

The Potential of Regional Ocean Literacy for Transforming Public Engagement in Marine Conservation

Threat Perception and Place Attachment at the German Baltic Sea Coast

Regional Ocean Literacy at the Baltic Sea

The Baltic Sea, one of the world's largest semi-enclosed brackish water systems, is ecologically unique and socioeconomically vital for its neighbouring regions.¹ Surrounded by nine countries, it encompasses a diverse range of political, economic and cultural contexts. The Baltic Sea serves as a living laboratory for understanding the challenges of shared marine governance and the historically and currently fragmented processes of transformation. Spanning approximately 420,000 square kilometres, the Baltic Sea is heavily impacted by surrounding human activities, from dense urbanisation and overexploitation of resources, to nutrient runoff from agriculture, chemical discharges from industry, and intensified maritime traffic.² Over the past decades, the region has faced increasing environmental degradation manifested through eutrophication, biodiversity loss, the influx of hazardous substances, and habitat destruction.³ Due to its unique geographic location and limited water

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- 1 HELCOM: State of the Baltic Sea. Third HELCOM Holistic Assessment 2016–2021, in: Baltic Sea Environment Proceedings n°194, Helsinki 2023, helcom.fi/post_type_publ/holas3_obs (18.07.2025); Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV): Zustand Der Deutschen Ostseegewässer 2024. Aktualisierung Der Anfangsbewertung Nach § 45c, Der Beschreibung Des Guten Zustands Der Meeresgewässer Nach § 45d Und Der Festlegung von Zielen Nach § 45e Des Wasser- Haushaltsgesetzes Zur Umsetzung Der Meeresstrategie-Rahmenrichtlinie. Bund/Länder-Arbeitsgemeinschaft Nord- Und Ostsee (BLANO), Bonn 2024, mitglieder.meeresschutz.info/de/berichte/zustandsbewertungen-art8-10.html?file=files/meeresschutz/berichte/art8910/zyklus2024/Zustandsbericht_Ostsee_2024.pdf (18.07.2025); Snoeijs-Leijonmalm, Pauline/Schubert, Hendrik/Radziejewska, Teresa (eds.): Biological Oceanography of the Baltic Sea, Dordrecht 2017.
 - 2 Reckermann, Marcus et al.: Human Impacts and Their Interactions in the Baltic Sea Region, in: Earth System Dynamics 13(2022), No. 1, pp. 1–80, DOI: [org/10.5194/esd-13-1-2022](https://doi.org/10.5194/esd-13-1-2022). (08.01.2026).
 - 3 HELCOM: State of the Baltic Sea; Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV): Zustand Der Deutschen Ostseegewässer 2024.

exchange, water renewal is particularly slow, taking up to 40 years.⁴ This leads to a prolonged circulation of hazardous substances, which further threatens its ecological balance, resulting in declining water quality, loss of biodiversity, and disruption of vital ecosystems.⁵ The pressures are further intensified by the accelerating impacts of climate change, creating a complex web of interdependent socio-ecological challenges.⁶

Despite decades of regional cooperation under frameworks like the HELCOM Baltic Sea Action Plan, environmental indicators continue to reflect slow or stagnant progress.⁷ While top-down governance remains a critical tool for the implementation of marine conservation measures, its effectiveness can be limited when social support is lacking or measures are subject to changing political and economic agendas.⁸ This raises fundamental questions about the sufficiency of predominantly top-down governance models to achieve long-term, resilient socio-ecological transformations. It is becoming increasingly acknowledged that effective marine governance requires more than regulatory mechanisms or technological interventions, it requires deeper societal engagement, especially at the regional level.⁹ In this context, regional ocean literacy emerges as a transformative approach that sheds light on various socio-psychological determinants of the human-ocean relationship, such as awareness or place attachment. This promises a more bottom-up approach to environmental governance that takes into account fragmented regional

4 Snoeijs-Leijonmalm/Schubert/Radziejewska: Biological Oceanography of the Baltic Sea; Reckermann et al.: Human Impacts and Their Interactions in the Baltic Sea Region; Stigebrandt, A.: Physical Oceanography of the Baltic Sea, in: Wulff, Fredrik V./Rahm, Lars A./Larsson, Per. (eds): A Systems Analysis of the Baltic Sea. Ecological Studies, vol 148, Berlin, Heidelberg 2001, DOI: 10.1007/978-3-662-04453-7_2.

5 HELCOM: State of the Baltic Sea.

6 *ibid.*; Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV): Zustand Der Deutschen Ostseegewässer 2024.

7 HELCOM: State of the Baltic Sea.

8 Lopes, Priscila F M et al.: Unintended and Overlooked Consequences of Exclusionary Marine Conservation, in: ICES Journal of Marine Science 82 (2025), No. 3, fsae190, DOI: 10.1093/icesjms/fsae190. (03.01.2025).

9 Jones, Peter J. S.: Marine Protected Areas in the UK: Challenges in Combining Top-down and Bottom-up Approaches to Governance, in: Environmental Conservation 39 (2012), No. 3, pp. 248–258, DOI: 10.1017/S0376892912000136. (08.01.2026); Eger, S. L. et al.: A Systematic Review of Integrated Coastal and Marine Management Progress Reveals Core Governance Characteristics for Successful Implementation, in: Marine Policy 132 (2021), 104688, DOI: 10.1016/j.marpol.2021.104688. (08.01.2026).

contexts.¹⁰ In turn, at the national and international levels, it may increase confidence and support for top-down action.

Given the escalating challenges marine environments face, ocean literacy has emerged as a key focus within the UN Decade of Ocean Science for Sustainable Development (2021–2030). Ocean literacy is generally understood as recognising the mutual relationship between humans and the ocean—how the ocean affects us, and how we impact it.¹¹ The concept was originally developed as a pedagogical framework in school curricula to promote understanding of the interrelationship between humans and the oceans among young students. Today, however, it has evolved into a broader tool for social transformation in educational and governmental practice as well as in academia.¹² It has evolved beyond knowledge alone to include dimensions such as emotional connection, access and experience, trust and transparency, as well as ocean-friendly behaviours.¹³ This holistic approach frames ocean literacy as a form of environmental citizenship.¹⁴ Ocean literacy now includes the aim to support meaningful behavioural and institutional change at both the individual and collective levels. In a review, Stoll-Kleemann (2019) synthesised factors influencing behaviour change and ocean literacy. She proposed extending Kollmuss and Agyeman's pro-environmental behaviour model into a conceptual framework for ocean-related sustainable behaviours, incorporating both internal (e.g., emotions and values) and external (e.g., politico-economic and socio-cultural) factors as essential for enabling change.¹⁵

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- 10 Weiland, Laura et al.: Advancing Ocean Governance in Marine Regions Through Stakeholder Dialogue Processes, in *Frontiers in Marine Science* 8 (2021), DOI: 10.3389/fmars.2021.645576. (08.01.2026); Schlüter, Maja/Lindkvist, Emilie/Basurto, Xavier: The Interplay between Top-down Interventions and Bottom-up Self-Organization Shapes Opportunities for Transforming Self-Governance in Small-Scale Fisheries, in: *Marine Policy* 128 (2021), 104485, DOI: 10.1016/j.marpol.2021.104485. (08.01.2026).
 - 11 Cava, Francesca et al.: Science Content and Standards for Oceans Literacy: An Ocean Literacy Update, in: National Geographic Society (2005).
 - 12 Ryabinin, Vladimir et al.: The UN Decade of Ocean Science for Sustainable Development, in: *Frontiers in Marine Science* 6 (2019), DOI: 10.3389/fmars.2019.00470. (08.01.2026).
 - 13 McKinley, E./Burdon, D./Shellock, R.J.: The Evolution of Ocean Literacy: A New Framework for the United Nations Ocean Decade and Beyond, in: *Marine Pollution Bulletin* 186 (2023), 114467, DOI: 10.1016/j.marpolbul.2022.114467.
 - 14 Stocco, Silvia/Rocca, Lorena: Place-Based Education for Ocean Literacy: Fostering Ocean Literacy and Place Attachment through Short Film, in: *J-READING Journal of Research and Didactics in Geography* 2 (2024), www.j-reading.org/index.php/geography/article/view/413 (18.12.2024).
 - 15 Stoll-Kleemann, Susanne: Feasible Options for Behavior Change Toward More Effective Ocean Literacy: A Systematic Review, in: *Frontiers in Marine Science* 6 (2019), 273, DOI: 10.3389/fmars.2019.00273. (28.05.2019).

Overall, ocean literacy is being acknowledged as a catalyst for transformative change aimed at achieving more sustainable and resilient ocean systems among diverse stakeholders.¹⁶ The concept further encompasses the need to embed ocean understanding within local contexts, emotional landscapes, and cultural narratives.¹⁷ This regional turn in ocean literacy seems particularly relevant in areas like the German Baltic Sea coast, where identity, memory, and socio-political developments deeply influence perceptions of and relationships with the marine environment.

Just like the assumption of regional differences in ocean literacy, it may further be assumed that interactions within a region vary between different stakeholder groups. Examples of such stakeholder groups include residents and visitors of a coastal region. Examining how these groups attach meaning to the sea, assess its value, and interpret ecological risks may provide important insights into their levels of awareness, concern, and potential for engagement. Moreover, their interactions may be shaped by different perceptions, experiences, and emotional connections, which can lead to fragmented or even conflicting views of the sea's value and vulnerability, potentially hindering shared visions and coherent policy-making.¹⁸ Considering such differences, through lenses like threat perception or place attachment, could reveal important insights for more inclusive marine governance. Thus, a regionally grounded approach to ocean literacy, which accounts for emotional and cultural dimensions beyond just knowledge and attitudes, may offer a way to integrate diverse perspectives and foster more context-sensitive and accepted strategies and interventions for marine stewardship.¹⁹

In this chapter, we examine how regional ocean literacy can help uncover the underlying fragmentation in how different actors, in this case residents and visitors of the German Baltic Sea coast, perceive and relate to the Baltic Sea. Building on Demmler and Stoll-Kleemann's (2025) findings about public perceptions of marine threats at the Baltic Sea, we explore the interplay

16 IOC-UNESCO: A New Blue Curriculum—A toolkit for policy-makers, in: IOC Manuals and Guides, No. 90. Paris 2022, DOI: 10.25607/OBP-1882.

17 Cavas, Bulent et al.: Research Trends and Content Analysis of Ocean Literacy Studies between 2017 and 2021, in: *Frontiers in Marine Science* 10 (2023), DOI: 10.3389/fmars.2023.1200181. (08.01.2026); Schwerdtner Máñez, Kathleen/Stoll-Kleemann, Susanne/Rozwadowski, Helen M.: Ocean Literacies: The Promise of Regional Approaches Integrating Ocean Histories and Psychologies, in: *Frontiers in Marine Science* 10 (2023), 1178061, DOI: 10.3389/fmars.2023.1178061. (08.01.2026).

18 Steinberg, Philip E.: *The Social Construction of the Ocean*, Cambridge 2001; Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: *Ocean Literacies*.

19 *ibid.*

between these threat perceptions and local place attachment on the Island of Rügen and the Greifswalder Bodden.²⁰ By integrating the two dimensions, we aim to deepen the discussion on their interrelation and enhance the implications for conservation initiatives, public engagement strategies and a socio-ecological transformation in general. We argue that regional ocean literacy, here conceptualised as ›Baltic Sea Literacy‹, offers valuable insights for addressing persistent governance challenges in the region, supporting more targeted, participatory, and context-sensitive approaches to marine protection along the German Baltic Sea coast. This may allow for the emergence of more socially robust, culturally embedded, and ultimately more effective marine conservation pathways in the Baltic Sea region.

Baltic Sea Literacy: Understanding Threat Perception and Personal Connection

A fundamental socio-ecological transformation in our relationship with the Baltic Sea is urgently needed.²¹ Adapting the concept of ocean literacy to the regional context of the Baltic Sea may offer a valuable framework for understanding the diverse ways in which people relate to the marine environment. A regional Baltic Sea literacy approach could represent a crucial step toward guiding the region onto a more sustainable trajectory that responds to the pressing ecological challenges facing the Baltic Sea.

A critical starting point for this transformation lies in deepening our understanding of how the public perceives and connects with the Baltic Sea, its ecosystems, and the environmental threats it faces. To this end, we conducted a series of face-to-face surveys between August 3rd and September 10th 2024 with a sample of 628 participants on the Island of Rügen and in the Greifswalder Bodden. These surveys formed part of a broader investigation into regional ocean literacy across two European sea basins: the Baltic Sea and the Mediterranean Sea. The present study focused on residents and visitors as key stakeholders who interact directly and frequently with the marine and coastal environment, and who are therefore considered particularly valu-

20 Demmler, Rebecca A./Stoll-Kleemann, Susanne: Understanding Public Perceptions of Marine Threats: Awareness and Concern among Residents and Visitors of the German Baltic Sea Coast, in: *Frontiers in Marine Science* 12 (2025), DOI: 10.3389/fmars.2025.1596331. (13.06.2025).

21 HELCOM: State of the Baltic Sea.

able for perception-based research.²² In addition to examining environmental threat perceptions and place attachment, the survey also addressed further core dimensions of ocean literacy such as knowledge, attitudes, emotions, and behaviours. However, due to space constraints, this chapter concentrates on the concepts of threat perception and place attachment. Threat perception was assessed using items on concern about threats, awareness of specific threats, and evaluations of the current ecological state, as well as an open-ended question regarding known sources of threats, as described in detail by Demmler and Stoll-Kleemann (2025).²³ Place attachment was measured using a four-item Likert scale adapted from Buchan et al. (2024),²⁴ a closed-ended question asking participants to identify their favourite sea, and a follow-up open-ended question for those who selected the Baltic Sea, asking about the reasons for their preference. The data were analysed using descriptive statistics and inductive content analyses, employing MAXQDA 24 and SPSS version 30.

From Threat Perception to Transformative Engagement

Despite growing recognition of the role public perception plays in advancing ocean literacy and marine conservation, empirical research on the topic remains scarce. Although public perceptions of marine threats have been explored in several European coastal and marine contexts, the Baltic Sea region remains notably understudied. However, highlighting the geographical variability in how marine environments are perceived, Lucrezi (2022) emphasises the importance of national-level studies for capturing diverse societal perspectives across spatial scales.²⁵

In response to the call for more nation- and region-specific research, our findings (Demmler and Stoll-Kleemann, 2025) offered the first empirical insights into threat perceptions among a Baltic Sea sample from the Island

22 Jefferson, R.L. et al.: Public Perceptions of the UK Marine Environment, in: *Marine Policy* 43 (2014), pp. 327–337, DOI: 10.1016/j.marpol.2013.07.004. (08.01.2026).

23 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

24 Buchan, P.M./Evans, L.S./ Pieraccini M.: Thalassophilia and Marine Identity: Drivers of »Thick« Marine Citizenship, in *Journal of Environmental Management* 352 (2024), 120111, <https://doi.org/10.1016/j.jenvman.2024.120111>.

25 Lucrezi, Serena: Public Perceptions of Marine Environmental Issues: A Case Study of Coastal Recreational Users in Italy, in *Journal of Coastal Conservation* 26 (2022), No. 26, 52, DOI: 10.1007/s11852-022-00900-4. (08.01.2026).

of Rügen and the Greifswalder Bodden. We found that residents and visitors exhibited high levels of self-reported awareness and concern regarding pollution levels in the Baltic Sea.²⁶ However, this expressed awareness did not necessarily reflect an exact or in-depth understanding of the ecological threats facing the region. On average, participants did not recognise the severely degraded ecological status of the Baltic Sea, nor did they consistently identify the most pressing environmental threats.²⁷ Figure 1 shows that visible and tangible forms of pollution, particularly plastic litter, microplastics, and illegal waste disposal, emerged as the most frequently mentioned concerns, followed by industrial pollutants such as oil spills.²⁸ These accounted for 41.52 % of all responses, echoing broader European trends in which highly visible pollution like litter and plastic dominates public environmental awareness.²⁹ Unlike samples in other European coastal regions, however, respondents in the Baltic Sea region identified eutrophication as a major threat, signalling a growing awareness of nutrient-related issues such as algal blooms and oxygen depletion. This may indicate a potential effectiveness of communication strategies on this issue. Conversely, more complex, abstract, or less visible threats, such as habitat degradation, climate change, or underwater noise, were rarely mentioned.³⁰ This disparity aligns with previous European and global research, which shows a consistent tendency for the public to focus on prominent,

26 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

27 *ibid.*

28 *ibid.*

29 Gelcich, Stefan et al.: Public Awareness, Concerns, and Priorities about Anthropogenic Impacts on Marine Environments, in: *Proceedings of the National Academy of Sciences* 111 (2014), No. 42, pp. 15042–15047, DOI: 10.1073/pnas.1417344111. (08.01.2026); Potts, Tavis et al.: Who Cares? European Attitudes towards Marine and Coastal Environments, in: *Marine Policy* 72 (2016), pp. 59–66, DOI: 10.1016/j.marpol.2016.06.012. (08.01.2026); Buckley, Paul J. et al.: Ten Thousand Voices on Marine Climate Change in Europe: Different Perceptions among Demographic Groups and Nationalities, in: *Frontiers in Marine Science* 4 (2017), DOI: 10.3389/fmars.2017.00206. (08.01.2026); Lotze, Heike K. et al.: Public Perceptions of Marine Threats and Protection from around the World, in: *Ocean & Coastal Management* 152 (2018), pp. 14–22, DOI: 10.1016/j.ocecoaman.2017.11.004. (08.01.2026); Gkargkavouzi, Anastasia/Paraskevopoulos, Stefanos/Matsiori, Steriani: Public Perceptions of the Marine Environment and Behavioral Intentions to Preserve It: The Case of Three Coastal Cities in Greece, in: *Marine Policy* 111 (2020), 103727, DOI: 10.1016/j.marpol.2019.103727. (08.01.2026); Lucresi: Public Perceptions of Marine Environmental Issues; Garcia-Bustos, Victor: Conservation Attitudes and Perceived Biodiversity Among Divers on the Spanish Mediterranean Coast: Insights from Local Ecological Knowledge, in: *Oceans* 6 (2025), No. 1, 4, DOI: 10.3390/oceans6010004. (08.01.2025).

30 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

tangible, immediate issues while overlooking diffuse, invisible, or long-term threats.

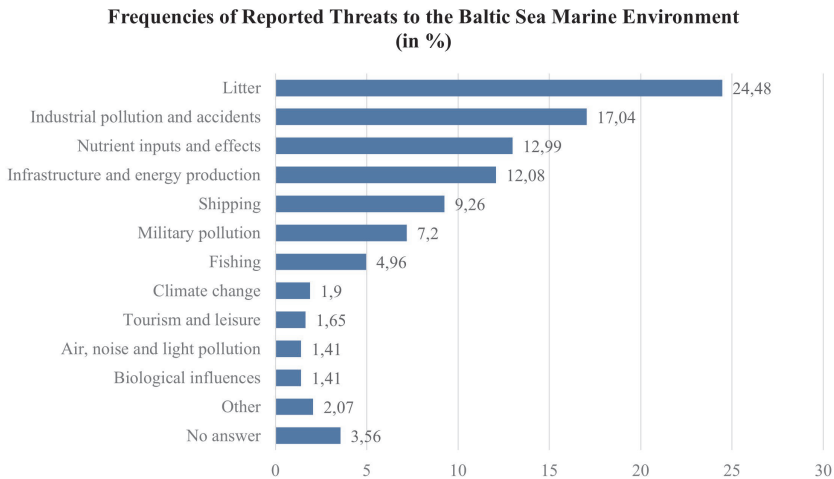


Figure 1: Distribution of the Frequencies of the Types of Pollution in the Baltic Sea mentioned by the Participants. Source: Demmler and Stoll-Kleemann, 2025. Note: $N = 524$.

These findings may point to the potentially significant impact of public discourse and media coverage in shaping environmental awareness and concern.³¹ Highly visible threats such as plastic pollution or oil spills are frequently sensationalised, generating attention and reinforcing public concern, while more complex or less photogenic issues receive minimal coverage. While this may indicate some effectiveness of media coverage of environmental threats, it may also suggest shortcomings in science-media communication and a lack of nuanced representation of the full spectrum of environmental risks.³² The resulting misalignment between scientific assessments and public understanding may contribute to misconceptions and incomplete knowledge, which in turn can hinder sustainable behavioural choices.

Understanding public perceptions of environmental threats can serve as a valuable tool for advancing regional ocean literacy, as such insights reveal

31 Stoll-Kleemann, Susanne/Nicolai, Susanne/Franikowski, Philipp: Exploring the Moral Challenges of Confronting High-Carbon-Emitting Behavior: The Role of Emotions and Media Coverage, in: Sustainability 14 (2022), No. 10, 5742, DOI: 10.3390/su14105742. (10.05.2022).

32 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

not only how information is received and disseminated, but also which issues resonate most with the public at specific moments and in particular contexts—highlighting what matters to people. In our study (Demmler and Stoll-Kleemann, 2025), participants frequently referred to locally significant concerns at the given time of the survey, such as the legacy of military contamination or the controversial LNG terminal construction in Mukran. These references highlight the embeddedness of environmental awareness within local narratives and broader socio-political contexts. Therefore, we propose that effective Baltic-Sea-literacy-strategies should be rooted in the lived experiences, cultural histories, and emotional geographies of the coastal communities, while at the same time acknowledging the broader geopolitical and economic systems that shape the region or even countries.³³

The emphasis on localised interpretations of environmental threats is consistent with findings suggesting that individuals may rather act on perceived threats, which are influenced by socio-cultural and psychological factors, than scientifically measured risks.³⁴ For regional environmental governance to be effective, scientific and societal understandings of ecological threats must be brought into closer alignment. Ultimately, exploring public perceptions of marine threats is not just about describing what people are aware of. It helps to identify important touch points for promoting behaviour change and designing more effective marine preservation strategies. A regional ocean literacy framework that is attuned to public perceptions can help tailor communication strategies, enhance the legitimacy of governance measures, and foster greater civic engagement and trust in marine stewardship. In the socio-ecological context of the Baltic Sea, where historical legacies, geopolitical tensions, and institutional distrust intersect with environmental fragility, such an approach seems essential. To protect the Baltic Sea effectively, regional ocean literacy should be both locally attuned and scientifically grounded.

33 *ibid.*

34 Van der Linden, Sander: The Social-Psychological Determinants of Climate Change Risk Perceptions: Towards a Comprehensive Model, in: *Journal of Environmental Psychology* 41 (2015), pp. 112–24, DOI: 10.1016/j.jenvp.2014.11.012. (08.01.2026); Zeng, Jingjing/Jian, Meiquan/Yuan, Meng: Environmental Risk Perception, Risk Culture, and Pro-Environmental Behavior, in: *International Journal of Environmental Research and Public Health* 17 (2020), No. 5, 1750, DOI: 10.3390/ijerph17051750. (08.01.2026); Sun, Yingying/Han, Ziqiang: Climate Change Risk Perception in Taiwan: Correlation with Individual and Societal Factors, in: *International Journal of Environmental Research and Public Health* 15 (2018), No. 1, 91, DOI: 10.3390/ijerph15010091. (08.01.2026).

Place Attachment—Emotional Connections and Environmental Values of the Baltic Sea

Ocean literacy and environmental engagement are not solely rooted in cognitive processes; it is also profoundly affective. However, there is a lack of research on what people value and what fosters their connection to place. As a result, concepts such as place attachment are underutilised as potential motivators for adaptation to environmental challenges, especially in the marine context.³⁵ The concept of place attachment, extensively studied across disciplines such as environmental psychology, human geography, and sociology, offers a compelling lens for understanding this emotional dimension of human-environment relations.³⁶ While definitions of place attachment vary, they commonly describe it as an emotional bond individuals form with a specific place, encompassing affective, cognitive, and behavioural components that reflect both personal and collective meanings, connections, and interactions associated with that place.³⁷ Researchers such as Devine-Wright (2013), Giuliani (2003), and Low and Altman (1992) describe place attachment as a positive emotional connection to a meaningful location.³⁸ These attachments often carry symbolic significance and are influenced by cultural, social, and psychological factors. Stocco and Rocca (2024) emphasise that place attachment is not only emotional but also shaped by shared understandings and

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- 35 Amundsen, Helene: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway, in: *Local Environment* 20 (2015), No. 3, pp. 257–276, DOI: 10.1080/13549839.2013.838751. (08.01.2026).
 - 36 Dang, Lisa/Weiss, Jan: Evidence on the Relationship between Place Attachment and Behavioural Intentions between 2010 and 2021: A Systematic Literature Review, in: *Sustainability* 13 (2021), No. 23, 13138, DOI: 10.3390/su132313138. (08.01.2026); Scannell, Leila/Gifford, Robert: Defining Place Attachment: A Tripartite Organizing Framework, in: *Journal of Environmental Psychology* 30 (2010), No. 1, pp. 1–10, DOI: 10.1016/j.jenvp.2009.09.006. (08.01.2026).
 - 37 Vaske, Jerry J./Kobrin, Katherine C.: Place Attachment and Environmentally Responsible Behavior, in: *The Journal of Environmental Education* 32 (2001), No. 4, pp. 16–21, DOI: 10.1080/00958960109598658; Devine-Wright, Patrick: Think Global, Act Local? The Relevance of Place Attachments and Place Identities in a Climate Changed World, in: *Global Environmental Change* 23 (2013), No. 1, pp. 61–69, DOI: 10.1016/j.gloenvcha.2012.08.003. (08.01.2026); Scannell/Gifford: Defining Place Attachment; Low, S.M./Altman, I.: Place Attachment. In: Altman, I., Low, S.M. (eds): *Place Attachment. Human Behavior and Environment*, vol 12, Boston, MA 1992, pp. 1–12.
 - 38 Devine-Wright: Think Global, Act Local?; Giuliani, Maria Vittoria: Theory of Attachment and Place Attachment, in: Bonnes, Mirilja/Lee, Terence/Bonaiuto, Marino (eds.): *Psychological Theories for Environmental Issues*, Aldershot 2003, pp. 137–170; Low/Altman: *Place Attachment*.

social meanings.³⁹ Scannell and Gifford (2010) propose a three-dimensional framework for understanding place attachment, highlighting the roles of the individual or group experiencing the attachment (person), the mental and emotional processes involved (affect, cognition, behaviour), and the characteristics of the place itself.⁴⁰ Research on place attachment in a marine context expands this view by framing place as a network of relationships rather than a fixed location.⁴¹

These perspectives highlight place as dynamic and socially constructed, emphasising how attachment is shaped by broader contexts of community, history, and interaction. The multiple dimensions of place attachment underscore its complexity and variability across individuals and groups. In marine environments like the Baltic Sea, this complexity is amplified by the diversity of stakeholder groups, each holding distinct values, uses, and experiences of the Baltic Sea as a place. Place attachment in this context can be fragmented or even conflicting, reflecting differing cultural, professional, or personal relationships to the sea. Understanding the diverse meanings people attach to marine places can enable more empathetic and context-sensitive marine policies by integrating the various attachments that shape people's attitudes and behaviours into conservation and communication efforts.

In this vein, various studies have found that place attachment has a positive influence on environmental awareness and behaviour, as people are more likely to care for places to which they feel connected.⁴² Strong emotional

39 Stocco/Rocca: Place-Based Education for Ocean Literacy.

40 Scannell/Gifford: Defining Place Attachment.

41 Buchan, Pamela M. et al.: Marine Citizenship: The Right to Participate in the Transformation of the Human-Ocean Relationship for Sustainability, in: *Plos one* 18 (2023), No. 3, pp. 1–23, DOI: 10.1371/journal.pone.0280518. (08.01.2026).

42 Dang/Weiss: Evidence on the Relationship between Place Attachment and Behavioral Intentions between 2010 and 2021; Ramkissoon, Haywantee/Smith, Liam David Graham/Weiler, Betty: Testing the Dimensionality of Place Attachment and Its Relationships with Place Satisfaction and Pro-Environmental Behaviours: A Structural Equation Modelling Approach, in: *Tourism Management* 36 (2013), pp. 552–566, DOI: 10.1016/j.tourman.2012.09.003. (08.01.2026); Ramkissoon, Haywantee/Smith, Liam David Graham/Weiler, Betty: Relationships between Place Attachment, Place Satisfaction and pro-Environmental Behaviour in an Australian National Park, in: *Journal of Sustainable Tourism* 21 (2013), No. 3, pp. 434–457, DOI: 10.1080/09669582.2012.708042. (08.01.2026); Ramkissoon, Haywantee/Betty, Weiler/Smith, Liam David Graham: Place Attachment, Place Satisfaction and pro-Environmental Behaviour: A Comparative Assessment of Multiple Regression and Structural Equation Modelling, in: *Journal of Policy Research in Tourism, Leisure and Events* 5 (2013), No. 3, pp. 215–32, DOI: 10.1080/19407963.2013.776371. (08.01.2026); Chow, Alice S. Y. et al.: The Impacts of Place Attachment on Environmentally Responsible Behavioral Intention and Satisfaction of Chinese Nature-Based Tourists, in: *Sustainability* 11 (2019), No. 20, 5585, DOI:

ties are found to heighten risk perception and motivate adaptive action. For instance, Amundsen (2015) showed that in Norwegian coastal communities, place attachment fosters proactive responses to social and environmental change.⁴³ Marine environments also provide cultural ecosystem services, like recreation, aesthetic enjoyment, and identity, which can further reinforce attachment. Ahtiainen et al. (2019) found that these cultural values significantly influence how people relate to marine areas like the Baltic Sea, shaping well-being and stewardship attitudes.⁴⁴ Moreover, recent work by Diamond et al. (2024) introduces the concept of ›Coastal Place Attachment‹, showing that emotional ties to the ocean enhance well-being and influence views on coastal access. ›Coastal Place Attachment‹, they argue, should inform more inclusive and community-sensitive coastal management approaches.⁴⁵ Stocco and Rocca (2024) further show how place-based education, such as the use of short films focused on local marine contexts, can foster both ocean literacy and emotional connection.⁴⁶ Their study highlights how educational practices rooted in specific regions help participants develop a sense of belonging and care, which are essential for regional ocean literacy and environmental responsibility. Drawing upon this earlier research and employing a regional ocean literacy framework analogous to that utilised in Baltic Sea studies, face-to-face interviews were also conducted at the Mediterranean Sea coast, encompassing 405 residents and visitors. In this comparative study, Demmler and Kleemann (2025) found that local residents exhibited statistically significant heightened awareness and slightly higher concern regarding marine pollution in comparison to visitors.⁴⁷ This suggests that place attachment may

10.3390/su1205585. (08.01.2026); Lee, Dukjae/Lee, Ju-Hyoung: A Structural Relationship between Place Attachment and Intention to Conserve Landscapes—a Case Study of Harz National Park in Germany, in: *Journal of Mountain Science* 14 (2017), No. 5, pp. 998–1007, DOI: 10.1007/s11629-017-4366-3. (08.01.2026).

43 Amundsen: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway.

44 Ahtiainen, Heini et al.: Cultural Ecosystem Services Provided by the Baltic Sea Marine Environment, in: *Ambio* 48 (2019), No. 11, pp. 1350–1361, DOI: 10.1007/s13280-019-01239-1. (08.01.2026).

45 Diamond, Emily/Urbanski, Kaitlin/Melva, Treviño: »The Ocean Is a Part of Me«: The Importance of Coastal Place Attachment to Well-Being and Implications for Coastal Access Management, in: *Coastal Management* 52 (2024), No. 4–5, pp. 215–233, DOI: 10.1080/08920753.2024.2406745. (03.10.2024).

46 Stocco/Rocca: Place-Based Education for Ocean Literacy.

47 Demmler, Rebecca A./Kleemann, Susanne (2025). Exploring ocean literacy at the French Mediterranean coast: Information seeking, knowledge, awareness and concern about threats

enhance certain dimensions of regional ocean literacy, with stronger local ties potentially fostering deeper awareness and emotional engagement.

In the case of the Baltic Sea sample in this chapter, the empirical data from our study reveal that residents and visitors to the Island of Rügen and the Greifswalder Bodden possess a moderate to high average level of place attachment ($M = 4.21$ on a six-point Likert scale). Content analysis of qualitative responses, displayed in Figure 2, further elucidates the depth of these connections, with emotional bonding and habitual ties emerging as dominant themes.

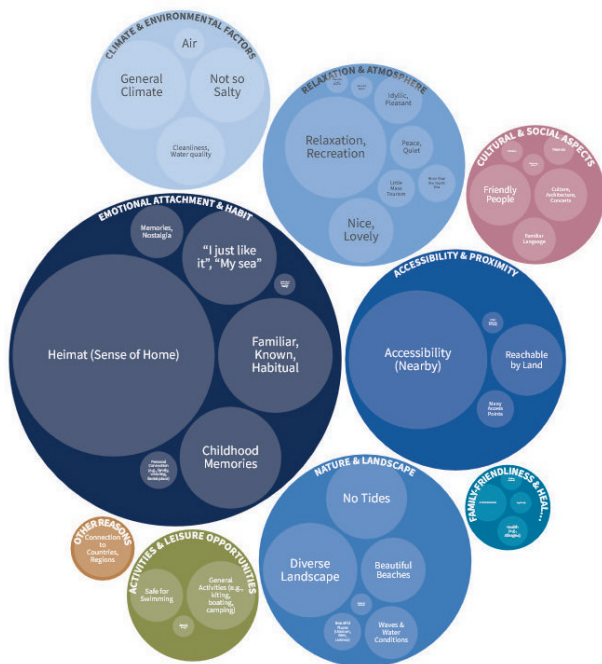


Figure 2: Perceived Attributes Contributing to the Baltic Sea's Popularity: A Frequency-Based Visual Content Analysis. The size of each circle reflects the frequency of mentions. $N = 264$, total mentions = 416.

Emotional attachment and habits, mainly ›Heimat‹ (a sense of home and nostalgia) along with themes of familiarity and childhood memories or personal

and professional connections (166 mentions), highlight the role of autobiographical memory in shaping affective attachments to the Baltic Sea among both residents and visitors.⁴⁸ This form of place attachment may reflect the Baltic Sea's unique historical context as the only proximate ocean basin accessible to individuals from the former GDR. As such, the sea held a special role as a recreational destination for citizens of East Germany and the Soviet Union. Functional aspects, such as *accessibility and proximity* (52 mentions), alongside the aesthetic and restorative qualities of the *nature and landscape* of the Baltic environment (52 mentions), further illustrate the multifaceted nature of people's attachment to the region. These elements underscore the Baltic Sea's role in providing valuable environmental ecosystem services on an individual level.⁴⁹ They also show the importance of the Baltic Sea's geographical location as one of only two ocean basins with relatively short coast lines in Germany. Additionally, the participants emphasised the *recreational and atmospheric* effects of the region, described as peaceful and idyllic (48 mentions), as well as the *favourable environmental and climatic conditions* (41 mentions), *cultural and social aspects* (22 mentions), and *activities and leisure opportunities* (17 mentions). Minor aspects included *family friendliness and health* and *other* (14 mentions). These environmental and cultural ecosystem functions underline the Baltic Sea as more than just a geographical space. They reveal its role as a meaningful setting for relaxation, regeneration, and well-being. The consistent appreciation of these qualities underscores the high symbolic and experiential value the marine environment holds for both residents and visitors. In sum, 64.4 % of the participants ($N = 410$) named the Baltic Sea as their favourite ocean, most commonly citing autobiographical reasons, functional aspects and environmental services for well-being. This high level of affective attachment reflects not only personal but also symbolic, historical, and environmental relationships with the Baltic Sea, resonating with Buchan et al.'s (2023)⁵⁰ conceptualisation of place as a network of relationships rather than a fixed location. Such emotional geographies may present powerful, yet underutilised, opportunities for fostering marine stewardship and pro-environmental behaviours.

However, the affective dimension of place attachment also entails certain vulnerabilities. Emotional connections to place may provoke resistance to en-

48 Low/Altman: Place Attachment.

49 Ahtaiainen et al.: Cultural Ecosystem Services Provided by the Baltic Sea Marine Environment.

50 Buchan et al.: Marine Citizenship.

vironmental change, particularly when landscapes of personal significance are perceived as threatened or changed. Strategies for Baltic Sea literacy, therefore, should strike a balance, leveraging emotional bonds to inspire stewardship while fostering adaptive capacities for change. Integrating cultural narratives, local knowledge, and participatory approaches into marine education may enrich emotional connections and promote resilient environmental behaviours. Ultimately, a place-based ocean literacy that embraces both emotional resonance and critical awareness may be most effective in cultivating long-term, sustainable relationships with the sea.

Implications for a Regional Ocean Literacy for Public Engagement in Marine Preservation

Returning to our guiding question of how regional ocean literacy can help uncover and address the fragmented ways in which residents and visitors perceive and relate to the Baltic Sea, this final section synthesises our empirical findings. It explores the implications for more inclusive public engagement and context-sensitive marine preservation strategies along the German Baltic Sea coast.

The identified gap between perceived and actual ecological threats in the Baltic Sea region calls for more effective and context-sensitive science communication. Public concern is currently skewed toward highly visible threats while less tangible or more complex issues receive limited attention. This misalignment may hinder informed engagement and may further constrain support for comprehensive marine protection measures. Therefore, Baltic Sea literacy initiatives may need to expand beyond merely disseminating information. Instead, they could aim to translate complex scientific knowledge into meaningful narratives that resonate with the lived experiences and values of different audiences, particularly those with direct emotional, autobiographical, and cultural ties to the region.⁵¹

Participants frequently described the sea as a place of peace, recreation, and well-being, while recurring references to a feeling of home, familiarity, and childhood memories reveal deep-rooted attachments shaped by both personal and collective histories. These affective bonds may offer significant strategic potential to inform, engage, mobilise, and sustain public commitment to marine protection at the Baltic Sea. This emotional dimension is not merely

51 Demmler/Stoll-Kleemann: Understanding Public Perceptions of Marine Threats.

anecdotal; it may also be a powerful motivator for action. As Amundsen (2015) has argued, place attachment may be more effective in driving conservation behaviours than abstract communication about ecological threats,⁵² precisely because it builds on what people already know, care about, and feel at risk of losing. Emotional and experiential connections may offer a more personally relevant pathway to environmental concern than distant or generalised messages.⁵³ In this context, communication strategies can benefit from actively highlighting the personal meanings that people associate with a healthy ocean, such as tranquillity, vitality, and leisure. Emotional storytelling formats that connect environmental threats to daily life, like vanishing beachscapes or memories of childhood summers, may transform vague concern into a sense of personal urgency and responsibility. However, since negative emotions like fear can lead to anxiety and passivity, tapping into negative emotions should be used with care and accompanied by suggestions on how to mitigate the threats.⁵⁴

The recurrent references to ›Heimat‹ and childhood memories also highlight the role of autobiographical memory as a key component of ocean literacy. These connections could be purposefully incorporated into outreach formats, such as participatory exhibitions, digital storytelling, or intergenerational workshops that invite residents and visitors to share their ›Baltic Sea stories‹. Such approaches may help bridge temporal and emotional gaps between past experiences and present environmental challenges, fostering long-term identification with marine protection goals. As Schwerdtner Máñez et al. (2023)⁵⁵ suggest, regional ocean literacy frameworks may need to account

52 Amundsen: Place Attachment as a Driver of Adaptation in Coastal Communities in Northern Norway.

53 Stoll-Kleemann/Nicolai/Franikowski: Exploring the Moral Challenges of Confronting High-Carbon-Emitting Behavior; Stoll-Kleemann: Feasible Options for Behavior Change Toward More Effective Ocean Literacy; Stoll-Kleemann, Susanne/O’Riordan, Tim: Revisiting the Psychology of Denial Concerning Low-Carbon Behaviors: From Moral Disengagement to Generating Social Change, in Sustainability 12 (2020), No. 3, 935, DOI: 10.3390/sul2030935. (08.01.2026).

54 Bissing-Olson, Megan J./Fielding, Kelly S./Lyer, Aarti: Experiences of Pride, Not Guilt, Predict pro-Environmental Behavior When pro-Environmental Descriptive Norms Are More Positive, in: Journal of Environmental Psychology 45 (2016), pp. 145–153, DOI: 10.1016/j.jenvp.2016.01.001. (08.01.2026); Norgren, Andrea (SEI)/Moss, Ellie (Moss & Mollusk Consulting): Reducing Plastic Pollution: Campaigns That Work, www.campaignsthatwork.org/ (13.01.2025).

55 Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: Ocean Literacies; Kleemann, S. Eine humanökologische Sicht auf die Mensch-Meer Beziehung im 21. Jahrhundert in sechs Thesen, in: Simon, K.-H./Deutsche Gesellschaft für Humanökologie (eds.): Mit Human-

for socio-cultural, historical, and economic contexts to enable a more situated and science-informed understanding of marine issues.

In addition, this personalised approach to ocean literacy may also require translation into participatory planning and monitoring practices. The inclusion of citizen-generated data or the use of community-based ›Perception Experts‹, as proposed by Beyerl et al. (2016),⁵⁶ could play a vital role in this. These facilitators, proposed to be trained to identify and represent local knowledge and emotional perspectives, could mediate between policy design and lived experience. By mobilising people's diverse emotional and functional ties to the Baltic Sea coast, as demonstrated by our research on the Island of Rügen and the Greifswalder Bodden, such roles may help translate abstract conservation goals into community-driven action. Incorporating stakeholder perceptions as valid forms of environmental knowledge, not just anecdotes, may further help democratise decision-making and foster trust in information sources and political decision-making processes. As research shows, trust in environmental governance is essential for public engagement, especially when institutions aim to encourage behavioural change.⁵⁷

Finally, to effectively support such transformations, ocean literacy strategies may consider adapting and expanding their communication platforms. As Schwerdtner Máñez et al. (2022) and Kopke et al. (2019) suggest, this can entail diversifying communication formats and channels, especially by creatively using social media and participatory tools, to reach and engage broader audiences, particularly younger, digitally connected demographics.⁵⁸

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56 Beyerl, Katharina/Putz, Oliver/Breckwoldt, Annette: The Role of Perceptions for Community-Based Marine Resource Management, in: *Frontiers in Marine Science* 3 (2016), DOI: 10.3389/fmars.2016.00238. (08.01.2026).

57 Gelcich et al.: Public Awareness, Concerns, and Priorities about Anthropogenic Impacts on Marine Environments; Hofman, Karen/Hughes, Karen/Walters, Gabrielle: Effective Conservation Behaviours for Protecting Marine Environments: The Views of the Experts, in: *Journal of Sustainable Tourism* 28 (2020), pp. 1–19, DOI: 10.1080/09669582.2020.1741597. (08.01.2026); Hogg, Katie et al.: Perceptions of Threats Facing Cabo de Palos-Islas Hormigas MPA and Potential Solutions, in: *Coastal Management* 46 (2018), pp. 58–74, DOI: 10.1080/08920753.2018.1405330. (08.01.2026); Soares, Joana et al.: Public Views on Plastic Pollution: Knowledge, Perceived Impacts, and pro-Environmental Behaviours, in: *Journal of Hazardous Materials* 412 (2021), 125227, DOI: 10.1016/j.jhazmat.2021.125227. (08.01.2026).

58 Schwerdtner Máñez/Stoll-Kleemann/Rozwadowski: Ocean Literacies; Kopke, Kathrin/Black, Jeffrey/Dozier, Amy: Stepping Out of the Ivory Tower for Ocean Literacy, in: *Frontiers in Marine Science* 6 (2019), No. 60, pp. 1–13, DOI: 10.3389/fmars.2019.00060. (08.01.2026).

In summary, we propose that regional ocean literacies, in this case Baltic Sea literacy, be understood and designed not just as a top-down educational task, but as a collaborative process that combines ecological understanding with emotional resonance, historical depth, and community-based meaning. Informing the public about the state of the Baltic Sea and its broad environmental threats remains essential, especially given ongoing knowledge gaps. However, conservation strategies may be more effective when they also engage with the personal and cultural dimensions of the sea. Incorporating personal memories, and symbolic or health-related values may strengthen public engagement. Transparent communication along diverse channels, inclusive planning, and sensitivity to community values are crucial to this process. Consequently, such strategies could foster long-term public engagement in marine conservation rooted in both threat awareness and place attachment.

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