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**SCIENCE-POLICY INTERFACE IN REGIONAL ENVIRONMENTAL MANAGEMENT:
CASE OF HELCOM IN THE BALTIC CONTEXT**

Abstract. The regional environmental cooperation in the Baltic Sea is the leading and “forerunner” model for managing environmental challenges at the regional level. The Baltic case is very often emphasized from the perspective of the successful implementation of non-binding recommendations toward marine environment management and the political will of contracting countries toward regional environmental cooperation. Despite four decades efforts, the Baltic region is a peculiar and unique case where long-term human-induced pressures and its fragile ecosystem cause even more challenges for regional states. In this study, we investigated the Baltic case from the perspective of the science-policy interface and used data from HELCOM (Helsinki Commission) Stakeholders Conferences organized from 2006 to 2022. The science-policy is regarded as the key processes in environmental protection and management. We conducted the qualitative research based on the document review tracing down interactions and activities of major stakeholders. We found that the Baltic case has led a long-term traditional science-policy processes where there has been a strong presence of scientific community aiming at providing the best available scientific knowledge for marine environment protection and management, and developing the database for decision-making. The Baltic regional cooperation has recently progressed towards involving citizen science, deliberation, and participatory approaches. The stakeholders agreed that to implement the ambitious BSAP into practice and concrete actions, the further development of civil councils, public participation, and multi-sectoral involvement is crucial for robust knowledge production in regional environmental management. From the institutional perspective, the working groups within the HELCOM can facilitate the mediation of scientific communities and societal actors. These groups can serve as boundary organizations in the science-policy interface.

Keywords: **Science-policy Interface, Marine Environment Protection, Regional Cooperation, the Baltic Region.**

JEL Classification: Q30; Q38; Q56.

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Introduction. The Baltic Sea marine ecosystem and its use and protection are of great importance to the economies and the welfare of 85 million people as well as future generations in the region (HELCOM, 2017). For the Baltic Sea region (Figure 1), long-term human-induced pressures and its fragile ecosystem cause even more challenges for regional

states. Human activities on land and sea resulted in enormous environmental degradation and natural resource depletion in the region. Due to its semi-closed and shallow ecosystem, nutrients and substances from human inputs have a cumulative impact and persist longer in the sea.



Fig. 1. Baltic Sea region

The environmental problems are eutrophication or high concentration of nutrients, hazardous chemical contaminants, and depleted natural resources (HELCOM, 2018). The Baltic states have developed regional cooperation on marine environment protection over four decades through the intergovernmental organization of the Baltic Marine Environment Protection Commission – Helsinki Commission (HELCOM). The HELCOM adopted the Baltic Sea Action plan in 2007 and renewed it in 2021. It is the historical milestone for policy change in the Baltic regional cooperation setting up ambitious goals towards achieving a “Healthy Baltic Sea Environment”. Research on “stronger” and “forerunner” regional cooperation models such as the Baltic, the Mediterranean, and the Caribbean reflect the uniqueness of each region and extensive experiences for other regional models for marine environment protection including Southeast Asia and East Asia. The Baltic case has been highlighted as its clear and ambitious policy commitment to a pressuring environmental issue based on **non-binding recommendations** and Baltic states come together to cooperate in addressing issue-specific problems (Maggio, 2019).

Despite persistent efforts, marine environment management is frequently challenged by complexities and technical uncertainty, especially in terms of unpredictable ecosystem dynamics and characteristics of pollution sources. In areas of high uncertainty and political complexities, scientific knowledge is a crucial aspect of the success of environmental policies, especially in marine environment management (Saunders, Gilek, & Linke, 2017). The objective of the paper is to how scientific knowledge is in-

corporated into regional environmental policy-making in the Baltic case from the perspective of the science-policy interface framework. In detail, it is aimed to explore whether the scientific community collaborates with stakeholders to develop robust knowledge considering the knowledge and experiences of other stakeholders such as residents, NGOs, and networks.

Literature review. In this study, the Baltic case is analyzed from the perspective of the science-policy interface. Science-policy interface is rapidly growing as a key process of regional environmental governance (Van den Hove, 2007). The conventional linear science-policy process raised a critique in early research as instrumental rationality of capitalist societies and later studies as social and policy influence on science (Forsyth, 2004). Following a series of environmental and health risks, science is called upon to be more democratized to generate more robust knowledge in policymaking as well as to build up its trust among stakeholders. Science-policy interface can be defined as social processes which encompass relations between scientists and other actors in the policy process and which allow for exchanges, co-evolution, and joint construction of knowledge to enrich decision-making (Van den Hove, 2007). It can involve stakeholder dialogues, epistemic communities, and deliberative processes to develop robust knowledge (Spruijt, Knol, Vasileiadou, Devilee, Lebret, & Petersen, 2014). In some cases, they can form epistemic communities which are as significant actors with expertise and willingness to act in transnational processes (Cross, 2013) problem-defining actors beyond agenda setting to policy formulation (Mukherjee & Howlett, 2015). All scientific or

expert groups do not necessarily constitute or emerge as epistemic communities. Rather it means that these matter as different sets of actors with different sets of influence in transnational processes (Cross, 2015).

In the previous literature, the adoption of BSAP in 2007 was regarded as unique and successful science-policy interaction where the scientific community recommended concrete targets of the regional policy and policymakers adopted these as a part of the Ministerial declaration (Saunders, Gilek, & Linke, 2017; Backer et al., 2010). It succeeded as scientific outputs were directly applicable to the BSAP (Johansson & Wulff, 2007). The scientific groups could reach a consensus on eutrophication as a main pressuring ecological problem in the Baltic Sea region by providing substantial evidence (Saunders, Gilek, & Linke, 2017). On the other hand, scholars argued that it was a conventional science policy interface or linear model of scientists and decision-makers interaction where few stakeholders were involved and less politically contested compared to fishing (Linke, Gilek, Karlsson, & Udoviyk, 2014). Furthermore, it is argued that wider stakeholders including public participation needed to be involved as pressuring environmental problems including eutrophication were exclusively defined from a science-technical nature and it might pose a problem in the implementation phase of BSAP (Tynkkynen, 2013).

Research methodology. Analytical framework: Science-policy interface

The rise of evidence-based decision-making over the past quarter century has been further complicated. Science is an activity whose most important output is scientific knowledge. In a rapidly changing world where environmental pressure becoming more pressuring, the role of

science cannot be confined to the traditional role of explaining, communicating, and applying knowledge and training the next generation of scientists. Scientists are called upon to address the most urgent needs of society. While technological spin-offs of science themselves pose critical societal and environmental risks, the appraisal and management of which necessitates inputs from scientists. When scientists and experts differ in their interpretation of uncertainty and complexities, they produce different sets of advice and affect the decisions of policymakers. Policymakers have to be aware of a vast array of scientific knowledge and other information sources for policymaking. Scientific experts should be aware of and transparent about the context and social construction of knowledge and normative assumptions to offer a balanced picture of scientific knowledge to decision-makers (Spruijt, Knol, Vasileiadou, Devilee, Leuret, & Petersen, 2014). The study applied the science-policy interface framework to analyze how the scientific community and other stakeholders collaborate or mediate between science and policy. It is also argued that the science-policy interface contributes to balancing different sets of knowledge (specialized knowledge and local knowledge) or scientific knowledge and policy priorities. Science-policy interfaces through deliberation and participation processes such as stakeholder discussions, and civil dialogues can serve as common platforms for a diverse set of actors to be engaged in policy development (Burton, Wang, & White, 2019). In recent studies, boundary organizations are emphasized as major organizations in the science-policy interface. They are defined as brokers, bridges, and mediators between the scientific community and policymakers fostering their communication (Burton, Wang, & White, 2019).

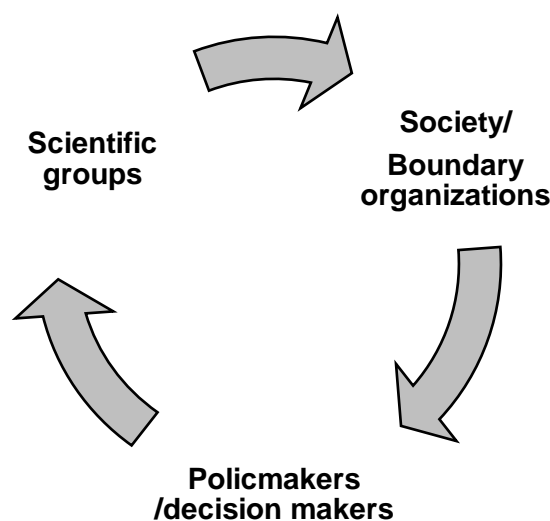


Fig. 2. Science-policy interface

Data collection

The data on the Baltic case was collected from HELCOM policy documents including Ministerial Declarations, activity proceedings, and recommendations as well as reports of HELCOM Stakeholder Conferences (HSC). **Firstly**, the study examined the institutional structure of HELCOM where the scientific community and networks are embedded within the organization for informing policymakers and society. In this regard, it examined the regional decision-making process in marine environment protection. **Secondly**, the science-policy interface and the democratization of knowledge require deliberation and participation of diverse groups and citizens through stakeholder discussions, the formation of epistemic groups, and deliberation and participation processes. HSCs organized from 2006 to 2022 have been examined based on document analysis. Reports on the HSCs were useful resources for understanding the role of various actors including scientific communities, expert groups, and other parties in the Baltic context.

Main results.

Organization of HELCOM and scientific/expert groups

The Baltic Marine Environment Commission known as Helsinki Commission (HELCOM) was established in 1974 under the Convention on the Marine Environment of the Baltic Sea Area (Helsinki Convention). The HELCOM acts as an environmental policy maker, focal point, body to develop recommendations, supervisory body, and coordinating body. It has 10 contract-

ing parties including Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden.

Hereafter the organizational structure is shown in Figure 3. HELCOM Chairmanship rotates every two years. Heads of delegation or Meetings of the Helsinki Commission present contracting parties and are responsible for decision-making where HELCOM working groups' works are approved. The HELCOM adopts Ministerial declarations and recommendations which are main regional policy instruments (Table 1).

HELCOM working groups are in charge of developing recommendations, policies, and strategies. There are eight main working groups. They are responsible for technical expertise and translating their findings into policies, recommendations, and strategies. Five of them are permanent (Gear, Maritime, Pressure, Response, and State & Conservation.) Three of them are time-limited (Agri, Fish, and HELCOM Vasab). These working groups are mainly composed of national experts, usually from a Ministry or national agency nominated by a HELCOM contracting party.

The expert groups and networks are supervised by and responsible for HELCOM working groups (Table 2).

HELCOM Stakeholder Conferences (HSC)

The HSCs have been organized from 2006 to 2022 as shown in Table 2. No data was available for several conferences which are excluded from Table 2. Compared to the HELCOM activities for four decades, the HSCs are relatively recent initiatives by the HELCOM.

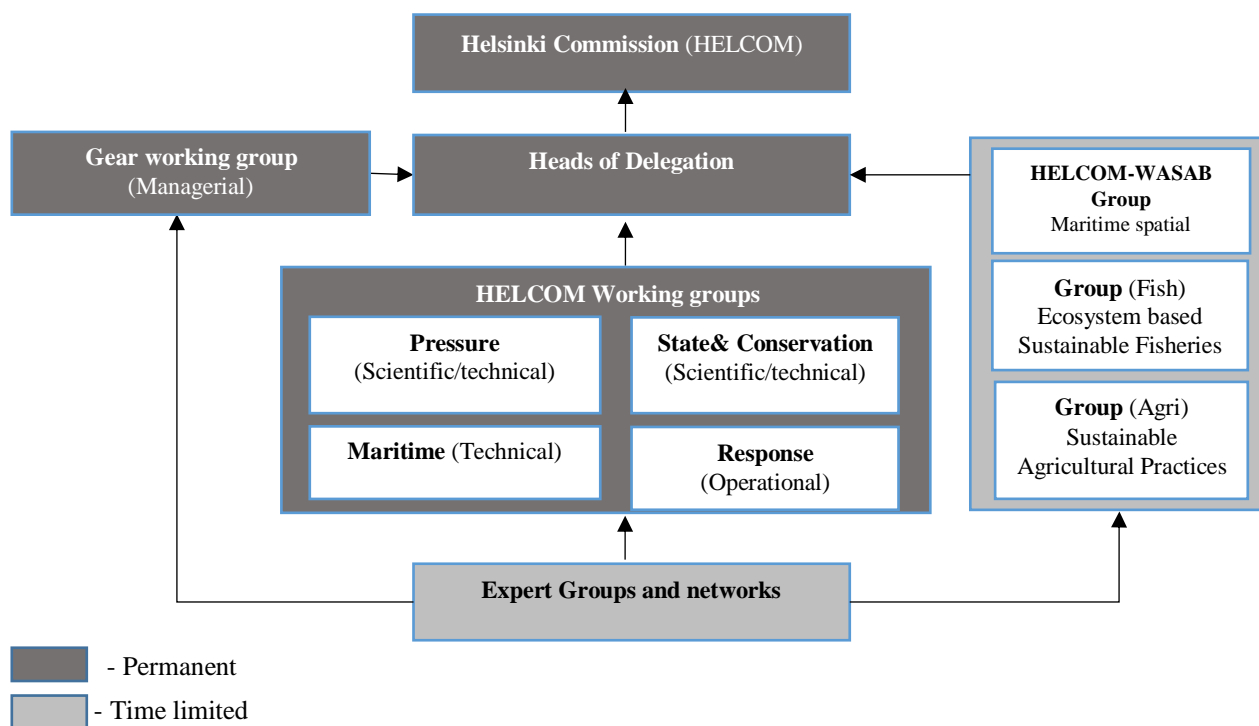


Fig. 3. HELCOM Organization

Source: HELCOM 2022

Table 1. HELCOM policy instruments

Policy instrument	Official documents
Helsinki Convention	Helsinki Convention in 1974 Helsinki Convention revised in 1992
Ministerial declarations	13 ministerial declarations
Recommendations	More than 260 recommendations since 1980s

The Conference themes were mainly developed around adopting and implementing the BSAP as shown in Table 2. For instance, the purpose of the 2007 HSC was to discuss with all the relevant stakeholders the content of the plan and proposed actions in top priority areas including eutrophication, pollution involving hazardous substances, maritime safety, accident response capacity, habitat destruction, and decline in biodiversity. The 2010 HSC was organized to coordinate between the BSAP and other processes like the EU Strategy for the Baltic Sea region, the NDEP, etc. The 2020 HSC was to al-

low stakeholders to voice their views on the BSAP update. The BSAP update should be “strongly communicated with stakeholders, enable knowledge sharing between science and policy across all levels, be developed in a participatory and transparent way at the regional and local levels including all appropriate stakeholders” (HELCOM HSC, 2020). The outcome of HSCs was to serve as an input to the ongoing process of developing, implementing, and updating the BSAP and to ensure the future Action plan is relevant and implemented effectively in practice.

Table 2. Expert groups supervised by HELCOM working groups

No.	Working group	Expert groups
1.	Fish	<ul style="list-style-type: none"> - CG Aquaculture – Correspondence Group concerning a draft document on Best Available Technology/Best Environmental Practices (BAT/BEP) descriptions for sustainable aquaculture in the Baltic Sea region - FISH-M – Task Force on migratory fish species
2.	GEAR	<ul style="list-style-type: none"> - EN ESA – Expert Network on Economic and Social Analyses
3.	Maritime	<ul style="list-style-type: none"> - AIS EWG – Expert Working Group for Mutual Exchange and Deliveries of AIS data - GREEN TEAM – Sub-group on Green Technology and Alternative Fuels for Shipping - JTG Ballast & Biofouling – Joint HELCOM/OSPAR Task Group on Ballast Management Convention Exemptions (BWMC) and Biofouling - PRF Cooperation Platform – Cooperation Platform on Port Reception Facilities in the Baltic Sea - SAFE NAV – Group of Experts on Safety of Navigation
4.	Pressure	<ul style="list-style-type: none"> - EG Hazardous Substances – Expert Group on Hazardous Substances - EG Marine Litter – Expert Group on Marine Litter - EG Noise – Expert Group on Underwater Noise - EG DREDS – Expert Group on Dredging/Depositing Operations at Sea - REDCORE DG – Reduction Scheme Core Drafting Group - CG PHARMA – Correspondence Group on Pharmaceuticals
5.	Response	<ul style="list-style-type: none"> - EG Wildlife – Expert Group on Wildlife Response - SHORE Network – Expert Coordination Network on Response on the Shore - IWGAS – Informal Working Group on Aerial Surveillance - SUBMERGED – Expert Group on Environmental Risks of Hazardous Submerged Objects
6.	State and Conservation	<ul style="list-style-type: none"> - EG MAMA – Expert Group on Marine Mammals - EG STUR – Expert Group on Sturgeon Remediation - EG Hazardous Substances – Expert Group on Hazardous Substances - EN BENTHIC – Expert Network on Benthic Habitats and Biotopes - EN CLIME – Joint HELCOM/Baltic Earth Expert Network on Climate Change - IN Eutrophication – Intersessional Network on Eutrophication - JWG Bird – HELCOM-OSPAR-ICES Joint Working Group on Seabirds - MORS – Expert Group on Monitoring of Radioactive Substances in the Baltic Sea

Source: HELCOM 2022

Table 3. HSCs between 2006 to 2022

No	Conference theme	Year
1	Development of the BSAP	2007
2	Broad Scale marine spatial planning, financing BSAP	2008
3	Building blocs for a cost-effective implementation of the HELCOM BSAP	2009
4	One goal, one direction, many ways: Streamlining the implementation of the BSAP	2010
5	Baltic Sea-NECA	2013
6	Tackling the challenges in marine litter in the Baltic Sea	2016
7	Joint BONUS-HELCOM Conference 2018: Research sustainability and innovation	2018
8	For a Sustainable Baltic Sea: The BSAP beyond 2021, 2020	2020
9	Practically Implementing Ecosystem-Based Management	2021
10	Climate change in the Baltic Sea	2022
11	Think outside the box: Implementing HELCOM BSAP	2023

Source: HELCOM website, accessed in December 25, 2022

These conferences invited a diverse set of participants annually including national authorities, politicians, businesses, municipalities, international financial institutions, other Baltic Sea regional bodies, industry, the scientific community, private foundations, and NGOs. The mode of communication and participation mainly includes workshops, presentations, round table and panel discussions, field trips, group exercises, exhibitions, etc. The participants ranged from approximately 90 to 130 persons. In 2022, the Stakeholder Conference was organized online for two days (in total 240 participants). The 2021 HSC titled “Practically implementing ecosystem-based management” was to agree on a shared understanding between various sectors and narrow down the ecosystem approach to facilitate its regional implementation through a common regional understanding and coherence of various stakeholders’ activities. The HELCOM teamed up with Coalition Clean Baltic and the Swedish Agency for Marine and Water Management.

Discussion

For more than four decades, the HELCOM put enormous efforts to use the best available scientific knowledge for marine environment protection and management. It strives towards providing information on the state and trends of the marine environment and the efficiency of measures and developing a base for decision-making. Monitoring and assessment are important parts of HELCOM activities. The Baltic networks are extensively maintained by a formal state, intergovernmental and non-governmental organizations. These networks have a high level of organizational structure and hierarchy. These networks are centered on influential inter-governmental organizations of the HELCOM or hosted by active non-governmental organizations (VanDeveer, 2011). So the HELCOM is well-equipped with science policy interaction.

The HELCOM scientific networks and experts are closely tied with the working groups which develop recommendations, strategies, and policies. From this perspective, the HELCOM is institutionally suited for one-directional communication or conventional linear science-policy process. The HELCOM was acknowledged as a role model and an advisory body for channeling scientific findings into regional policies (HELCOM HSC, 2020). From the science-policy interface, the working groups can serve as boundary organizations to mediate the Heads of Delegation (Ministerial Meetings), scientific groups as well as other stakeholders including public participation.

From the perspective of the HSCs, the HELCOM adopted the conventional model of science policy interaction. The HSCs up to 2020 served as a platform to educate and inform the scientific outcomes of other stakeholders. These Conferences were mainly aimed at knowledge sharing between science and policy across all levels to facilitate the development and implementation of the BSAP. During the HSCs, the various actors voiced their positions in regarding the BSAP. For instance, in the HSC 2007, the representative of the fisheries sector stated that they are not against the marine protected areas per se and that areas closed for fisheries are used voluntarily by fisheries (VanDeveer, 2011). In the HSC 2009, the Baltic Farmers Forum stressed the need for a strengthened dialogue between agricultural and environmental sectors. In the HSC 2021, it is stated that despite those dealing with marine protection, fisheries or agriculture do not give enough consideration to environmental matters. Some policies such as maritime spatial planning place human activities at the forefront, not the environment (HELCOM HSC, 2007). All these examples assume a lack of coordination and communication between stakeholders.

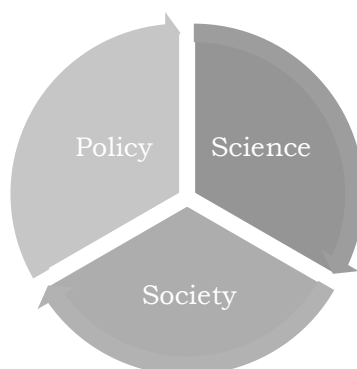


Fig. 4. Three stations of 2021 HSC (HELCOM HSC, 2021)

However, the HSC 2021 may be regarded as a turning point for the science-policy interface for marine environmental management in the Baltic sea. The Conference was stationed into three topics including policy, science, and society. The participants were split into smaller manageable groups under these topics and rotated between stations. This model was similar to the science-policy interface developed by Sprujit. At the Policy station, it was recognized that all participants recognized the limited interaction between major policies such as fisheries, agriculture, and environmental protection. To put the ambitious BSAP towards the sustainable Baltic Sea into concrete actions, the HELCOM stakeholders agreed on considering citizen science, public participation, and the involvement of educators and social scientists. The 2022 HSC was stationed into three topics namely science, policy, and management, and rotated in between. The Conference was to disseminate knowledge about the regional effects of climate change while allowing gathering fresh views on climate change mitigation and adaptation from all stakeholders in the Baltic Sea region. The stakeholders agreed that more deliberation and participation including civic councils, dialogue platforms, and stakeholder confer-

ences should be established for better knowledge creation and transparent and participatory policy making.

Conclusion. The regional cooperation of the Baltic sea is the leading and “forerunner” model for environmental management. The Baltic case is very often emphasized from the perspective of the successful implementation of non-binding recommendations and the political will of contracting countries toward regional cooperation. The study examined the Baltic case from a science-policy interface perspective. Despite long-term science-policy processes, regional cooperation has recently progressed towards involving citizen science, deliberation, and participatory approaches. The stakeholders agreed that to implement the ambitious BSAP into practice and concrete actions, the further development of civil councils, public participation, and multi-sectoral involvement is crucial for robust knowledge production in regional environmental management. From the institutional perspective, the working groups within the HELCOM can facilitate the mediation of scientific communities and societal actors. These groups can serve as boundary organizations in the science-policy interface.

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ВЗАЄМОДІЯ НАУКИ ТА ПОЛІТИКИ В РЕГІОНАЛЬНОМУ УПРАВЛІННІ НАВКОЛИШНІМ СЕРЕДОВИЩЕМ: ПРИКЛАД HELCOM У КОНТЕКСТІ БАЛТІЇ

Регіональне екологічне співробітництво в Балтійському морі є провідною та «першопрохідною» моделлю управління екологічними проблемами на регіональному рівні. Випадок Балтії дуже часто наголошується з точки зору успішного впровадження необов'язкових рекомендацій щодо управління морським середовищем та політичної волі країн-учасниць щодо регіонального екологічного співробітництва. Незважаючи на чотири десятиліття зусиль, Балтійський регіон є своєрідним і унікальним випадком, де довгостроковий антропогенний тиск і його тендітна екосистема спричиняють ще більше проблем для держав регіону. У цьому дослідженні ми розглядали приклад Балтії з точки зору взаємодії науки та політики та використовували дані конференцій зацікавлених сторін HELCOM (Гельсінська комісія), організованих з 2006 по 2022 рік. Наука-політика розглядається як ключовий процес у захисті та управлінні навколишнім середовищем. Ми провели якісне дослідження на основі аналізу документів, відстежуючи взаємодію та діяльність основних зацікавлених сторін. Ми виявили, що Балтійський випадок привів до довготривалих традиційних науково-політичних процесів, де була сильна присутність наукового співтовариства, спрямованого на надання найкращих доступних наукових знань для захисту морського середовища та управління ним, а також розробку бази даних для прийняття рішень. Балтійська регіональна співпраця нещодавно просунулася до залучення громадянської науки, обговорення та підходів участі. Зацікавлені сторони погодилися, що для реалізації амбітної програми BSAP на практиці та конкретних дій подальший розвиток громадських рад, участь громадськості та багатосекторальне залучення є вирішальними для надійного виробництва знань у регіональному управлінні навколишнім середовищем. З інституційної точки зору, робочі групи в рамках HELCOM можуть сприяти посередництву наукових спільнот і суспільних діячів. Ці групи можуть служити прикордонними організаціями в науково-політичному інтерфейсі.

Ключові слова: **взаємодія науки та політики, захист морського середовища, регіональне співробітництво, Балтійський регіон.**

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