recently updated Baltic Sea Action Plan. In a reference to a video that went viral at COP26, he further emphasized the dire need for urgent action on climate change.

Keynote presentations

1.5 Ms. Dorte Krause-Jensen, Aarhus University, Denmark, gave a keynote presentation on "Vegetated coastal ecosystems, blue carbon and nature-based solutions in the Baltic area and beyond" (Presentation 1). In her presentation, she pointed out the role of marine vegetation such as marine and blue forests as natural or nature-based solutions to the coupled crises of climate change and biodiversity loss, particularly highlighting their capacity for sequestrating carbon while, at the same time, also having a number of other environmental, social and economic co-benefits.

1.6 Following the presentation, the potential amount of carbon sequestration that has been lost by the destruction of marine habitats that could sequester carbon was discussed. There are estimates of this loss. For example, it is estimated that two thirds of the potential eelgrass habitats in the coast of Denmark

have been lost. It is very important to reduce pressures that drive this development, especially eutrophication and bottom trawling.

1.7 The presenter also clarified that the carbon sequestration potential is estimated to be higher in the sediments of marine ecosystems that can store blue carbon than in the forest floor of terrestrial ecosystems due to the anoxic conditions on the seafloor of marine ecosystems and the lack of fires. As for the blue carbon potential of whales and fish, she clarified that whales can act as carbon stocks as they are large animals with a long lifespan and their carcasses will eventually sink to the seafloor below 1,000 meters (in oceans outside the Baltic Sea). It was also noted that carbon is also bound to the biomass of fish.

1.8 Mr. Thorsten Reusch, Geomar, Germany, gave a keynote presentation on the topic "The blue carbon wealth of nations – global and Baltic perspective with link to the sequestration potential of seagrass beds" (Presentation 2). He provided insights into the blue carbon potential and differences between countries at the global level and presented the results of a case study in the German Baltic Sea, further addressing the issue of conservation versus active restoration, as well as some open questions on enhancing the Baltic's blue carbon potential. These included the current scientific knowledge gaps and considerations on how to upscale restoration, as well as societal, governance and legal issues.

1.9 Following the presentation, it was discussed and clarified that restoration activities are generally possible in marine protected areas (MPAs). In those MPAs where stricter restrictions apply, habitats and biotopes are already mostly in good condition. It was also mentioned that an EU Regulation on restoration would be available soon.

1.10 A question on the potential of using seeds in the Baltic Sea for restoration of seagrass beds was raised and the presenter highlighted that seed losses due to winter conditions in temperate regions are substantial so that providing good overwintering conditions, e.g., in the laboratory, should be considered for this to be successful in the Baltic Sea region. Further applied research is needed on this topic.

1.11 In addition, the long time needed for general ecosystem recovery was pointed out in relation to the little time left to combat climate change (i.e., to restrict the temperature rise to below 2 degrees Celsius compared to pre-industrial times), as well as the rather minor contribution of nature-based solutions to the overall carbon sequestration budget. The assisted expansion of key habitats was discussed to support the renaturation of certain areas.

Agenda Item 2 Question #1 "What is our understanding of Blue Carbon?"

Plenum: Input of views from Baltic representatives

2.1 The session started with a discussion about how "blue carbon" may be understood differently among participants, and that one of the goals of the workshop should therefore be to reach a common understanding of the term blue carbon. The results of the registration questions were briefly presented, indicating that most participants seemed already to be familiar with the term "blue carbon" prior to the workshop. According to the compiled answers of the registration form, close to half of the participants ranked the blue carbon potential (in their country's Baltic Sea area) as moderate, and about one third as substantial or very substantial (see **Annex 2**).

2.2 The participants noted that the question of where blue carbon "stops" would be worth discussing. It was especially discussed whether human driven (and economically motivated) interventions should also be considered under blue carbon, and if yes, whether this would also include the incorporation of non-native species in the blue carbon mitigation actions, as well as include activities such as seaweed cultivation. On a related note, dumping biomass into the sea as means to dispose of trapped carbon was cautioned against as it may disturb environmental conditions in the sea, and the consequences of such action remain unclear.

2.3 The need for establishing standards regulating blue carbon projects and actions was also highlighted, as was the fact that these projects should also focus on improving the state of biodiversity. Ideally, blue carbon projects should simultaneously address both the climate change and biodiversity crises.

Any blue carbon definition should therefore consider both climate change and biodiversity/environmental protection, and only a combination of both would support the implementation of the Baltic Sea Action Plan (BSAP) and the achievement of good ecological and environmental status of the Baltic Sea. Blue carbon projects that serve both purposes (tackling climate change and protecting biodiversity) should be preferred and prioritized.

2.4 Blue carbon should also be considered in a horizontal manner and in conjunction with other pressures such as eutrophication that may have an impact on blue carbon species and their ability and effectiveness to store carbon. Establishing links between blue carbon and other issues, especially the pressures on the Baltic Sea such as riverine inputs of nutrients or hazardous substances, would therefore also be needed.

Round table discussions aiming for common understanding of the term "blue carbon" within the HELCOM area

2.5 The three roundtable discussions were based on proposals of a "blue carbon" definition formulated in advance by the workshop organizers, and provided the following insights into the common understanding of blue carbon:

- It is not easy to find a common definition for blue carbon and there are still knowledge gaps;
- Both organic and inorganic blue carbon could be considered but the total budget for inorganic carbon should be known;
- In addition to marine and coastal ecosystems, associated terrestrial ecosystems, such as coastal peatlands, could be considered;
- Marine organisms such as fish should be included;
- For climate change mitigation, long-term storage needs to be achieved but this can be promoted by short term measures;
- There is a need for clarification of the following terms: long-term and short-term; carbon stored, sequestered, accumulated, assimilated;
- There is no need to invent safeguards since these are already included in the HELCOM framework.

Plenary discussion to narrow down a proposal for a HELCOM-wide definition for "blue carbon"

2.6 Following the roundtable discussions, the participants of the plenary session shared views about narrowing down the HELCOM-wide definition of "blue carbon". The participants had varied views on whether the definition of blue carbon should be a narrow or a wide one, whether only nature-based solutions should be included and whether only long-term storage should be included in the definition.

2.7 Some participants were of the view that the definition of blue carbon should not be too narrow since there are significant knowledge gaps and questions related to changing land-sea connectivity and factors related to climate change. It has not been determined how far inland to go to still consider the habitat as blue carbon habitat. If peatlands are included even if they are coastal, double accounting of carbon credits could become an issue. The problem with coastal zones is that, in many countries, they fall under private ownership and thus restoration work might conflict with livelihoods. It was, however, pointed out that HELCOM also works with land-based pressures, and thus the HELCOM definition for blue carbon could be wider.

2.8 Another knowledge gap with regard to double accounting is that marine areas are not yet included in the accounting under UNFCCC in the same way as land ecosystems already are. This could lead to a situation where only the storages are counted, while losses in carbon in the marine ecosystems are not.

2.9 The participants discussed whether short-term storage of carbon, for example for 10-15 years, should also be considered as blue carbon. It was pointed out that there could be a more general definition of blue carbon without defining a timeframe, but long-term storage should be the aim when blue carbon is considered in climate change mitigation.

2.10 The inclusion of marine organisms, e.g., fish, in the definition was considered important. Short-term measures to help the fish stocks to recover could lead to a long-term storage in the marine cycle.

2.11 There were some views pointing out that the interest in blue carbon is driven by the interest in climate change mitigation and thus this element should be in the definition, and that carbon cycles in the water column should not be called blue carbon. Also, it was pointed out that the interest in blue carbon is strongly linked to the interest in nature-based solutions whereas geoengineering solutions should not be considered. While it was stated that the Helsinki Convention and other existing HELCOM instruments would be sufficient frameworks to prohibit harmful projects, not all participants shared this view, pointing for instance at potential projects dealing with the removal of internal nutrient reserves where additional regulations and/or guidance may be needed.

2.12 Some participants were of the view that blue carbon created by humans should be included in the definition since the human species has such a large impact on nature, and that human activities do affect blue carbon ecosystems. From the climate change mitigation perspective, it may therefore not matter whether the carbon has been stored as blue carbon via either human-made or natural means.

2.13 The discussion on the definition of blue carbon in the HELCOM context was continued under Agenda Item 5.

Agenda Item 3 Question #2 "What are Blue Carbon projects in the Baltic Sea region?"

Presentations on projects contributing to conservation or restoration of Blue Carbon relevant habitats in the Baltic Sea region

3.1 Mr. Ketil Koop-Jakobsen, AWI, Germany presented the project "sea4soCiety - Innovative approaches to improving the carbon storage potential of vegetated coastal ecosystems with focus on the Baltic Sea" (Presentation 3). He presented the work of the project, which aims to develop innovative approaches to enhancing the potential for carbon sequestration in coastal ecosystems in Germany and worldwide, notably by working on the quantification of carbon storage in vegetated coastal ecosystems, and on the assessment of societal and governance aspects of using coastal ecosystems for carbon storage.

3.2 Following the presentation, it was clarified that within the project blue carbon is considered as carbon taken up by vegetation and stored in the sediment in the long term.

3.3 A question on the importance of salt marshes as blue carbon habitats in the Baltic Sea in comparison to the North Sea was raised and the presenter noted that in the Baltic Sea salt marshes are less abundant and different as in the West Coast of Germany. The project will investigate whether having salt marshes and seagrass meadows located next to each other will be beneficial and bring added value to carbon sequestration.

3.4 It was further noted that many coastal areas in the Denmark and Germany have high amounts of infrastructure and other anthropogenic pressures affecting the coastal habitats/biotopes.

3.5 Mr. Nerijus Zableckis, Foundation for Peatland Restoration and Conservation, Lithuania, gave a presentation on "Peatland rewetting and paludiculture in Baltic Sea Region as nature-based solution" (Presentation 4). He emphasised the need to restore drained peatlands in order to reduce greenhouse gas emissions. Showcasing examples of paludiculture – the productive land use of wet and rewetted peatlands – in Lithuania, he indicated that the agricultural use of such lands could help to preserve the peat soil and thereby minimize CO_2 emissions and subsidence, as well as improve nutrient retention.

3.6 Following the presentation, the relevance of the project in relation to private funding and investments in green solutions was discussed as well as incentives for farmers to turn to paludiculture or take their lands out of production. It was highlighted that a better ecosystem condition may not only be supported by designating protected areas but also with wisely or sustainably conducted activities or uses.

3.7 It was also emphasized that restoration of peatlands and wetlands not only retains nutrients and reduces greenhouse gas emissions but also increases biodiversity and that the consideration of how to handle peatlands in the best way could be further discussed within HELCOM.

3.8 Several projects in the Baltic Sea region were named by the participants in advance by answering the registration form and are included in **Annex 3**.

3.9 Out of those, the new research center "CoastClim" (Centre for Coastal Ecosystem and Climate Research), which is based on a partnership between the University of Helsinki and Stockholm University, focuses on strengthening collaborative marine ecosystem and climate change research and invites more interested experts to join, was described a bit more in detail as well as WWF initiatives.

3.10 In addition, it was noted that work on economic and social analyses under HELCOM HOLAS III will include blue carbon sequestration/carbon storage as part of ecosystem service assessment and marine ecosystem accounting and that Mr. Kemal Pinarbasi (kemal.pinarbasi@helcom.fi) can be approached for further information.

Agenda Item 4 Question #3: What may hamper or promote the conservation and restoration of blue carbon habitats?

4.1 The session started with a recap of Day 1 by Mr. Jochen Krause. The participants noted that too much carbon is still being produced at the source, and that, concerning climate change, the main role of marine nature conservation is to strengthen the resilience of marine ecosystems. As a result, these ecosystems may then better absorb the effects from both climate change and the activities that are carried out to tackle it. It has also been noted that there is a decline in the capacity of our oceans and seas to reduce and trap carbon, thus calling for restoration measures. In addition, it was also noted that ecosystems should not be degraded further when carrying out any activities to improve carbon sequestration.

Kick-off presentations

4.2 Ms. Valerie de Liedekerke, WWF, Sweden, gave a presentation on "Heavy use of the Baltic Sea by maritime sectors as well as the lack of protected areas hinder Blue Carbon potentials (Presentation 5)", notably highlighting that the global ocean economy is expected to double by 2030, and that due to heightened sea-based activities and other pressures, blue carbon ecosystems are expected to decline further.

4.3 The participants discussed how to better involve the private sector in blue carbon activities, as for instance finance stakeholders are usually not involved in such processes and may not necessarily always be aware of investment opportunities and their negative or positive consequences. The Baltic Sea Action Plan (BSAP) was also seen as a good instrument for protecting blue carbon habitats. Furthermore, additional analysis of the benefits of blue carbon was thought to be a driver of a wider uptake. It was also noted that, besides the BSAP, the UNEP Sustainable Blue Economy Finance Principles could also provide guidance to various sectors when addressing blue economy and blue carbon.

4.4 Ms. Sandra Kleine, Ministry of Environment, Agriculture and Climate of the State of Mecklenburg-Vorpommern (Germany), presented "Economic instruments in the financing and implementation of carbon sequestration (Presentation 6)", notably highlighting the issue of valuation of ecosystem services, and on how to make them visible, assessable, and investable, so that ecosystem services could be seen as an opportunity for financial investments.

4.5 The ensuing discussion touched on the possibility to extend or replicate the carbon credit system to and for ecosystem services including blue carbon. But it was also noted that possible double accounting of carbon credits could be misused to claim carbon neutrality by some, and therefore undermine the original intentions.

Roundtable discussion on difficulties as well as potential solutions to conserve and restore blue carbon habitats

4.6 The three roundtable discussions took up the keywords collected in advance of the meeting in the registration form as a basis, e.g., lack of research and data, and lack of political will, and pointed out additional difficulties to conserve and restore blue carbon habitats before exchanging ideas for potential solutions to overcome these difficulties as included in **Annex 4**.

Plenary discussion focused on the exchange of experiences on restrictions, options, and solutions

4.7 Following the roundtable discussions, the participants of the plenary session exchanged experiences on the difficulties and solutions.

4.8 It was discussed that there is a lack of knowledge regarding coastal habitats and their real sequestration rates. Blue carbon is only one aspect of the diverse ecosystem services. For example, an ecosystem could simultaneously be a sink for CO_2 and a source of methane. There is a need for a holistic understanding of the ecosystems and the multiple drivers and processes at work. The focus should not only be on blue carbon but on considering these ecosystems as a whole. It was also stated that it is still under scientific debate whether the Baltic Sea is a sink or a source of carbon.

4.9 The participants welcomed that WWF has started a tendering process for Blue Forest Initiative, a ten-year programme on blue carbon.

4.10 At the EU level, there is an ongoing initiative on green taxonomy where e.g., UBA and WWF have already been involved. Blue systems are however not included. The participants were invited to share information on similar initiatives regarding blue systems with UBA (ulrich.claussen@uba.de).

4.11 It was highlighted that it is important to have guidelines for a good blue carbon project to ensure that funding goes to viable projects. It was also pointed out that there is a lack of funding for international research cooperation projects in the Baltic Sea region. The Horizon programme Land, ocean and water for climate action (HORIZON-CL6-2022-CLIMATE-01) was considered as a potential call for a Baltic-wide blue carbon project.

4.12 Regarding next steps for HELCOM regarding blue carbon work, the participants made suggestions for possible initiatives. Based on the good experiences by the German national roundtable on marine litter, one proposal was a HELCOM blue carbon roundtable inviting relevant stakeholders. It was also suggested that there could be an ecosystem and carbon impact assessment to address the issue of the cost of doing nothing (business as usual scenarios).

4.13 The need for a coordinated approach to measuring CO_2 fluxes and greenhouse gas inventories as well as agreed methodologies for blue carbon habitats was raised.

Agenda Item 5 Blue Carbon potential for the Baltic Sea region – State of knowledge

5.1 The following description of blue carbon for the Baltic Sea region, which was prepared after the discussions of Day 1, was elaborated:

"Blue Carbon" is one form of marine-based carbon dioxide removal (CDR).

"Blue Carbon" in the Baltic Sea region is the net organic and inorganic carbon sequestered and stored in coastal, brackish and marine ecosystems**. For climate change mitigation long term [carbon] storage needs to be achieved.*

In the Baltic Sea region, "Blue Carbon" includes coastal, brackish, and marine ecosystems, e.g., saltmarshes, seagrass beds, macroalgae and sediments. Inclusion of peatlands interacting with the coastal zone of the Baltic Sea is under discussion. New knowledge may add marine organisms, e.g., fish [to the definition].

The possibility to sequester and store carbon should not hamper efforts to avoid and reduce climate-driving (greenhouse gas) emissions.

*"Coastal" should not be understood as a clear cut-off-line, but include related ecosystems facing comparable challenges and being under the same governance and management as marine ecosystems

**including sea bottom and deeper sea areas

Agenda Item 6 Towards the integration of the Blue Carbon topic into HELCOM processes

6.1 Ms. Jannica Haldin, HELCOM Deputy Executive Secretary, informed the workshop of HELCOM's goals on climate change, pointing out that the ultimate aim of HELCOM is to increase the resilience of the Baltic Sea so that it can cope with and adapt to the effects of climate change. She added that, in order to help

the ecosystem, withstand the effects of climate change and help species to adapt, we would therefore need to take responsibility for managing and reducing our own impacts on the marine environment. Providing insights into the future work of HELCOM on climate change, she highlighted that HELCOM needs to focus on a long-term, multi-disciplinary approach, particularly focussing on 1) developing and establishing HELCOMs function as a regional platform for a policy-science dialogue on climate change, 2) provisioning of robust, policy relevant, research-based knowledge on the state, impacts and vulnerabilities of the Baltic Sea and its surroundings to climate change, 3) review and adapt policies in the light of climate adaptation. Ms. Haldin also reminded the participants of the work of the joint Baltic Earth and HELCOM Expert Network on Climate Change (EN CLIME), which recently published the first Fact Sheet on Climate Change in the Baltic Sea. She also reminded that blue carbon will be included in ecosystem accounting under HOLAS III and emphasized the need to clarify HELCOM's role in climate change policy, which will be the focus of the HELCOM/Baltic Earth Stakeholder conference on climate change to be organised on 9-10 March 2022. The conference will also further consider blue carbon in the region as a concrete way to close the gap between intention and action. Several actions in the 2021 Baltic Sea Action plan closely link to blue carbon. The implementation of the BSAP forms the core of HELCOM's work and will drive it during the next 9 years until 2030, by when all BSAP actions are to be implemented. Thus, there is high potential for including blue carbon in HELCOM's future work, which should be used to the utmost.

6.2 In his closing remarks recapping the outcome of the workshop, Mr. Ulrich Claussen – also speaking on behalf of the other co-chair, Mr. Jochen Krause – particularly stressed the fact that blue carbon should be considered in the light of the two major crises we are currently facing, namely climate change and biodiversity loss. Blue carbon initiatives can therefore contribute to solving both. At the same time, he also cautioned against using blue carbon as an excuse to not reduce greenhouse gas emissions. He mentioned that the conservation and restoration of blue carbon habitats and such elements should be part of the toolkit for mitigating climate change, as they do not pose a major environmental risk. This is opposed to large-scale marine geoengineering solutions and the current uncertainties regarding their impacts on marine ecosystems. He further summarized some of the challenges flagged during the workshop currently hampering the wider adoption of blue carbon initiatives, such as the lack of knowledge, data, research, finances, political willingness, and limited coordination. He pointed out possible solutions that were voiced by the participants, for instance highlighting costs of business-as-usual for society, information platforms on blue carbon such as a HELCOM round table, full implementation of the revised BSAP, and sustainable financing for Blue Carbon projects. He announced that the final results of the workshop will be presented to relevant HELCOM groups and at the joint HELCOM/Baltic Earth Stakeholder Conference on Climate 9-10 March 2022.

Agenda Item 7 The Report of the workshop

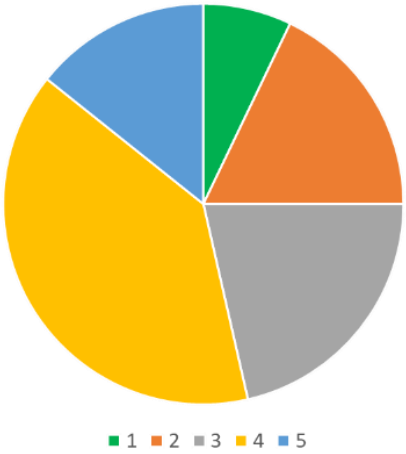
7.1 The Report of the workshop was prepared by the HELCOM Secretariat, UBA and BfN and was made available on the HELCOM website.

Annex 1. List of participants.

Name	Organization	Country
Odran Corcoran	WWF European Policy Office	Belgium
Rebecca Hubbard	Our Fish	Belgium
Dorte Krause-Jensen	Aarhus University	Denmark
David Connor	European Commission DG Environment	European Union
Freja Vermeer	European Commission DG MARE	European Union
Laurine Tertre	European Commission DG MARE	European Union
Camilla Gustafsson	Tvärminne Zoological Station, University of Helsinki	Finland
Iiris Kokkonen	WWF Finland	Finland
Ketil Koop-Jakobsen	AWI - representing Sea4soCiety	Germany
Julian Koplin	AWI/University of Gibraltar	Germany
Julia Busch	Common Wadden Sea Secretariat	Germany
Katja Hockun	Deutsche Umwelthilfe	Germany
Britta Knefelkamp	Federal Agency for Nature Conservation	Germany
Jochen Krause	Federal Agency for Nature Conservation	Germany
Miriam Sollich	Federal Agency for Nature Conservation	Germany
Thorsten Reusch	GEOMAR Kiel	Germany
Burkard Baschek	German Oceanographic Museum	Germany
Lucy Baumgartner	German Environment Agency	Germany
Lilian Busse	German Environment Agency	Germany
Ulrich Claussen	German Environment Agency	Germany
Friederike Erxleben	German Environment Agency	Germany
Manuela Krakau	German Environment Agency	Germany
Wera Leujak	German Environment Agency	Germany
Julian Mönnich	German Environment Agency	Germany
Marcus Reckermann	International Baltic Earth Secretariat at Helmholtz Zentrum Hereon	Germany
Laura Lehnhoff	University of Bremen	Germany
Corina Peter	The Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research	Germany
Nerijus Zableckis	Foundation for Peatland Restoration and Conservation	Lithuania
Karol Kulinski	Baltic Earth, Institute of Oceanology PAS	Poland
Florian Roth	Baltic Sea Centre, Stockholm University	Sweden
Valerie de Liedekerke	WWF Baltic Ecoregion Programme	Sweden
Jannica Haldin	HELCOM Secretariat	HELCOM
Susanna Kaasinen	HELCOM Secretariat	HELCOM
Petra Kääriä	HELCOM Secretariat	HELCOM
Dominik Littfass	HELCOM Secretariat	HELCOM
Kemal Pinarbasi	HELCOM Secretariat	HELCOM
Rüdiger Strempel	HELCOM Secretariat	HELCOM

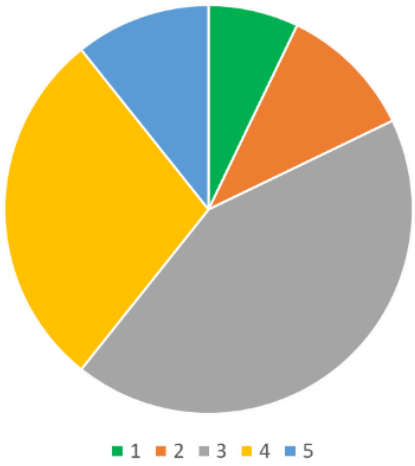
Annex 2. Level of participants' understanding of Blue Carbon.

How familiar are we with the term Blue Carbon?



1-not at all … 5-very

How would you rank the Blue Carbon potential?



1-very low … 5-very substantial

Annex 3. Blue Carbon projects in the Baltic Sea as informed by the participants.

- Havets Skove („Sea Forests“) and Blå Skove (“Blue Forests“)
- FutureMARES, EU Horizon 2020
- NordSalt, EU BiodivERsA program
- CARMA (“CARbon sequestration by Greenland‘s Marine forests in an warming Arctic“)
- Nordic Blue Carbon
- “Oceans2050“ (seaweed farming project)
- “Red Horsens Fjord“, “Sund Vejle Fjord“, “Als Stenrev“ (restoration projects)
- Blue Carbon Habitats by SYKE (a comprehensive mapping of Nordic salt marshes for estimating Blue Carbon storage potential)
- CARBON POLYGON
- INTEGRAL (Integrated carboN TracE Gas monitoRing for the bALtic sea)
- Interreg CONTRA (Baltic Beach Wrack - Conversion of a Nuisance To a Resource and Asset)
- International network project ILTER "International long term network site“
- Carbdown, Negative carbon emissions by enhanced weathering (Olivine)
- Project: "Resolving the missing carbon sink in blue carbon ecosystems: Oceanic outwelling"
- Sea4soCiety (Searching for solutions for Carbon-sequestration in coastal ecosystems)
- SeaStore (seaweed restoration)

Other:

- Nordic Blue Carbon Initiative workshop in Copenhagen - Sep 2019
- New research centre “CoastClim“ (Centre for Coastal Ecosystem and Climate Research)
- Baltic Earth - Earth System Science for the Baltic Sea Region

Annex 4. Round-table discussion on difficulties as well as potential solutions to conserve and restore blue carbon habitats

1) Competing/economic interests, e.g. land use conflicts
    a. Possible solution: Working with sustainable finance, blue crediting system, including the impact of carbon emissions into economic calculations (e.g., loss of carbon storage by bottom trawling) increasing information flow from science to stakeholders
2) Impacts of anthropogenic pressure
    a. Possible solution: more efforts to prevent eutrophication (legislation etc.)
3) Lack of knowledge
    a. Possible solution: Information campaigns, providing spaces to communicated, sharing information and consult all the stakeholders
4) Lack of research and data
    a. Possible solutions: Promoting research on topics include macroalgal farming and its ecological benefits, estimating the carrying capacity/risks/limits, distinguishing between carbon sinks and methane emissions, shallow areas; increasing awareness of the difference to fish farming; interlinkage of data; increased involvement of scientists; including results from science as a first step in decision making on blue carbon projects
5) Lack of management
    a. Possible solutions: Full and fast implementation of the 2021 Baltic Sea Action Plan
6) Limited coordination of blue carbon projects
    a. Possible solutions: providing spaces to communicated, sharing information and consult all the stakeholders, involving HELCOM Working Groups or Expert Groups
7) Lack of political will and appropriate national legislation
    a. Possible solutions: Highlighting the cost of doing nothing for political decision makers and companies and what benefits there are for them to invest in blue carbon projects (CO2 sequestration potential, biodiversity, co-benefits), more binding politics e.g. to implement the BSAP, providing solutions (e.g. case studies, examples of opportunities), clarify who "owns" the carbon benefits (public good or credit goes to country) and what are the responsibilities regarding the carbon benefits.
8) Low support from stakeholders outside scientific public
    a. Possible solutions: Providing spaces to communicated, sharing information and consult all the stakeholders, better communication with stakeholders that are already "sitting at the table"
9) Lack of consensus of blue carbon habitats, including marine life like fish populations
    a. Possible solutions: A better understanding and consensus on blue habitats, coordinating a common consensus/standard on (the impact of) blue carbon based on scientific knowledge (e.g. by IPPC key scientists) and only after this to go into politics
10) Climate change and its consequences for blue carbon habitats; human reaction to climate change; hypoxia/anoxia
    a. Possible solutions: Measures to stop further losing blue carbon habitats and potential
11) Lack of innovation
    a. Large scale mapping of blue carbon habitats and historical data
12) Lack of coordination and integration across sectors

   a. E.g. the conflict between seagrass rehabilitation vs. mussel trawling

13) Lack of accounting and methodologies
14) Lack of enforcement
15) Lack of funding