

## Work package 4

**Deliverable:** D4.8 Report proposing measures stimulating ‘citizen science’ in the new (BANOS) programme

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### *The main outcomes*

- The first steps to define desirable Citizen Science (CS) approaches in the future BANOS context have been outlined and discussed and links initiated with the wider CS landscape.
- In BANOS context, CS is defined as follows: *CS is a research approach which allows science and civil society to cooperate, to learn, and work together to generate and use scientific knowledge and understanding for mutual benefit. These benefits include, for example, enhanced data collecting capability for scientific research, empowerment of civil society and increased environmental awareness. In BANOS, CS is based on and delivers towards objectives and aims of the BANOS SRIA and the BANOS Programme as a whole.*
- Further recommendations issued in this task to be used for guidance of BANOS include:
  - Support to development of CS approaches where applicable, and inclusion of CS also among BANOS projects’ performance indicators
  - Encouragement of future projects to practice CS approaches wherever appropriate
  - Valuing all levels of citizen science related participation from crowdsourcing to involving citizens throughout the project cycle that need to be fostered as possible
  - Encouraging citizens involvement in widest sense, incl. marginal communities, ethnic and other minorities
  - Recognition that not all BANOS funded projects will necessarily be suitable for inclusion of CS
  - Contributions to international development of marine CS in close collaboration with CS experts
  - Support to creation of a joint, marine and coastal CS database for the BANOS region
  - Encouragement of exploring new ways for knowledge transfer and use of new technologies
  - Support of compulsory data management plans for all future BANOS projects, including aspects of data ownership and openness
- The Baltic Sea Citizen Science baseline mapping was added to the report as an annex 3 on 2 Nov 2021.

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## **Description of task: (i.e. as in the Description of Work)**

Citizens form an important and often overlooked stakeholder group in society. Citizens are not only affected by policies and regulations formulated as a consequence of new knowledge/research, they are also a valuable resource when it comes to observations, data collection and spreading of knowledge (e.g. through social media etc.). Citizen science is an approach which, in its simplest form, involves members of the public in observations and gathering scientific data. However, citizen science can also mean the inclusion of citizens in the co-design of research programmes or projects, or in the funding of research projects (through crowdsourcing). The benefits of including citizens in scientific work may include enhancing monitoring capabilities, but also empowering citizens, increase the public trust and to help reverse the current erosion of public support (including funding). Earlier work has shown that the inclusion of citizens in marine science may help increase the ocean literacy, which itself can lead to sustainable behaviour. This task will prepare a strategy paper for how citizen science can add value to the future programme. The strategy paper will be based on a workshop (M8-M9) with 10 – 15 marine citizen science experts across Europe. The workshop will aim to identify different aspects of citizen science, collect best practices and set priorities that are specifically suited to support marine policy and ocean literacy. As the final output of this task, a strategy paper providing guidance on how citizen science best add value and could be implemented at various phases of the future programme will be produced.

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## 1. Executive summary

The Baltic and North Sea Coordination and Support Action (BANOS CSA) is preparing a framework for the joint Baltic Sea and North Sea Research and Innovation Programme (BANOS), to be ready in 2021. Task 4.7 *Strategies supporting 'Citizen Science' (CS)* is included under the umbrella of Open Science strategy as part of BANOS CSA work package 4: *Specific measures reinforcing future programme's lasting impact*.

In recent years, CS has emerged as a powerful new concept to enable individuals representing the general public to become involved in scientific research in different shapes and forms. While CS increasingly demonstrates its potential to enhance e.g., scientific data collection, it equally provides an avenue to strengthen an ocean literate and engaged society, emphasising more and more the role society can have in science and vice versa.

Development of the overall framework for the future BANOS Programme provides an opportunity to consider recent marine CS developments and embed the most appropriate approaches into the Strategic Research and Innovation Agenda (BANOS SRIA) – the backbone of the future BANOS as is planned in BANOS CSA (WP1). In this way the CS framework can act as a fit-for-purpose support tool that works towards realising some BANOS SRIA aims and objectives and add potentially value to the to the BANOS Programme as a whole.

In this report, the first steps to define desirable CS approaches in the future BANOS context are outlined and discussed. In support of realising this goal, some preliminary baseline information regarding the current and relevant marine focussed CS landscape in the BANOS region and at European level are visited. The very nature of CS and its current, rapid evolvement in the European landscape, serves as a strong incentive to link the BANOS approach from the outset to the wider European marine CS movement to which BANOS can contribute to and build on in future.

Finally, recommendations are issued as a basis for forming a fit-for-purpose CS strategy of the future BANOS Programme. In particular, the common factors of success identified for marine CS in recent times together with further consideration of nuances specific to the BANOS realities, and appreciation of the fast-evolving marine CS field in general, are viewed as guidance for formulating the recommendations. The recommendations propose a BANOS definition of CS with a recognition of civil society as a potentially valuable asset contributing to BANOS programme and implementation of its SRIA. The support to development of CS approaches and inclusion of CS among BANOS projects' performance indicators are both noted. Furthermore, future projects are encouraged to practice CS approaches as appropriate for reaching their objectives while equally it is recognised that not all BANOS funded projects will necessarily be suitable for inclusion of CS. Recognition of the value in all levels of CS related participation from crowdsourcing to involving citizens throughout the project cycle is made, as is consideration of citizens involvement in the widest sense, incl. marginal communities, ethnic and other minorities. Furthermore, BANOS is encouraged to explore new ways for knowledge transfer and possibilities to use new technologies, and support compulsory data management plans for all future BANOS projects, including aspects of data ownership and openness. Contributing to the international development of marine CS and close collaboration with dedicated CS experts is necessary as is support to all efforts towards creation of a joint, marine and coastal CS database for the BANOS region.

## 2. Introduction – defining Citizen Science

In the face of the rapidly evolving activities described as Citizen Science (CS), it is evident that the definition of CS is constantly under scrutiny and that there is not one, single definition to suit all contexts. For instance, in a recent article 34 current and commonly used examples of definitions of CS were presented (Haklay et al. 2021). Haklay et al. differentiate between ‘descriptive’ definitions provided by dictionaries e.g., in Oxford English Dictionary i.e., "*scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions*" (introduced first time in 2014, retrieved 26 February 2021 online) and ‘instrumentalist’ and ‘normative’ aspects. The latter two include matching goals and objectives, as well as expectations and different layers of engagement. To a varying degree, these different aspects appear in all CS definitions, e.g. by CS associations, such as European Citizen Science Association (ECSA)<sup>1</sup> and the EU and Science Europe<sup>2</sup>. This multiplicity of definitions has been essential to the development of CS, by enabling frameworks and mechanisms in relation to the different needs of specific fields of application.

The appropriate definition depends on the context. For example, when addressing engagement in policy, the definition developed by the EU Open Science Policy Platform<sup>3</sup> could provide a good example: "*CS can be described as the voluntary participation of non-professional scientists in research and innovation at different stages of the process and at different levels of engagement, from shaping research agendas and policies, to gathering, processing and analysing data, and assessing the outcomes of research*" (Factsheet on CS 2020). When applying for funding that may include also CS component, the White Paper on Citizen Science for Europe (2014) definition might be the most applicable: "*CS refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.*"

The definition by the European Marine Board<sup>4</sup> noted among other in the EMD marine CS policy brief (2017) provides also the important link between CS and Ocean Literacy (OL): "*CS is a research approach which allows science and civil society to cooperate, to learn, and to work together to generate and use scientific knowledge and understanding for mutual benefit. These benefits include enhanced monitoring capability for scientific research, empowerment of civil society and increased environmental awareness...*" ..... "*With regard to the ocean, it has a special role to play. The vastness of the ocean and the lack of connection most people feel with the blue part of our planet, make marine CS a vital tool to promote Ocean Literacy (OL) and engage citizens in coastal and ocean research.*"

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<sup>1</sup> The European Citizen Science Association, ECSA, was launched in 2013. Their mission is to encourage the growth of the CS movement in Europe and to enhance the participation scientific processes, mainly by initiating and supporting CS projects as well as performing research on CS. <https://ecsa.citizen-science.net/about-us>

<sup>2</sup> Science Europe is non-profit organisation representing major Research Funding and Research performing Organisations in Europe: [www.scienceeurope.org](http://www.scienceeurope.org)

<sup>3</sup> [https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science\\_en](https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science_en)

<sup>4</sup> The European Marine Board (EMB) is the leading European think tank in marine science policy. It provides a platform to advance marine research and to bridge the gap between science and policy. [www.marineboard.eu](http://www.marineboard.eu)

## 2.1 Identifying key principles of successful Citizen Science

The ECSA published 'Ten principles of CS' (ECSA, 2015) as guidance for cooperation between citizens and researchers, available to date in 30 language. The principles have been taken up and been further developed by many organisations and professionals. For instance, the Australian Citizen Science Association has adapted a national version of the 10 principles from ECSA.

### **ECSA's 10 principles of citizen science**

1. CS project actively involve citizens in scientific endeavour that generates new knowledge or understanding.
2. CS projects have a genuine science outcome.
3. Both the professional scientists and the citizen scientists benefit from taking part.
4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process.
5. Citizen scientists receive feedback from the project.
6. CS is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. CS project data and meta-data are made publicly available and where possible, results are published in an open access format.
8. Citizen scientists are acknowledged in project results and publications.
9. CS programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of CS projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.

These fundamental principles have prompted further discussion on different nuances to consider in different fields and depending on the aim of the CS project (Haklay et al. 2021). Thus, to add further value in specific CS contexts additional principles have been presented. For instance, in the BiodivERsA Citizen Science Toolkit for biodiversity scientists (2020), the following additional principles are listed:

11. Consider the CS aspect at project inception: consider IF and WHICH CS approach could fit (CS is not always possible or relevant).
12. To ensure the success of a CS project, volunteers should be well trained and clear methods and protocols should be developed.
13. Data management is central to CS, especially if dealing with Open data practices.
14. Communications with volunteers and feedback on the project are essential.
15. Ethical and legal aspects should be considered when working with citizens and CS data.

Six factors for successful CS project are outlined in the European Marine Board's Position Paper 23 'Advancing Citizen Science for Coastal and Ocean Research' (García-Soto et al. 2017; Figure 1). Although formulated within the context of marine CS, 'factors of success' could apply, apart from 'improved OL' (which may or may not be included), to any CS project. For instance, these factors were adapted and

taken into considerations when planning the design and implementation of the SOPHIE Pilot “Tourism & Citizen Science” Program on Oceans & Human Health, 2019-20<sup>5</sup>.



Figure 1. Factors of success in citizen science projects. Modified from Garcia-Sato et al. 2017.

### 3. Citizen Science in the EU and UN

In the context in which the future BANOS Programme will operate in (as is planned in the BANOS CSA), the wider (marine) CS landscape must be considered. At the European level, the EU seeks and seizes opportunities to enhance public engagement and understanding of the value of investment in research and innovation. Furthermore, with increased possibilities via e.g. digitalisation, citizens can contribute to efficient and low-cost data collection. Subsequently, in the next **EU Research and Innovation**

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<sup>5</sup> The SOPHIE program was an opportunity to understand how marine ecotourism operators contribute to both healthy coastal living and ocean literacy (H2020 SOPHIE Consortium, 2020).

**Framework Programme Horizon Europe (HE)**, CS is well embedded across the whole Programme as one of the eight ambitions of Open Science policy<sup>6</sup>.

A new element in the HE Programme are the Missions<sup>7</sup>. In the recent report **Mission Starfish 2030: Restore our Ocean and Waters by 2030**<sup>8</sup>, the Mission Board on the mission area **Healthy oceans, seas, coastal and inland waters** published five overarching objectives that are considered indispensable components of a holistic approach to systemic change for 2030: (i) filling the knowledge and emotional gap, (ii) regenerating marine and freshwater ecosystems, (iii) zero pollution, (iv) decarbonising our ocean, and waters (v) revamping governance. The report emphasises the powerful engagement with society as a key condition for success and lists CS as an important tool to reach the five objectives. Knowing, restoring and protecting our ocean and waters is a shared responsibility, individually and collectively, and must be supported by citizens. A powerful engagement with society to captivate relevance of Mission objectives in all its forms and a strong communication strategy based on media campaigns and awareness raising actions, including CS initiatives, are among the ingredients noted imperative in achieving success. CS with larger public engagement will help gather empirical data and foster public participation and cooperation in scientific endeavours. Promoting exchanges between society and science and broadening access to knowledge, CS will help build confidence and provide learning experiences for participants as well as draw on citizens' knowledge to develop the solutions for regenerating the ocean and waters.

The EU facilitates also other means and tools promoting CS efforts and knowledge sharing. For example, the **EU-Citizen.Science**<sup>9,10</sup> platform aims to share knowledge, initiate actions and support mutual learning across Europe. It is a consortium representing a variety of stakeholders that are active in CS, including universities, non-governmental organisations, local authorities, community service organisations and museums. Further examples of CS in different projects are also given e.g., from slides from EU Research and Innovation days 2019 (slideshare.net<sup>11</sup>).

CS can act as a powerful tool in promoting OL. Supported by the European Commission, the **EU4Ocean Coalition for Ocean Literacy**<sup>12</sup> platform is a bottom-up inclusive initiative that connects diverse organisations, projects and people to contribute to OL and the sustainable management of the ocean. Understanding how we influence the ocean and how the ocean influences us is at the core of OL. This understanding allows us to make responsible choices to better protect our ocean and to use the opportunities it offers in a sustainable manner. Thereby, contributing to the improvement of the well-being of people, as envisioned in the European Green Deal<sup>13</sup>. The coalition pledges to contribute to enhancing awareness and the engagement of all parties involved in the sustainable management of our ocean and seas. It also is set to help its members to become ocean advocates in their own field/role/region as well as agents of transition supporting changes in perception, values, attitudes and

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<sup>6</sup> [https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science\\_en#8-ambitions-of-the-eus-open-science-policy](https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science_en#8-ambitions-of-the-eus-open-science-policy)

<sup>7</sup> [https://ec.europa.eu/info/horizon-europe/missions-horizon-europe\\_en](https://ec.europa.eu/info/horizon-europe/missions-horizon-europe_en)

<sup>8</sup> [Mission Starfish 2030: Restore our Ocean and Waters | European Commission \(europa.eu\)](https://ec.europa.eu/mission-starfish/)

<sup>9</sup> <http://eu-citizen.science>

<sup>10</sup> The platform has received funding from EU Horizon 2020, GA No. 842580

<sup>11</sup> [www.slideshare.net/mukih/citizen-science-in-different-project](https://www.slideshare.net/mukih/citizen-science-in-different-project)

<sup>12</sup> <https://webgate.ec.europa.eu/maritimeforum/en/node/4484>

<sup>13</sup> [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)

behaviour towards more sustainable practices and management of the ocean. It also aims to promote blue economy opportunities and put OL high on the policy agenda, contributing to the implementation of the EU marine and maritime policies and the achievement of the Sustainable Development Goals (SDGs)<sup>14</sup> of the Agenda 2030 and in particular the SDG 14 Life below water. The EU4Ocean coalition also combines EU-wide activities with actions dedicated to the Arctic Ocean, the Atlantic Ocean, the North Sea, the Baltic Sea, the Black Sea, the Mediterranean Sea and the global ocean.

Explicit reference is made also to a role that CS plays in ensuring that ocean science meets the needs of the society in the **UN Decade of the Ocean Science for Sustainable Development**<sup>15</sup>. In particular, the IOC Ocean Literacy Portal and the online Toolkit 'Ocean Literacy for All' (UNESCO 2019) are set to be put in use during the Ocean Decade (started in 2021) to provide a global, common framework for sustainable management of the ocean, all in the context of the 2030 Agenda. In its portal, OL is defined as *"an understanding of the ocean's influence on you, and your influence on the ocean. OL is a way not only to increase the awareness of the public about the ocean, but it is a way to encourage all citizens and stakeholders to have a more responsible and informed behaviour towards the ocean and its resources."* In realising key priority areas, a participative and transformative process for the implementation has been designed in order to 1) Facilitate mutual learning across research and stakeholder communities, 2) Ensure robust communication across stakeholder communities, and 3) Create stronger connections between scientists, policy makers, managers, and service users, so that ocean science delivers greater benefits for the ocean ecosystem and for society.

#### 4. Marine Citizen Science

Due the importance of oceans as climate regulators, producers of oxygen we breath, the extent of our reliance on its ecosystem goods and services and the ongoing unprecedented habitat and species loss, among other, the perspective of advancing in particular CS for coastal and ocean research becomes evident. In comparison to other areas of CS, the marine CS faces some major challenges given the inaccessibility of most of the marine environment, the (at times) rapidly changing management landscape and the accelerating speed and the extent of climate change impact on marine system. Yet, as policy becomes more dependent on large datasets required to assess many impacts on ecosystems over long timescales – while operating in a scarce resourced funding climate – CS has the potential to add to marine evidence base – provided that utility is well assessed (Garcia-Soto et al, 2017). Digitalisation has the power to allow citizens to contribute meaningfully to data collation from an otherwise remote and inaccessible environment. For instance, data collection via e.g. a mobile phone facilitates rapid return of species records or environmental variables. Citizen data offers significant possibilities for supporting remote sensing operations by aiding in the identification of temporal patterns that are not covered by more precise remote sensing data. Water temperature measurements from, e.g. divers watches, comply well with in-situ systems and may support quality control of space-borne observations. Sporadic events,

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<sup>14</sup> <https://sdgs.un.org/goals>

<sup>15</sup> The [United Nations proclaimed a Decade of Ocean Science for Sustainable Development](https://oceandecade.org/) will be held from 2021 to 2030. This Decade will provide a common framework to ensure that ocean science can fully support countries' actions to sustainably manage the Oceans and more particularly to achieve the 2030 Agenda for Sustainable Development. <https://oceandecade.org/>

such as algal or jellyfish blooms, a new species on a shore, mass mortalities of fish, strandings or oil spills can be detected by CS where no space-borne data are available. Marine CS can also serve as a vehicle through which marine environmental policy is enacted. Thus, by driving the best practices, cultivating OL and understanding the wider benefits of CS for different actors, the marine CS can contribute to scientific, social and economic added value. In Annex 1 types of CS and Annex 2 examples of CS efforts in marine CS are listed for further reference.

While marine citizen science is emerging with promising opportunities for science, policy and public, there is still no comprehensive overview of the current state in Europe. An overview of the current situation and new technological advances of Europe is addressed in a recent review article (Garcia-Soto et al, 2021) which relies to a large extent on the most holistic, current mapping of CS projects carried out in the North Sea region (van Hee et al. 2020). This is of key interest also for the future BANOS Programme, which aims to contribute, as deemed appropriate, to the marine CS action of its region. To this end, creation of a joint marine and coastal CS database for the Baltic Sea and the North Sea area would inform and add value and understanding as well as act as a good reference point for all marine CS activity taking place across the BANOS region. Currently, as such holistic oversight is still lacking, separate accounts of both the North Sea and the Baltic Sea CS activity is outlined in the following chapters.

#### 4.1. The North Sea region

A BANOS CSA member, the Flanders Marine Institute (VLIZ), Belgium, has been at the forefront of examining the marine CS surge of recent times, and in particular advocating OL in the North Sea region, in Europe and beyond, also as part of pan-European CS network. VLIZ has co-authored above EMB publications and issued in late 2020 a further publication “*Policy Informing Brief: Marine Citizen Science in the North Sea area - and what policy makers can learn from it*” (van Hee et al. 2020). This takes a considered look of the CS landscape in the North Sea region by thoroughly reviewing and analysing 127 marine CS projects in the North Sea area and then formulating recommendations for policy makers.

van Hee et al (2020) shows that almost half of the North Sea CS projects deal with the study of plant or animal species. These projects cover the distribution or abundance of one or more species, or gather information about population changes (migration patterns, behaviour). Most frequently projects in this ‘species’ category relate to marine mammals (28%), fish (20%) and birds (20%). Another 17% of the projects deal with ‘pollution’, such as marine litter or oil contaminated seabirds. Some 16% have a more general ‘biodiversity’ focus while the other categories (‘Ecology’, ‘Fisheries’, ‘Environmental’ and ‘Archaeology’) are less commonly featured among the projects. Undoubtedly, there is still a big untapped potential for marine and coastal CS initiatives in the non-biological sciences (geology, archaeology, history, coastal engineering, maritime technology, etc.).

A variety of organisations (charities and foundations, governmental organisations, research institutes, non-governmental organisations, partnerships or individuals) are involved in CS projects. NGOs are the major contributors to North Sea CS initiatives, research institutes are second.

Overall, the analysis displays a mixed pattern in what organisations aim for. Government organisations prefer projects that draw attention to important policy issues, research institutes invest most in

‘descriptive’ initiatives, whereas NGOs have a slight preference for initiatives in which monitoring and evaluation is crucial.

Regarding the level of participation, there is certainly scope for growth compared to what is at stake today. The higher the level of participation, the more effort needed from the citizen scientists (and from the organisers) and the less projects you will find. Crowdsourcing, which requires no knowledge on the subject, is the most frequently used method (69%), whereas extreme citizen science, where non-professionals are motivated to participate in all steps of research (problem definition, data collection, analysis and results), is still relatively rare.

van Hee et al (2020) conclude that although their study shows an exponential growth, and interesting variety of marine CS projects in the North Sea area from 1960s to today, CS in the marine field is still lagging behind compared to the development of CS in terrestrial and freshwater areas. The main reason for this is that the sea does not have the same general access in comparison to the terrestrial environment and lakes. The development for CS in the marine environment could be supported by a specific strategy and by platforms e.g. including a development of a comprehensive database. Furthermore, additional incentives, including seed money, in order to create a wide range of marine CS projects and initiatives, from easy, well-attended beach-based reporting of sightings to more complex ‘extreme’ forms of CS. A well-designed strategy could lead towards a more diverse, more accessible and highly desirable spectrum of marine CS initiatives in Europe.

## 4.2. The Baltic Sea region

A recent study of how marine CS can provide real added value in the Baltic Sea region was carried out in Finnish waters where citizen observations were utilised in regards of the non-indigenous Harris mud crab *Rhithropanopeus harrisi* (Lehtiniemi et al. 2020). With an aim to show the potential of CS in environmental monitoring, citizen observations on the species were collected from the first observation onwards between 2009 and 2018, at first via email and later through an active citizen observation web portal (Invasive Alien Species Portal). The outcomes of the study clearly indicated that species-specific citizen observations can be a beneficial addition to supplement national monitoring programs to fulfil legislative reporting requirements and to target potential management. Furthermore, the results showed that recognisable species and geographical areas with low biodiversity provide a good opportunity to utilise citizen observations in the Baltic Sea region. Moreover, citizen observations may enable distribution assessments for certain species that would otherwise require excessive resources and sampling efforts.

Such studies as above indicate encouragingly positive evidence of usability of marine CS in different ways in the region’s research efforts. However, on a more general note, while anecdotal evidence exists of marine CS activity in the Baltic Sea region, the oversight of the marine CS landscape in the region is currently still dispersed in the absence of similar, holistic baseline study as has been carried out recently for the North Sea region (see 4.1.). (N.B. On 2 November, an annex containing the first ever CS baseline study in the Baltic Sea region commissioned by BONUS EEIG on behalf of BANOS CSA was added as an annex 3 of this report.)

Some steps towards identifying the breadth of marine CS activities in the region have been initiated nevertheless in recent times. This is, in particular, the case in respect of gaining an oversight of the OL activity in the region. The EU4Ocean Coalition for Ocean Literacy coordinator for the Baltic Sea region, the SUBMARINER Network<sup>16</sup> (through its founding member s.Pro), found in their initial, non-exhaustive mapping, 78 organisations or projects engaged in CS/OL activities in the Baltic Sea region (Submariner Network, *in prep.*) This is a start and further possibilities and avenues are explored by now increasingly active actors in the region to conduct a more holistic baseline study of the overall marine CS landscape in the Baltic Sea region, hopefully in the near future.

Relevance to the considerations of the future BANOS programme's CS approach can be found also in the recommendations issued by the SUBMARINER Network (based on consultation with the wide community of actors and information to be published in report in spring 2021) which note that "...it is essential that OL (even as a facet of CS more generally) becomes integrated into the funding logic of programmes throughout the Baltic and beyond. This includes both research-oriented programmes as well as those aimed at broader collaboration and regional integration. We recommend two essential aspects:

- Adopting OL as a concern in the evaluation criteria for proposed projects' communication and exploitation activities. There has already been an ongoing effort to integrate communication efforts transversally across project activities and the same logic should apply to OL as a key component of communication goals.
- A very effective way of promoting the application of CS and OL would be for funding bodies to create a dedicated Coordinating and Support Action for this field. This would enable the better support of cross-sectoral efforts connecting e.g. skills development in businesses, public authorities, schools and individual contributors."

## 5. Citizen Science and BANOS

Citizen Science provides a valuable opportunity to engage and interact with local citizens and societies in the BANOS region as well as to increase the ocean literacy and emotional attachment to the regional seas and coasts. In the following sections, the possibilities how CS and thereby support of OL may be incorporated into BANOS SRIA at research project level (section 5.1) – including some examples of potential of the CS practice outlined in the Table 1. – and at the programme (section 5.2) level, are discussed further.

### 5.1 Embedding Citizen Science into BANOS SRIA

The current, ongoing development of the framework for the future BANOS Programme, provides an ideal opportunity to consider also the recent marine CS developments in this context. The aim here is to define possible ways to embed the most appropriate approach into the Strategic Research and

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<sup>16</sup> <https://www.submariner-network.eu/>

Innovation Agenda (BANOS SRIA) – the backbone of the future BANOS as is planned in BANOS CSA (Task 1.3). In practical terms, foremost CS can act as a fit-for-purpose support tool that works towards realising some specific objectives under the three strategic objectives of the BANOS SRIA (figure 2).

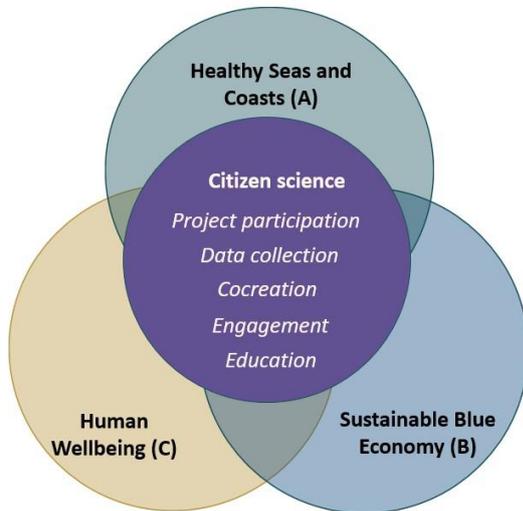


Figure 2. Various citizen science activities and actions can potentially contribute significantly towards the three Strategic Objectives of the BANOS SRIA: Healthy Seas and Coast (A), Sustainable Blue Economy (B) and Human Wellbeing (C).

While some aims and objectives are more applicable and ready for CS tool to be put in use, or at least carefully considered for its use, the potential added value that CS approaches can present is evident. For example, to ensure the realisation of the strategic objective Healthy Seas and Coasts (see BANOS strategic objective A, Figure 3. and Table 1.), the engagement of citizens is essential. This is important, not only to inform about the state of the marine environment and current threats it is facing due to climate change and human induced pressures, but also to add emotional value to the local marine environment for people to feel more protective over it. This way people are also more likely to follow sustainable practises and take environmentally conscious decisions as well as expect these values to be taken into account in local, national and regional decision making. All these efforts culminate towards achieving and maintaining healthy marine environment in the BANOS region.

In more practical terms, the potential of involving citizens in scientific projects for mutual benefit is immense. Collecting data on species observations and threats facing the environment, such as accidental pollution events and litter are good examples of possible contributions. Sailing and recreational boating are also popular leisure activities in both the Baltic Sea archipelago and the North Sea area. As the leisure boats are increasingly being equipped with modern technologies and sensors, the data collected by such means could be used more widely by scientific community and monitoring applications. In addition, such data could be used for calibration of satellite derived observations, or to complement such approaches to observations. As an example, the BONUS ESABALT project<sup>17</sup> pioneered development of a concept of vessel-driven and user-driven autonomous crowdsourcing techniques for information gathering and integration across national borders and administrative sectors in the

<sup>17</sup> [www.banoscsa.org/banos\\_csa/bonus\\_legacy/bonus\\_projects/innovation\\_2014-2017/esabalt](http://www.banoscsa.org/banos_csa/bonus_legacy/bonus_projects/innovation_2014-2017/esabalt)

Baltic. This demonstrator platform encompasses also recreational vessels. In some cases, citizens could also be involved in scientific sample collection, to provide larger spatial and temporal sampling coverage of, for example, phytoplankton and algal communities, or surface water samples. Possibilities are manifold, provided that citizens are well educated in sampling techniques and approaches, and sample storage is easily arranged e.g. in respect to storage temperature. Cocreation projects together with citizens, for example, to create local, nature-based solutions, e.g. to combat nutrient leakage to the marine environment or ways to enhance coastal biodiversity, have the potential to provide citizens the feeling of “ownership” and sense of value. Such projects can also enhance the appearance and opportunities of local communities, leading to benefits of wellbeing, both in terms of health and economic perspectives (with clear links to the BANOS Strategic Objective C, see below).

The ongoing development of Blue Economy sector provides multiple opportunities to interact with citizens and for them to be involved in sustainable development of this sector (see BANOS strategic objective B, Figure 3. and Table 1.). In particularly crucial is education on sustainable use of marine products and goods, for both consumption of seafood and other sea-based materials and goods. Where appropriate, smart technology and associated apps could be developed and used for such purposes. These platforms can potentially serve also for collection of data, for example, on consumer behaviour and preferred choices. The expansion of new emerging sectors, e.g. ocean energy, may also lead to potential conflicts between different stakeholder groups, of which citizens and local communities are one important sector. Projects could potentially engage with citizens and local business to explore ways to how the development of new sectors can benefit not only industry but also local communities, for example by providing new business opportunities, jobs and economic growth to the area.

Marine environment is also intrinsically linked to human wellbeing (see BANOS strategic objective C, Figure 3. and Table 1.) as a provider of healthy and nutritious food. In addition, more evidence is piling up to link the health and emotional wellbeing to spending time at seaside. To promote human wellbeing in the BANOS region, projects could engage with citizens in multiple ways, through education on sustainable seafood choices and possible contaminant risks or how to avoid those. Citizens can also provide and collect data on consumer choices and how the choices are made and potentially altered, for example, to include more sustainable choices and consumption of non-traditional species. Climate change may also have negative impact on human wellbeing and coastal communities, with citizens being especially vulnerable for these e.g. due to potential increase in sea level, coastal erosion and storm surges. Local communities could be educated of potential dangers and ways to minimise these risks. Potential cocreation projects with local communities could serve as a way to reduce these risks, as well as lead to new recreation opportunities for citizens to benefit from.

Table 1. Considerations of the BANOS Strategic Research and Innovation Agenda and the potential of marine Citizen Science

BANOS					
Strategic objective	Specific objective	BANOS R&I theme	Potential project involvement	Examples on education/Ocean literacy	Other engagement with society
Healthy seas and coasts	A.1.: A resilient marine ecosystem	A.1.1 Understanding food web interactions and their services, with respect to species, population and system levels	Species and habitats observations	Education on species (common, red listed, aliens) e.g. in apps in native language (e.g. <a href="#">“Livet i havet”</a> )	
		A.1.2 Understanding critical components of marine ecosystem resilience and drivers of change	Species and habitats observations	Education on effects of multiple pressures on local marine ecosystems	
		A.1.3 Understanding the potential of marine organisms and ecosystems to adapt to rapid environmental changes (e.g. climate change and ocean acidification)	Species and habitats observations	Education on effects of climate change on local marine ecosystems	
		A.1.4 Operationalization and assessments for the implementation of the ecosystem approach			
		A.1.5 Coastal and marine ecosystems as nature-based solutions	Habitats and coastal erosion observations		Potential for co-creation process with the local community
	A.2.: Seamless governance linking land, coast and sea	A.2.1 Understanding the impact of land-derived pollution, litter and nutrients on the status of the marine environment and ecosystem services, including ways to reach good environmental status	Observations on litter	Education regarding household waste (including chemicals and pharmaceuticals) on water quality	
		A.2.2 Evaluation of effectiveness and cost-effectiveness of various pressure mitigation actions			
		A.2.3 Evaluation of synergies and conflicts in relation to targets of different environmental policies			
		A.2.4 Development of alternative policy instruments and new governance structures, which respond to current and future sustainability challenges			Engage with local communities to enhance social understanding of policies, and explore ways how to co-create governance mechanisms

		A.2.5 Develop fast feedback mechanisms from maritime observation to support surveillance and control activities, evaluation of management measures and risk-assessment	Observations on oil-spills, lost containers etc. at sea. Potential to contribute to data collection e.g., measurements and observations on bathing water quality			
	A.3: Digital Ocean - Competent ecosystem modelling, assessments and forecasting	A3.1 Development of machine learning methods for ecosystems data analysis and models				
		A.3.2 Improved, ecologically relevant modelling of underwater landscapes and the associations between species and abiotic parameters				
		A.3.3 Development of models to predict tipping points or cascade effects in biological systems, including identification of the drivers of the changes and their impact on biota			Explore mechanisms how society can better prepare for sudden shifts in ecosystem functioning i.e. tipping points and minimise impact of such events on communities.	
	A.4: Efficient techniques and approaches for environmental monitoring and assessment	A.4.1 Application of powerful DNA approaches to monitor ecosystem resilience and changes	Sample collection			
		A.4.2 Novel techniques and approaches in monitoring and assessment for sustainable ecosystem management and weather and climate models/forecasts	Data collection by seagoers			
		A.4.3 Monitoring and long-term solutions for micro and macro debris in aquatic environments	Observations and data collection on litter	Education on impact of debris on marine environment	Engaging with society to understand behaviour in respect to littering. Cocreate ways to reduce littering and e.g. make recycling more convenient	
	<b>Sustainable blue economy</b>	B.1: Sustainable resource management of marine commons	B.1.1 Sustainable harvesting/extraction and use of marine living and mineral resources		Education on how to choose sustainable marine living and non living resources	Engage with society to find ways how to make it easy to make sustainable choices in respect to seafood consumption
			B.1.2 Explore possibilities for innovation in seafood and zero food waste throughout the entire production system, for example, through			Engage with local communities and business to explore ways how to minimise seafood waste.

		valorisation of bycatch and recycling of waste			
		B.1.3 The development of multifactorial marine spatial planning management tools as knowledge bases for the competing demands of space utilization and ocean challenges			Engage with local communities in respect to MSP and find optimal solutions for serving multiple stakeholder groups
		B1.4 Predicting and managing ecosystem-scale effects of large-scale wind farms in the North Sea and the Baltic Sea (NEW THEME proposed by CEAF)	Species observations by recreational seagoers in vicinity of wind farms		
B.2: Understanding the impact of ecosystem goods and services on human wellbeing		B.2.1 Integrated analyses of the ecosystem and social-economic system, describing and quantifying linkages between human activities, pressures, state of the environment, ecosystem services and human welfare to support the implementation of the ecosystem approach in marine policies			
		B.2.2 Spatial and temporal analysis of the contribution of ecosystem services and environmental changes to human wellbeing			Engage with various communities to understand the importance of ecosystem services to human wellbeing and how temporal variability in the services affects it. Cocreate ways how to minimise temporal changes to human wellbeing and communities effected by them
		B.2.3 Incorporation of ecosystem goods and services into national accounts (cf OECD, UN environment)			
B.3: Smart Seas - sustainable, circular and bio-based blue solutions		B.3.1 Secure, clean and efficient renewable energy			Engage with local community to gain support for development of new industries and sectors. How these new sectors can serve to the benefit of the communities
		B.3.2 Sustainability of marine infrastructures			Engage with communities to understand the social perception of multi-use, and in general, expansion of infrastructure at sea, including solution how to overcome the silos of various sectors (including recreational seagoers) involved that do not normally interact.

		B.3.3 Towards a smart blue economy		Educate citizens about sustainable blue choices for example in respect to consumer goods via apps and other smart technology.	
		B.3.4 Technological aspects of development of new recyclable materials, pharmaceutical substances, food products and natural fabrics from marine resources		Educate citizens about benefits of novel sustainable products in respect to traditional ones.	

<b>Human wellbeing</b>	<b>C.1: Safe food and feed</b>	C.1.1 Aquatic food security in a changing environment	Provide data on seafood choices by consumers	Educate citizens about different seafood choices (related to possible changes in the seafood supply) their health benefits and sustainability	Engage with citizen to increase understanding of consumer choice under changing seafood supply
		C.1.2 Update of strategies for reduction of health risks from toxic substances in regional sea food and feed chains		Educate consumers on seafood safety	
		C.1.3 Prediction on the prevalence and reduction of the impacts of marine toxins, including from cyanobacteria	Observations of harmful algal blooms		
	<b>C.2: Safe and accessible coast</b>	C.2.1 Challenge-driven transformation of (local) coastal economies (or areas)	Provide data on impact of climate change on coastal communities. Observations on coastal erosion.	Educate coastal communities about risks and new opportunities in respect to climate change adaptation	Engage with communities to cocreate strategies how to adapt coastal areas and economies to climate change and changing societal drivers
		C.2.2 Developing innovative and sustainable blue tourism and recreation	Provide data on consumer choices in respect to blue tourism and recreation	Educate citizens about impact of mass tourisms on marine environments and how to seek sustainable holidays	Engage with local communities to seek opportunities for development of sustainable blue tourisms and recreation

## 5.2 Added value of CS for the BANOS Programme

The BANOS Programme (as planned in the BANOS CSA) has the potential to substantially contribute towards development of CS and OL in the region as well as to contribute to policy goals such as HE Ocean Mission, UN Decade of Ocean and SDGs. In more practical terms, the BANOS Programme level activities could enhance and support its projects' efforts to disseminate and manage educational

materials they produce and further promote these e.g. through synthesis of themes covered by several or more projects. The programme could also identify and search for opportunities to produce OL materials with other educational projects and actions to support transparently the CS movement in the BANOS region and wider for instance to avoid duplication of materials on specific subjects, gain higher visibility, reach a larger audience and create more impact. Additional programme level activities could also include campaigning on certain topics and arranging (web-based and other) events where citizens can interact with scientists directly and ask specific questions regarding their interest and concerns related to marine environment, development of blue economy and the links between oceans and wellbeing. Such gatherings would also contribute toward enhancing the trust in the scientific process as well as making science more accessible to everyone. Currently, there is no holistic database for CS projects and activities. Development of such data base is of crucial importance for visibility and alignment of projects and their results across the BANOS region and beyond. The BANOS Programme would fully support the development process of such database and contribute towards it as feasible, and naturally would ensure that BANOS projects are accordingly recorded in the database.

### 5.3 Risks associated with Citizen Science

Given the very nature of CS, careful consideration of how to limit risks associated with it are necessary. Involving the civil society in traditional scientific projects must build on mutual trust between the scientists and the non-scientists. The terms for the cooperation should be clear from the start and the different roles well defined. To ensure the success of CS, detailing of aims and objectives of CS is necessary as is appropriate training of both scientists and citizens participating. Clear methods and protocols must be well developed and roles (e.g. who is participating in providing data, analysing data, checking data, communicating the results etc.) clearly identified. For instance, CS requires substantial communication competences prompting possible additional skills and training needs as not all scientists are good communicators – yet such skills are required when involved in CS. Neither are all projects suitable for CS approaches. In extreme case, if CS is carried out in a project unsuited for CS, or by non-CS competent scientists, it can result in negative effects such as loss of trust in science, or increased risk of generating false information etc.

To avoid any disputes, also a solid data management plan is required which includes all aspects of data ownership. The risk associated with data protection and security need to be carefully considered and to this end, compulsory data management plans will be required by all future BANOS projects<sup>18</sup>, including aspects of data ownership and openness.

Broadening the research by involving citizens in scientific projects gives additional competence and perspective, which must be acknowledged by research funders too. Research funders should also consider that some research projects with active participation of citizens will most probably be more expensive than projects where the citizens are only informed of the scientific results after finishing the project. In addition, depending on the type of CS activity, the project duration and costs associated with for example maintenance of data bases etc. must be carefully planned.

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<sup>18</sup>BANOS CSA Deliverable 4.7 Report proposing new programme's data strategy and mechanisms for its implementation

Finally, a real risk from the ‘outside in’ citizens’ perspective exists if not all levels of citizen science related participation are valued and considered as is possible and appropriate in BANOS, e.g. from crowdsourcing to so-called ‘extreme citizen science’ that involves citizens throughout the project cycle. Also, involvement of different citizens in the widest possible sense, especially considering different marginal communities of society, ethnic and other minorities etc. is critically important. This is especially the case as marginal communities may often be amongst those most affected in the face of mitigation and protection action of our seas and coasts.

## 6. Recommendations

While keeping in mind the principles developed by ECSA and other CS actors and further progress of the fast-evolving marine CS field, the nuances specific to the BANOS realities will be reflected particularly on the common factors of success identified for marine CS by the European Marine Board’s CS working group (see chapter 2.). The bullet points below provide preliminary guidance for the BANOS engagement and cooperation with the civil community and to embedding CS as a fit-for-purpose tool to support and add value to, as feasible, to delivering the aims and objectives of BANOS SRIA and the BANOS Programme as a whole.

- BANOS adopts the following definition of CS to be used as the basis for BANOS related CS activity and to be updated as and when appropriate: *CS is a research approach which allows science and civil society to cooperate, to learn, and work together to generate and use scientific knowledge and understanding for mutual benefit. These benefits include, for example, enhanced data collecting capability for scientific research, empowerment of civil society and increased environmental awareness. In BANOS, CS is based on and delivers towards objectives and aims of the BANOS SRIA and the BANOS Programme as a whole.*
- BANOS recognises civil society as a potentially valuable asset to add value and contribute to its programme and implementation of its SRIA
- BANOS supports development of CS approaches where applicable, and commits to including CS among BANOS projects’ performance indicators
- BANOS encourages its projects to practise CS approaches wherever appropriate for reaching their specific objectives and aims
- BANOS recognises that not all BANOS funded projects are necessarily suitable for inclusion of CS approaches
- BANOS values all levels of citizen science related participation from crowdsourcing to involving citizens throughout the project cycle and encourages these to be fostered as possible
- BANOS encourages involvement of different citizens in the widest possible sense, including different marginal communities of society, ethnic and other minorities
- BANOS is committed to contributing to the international development of marine CS and welcomes close collaboration with dedicated CS experts, networks and organisations working in the BANOS region, pan-European level and wider as appropriate

- BANOS supports all efforts towards creation of a joint, marine and coastal CS database for the Baltic Sea and North Sea regions
- BANOS encourages new ways for knowledge transfer and exploration of possibilities to use technologies like apps for easy reporting of data or getting reports about CS project activities
- BANOS recognises the importance of data protection and security, and supports compulsory data management plans for all future BANOS projects, including aspects of data ownership and openness

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## 9. Annexes

### Annex 1

#### **Types of data relevant to Marine Citizen Science**

The examples are from European Marine Board policy brief, October 2017: *Marine Citizen Science: Towards an engaged and ocean literate society.*

#### **On land and along shorelines**

- Online identification of organisms and features etc. from image banks and archives
- Microclimate monitoring
- Monitoring of beach morphology changes
- Report on shoreline changes (sand, water level)
- Report on stranded organisms (fish, cephalopods, gelatinous organisms, marine mammals) during periodic visits to the shoreline
- Monitoring of fresh fish catches for invasive species
- Beached seabird observations
- Mammal and turtle observations
- Report on stranded litter and organic matter (wood, flotsam)

#### **In shallow waters**

- Surveys of shallow water hotspots by diving clubs or water sports associations
- Long-term monitoring programmes of Marine Protected Areas
- Monitoring of changes in protected benthic communities
- Reporting on anthropogenic damage to shallow water communities
- Coral and artificial reef monitoring
- Night observations of shallow water biodiversity
- Invasive species observations
- Studies of diverse but accessible habitats
- Extensions of fish and seafood databases by divers and anglers

#### **In open sea**

- Sampling from ship of opportunity
- Mobile applications to determine water colour, reflectance, clarity
- Collaboration with eco-volunteer organisations for survey and sampling
- Use of drones for observations of mammals and floating debris or coastal and intertidal habitats
- Ferry boxes for underwater sampling
- Use of tethered underwater robots

## Annex 2

Some examples of marine Citizen Science projects

- **Marine Ecotourism**

The program is an opportunity to understand how marine ecotourism operators contribute to both healthy coastal living and ocean literacy. Lead by Travelecoology and SUBMON, the Citizen Science Programme encouraged tourism operators and their clients to help build knowledge on Oceans and Human Health, while also enhancing visitor experiences. (H2020 SOPHIE Consortium, 2020)

- **Fish monitoring of coastal fish**

To get information about potential changes in fish distribution or abundances, a voluntary catch system was initiated in collaboration with locally organised recreational fishermen. Together with scientists they developed a protocol for data collection, which the fishermen then implemented. During the first three years the fishermen could use their own gears and fish where they normally used to. After an evaluation the fishing method was changed to fixed gears and fixed positions. The time series-data now spans over ten years and over 16,000 instances. The data are now being used to create coastal fish indicators for managers to assess environmental status at a regional scale. (Stottrup, J.K. et al, 2018)

- **Samples from large areas**

In a study of microplastic contamination of beach sediment, citizens from 13 countries (from Iceland and northern Norway in the north to Israel and southern Italy in the south) were responsible for collecting samples from 23 locations. This contributed to/enabled a large spatial-scale analysis of microplastics on European beaches. (Lots F.A.E. et al, 2017)

- **Samples from a gradient**

Samples for a study on small-scale differences in the diet composition of Atlantic cod in a fjord system in northern Norway were provided by anglers and tourists through a citizen science campaign. The diet composition significantly differed between cod from the outer area with strong tidal currents and the inner fjord area. (Enoksen S.E. et al, 2018)

- **Monitoring the pelagic and coastal zone**

One example of an EU-financed activity is CITCLOPS ([www.citclops.eu](http://www.citclops.eu)), the Citizens' Observatory for Coast and Ocean Optical Monitoring. The CITCLOPS project involves citizens in collecting data on seawater colour, transparency and fluorescence and includes a number of academic institutes and technology centres in Europe. Now, this is known as EyeOnWater <https://www.eyeonwater.org/apps>

- **Mapping the distribution of a species**

The labrid Scale-rayed Wrasse (*Acantholubrus palloni*) was thought to be an occasional guest in the eastern Skagerrak in the border of its known range in the eastern Atlantic and Mediterranean Sea. However, verified angling records in the Swedish Anglers Association's specimen database and personal communication with anglers suggest that the species is established in the Swedish parts of Skagerrak. (Naslund J, et al 2018)

- **Observations of litter**

Propagation pathways for litter in the southern North Sea were studied by using two kind of drifters released in offshore German waters. One drifter, which was moved by surface currents, was equipped with GPS. The other kind of drifters consisted of 1600 wooden drifters, mostly driven by

wind and Stokes drift. Many of the stranded wooden drifters were found and reported by citizens. The detailed information of the wooden drifters provided valuable contribution to the drifter experiment and demonstrated the usefulness of citizen science. (Stanev E.V. et al 2019)

- **Observation of marine mammals**

To increase the knowledge about distribution and diversity of mammals around offshore anthropogenic structures, incidental sightings around oil and gas installation about 200 km off the Danish coast have been reported by citizens. About 288 animals, in a total of 131 sightings, were reported, and seven marine mammal species were identified. (Delefosse M, et al. 2018)

- **Communication**

The study compared the correspondence between messages about jellyfish (increase, causes, threats, solutions etc), the main media and the knowledge and perception of recreational users, tourism-related professional and local government officials at the Belgian coast. A one-off questionnaire-based survey indicated that jelly perception is only partly driven by the general media, while personal experience seemed at least equally important. (Vandendriessche, S. et al 2016)

- **Method development**

A novel rig configuration in artificial lure fishing for top predators was designed. Its effectiveness in angling was tested for Baltic northern pike (*Esox lucius*) using a citizen science approach based on observational data collection from volunteer anglers in the field. They used either the novel rig or a standard rig of the same size. (Brusell, J.J. and Arlinghaus, R., 2019)

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## Annex 3



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# HOLISTIC MARINE CITIZEN SCIENCE PROJECTS' MAPPING IN THE BALTIC SEA REGION

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## Summary

During the months of May through September of 2021, the first-ever holistic study of Marine Citizen Science projects in the Baltic Sea area was undertaken, consisting of targeted stakeholder outreach as well as desk research, with the support of an online questionnaire. A total of 55 projects were identified, which fit the criteria of projects no older than five years prior to 2021; focusing on the Baltic Sea Region marine or coastal environment; and only projects where the data collected by citizen scientists was actually used by researchers for scientific research or for exerting influence on policy-makers. This report presents the review and analysis of the study, considering also the implications for future Marine Citizen Science projects in the Baltic Sea Region.

## Background

Understanding the workings and responses of the marine environment to current and future pressures, is crucial for the development and subsequent implementation of sustainable development policies (Garcia-Soto, Carlos et al., 2021). In various efforts to widen the scope of research to include input from the wider public and thus non-scientists, in recent years Citizen Science is becoming more and more mainstream, including not only projects that refer to terrestrial or coastal environments, but also to a large extent those that take the marine environment as their focus (Silvertown, 2009). Understanding the landscape of Marine Citizen Science projects would be a highly valuable resource to get a clear idea of to what extent such projects are truly contributing to relevant scientific endeavours. To date however, there exist no dedicated databases on Marine Citizen Science projects, neither on the European scale, nor on the scale of the Baltic Sea Region. The Baltic community thus has to rely on anecdotal evidence and own desk research, considering also the complicating factor that there are nine national languages spoken in the region.

On behalf of the Baltic and North Sea Coordination and Support Action (BANOS), s.Pro – sustainable projects GmbH has undertaken the first-ever comprehensive study of recent and on-going Marine Citizen Science projects in and around the Baltic Sea Region. The aim was to deliver a study that was not only comprehensive, but also including only relevant projects and assessing their value, as well as lessons learned and potential recommendations for future Baltic Marine Citizen Science projects. This report presents the main results of the review and analysis, together with the database file representing a) the stakeholder outreach and b) the identified projects on which the study is founded, both of which can be found in the Annex.

Taking a similar study done in the North Sea Region (van Hee, 2020) as prime inspiration, the Baltic Marine Citizen Science study set out to deliver a single and holistic baseline study for the Baltic Sea Region, covering not only that information which may be found online, but also through actively engaging with those stakeholders that may play a key role in Baltic Marine Citizen Science projects. As this report will present, the overview may not be fully complete, but it provides a major resource for those interested in pursuing and initiating further Marine Citizen Science projects in the Baltic Sea Region.

## Methodology

The study of Marine Citizen Science projects in the North Sea Region (van Hee, 2020) was taken as a core inspiration for this report. This means that the study is using the same structure for the report and includes roughly the same categories for the Excel database in which the identified projects were categorised. Following an extensive reading of the VLIZ study, the authors started off with developing a template database and utilised the existing actors mapping done under the EU4Ocean Ocean Literacy initiative, for which the authors act as the Baltic Sea Focal Point. This mapping includes a database of actors active in Ocean Literacy and Citizen Science in the Baltic Sea Region. Of this database, 74 relevant individual contacts were identified, serving as the basis for a 'snowball' enquiry, whereby the targeted stakeholders were asked not only about MCS projects they were aware of or involved in, but also whether they could point to any individuals that they thought could tell us more.

For the purposes of this study, a Citizen Science project is defined as one where data is collected and where this data is subsequently used for a pre-defined purposes, either scientific in the traditional sense, or serving as input for informed discussions. For this study, the emphasis was on both the marine (the sea) as well as the Baltic Sea Region coastal areas. In addition, it was agreed that the study should have a focus on Marine Citizen Science projects that provide data and **tangible outcomes** and that are as such **'consultable'** - meaning that **the study also considered scientific projects that use or used Citizen Science approaches to their enquiries. This is especially poignant considering that the future BANOS will be a scientific programme**, and taking into account that Citizen Science projects should be considered as 'key enablers' of a future European open science landscape (Garcia-Soto, Carlos et al., 2021).

The approach to the study was three-fold: starting off in May 2021 by a) reaching out with a questionnaire to known stakeholders, b) promoting the study to unknown stakeholders and c) by undertaking a comprehensive online desk research. From May until September 2021, a total number of 119 stakeholders were contacted directly, both per email as well as to a lesser extent per telephone.

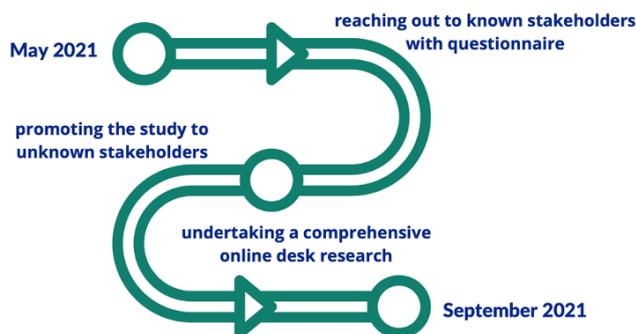


Figure 1: Timeline of Study

## Questionnaire

Targeted stakeholders were presented with an online questionnaire that was developed through JotForm (available here: <https://form.jotform.com/211522641508347> and in the Annex). Respondents were free to save their input and to retrieve it at a later stage. The average time for filling in the questionnaire was estimated to be around 10 minutes. Some of the questions were made obligatory, while most of them were not.

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3% Completed Fields Completed 1 / 31

### Holistic Marine Citizen Science projects' mapping in the Baltic Sea Region

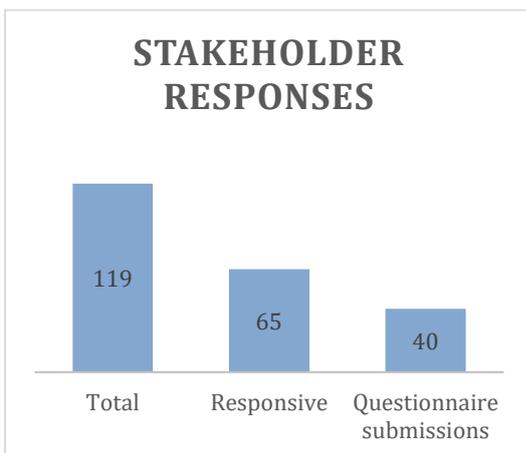
In the context of the assignment 'Holistic Marine Citizen Science Projects' Mapping in the Baltic Sea Region' as funded by BANOS CSA – s.Pro sustainable-projects GmbH is undertaking a comprehensive mapping exercise to develop the first-ever overview of marine citizen science projects in and around the Baltic Sea Region. We are keen to hear from you and to include your project into our database, with the ultimate aim of encouraging more of such projects to be realized in the future. Please feel free to send this survey to any of your immediate colleagues that you think could contribute to our study by providing them with this link: <https://form.jotform.com/211522641508347>

#### What is meant by Marine Citizen Science projects?

Following the definition of the BANOS CSA, "Citizen Science is a research approach which allows science and civil society to cooperate, to learn, and work together to generate and use scientific knowledge and understanding for mutual benefit. These benefits include, for example, enhanced data collecting capability for scientific research, empowerment of civil society and an increased environmental awareness." A Citizen Science project is thus one where data is collected and where this data is subsequently used for scientific purposes. For this study, the emphasis will be on the sea and coastal areas, with a focus on Marine Citizen Science projects that provide data and tangible outcomes and that are as such 'consultable'- meaning that we also consider science projects that use citizen science approaches.

**Figure 2: Screenshot of Stakeholder Questionnaire**

Targeted stakeholders were given the option of filling the questionnaire in by themselves online or to go through the questions per telephone with the authors. Of the total 119 directly targeted stakeholders, 65 were positively responsive, meaning they either replied to emails sent or answered the phone, with a potential project contribution. A total of 40 persons submitted a response to the questionnaire.



**Figure 3: Stakeholder Responses**

## Categories and variables used in the Study

This study built on earlier work done in the North Sea Region, allowing for the use of a template database as well as previously used search terms and methodology. However, there were some key differences regarding the study area and characteristics. These include for instance the language factor, as there are 9 national languages around the Baltic Sea Region and many of the identified Marine Citizen Science projects are or were organised in national languages. Considering a rough comparison with the North Sea Region study, this means that if the authors had only included a desk study research with English search terms, the study results would be quite biased, as it would most likely deliver a significant percentage of transnationally funded projects. A further differentiating factor between the Baltic Sea Region study and the North Sea Region study also includes the geographic and environmental characteristics specific to the Baltic Sea Region, such as the problem of eutrophication and the transnational approaches to marine litter.

In the final weeks of the study, the authors sent out reminders to targeted stakeholders and further promoted the questionnaire online. In addition, it was decided to extend the study period with two weeks, allowing targeted stakeholders the opportunity to include projects upon returning from their summer holidays. This extension period was promoted through online social media promotion as well as an additional round of targeted emails to those stakeholders integrated in the list of potential Baltic Marine Citizen Science projects collected so far. This additional round focused on a direct question, namely whether the targeted stakeholders considered a potential project to be missing from the draft list of potential projects. This ensured that the study delivered the most comprehensive overview and analysis of Baltic Marine Citizen Science projects as possible, functioning as an additional verification round. The extension period resulted in 7 additional projects suggested by stakeholders.

As the responses to the questionnaire were coming in, the authors verified the categorisations and variables used by the respondents in the questionnaire responses. In some instances, it was needed to double-check the information provided, to add information or correct it, or to actually not consider the suggested project in the study, as it did not meet all the criteria. For all of the suggested projects, strict criteria were applied, considering whether a) a project's timeline was recent enough, b) whether the project focused on the Baltic Sea Region marine or coastal environment, and c) whether the data collected by citizen scientists was actually used by scientists, either for scientific research or for exerting influence on policy-makers.

For the purpose of the study, the authors used the following definition of 'Levels of participation' – meaning the level of knowledge and co-creation that participants of Citizen Science studies had:

- **crowdsourcing**: no subject knowledge required, citizens report observations;
- **distributed intelligence**: certain level of knowledge is required for the sake of interpretation, either pre-existing knowledge or via a training course;
- **participatory science**: citizens define the problem, compose a method and do data collection but scientists still play a leading role in analysing the data and interpreting the results;
- **extreme citizen science**: collaborative science, non-professionals participate in all steps of research but they choose their level of (Shum B., 2012); (Haklay, 2013)

The other definition that was crucial to the structure and analysis of the study, was the definition of 'Type of initiative'. This refers to the degree in which the data collected by citizen scientists in projects, was valuable to the project objective as well as referring to the aim of the project. The three definitions include:

- **descriptive:** data collected without specified intended use;
- **performance:** monitoring and evaluation is crucial, collecting data long-term;
- **composite:** drawing attention to important policy issues by providing a shared conceptual framework as basis for interpretation, analysis and practice (Lehtonen M., 2016)

The above definitions were also included in the questionnaire – ensuring that respondents were aware of the definitions used in the study to categorise projects. It was decided that the focus of the study should be as wide as possible, within limits. This meant that the study considers the whole of the Baltic Sea Region, including all European coastal Member States of the Baltic Sea Region, as well as the Baltic coast of Russia, and excluding Norway and Belarus. The study includes references to projects that are also on the more inland coastlines of countries. It was also decided to delimitate the timeline of projects to be studied. Although the North Sea Region study includes reference to projects going back as early as the year 1960, it was decided that for the Baltic Marine Citizen Science study, it would be of more value to only include those projects that have finalised no earlier than 5 years prior (to the year 2021). Reasons for this decision include the fact that the further in the past the projects took place, the more difficult it is to find accurate and detailed information about the projects, as well as the fact that the Southern coastal countries only entered into the European Union by the year 2004 and thus it may be quite difficult to find information about any projects before this time.

## Desk Research

In parallel with the online as well as the targeted outreach to stakeholders, the authors undertook an intensive desk research, consisting both of online research as well as a literature review. Those projects that were identified as relevant for the study were integrated into the Excel database under the category 'Found proactively'. The online research consisted of an intensive Google search for the whole Baltic Sea Region, using specific search terms, including the national terms for 'Citizen Science':

- Danish: *borgervidenskab*
- Estonian: *kodaniku teadus, Kodanikuteadus*
- Finnish: *kansalaistiede*
- German: *Bürgerwissenschaften*
- Latvian: *pilsoņu zinātne*
- Lithuanian: *piliečių mokslas*
- Polish: *nauka obywatelska*
- Russian: *гражданская наука (grazhdanskaya nauka)*
- Swedish: *medborgarvetenskap*

The authors used the automatic translation service in the browser Google Chrome to further identify any Baltic Marine Citizen Science projects that satisfied all agreed upon criteria, i.e. whether it had a focus on marine or coastal relevant topics, whether it was

on-going or ended no earlier than 5 years past, and whether the data collected by citizen scientists was actually used for scientific research or used to influence policy-makers. The authors did the same search via social media, including the platforms Facebook, Twitter, Instagram and LinkedIn. In addition, the authors searched through the existing project databases of BONUS, Interreg, EU MSP Platform and the European Citizen Science Association in order to identify relevant Baltic Marine Citizen Science projects.

When contacting the stakeholders, they were asked whether they were aware of any relevant projects that fit the agreed upon criteria, whether they had been involved in it, or whether they could point to any other relevant stakeholders with further knowledge about Marine Citizen Science projects in the Baltic Sea Region. In addition, the identified coordinators of projects as well as those that filled in the questionnaire by themselves, were asked to categorize their projects according to the variables, as it was figured that they know their project best. When a project was suggested to the authors without those variables being inserted or provided, the authors did their own online search to find out more about the project in question.

## Results

Considering both those stakeholders that were targeted directly as well as those that responded to the online questionnaire through the general online promotion of the on-going study, a total number of 40 useful questionnaire responses were received. The total number of identified relevant Baltic Marine Citizen Science projects, found both through the proactive desk study as well as those identified by targeted stakeholders and questionnaire respondents, is 55. The following categories were included in the study:

<b>Name of project in EN</b>	<b>Suggested by respondent or found proactively</b>	<b>Name of project in original language</b>	<b>Duration of project</b>	<b>Start date of project</b>
<b>End date of project</b>	<b>Project finished or on-going</b>	<b>Scale of project</b>	<b>Location of project</b>	<b>Language of project</b>
<b>Frequency of data collection</b>	<b>Category</b>	<b>More precise information about topic of project data collection</b>	<b>What kind of data did the project collect and how?</b>	<b>How was the data sent to the project lead?</b>
<b>What is/was the aim of the project?</b>	<b>Is the dataset available?</b>	<b>Lessons learned</b>	<b>Number of participants</b>	<b>Participant feedback</b>
<b>Level of participation</b>	<b>Role of sustainability</b>	<b>Other comments</b>	<b>Project lead</b>	<b>Project co-leads</b>
<b>Project website</b>	<b>How is/was the project funded?</b>	<b>Project lead contact name</b>	<b>Project lead contact email</b>	

*Table 1: Categories used in the study*

For the 55 identified projects, the categories in the Excel database were filled with specific variables, although for some of the projects, not all of the information for the categories could be found. If this was the case, the variable was included as 'Unknown'. Of the 55 projects, 28 were found proactively and 27 were suggested by stakeholders, although there is a caveat to be mentioned: some of the projects that were initially identified through proactive desk research, were later also suggested by a stakeholder. If this was the case, the project was then categorised as being 'Suggested by a questionnaire respondent'.



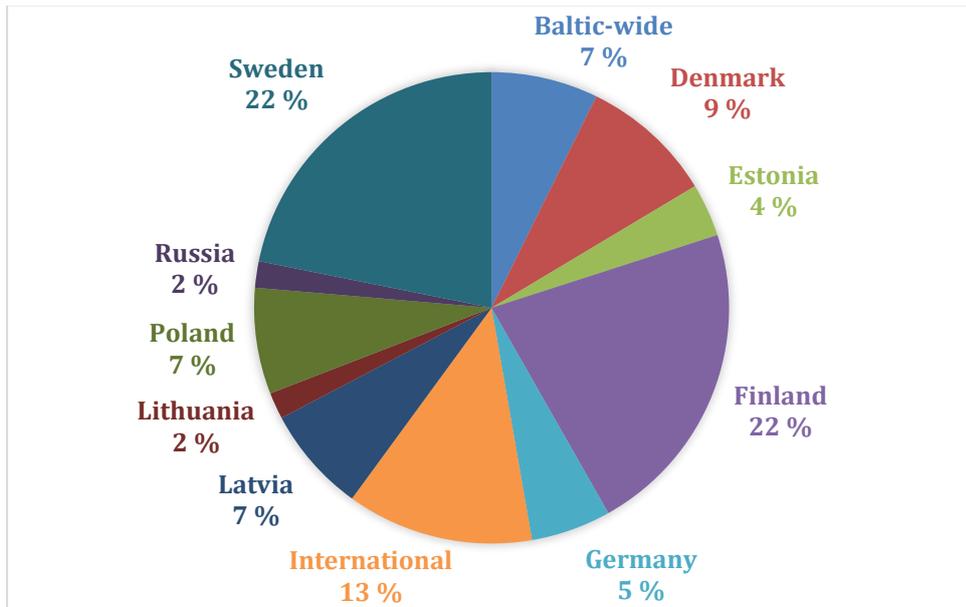
Plastic Pirates – Go Europe! Project (PlastikPiraten) is an on-going Marine Citizen Science project in Germany, led since 2016 by the German Federal Ministry of Education and Research. The aim of the project is to encourage citizens and especially children, to collect marine litter and plastic waste and to help conduct research on the pollution of bodies of water. The project has developed uniform experimental guidelines and working steps for all participants, ensuring that all collected data exists in a comparable format. It is a joint campaign of three national ministries of education, science and research, emphasising the importance of international research collaboration. Since 2016, over 15,000 participants have submitted data sets and samples. Under normal scientific conditions, it would have taken years to collect data with this enormous spatial distribution. Project website: <https://www.plastic-pirates.eu/en>

*Figure 4: Highlight of the Plastic Pirates – Go Europe! Marine Citizen Science project*

41 of the identified projects are on-going and 12 were finalised by or before the year 2021. As for some of the projects there was little information available, it was assumed that they were still on-going, as more often than not, the portals for submissions from citizen scientists were still functional. In addition, 2 projects were identified that are in fact upcoming: 'FPCUP EO-Crowd' (scale: national, location: Finland) and 'Roots University of Kiel Citizen Science Project' (scale: local, location: Germany). It was decided to include these projects as they show that Baltic Marine Citizen Science projects are not only a thing of the past, but also very much of the future. The study considered both the name of the projects in English as well as the name in the respective national language and included whether the project information was available in English or in the respective national language. For 21 projects, the information was available in English. In addition, the categories included the project lead institution as well as any relevant co-leads, the project website, the name of the project coordinator as well as their email address.

### **Where do Baltic Marine Citizen Science projects take place?**

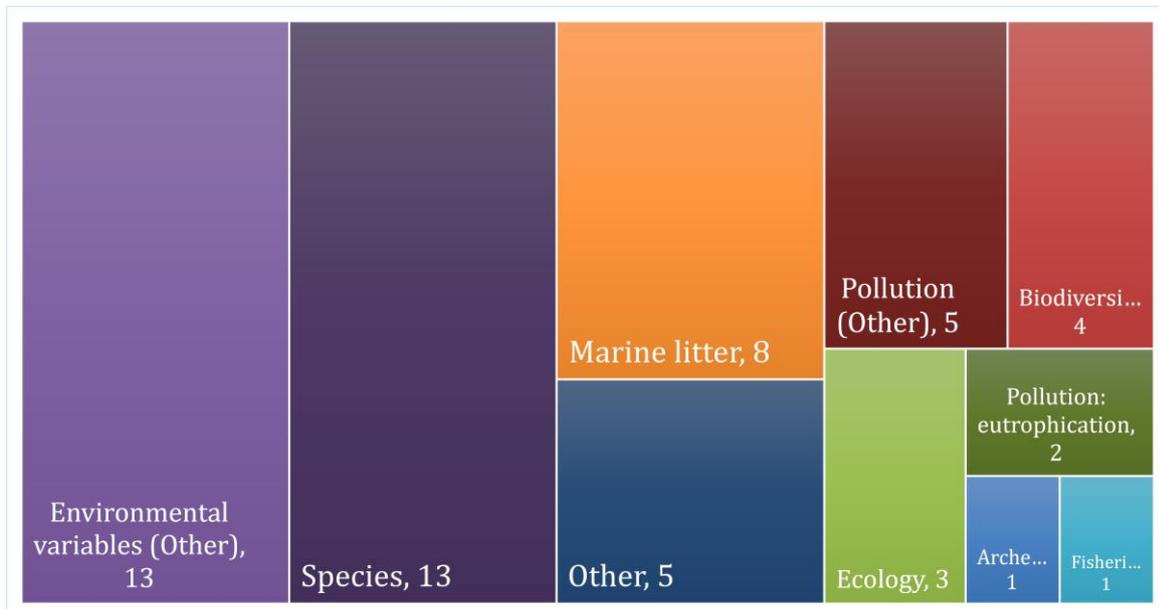
Two categories were used to assess the locality of the project: 'Scale' and 'Location'. These two categories are complementary, but a bit different in focus. For example, a project can be categorised as 'National' under the category 'Scale', with 'Finland' as the variable under the category 'Location'. Of the 55 Baltic MCS projects identified, 40 are or were country-specific, meaning that the relevant project took place in national waters, categorised either as local, subregional, regional or national. Of those projects, the most took place in Finland, with 12 projects, and Sweden, also with 12 projects. Ten projects considered a supranational scale, with four projects focusing on the whole Baltic Sea Region, 6 projects focusing on the whole of Europe, and with four projects focusing on a wider international scale.



**Figure 5: Location of projects**

**What do Baltic Marine Citizen Science projects study?**

In order to get a clear picture of what the identified projects studied, the category aptly named ‘Category’ was included in the questionnaire and Excel database, with the distribution of variables as illustrated in Figure 5. The projects that studied the category ‘Species’ were the most common with 13 projects, tying with the category ‘Environmental variables (Other)’ with also 13 projects. Marine litter was the second-most chosen category, with 8 projects. The least chosen categories were Archaeology and Fisheries, with each category only being chosen once.



**Figure 6: Project Categories**

It could be argued that it is logical that marine litter represents a large focus of the study, as marine litter monitoring is now a legal obligation under the European-wide Marine Strategy Framework Directive (MSFD). However, the authors have decided to leave

some of the suggested projects on marine litter out of the scope of the study, as many of these conclusively did not meet the criterium of collected data by citizen scientists being actually used for scientific research. Several of such suggested projects could in fact not be classified as true Marine Citizen Science projects, but rather as beach clean-ups. Although the latter are a key tool in increasing environmental awareness among participants, if a project is 'merely' focusing on an educational purpose and there is no real scientific result, it cannot be classified as a Citizen Science Project (Garcia-Soto, Carlos et al., 2021).

It may also come as little surprise that most projects could be categorised as environmental variables (other) and species, as these are two categories that are highly suitable for monitoring by citizens, meaning that the gathering of relevant data and information may be quite straightforward, e.g. measuring water quality or temperature, counting water birds, or general observations of the marine environment. In fact, most Marine Citizen Science projects tend to involve environmental monitoring of some sort by the citizen scientists (Dean AJ, 2018). However, not all projects that ask volunteer citizen scientists to engage in environmental observation or even monitoring, may be classified as Citizen *Science* projects. For instance, it was decided not to include Naturgucker.de and its English language counterpart, since although they may definitely be defined as citizen *observation* projects, it cannot be categorized as a Citizen *Science* project, since the data that is being provided by the participating citizens is collected, uploaded and integrated onto a map, but then it is not used for any scientific purposes nor for informing discussions with stakeholder groups such as policy makers.

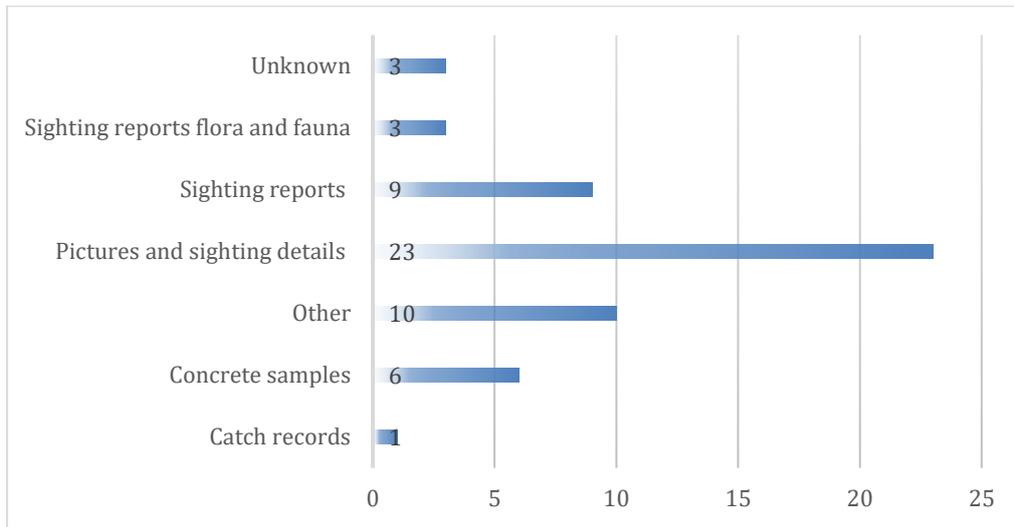


Lake and Sea Wiki (Järvi Meri Wiki) is an on-going Marine Citizen Science project in Finland, focusing on algae observations as well as general observations of Finnish lakes and seas. The project has been running since 2011 and has trained artificial intelligence algorithms that can recognise this species of coral. These AI algorithms also allowing the automatic processing of the thousands of videos and photos collected. The project is run by the Finnish Environment Institute SYKE. Lake and Sea Wiki focuses on both lakes as well as the marine waters including the Baltic Sea. For each location, a discussion forum page has been created where users actively

discuss. There are also clear guidelines as well as an abundance of information about the Finnish marine environment. The database is externally available here: <https://www.jarviwiki.fi/wiki/Havaintol%C3%A4hetti>

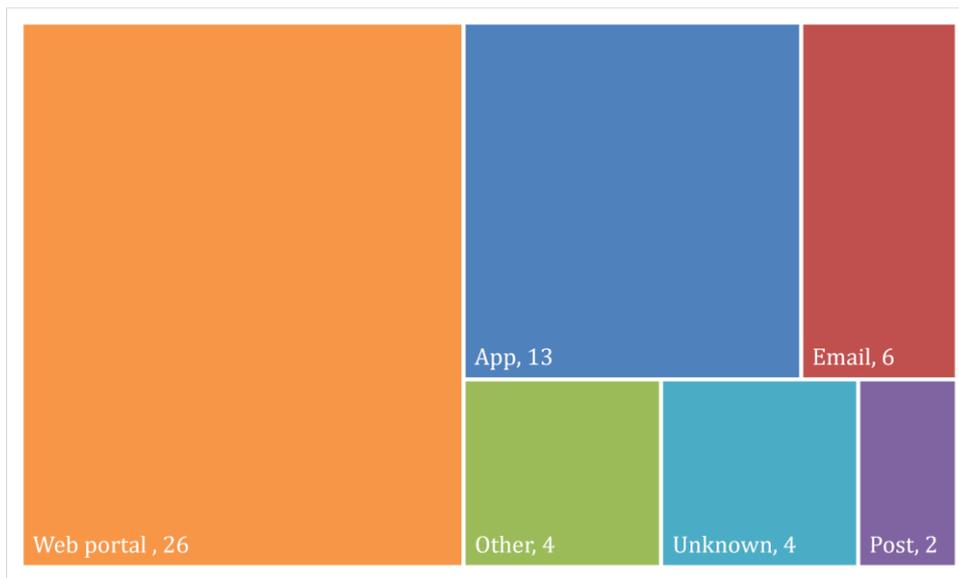
**Figure 7: Highlight of the Järvi & Meri Wiki Marine Citizen Science project**

In order to learn more about how the citizen scientists contributed their data, the categories 'Frequency of data collection' was included in the study, with variable 'Ad-hoc/continuous' taking the lead with 36 projects. This is no large surprise, as most projects either delineated a timeline for the projects during which observations and measurements could take place by citizen scientists, or the collection of data was centred around specific dates and times. To get more details about the topic of the projects, the questionnaire included the category 'More precise information about topic of data collection'. For instance, for the category 'Environmental variables (other)' this could include water colour and water quality, specific items under marine litter such as plastics and fishing gear, or under the category 'Species' or 'Biodiversity' this included molluscs, fish or mammals. Further categories that were used to learn more about the projects included 'What kind of data did the project collect and how', with the following variables:



**Figure 8: Methods of data collection**

The most common variable in this category was ‘Pictures and sighting details’ with 23 projects, followed by ‘Sighting reports’ with 9 projects. The category ‘How was the data sent to the project lead’ assessed whether citizen scientists sent the data via mobile phone application, web portal, phone, email, post, other or unknown, with ‘Web portal’ with 26 projects taking the lead.



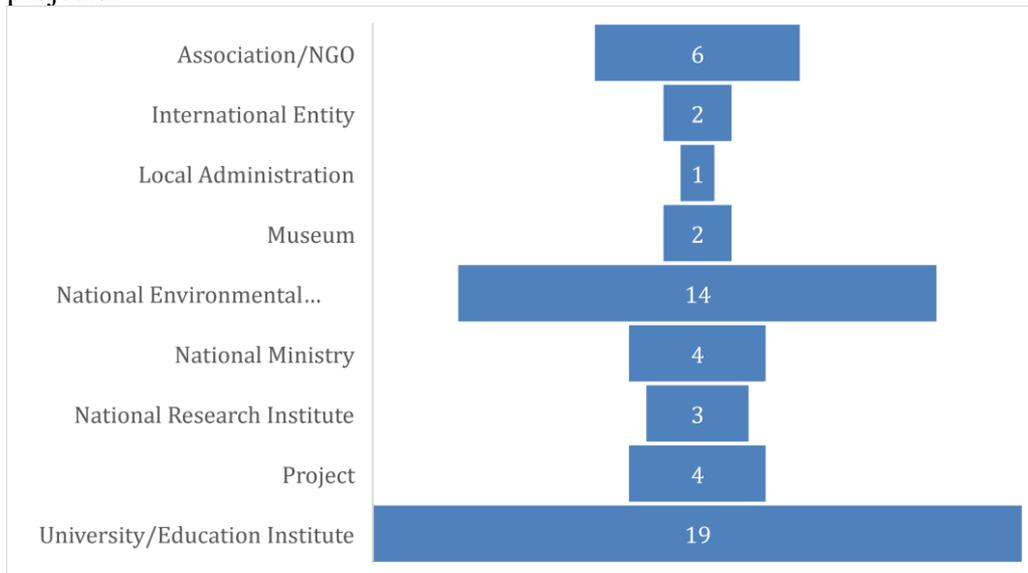
**Figure 9: Ways of sending data**

This study thus also considers the way in which volunteer citizen scientists had sent their data and information to the researchers, as it may be concluded that with the advent of the digital age, Citizen Science projects have increased enormously due to the widespread use of web portals and phone apps. Of the 55 identified projects, 39 projects used either a web portal or a mobile phone app to allow citizen scientists to send their data to researchers. This may indicate that using the Internet and appropriate technologies such as mobile phone applications, could be a key success factor for future Marine Citizen Science projects (Andrews 2019; (Science Europe, 2018).

### Who is organising Baltic Marine Citizen Science projects?

As introduced in Figure 4, most of the identified projects take place in Finland and in Sweden. This very well may be attributed to two aspects: namely that the institutions that organise many of these projects are institutions with a longstanding history in marine research as well as with the engagement of the general public. In addition, the information was often available online through dedicated webpages. For the projects in Finland, the Project leads included very often the Finnish Environment Institute SYKE as well as the Natural Resources Institute LUKE. For the Swedish projects, the Project lead was often a university, such as the University of Gothenburg or the University of Uppsala, or a public authority on different levels, such as the national Swedish Maritime Administration or the local Stockholm County Administration.

Figure 7 highlights roughly the type of Project Leads for the identified Baltic Marine Citizen Science projects. The most common Project Lead is the category University/Education Institute with 19 projects, which supports the finding of the study that most projects are focused on Crowdsourcing and Participatory research, as it may be assumed that at least to a certain degree, universities and other educational institutes see it as a prime objective not only to engage citizen scientists to gather more input data for research, but also especially to include an element of education in their Citizen Science projects.



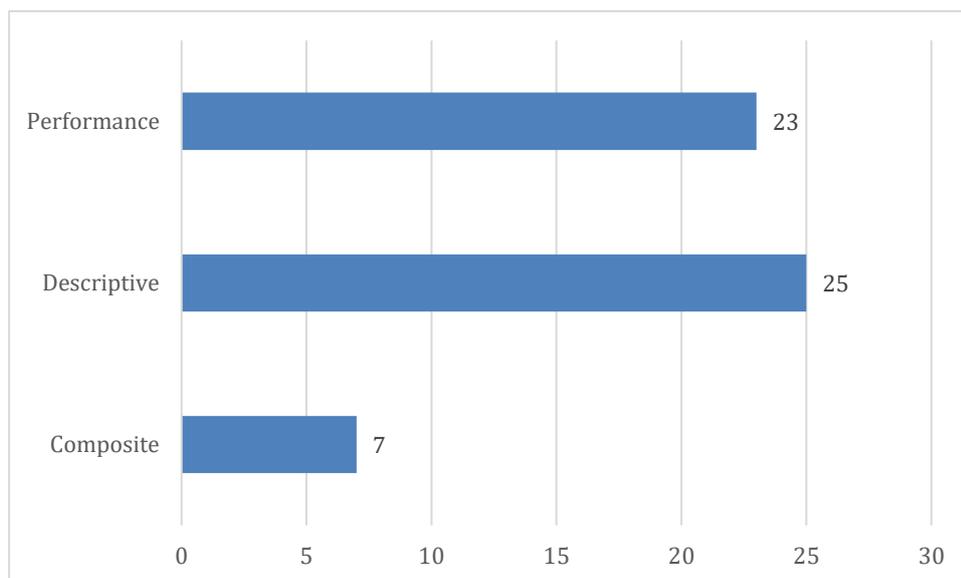
**Figure 10: Types of Project Leads**

### What do organisations aim for?

In order to assess the value of the contributions of the citizen scientists to the identified projects and the degree to which their input was crucial to the overall aim of the projects, the categories 'Level of participation' and 'Role of sustainability' were included in the study.

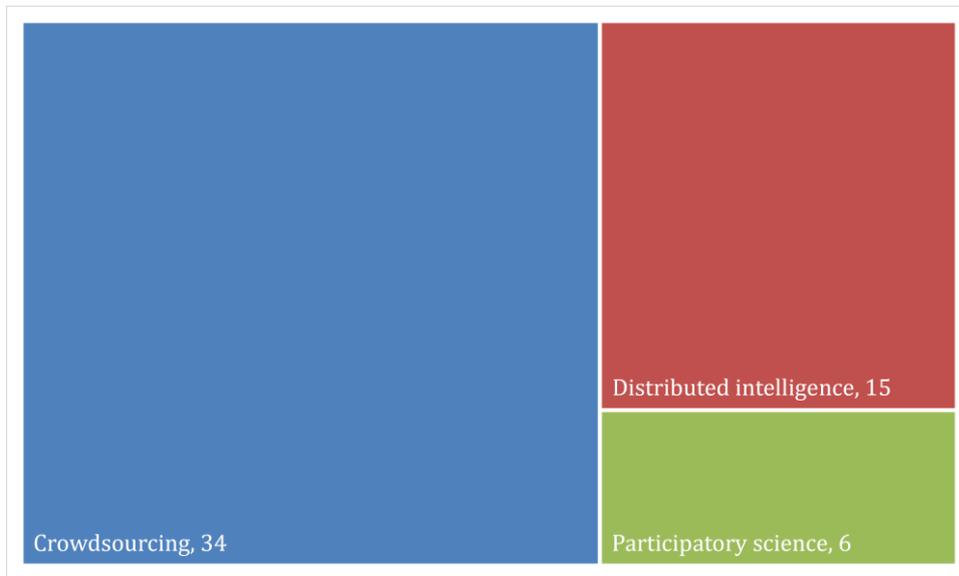
In the category 'Role of sustainability', 25 projects were categorised with the variable 'Descriptive'. This indicates that for almost half of the identified Baltic Marine Citizen Science projects, the support from volunteer citizen scientists was asked to the extent where their input was collected without a clear purpose for using it, at the time of collection. However, these projects were still included in the study, as the aim of the project adhered to the criteria agreed upon regarding what should be considered a marine Citizen Science project. This means that for instance citizens were asked to contribute their monitoring data or general observations, with the aim of integrating these into proper research at a later stage.

According to a recent article (Garcia-Soto, Carlos et al., 2021), Citizen Science projects can often have a real influence on local policies. In the Baltic study, those projects that could be classified as 'Composite', totaled to a number of seven. This is referring to those projects that empower communities 'by involving them in research that can be used to drive forward policy changes' (Martin V., 2016).



**Figure 11: Role of sustainability**

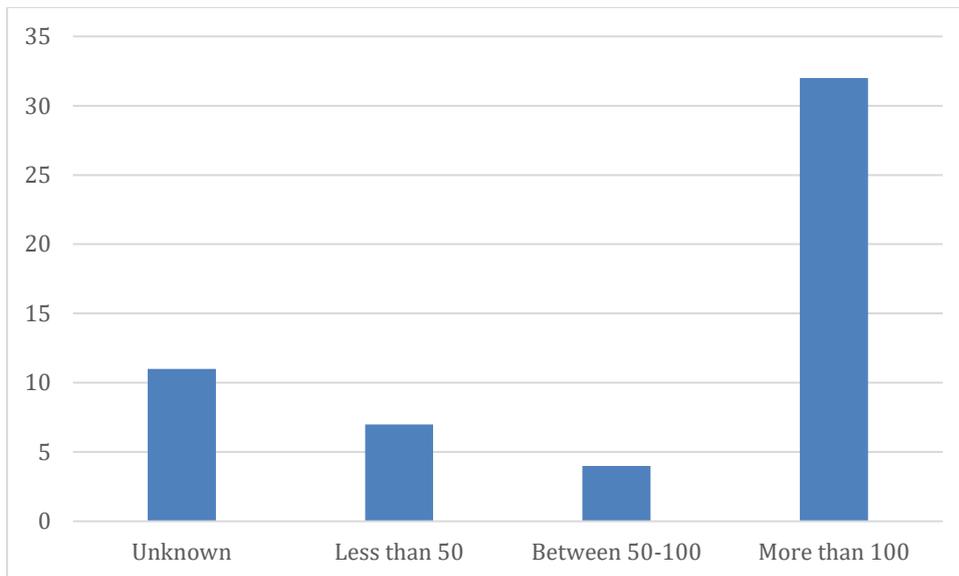
As was to be expected, the variable 'Crowdsourcing' meaning that citizen scientists did not need to have any initial knowledge for data collection, were the most numerous under the category 'Level of participation', with 34 projects. As was perhaps to be expected, none of the identified projects could be categorized as 'Extreme Citizen Science'. However, this needn't mean that it will not happen in the future. (Science Europe, 2018). There were only six projects identified that could be categorised under 'Participatory Science'. This can be explained by the fact that is often the limit of many people's participation in a Citizen Science project. However, encouraging participating citizen scientists to take an active role in the design and implementation of a project could increase feelings of ownership (John A. Cigliano, 2015).



**Figure 12: Level of participation**

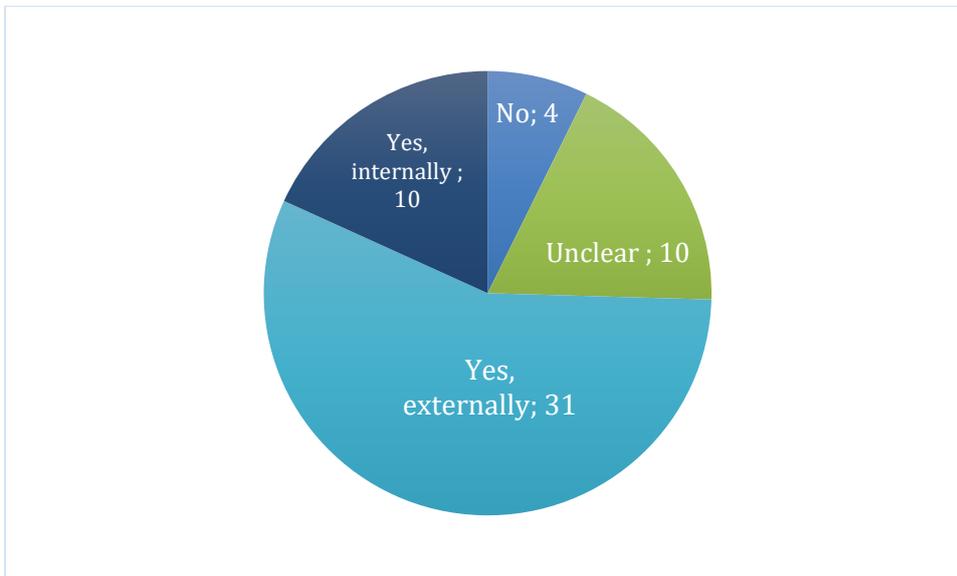
### Continuity of Baltic Marine Citizen Science projects

As 41 projects that were identified were still on-going, and two could be identified that are in fact upcoming, this bodes well for the future of Marine Citizen Science projects in the Baltic Sea Region, considering also that for 32 identified projects, more than 100 volunteer citizen scientists joined the project with active contributions.



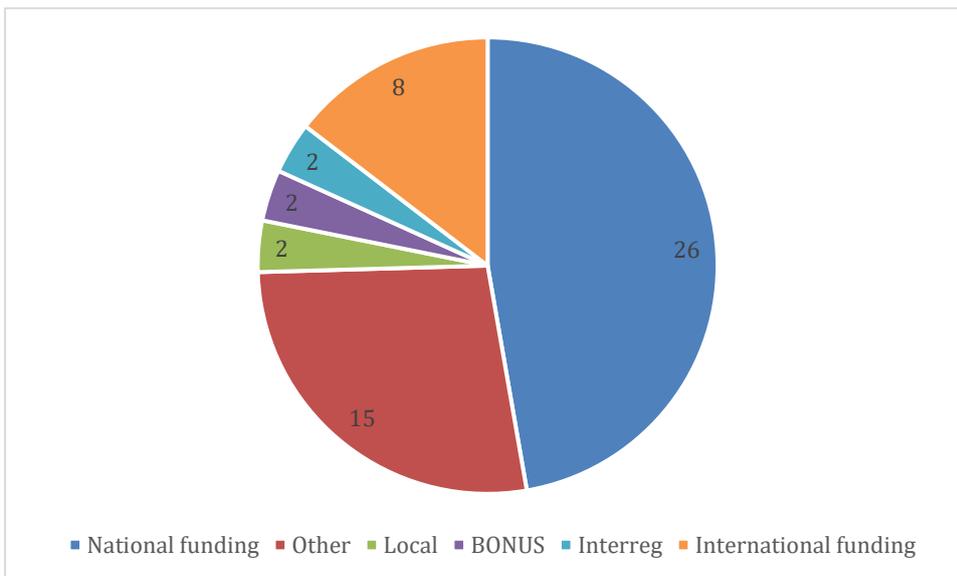
**Figure 13: Number of participants**

Another aspect that underlines the potential positive continuity of Marine Citizen Science projects in the Baltic Sea Region, is the fact that for 31 projects, the data set is available online to external parties.



**Figure 14: Database available or not**

In addition, a relevant category to be considered may be ‘How was the project funded’, as 26 projects represented the variable ‘National funding’, meaning that the continuity of Baltic Marine Citizen Science projects may depend heavily on the national support for such initiatives.



**Figure 15: Project funding source**

## Discussion and recommendations

Perhaps the most interesting categories considered in the study were 'Participant feedback', 'Lessons learned' and 'Other comments'. Many of the respondents included under 'What is/was the aim of the project' aspects such as increasing ocean literacy, education and awareness-raising, providing information to political decision-makers and promoting dialogue between citizens, scientists, policy-makers and other stakeholder groups. In addition, the aims of many of the identified projects included aspects such as documentation, monitoring and forecasting, contributing data for the development of AI-supported prediction tools, and even developing warning systems (related specifically to marine litter and algae blooms). Project aims also included the development of strategies, ecosystem service assessments, studying so-called 'indicator species', assessment of invasive species as well as collecting input to assess current and future impacts of climate change. For many of the projects, the feedback from the participating citizen scientists was positive, and many projects also explicitly sought the feedback from participants, either through an online survey or a discussion forum.

Some of the projects encouraged citizen scientists to set up their own monitoring stations and systems, as well as in some cases even their own 'sub-projects'. Quality assurance of the contributed data and information by citizen scientists was explicitly addressed in some of the projects, while for others there was no mention of such a protocol being in place. The issue of privacy was also quite different between the projects, with some of the projects explicitly emphasising the anonymity of contributions, while others explicitly informed participating scientists that their data (and in some cases even their names and affiliations) would be available publicly.

In addition, the instructions for citizen scientists to participate in the identified projects were not always as clear: whereas some projects developed concise guidance materials, other projects simply included a limited form entry on their website with no further guidance, limitations, or definitions. The Finland Environment Administration published a dedicated webpage with regard to Guidelines on data protection and sharing, which is available [here](#). In addition, they published a dedicated webpage on the topic of 'Campaign for quality control of citizens' perceptions', which is available [here](#). This could be considered good practice for future Marine Citizen Science projects in the future.



Algal Blooms Sweden is an on-going Marine Citizen Science project and information platform in Sweden that started in 2020, led by the Stockholm County Administrative Board together with Ocean Data Factory. The focus of the project is on algal blooms: the mass presence of cyanobacteria, which can be found in lakes, seas, soil and in symbiosis with

plants. The aim is to engage the general public to help survey and forecast harmful algal blooms and to develop an AI-based tool to predict these recurring events and that will assess how different types of toxic algae are affected by climate change and that will provide local forecasts for where along the east coast the algae are blooming right now. The database consists of many sighting reports and is externally available here: <https://www.gu.se/node/59249>

*Figure 16: Highlight of the Algal Blooms Sweden Marine Citizen Science project*

The authors decided to include the category 'Lessons learned' in the questionnaire, with the aim of encouraging respondents to consider the potential legacy and transferability of their project, so that it may contribute to the stimulation of further Baltic Marine Citizen Science projects in the future. Although this category could not be filled in for many of the projects, it still delivered some interesting results. For example, in some of the projects it was explicitly mentioned that language was a barrier, as well as there being issues with the more technical aspects of submitting data by volunteer citizen scientists. Most notably, for many of the projects it was stressed that Citizen Science volunteers should be made aware of the quality assurance protocols (if available) and to encourage them to correctly follow classification protocols, in order to ensure validity and consistency of the collected data and information. Quite often it seemed a challenge to engage users to follow such guidelines and to motivate them to collect and submit data and information both correctly as well as systematically. Some of the ways in which this was encouraged included for instance the use of existing apps, developing clear instruction manuals as well as (video) tutorials. For the project 'ClimateScan', an article was even [published](#) in the online journal *Land*, presenting the 'Potentials and Pitfalls of Mapping Nature-Based Solutions with the Online Citizen Science Platform ClimateScan'.

The analysis of the identified Baltic Marine Citizen Science projects has shown that there are in fact numerous projects either on-going, or recently finalised. Of course, there is no baseline figure to which to compare the number of 55 identified projects to, but there are many indicators that Marine Citizen Science projects are very much prolific in the Baltic Sea Region. Numerous research projects on the European scale as well as beyond are currently on-going or are being planned, focusing on aspects of marine research such as harmful algal blooms, marine litter and other pollution, as well as for example climate change. As this study has shown, the involvement of citizen scientists in such research can be a highly valuable addition. This should also be considered in light of wider supra-European endeavours, such as the United Nations Decade of Ocean Science for Sustainable Development, which indicates that not only *more* marine research is needed and that stakeholders need to become *more* engaged in research, but also especially foresees a greater role for Marine Citizen Science projects in the future. In this light, the Baltic Sea Region should continue to act as forerunner. The authors hope that the report and the study on which it is based, will prove a fruitful resource for those that are keen to start their own Marine Citizen Science projects in the Baltic Sea Region, and that the lessons learned may be taken on board.

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## **Annexes**

Annex I : Questionnaire Template

Annex II: Overview of identified relevant Baltic Marine Citizen Science projects

Annex III: Overview of directly targeted Stakeholders



## HOLISTIC MARINE CITIZEN SCIENCE PROJECTS' MAPPING IN THE BALTIC SEA REGION

In the context of the assignment 'Holistic Marine Citizen Science Projects' Mapping in the Baltic Sea Region' as funded by BANOS CSA – s.Pro sustainable-projects GmbH is undertaking a comprehensive mapping exercise to develop the first-ever overview of marine citizen science projects in and around the Baltic Sea Region. We are keen to hear from you and to include your project into our database, with the ultimate aim of encouraging more of such projects to be realized in the future. Please feel free to send this survey to any of your immediate colleagues that you think could contribute to our study by providing them with this link: <https://form.jotform.com/211522641508347> The information you provide in the survey responses will only be used for the purposes of this study and your contact information will not be shared with third parties. For more information about how s.Pro – sustainable projects GmbH handles data protection, please visit: <http://www.sustainable-projects.eu/data-protection>

### What is meant by Marine Citizen Science projects?

Following the definition of the BANOS CSA, "Citizen Science is a research approach which allows science and civil society to cooperate, to learn, and work together to generate and use scientific knowledge and understanding for mutual benefit. These benefits include, for example, enhanced data collecting capability for scientific research, empowerment of civil society and an increased environmental awareness." A Citizen Science project is thus one where data is collected and where this data is subsequently used for scientific purposes. For this study, the emphasis will be on the sea and coastal areas, with a focus on Marine Citizen Science projects that provide data and tangible outcomes and that are as such 'consultable'- meaning that we also consider science projects that use citizen science approaches.

### Definition of 3 major types of initiatives:

- descriptive – data collected without specified intended use
- performance – monitoring and evaluation is crucial, collecting data long-term
- composite – drawing attention to important policy issues by providing a shared conceptual framework as basis for interpretation, analysis and practice

### Definition of levels of participation:

- crowdsourcing – no subject knowledge required, citizens report observations
- distributed intelligence – certain level of knowledge is required for the sake of interpretation, either pre-existing knowledge or via a training course
- participatory science – citizens define the problem, compose a method and do data collection but scientists still play a leading role in analysing the data and interpreting the results
- extreme citizen science – collaborative science, non-professionals participate in all steps of research but they choose their level of engagement

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Date:

Method:

Interviewer (if relevant):

Interviewee name:

Interviewee institution:

Contact information email address/phone number:

**Questions:**

- Are/were you/your institution involved in a Baltic Marine Citizen Science project? (multiple choice: yes/no)
- What is the name of the project in English?
- What is the name of the project in its original language?
- What is/was your role in this project?
- Do/did you collaborate with other institutions in this project?
- Who is/was the project lead, and could you provide us their contact information or a weblink to the project?
- How was/is the project funded? (multiple choice: local funding, regional funding, international funding, Interreg, BANOS, other)
- Is the project finalised or on-going? (multiple choice: finalised/on-going)
- What is/was the start and if relevant the end-date of the project?
- What do/did you study? (multiple choice: species, biodiversity, ecology, fisheries, environmental variables (other), pollution: eutrophication, pollution (other), archeology, marine litter, other)
- What is/was the aim of the initiative?
- What kind of data do/did you collect and how? (multiple choice: pictures and sighting details, catch records, sighting reports, sighting reports of flora and fauna, diving watches, boats, concrete samples, other)
- How was the data sent to the project lead? (multiple choice: web portal, app, phone, email, post, other)
- What is/was the scale of the project? (multiple choice: local, sub-regional, regional, national, European, international, other)
- What is/was the location of the project? (multiple choice: Baltic-wide, Denmark, Germany, Estonia, Finland, International, Latvia, Lithuania, Poland, Sweden, Russia, other)
- What is/was the language of the project? (multiple choice: Danish, English, Estonian, Finnish, German, Lithuanian, Latvian, Polish, Russian, Swedish)
- What is/was the frequency of data collection for the project? (once per year, once per month, once per week, ad hoc)
- Can you tell us more about the topic of the project data collection, e.g. species taxonomy, invasive species, mollusks, etc.?
- What is/was the level of participation? (multiple choice: crowdsourcing, distributed intelligence, participatory science, extreme citizen science)

- What is/was the role of sustainability in the project? (multiple choice: descriptive, performance, composite)
- What is/was the number of participants/volunteers involved? (multiple choice: <50, 50-100, >100)
- What was the participants' feedback?
- Is/was the data set available? (multiple choice: yes, externally; yes, internally; unknown; no)
- What would you say are or were the lessons learned of the project?
- Do you have any other comments regarding the project?
- Are you aware of other Baltic MCS projects?
- What is the name of the project, who is the contact person and how could we find out more about the project?
- May we contact you for further questions?

Name of project EN	Suggested by survey respondent or found proactively	Name of project original language	Duration of project	Start date of project	End date of project
A nationwide assessment of plastic pollution in the Danish realm using	Found proactively	A nationwide assessment of plastic pollution in the Danish realm using	<1 year	2016	2016
Algal bloom monitoring	Found proactively	Algal bloom monitoring - FI Environment Department	<1 year	01.06.20	01.08.20
Algal Blooms Sweden	Suggested by survey respondent	Algal Blooms Sweden	Unknown - on-going	01.08.20	n/a
Animals stuck in the trash	Found proactively	Roskiin takertuneet eläimet	Unknown - on-going	16.06.20	On-going
Baltic App	Found proactively	BONUS Baltic App - Wellbeing from the Baltic	3 years	01.04.15	31.03.18
Baltic Explorer	Found proactively	BalticExplorer	Unknown - on-going	01.12.16	n/a
Baltic Sea Project BioBlitz	Found proactively	Baltic Sea Project BioBlitz	<1 year	27.08.20	27.08.20
Baltic Seabird Project	Found proactively	Baltic Seabird Project	Unknown - on-going	01.06.19	On-going
Brown Water	Found proactively	Brunt vatten	<1 year	2016	2016
Bycatch and Seal Sightings	Found proactively	Siivusaalis- ja hyönteisvaurioiden havu	Unknown - on-going	2016	On-going
Climate Learning Portal "Our warmer Sea"	Suggested by survey respondent	Klimatläroportalen "Vårt varmare hav"	3 years	2021	Spring 2024
ClimateScan	Found proactively	ClimateScan	Unknown - on-going	2020	On-going
Consumer driven product development of unpopular fish species from	Suggested by survey respondent	Rannapüügi ja siseveekogude kalaliikide väär	2 years	01.09.19	31.08.21
Crab Watch	Found proactively	Crab Watch	3 years	2015	2018
Crowdwater	Found proactively	Crowdwater	Unknown - on-going	2016	On-going
DNA & Life	Suggested by survey respondent	DNA & Liv	3 years	04.01.20	31/12/2022
ESABALT - Enhanced Situational Awareness to Improve Maritime Safety	Found proactively	ESABALT - Enhanced Situational Awareness	Unknown - on-going	2016	Unknown
ESMIC-Estimation, monitoring and reduction of plastic pollutants in	Suggested by survey respondent	Estimation, monitoring and reduction of plastic	2 years	01.10.20	30.09.22
Eye on Water	Found proactively	Eye on Water	Unknown - on-going	Unknown	On-going
FPCUP EO-Crowd	Suggested by survey respondent	FPCUP EO-Crowd	Project upcoming - unknown	Unknown	Unknown
Gears, lost and found	Found proactively	Kalainpöydätyt, kadonneet ja löydettyt	Unknown - on-going	Unknown	On-going
Golelly: a gelatinous solution to microplastic pollution	Suggested by survey respondent	Golelly	3 years	2018	2021
Human Impacts @ coastal ecosystem	Suggested by survey respondent	Human Impacts @ coastal ecosystem	3 years	2018	2021
I Live by the Sea Ocean Action	Suggested by survey respondent	I Live by the Sea Ocean Action	Unknown - on-going	2017	On-going
Keep Sweden Tidy Foundation	Suggested by survey respondent	Håll Sverige Rent	Unknown - on-going	Unknown	On-going
Killer Shrimp Invasion Challenge	Found proactively	Killer Shrimp Invasion Challenge	<1 year	06.06.20	02.06.20
Koster Seafloor Observatory	Found proactively	Koster Seafloor Observatory	Unknown - on-going	Unknown	On-going
Lake and Sea Wiki	Suggested by survey respondent	Järvi Meri Wiki	Unknown - on-going	2011	On-going
Lakes in your spare time	Suggested by survey respondent	Sjøer i fritiden	Unknown - on-going	01/04-21 (plus a preproject in 2018)	On-going
LitterExplorer	Suggested by survey respondent	LitterExplorer	Unknown - on-going	01.01.2018 (Start of the educational project)	On-going
Mapping the presence of Maerl on Swedish Seabeds	Suggested by survey respondent	Hjälp forskare att kartlägga förekomsten av Maerl	<1 year	01.06.21	On-going
Marine Litter Watch	Found proactively	Marine Litter Watch	Unknown - on-going	2013	On-going

Name of project EN	Project finished or on-going	Scale of project	Location of project	Language of project	Frequency of data collection	Category	More precise information about topic of project data collection
A nationwide assessment of plastic pollution in the Danish realm using national monitoring	Finished	National	Denmark	English	Once per month	Pollution (Other)	More precise information about topic of project data collection: cigarette butts, plastic pieces and candy/chips wrappings
Algal bloom monitoring Sweden	Finished	Subregional	Finland	English	Ad hoc / Continuous	Pollution: eutrophication	cyanobacterial blooms
Animals stuck in the trash	On-going	International	Sweden	English	Ad hoc / Continuous	Pollution: eutrophication	What we call algal blooms is actually a mass presence of cyanobacteria. The bacteria c
Baltic App	On-going	National	Finland	Finnish	Ad hoc / Continuous	Species	What kind of animal has gotten stuck (Bird, fish, mammal, other), what kind of rubbish
Baltic Explorer	Finished	European	Baltic-wide	English	Ad hoc / Continuous	Environmental variables	What kind of animal has gotten stuck (Bird, fish, mammal, other), what kind of rubbish
Baltic Sea Project BioBlitz	Finished	European	Baltic-wide	English	Ad hoc / Continuous	Biodiversity	(e.g. air and water temperature, algal blooming information, beach quality). The second
Baltic Seabird Project	On-going	International	Baltic-wide	English	One-off	Other	Quadrupeds, birds, whales, fishes, shellfish and starfish, soft bodied animals, weeds, bud
Brown Water	On-going	Local	Sweden	Swedish	Ad hoc / Continuous	Biodiversity	All taxa - both terrestrial and marine
Bycatch and Seal Sightings	Finished	National	Sweden	Swedish	Once per year	Environmental variables	Herring guillemot penguins webstream at the Auk Lab Research Facility near Götland
Climate Learning Portal "Our warmer Sea"	On-going	National	Finland	Finnish	Ad hoc / Continuous	Species	examine watercolormeasure temperatureexamine benthic faunatest pH in water
Consumer driven product development of unpopular fish species for Crab Watch	On-going	Subregional	Sweden	Swedish	Once per year	Other	Seals and porpoises, dead or alive
Crowdwater	On-going	Local	Sweden	English	Ad hoc / Continuous	Environmental variables	it's a communication portal between students and scientists
DNA & Life	On-going	European	Estonia	Estonian	Ad hoc / Continuous	Fisheries	Climate scan is an interactive web-based map application for international knowledge
ESABALT - Enhanced Situational Awareness to Improve Maritime Safety	On-going	International	Denmark	English	Ad hoc / Continuous	Species	Consumer preferences for fish and new fish products. Adding value to locally caught
ESMIC-Estimation, monitoring and reduction of plastic pollutants in Eye on Water	On-going	Regional	Baltic-wide	Danish	Ad hoc / Continuous	Environmental variables	Crabs: Species, sex, eggs, carapace width, photo, parasites, soft, mating, damage
FPCUP EO-Crowd	Upcoming	National	Lithuania	Lithuanian	Summer Season	Ecology	Water level data with physical and virtual staff gaugesQualitative data on soil moisture
Golejly: a gelatinous solution to microplastic pollution	On-going	European	Denmark	English	Ad hoc / Continuous	Species	Non-indigenous marine species, water samples for eDNA analysis
Human impacts @ coastal ecosystem	On-going	European	Denmark	English	Ad hoc / Continuous	Environmental variables	Ordinary citizens can be of a great help in improving maritime safety. A new, innovative
I Live by the Sea Ocean Action	On-going	National	Sweden	Swedish	Ad hoc / Continuous	Marine litter	Size and properties of the beach wrack, opinion on the marine litter issue and beach qu
Keep Sweden Tidy Foundation	On-going	Local	Sweden	English	Ad hoc / Continuous	Ecology	Water colour and clarity
Killer Shrimp Invasion Challenge	On-going	Local	Sweden	Swedish	Ad hoc / Continuous	Ecology	Litter: algae blooms, bladderwrack, all sorts of information as related to the Baltic Sea,
Koster Seafloor Observatory	On-going	Regional	Sweden	English	Ad hoc / Continuous	Environmental variables	Litter: algae blooms, bladderwrack, all sorts of information as related to the Baltic Sea,
Lake and Sea Wiki	On-going	International	Denmark	Danish	Ad hoc / Continuous	Marine litter	Lost (fishing) gear
Lakes in your spare time	On-going	National	Denmark	English	Ad hoc / Continuous	Species	gelatinous zooplankton; jellyfish species sightings
LitterExplorer	On-going	National	Germany	German	Ad hoc / Continuous	Ecology	Project I live by the Sea Ocean Action is dedicated to young learners of ages 9-18, who
Mapping the presence of Maerl on Swedish Seabeds	On-going	Regional	Sweden	Swedish	Ad hoc / Continuous	Ecology	79% of the litter found on the reference beaches in 2020 was plastic.
Marine Litter Watch	On-going	European	International	English	Ad hoc / Continuous	Marine litter	Predict the presence of the invasive species D. Villosus in the Baltic Sea

Name of project EN	What kind of data did the project collect and how?	How was the data sent to the project lead?	What is/was the aim of the project?	Is the data set available?	Lessons learned	Number of participants
A nationwide assessment of plastic pollution in the Danish realm using	Sighting reports	Other	Plastic pollution is considered one of today's most serious environmental problems. Nation-wide cyanobacterial monitoring has been running since 2015. The aim of the project is to assess the extent of plastic pollution in the Danish realm using citizen science.	Yes - internally	Unknown	more than 100
Algal bloom monitoring	Sighting reports	Web portal	Nation-wide cyanobacterial monitoring has been running since 2015. The aim of the project is to assess the extent of plastic pollution in the Danish realm using citizen science.	Yes - internally	During the summer, a total of almost 15000 photos were taken.	more than 100
Algal Blooms Sweden	Sighting reports	App	Algal Blooms Sweden is a Citizen Science project where citizens report sightings of algal blooms in Sweden.	Yes - externally	Unknown	more than 100
Animals stuck in the trash	Pictures and sighting details	Web portal	Eating debris and clinging to debris leads to injury and death for many animals. The project will study both the supply and demand for animal-friendly products.	Yes - externally	Unknown	less than 50
Baltic App	Pictures and sighting details	App	The project will study both the supply and demand for animal-friendly products.	No	Many things to consider when you decide to use an app.	more than 100
Baltic Explorer	Sighting reports	App	We offer determination support and information about bird sightings.	Yes - internally	It seems like many of the pages on the website are outdated.	more than 100
Baltic Sea Project BioBlitz	Pictures and sighting details	App	One day mini citizen science project to promote biodiversity in the Baltic Sea.	Yes - externally	Using existing app "Naturalist" and giving out information about the project.	less than 50
Baltic Seabird Project	Pictures and sighting details	Web portal	Herring gulls are a so-called indicator species for the health of the Baltic Sea.	Unclear	Unknown	Unknown
Brown Water	Concrete samples	Post	We are particularly interested in changes in the water quality of the Baltic Sea.	No	Unknown	more than 100
Bycatch and Seal Sightings	Pictures and sighting details	Web portal	The Natural Resources Center is responsible for collecting data on bycatch and seal sightings.	Yes - externally	Unknown	Unknown
Climate Learning Portal "Our warmer Sea"	Pictures and sighting details	Web portal	for students to aid scientists in collecting data on climate change.	No	none yet since it starts now	50-100
ClimateScan	Other	Web portal	The online knowledge-sharing platform ClimateScan aims to improve climate literacy.	Yes - externally	Three main concerns related to online platforms: lack of time, lack of resources, and lack of motivation.	more than 100
Consumer driven product development of unpopular fish species for	Pictures and sighting details	Web portal	To develop new technologies and products for unpopular fish species.	Yes, internally	Consumers are open minded, but need to be educated.	more than 100
Crab Watch	Pictures and sighting details	Email	A Citizen Science initiative to study the distribution of crabs.	Unclear	Unknown	Unknown
Crowdwater	Other	App	The CrowdWater project is investigating how to improve water quality monitoring.	Yes - externally	Unknown	more than 100
DNA & Life	Concrete samples	Web portal	Monitoring via eDNA analysis	Yes - internally	Need to have focus on consistent data validation.	more than 100
ESABALT - Enhanced Situational Awareness to Improve Maritime Safety	Sighting reports	Web portal	The primary goal of ESABALT is to study the feasibility of using eDNA for maritime safety.	Unclear	Unknown	Unknown
ESMIC-Estimation, monitoring and reduction of plastic pollutants in	Sighting reports	Web portal	Awareness raising for reducing plastic pollution	Yes, internally	Still in progress	less than 50
Eye on Water	Pictures and sighting details	App	One of the most apparent characteristics of water pollution is the presence of plastic waste.	Yes - internally	Unknown	more than 100
FPCLUP EO-Crowd	Sighting reports of flora and fauna	Web portal	kansalaishavainnot.fi aims to improve citizen science data collection.	Yes - externally	Technical arrangements of cross-disciplinary work.	Unknown
Gears, lost and found	Pictures and sighting details	Web portal	Some of the fishing gear or parts of it that fishers lose can be harmful to the environment.	Yes - externally	Unknown	less than 50
Gokelly: a gelatinous solution to microplastic pollution	Pictures and sighting details	App	to use sighting data collected through the citizen science app.	Yes - internally	still ongoing	more than 100
Human Impacts @ coastal ecosystem	Pictures and sighting details	Web portal	Students study the impact of human activity on the coastal ecosystem.	Yes - externally	Every citizen should care.	more than 100
I Live by the Sea Ocean Action	Other	Web portal	To map Ocean Literacy among youth across Europe.	Yes - externally	English may be a barrier	more than 100
Keep Sweden Tidy Foundation	Pictures and sighting details	App	Keep Sweden Tidy has with support from Statistics Sweden.	Yes - internally	Unknown	more than 100
Killer Shrimp Invasion Challenge	Other	Other	The goal of this challenge is to spur research on the killer shrimp.	Unclear	Unknown	50-100
Koster Seafloor Observatory	Other	Web portal	At the new website Koster Seafloor Observatory.	Unclear	Underwater images are usually of poor quality.	more than 100
Lake and Sea Wiki	Pictures and sighting details	Web portal	Järvi-merwiki is Finland's own wiki for lakes and seas.	Yes - externally	Unknown	more than 100
Lakes in your spare time	Pictures and sighting details	Web portal	To gain more knowledge in Danish lakes and seas.	Yes - externally	(still ongoing project)	more than 100
LitterExplorer	Other	Web portal	The aim of the project was to sensitize children to litter.	Yes - externally	A special challenge of the project "Alles im Fokus"	more than 100
Mapping the presence of Maerl on Swedish Seabeds	Sighting reports	Email	We simply need help finding where on Sweden Maerl is present.	Unclear	Unknown	Unknown
Marine Litter Watch	Pictures and sighting details	App	The European Environment Agency has developed the Marine Litter Watch app.	Yes - externally	The MLW app allows users to monitor, identify and report litter.	more than 100

Name of project EN	Participant feedback	Level of participation	Role of sustainability	Other comments	Project lead	Project co-leads	Project website	How is/was the project funded	Project lead contact name
A nationwide assessment of plastic pollution in the Danish realm	Unknown	Crowdsourcing	Composite	Sampling was conducted on SDU	SDU	National Institute of Aquatic Science	<a href="https://orbit.dtu.dk/en/publications">https://orbit.dtu.dk/en/publications</a>	Other	Kristian Syberg
Algal bloom monitoring	A lot of feedback on the online survey	Distributed intelligence	Performance	Precise location: northern Baltic Sea	Finnish Environment Institute	Finnish Border Guard, research	<a href="https://www.ymparisto.fi/en">https://www.ymparisto.fi/en</a>	National funding	Hari Kuosa
Algal Blooms Sweden	Unknown - but a lot of sightings	Distributed intelligence	Performance	Interested in helping people identify blooms	Stockholm County Administration	University of Gothenburg, Oskarö	<a href="https://www.gu.se/myheter">https://www.gu.se/myheter</a>	National funding	Ana Tronholm
Animals stuck in the trash	Unknown	Crowdsourcing	Performance	n/a	Finnish Environment Institute	n/a	<a href="https://www.ymparisto.fi/en">https://www.ymparisto.fi/en</a>	National funding	Unknown
Baltic App	Unknown	Crowdsourcing	Performance	the project will pilot a mobile app	University of Helsinki	Partner countries: Finland, Denmark, Estonia, Latvia, Lithuania	<a href="https://blogs.helsinki.fi/balticapp/">https://blogs.helsinki.fi/balticapp/</a>	BONUS	Kari Hyttäläinen
Baltic Explorer	Unknown	Crowdsourcing	Descriptive	Not so much a project per se, but a platform	Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz	n/a	<a href="https://www.balticexplorer.de/">https://www.balticexplorer.de/</a>	National funding	Unknown
Baltic Sea Project BioBlitz	Unknown	Crowdsourcing	Descriptive	Instructions for using the app	UNESCO Associated Schools	n/a	<a href="https://www.naturalist.org">https://www.naturalist.org</a>	International funding	Aira Undén-Selander
Baltic Seabird Project	Unknown	Crowdsourcing	Composite	With IR light and IR-sensitiv cameras	Baltic Seabird Project	WWF Sweden, SLU, Stockholm University	<a href="https://www.balticseabird.org/">https://www.balticseabird.org/</a>	Other	Olof Olsson
Brown Water	Unknown	Crowdsourcing	Performance	The classes would present the results	Uppsala University	n/a	<a href="https://www.teknat.lu.se/">https://www.teknat.lu.se/</a>	Other	Gesa Weyhenmeyer
Bycatch and Seal Sightings	Unknown	Crowdsourcing	Descriptive	Also reporting bycatch: Seal	Finnish Ministry of the Environment	WWF, the Natural Resources Institute Finland	<a href="https://lomakkeet.luke.fi/hy/">https://lomakkeet.luke.fi/hy/</a>	National funding	Kaarina Kauhala
Climate Learning Portal "Our warmer Sea"	Unknown	Participatory science	Performance	n/a	Baltic Sea Science Center, Stockholm University	n/a	Unknown	National funding	Anna Björn
ClimateScan	Unknown	Crowdsourcing	Descriptive	n/a	Unknown	n/a	<a href="https://www.balticwaterhub.eu/">https://www.balticwaterhub.eu/</a>	Interreg	Floris Boogaard
Consumer driven product development of unpopular fish species	Consumers liked new fish products	Distributed intelligence	Performance	n/a	Estonian Maritime Academy	fisherman, fishing companies	<a href="https://www.pria.ee/sites/default/files/2019-09/20190901_01.pdf">https://www.pria.ee/sites/default/files/2019-09/20190901_01.pdf</a>	National & international funding	Loreida Timberg
Crab Watch	Unknown	Distributed intelligence	Composite	The project was focused on SEACHANGE	SEACHANGE project	Project Partners	<a href="https://www.seachangeproject.com/">https://www.seachangeproject.com/</a>	International funding	Unknown
Crowdwater	Unknown	Crowdsourcing	Performance	n/a	University of Zürich	n/a	<a href="https://crowdwater.ch/en/">https://crowdwater.ch/en/</a>	National funding	Sara Blanco
DNA & Life	Very good	Distributed intelligence	Performance	n/a	Statens Naturhistoriska Museum	Ministry of Environment of Denmark	<a href="https://snm.ku.dk/besoeg-og-aktiviteter/">https://snm.ku.dk/besoeg-og-aktiviteter/</a>	National funding	Maria Rytter
ESABALT - Enhanced Situational Awareness to Improve Maritime Safety	Unknown	Crowdsourcing	Descriptive	n/a	Finnish Geospatial Research Centre	The partners in the ESABALT project	<a href="https://cordis.europa.eu/articulo/">https://cordis.europa.eu/articulo/</a>	BONUS	Heidi Kuusniemi
ESMWC-Estimation, monitoring and reduction of plastic pollutants in the Baltic Sea	Still in progress	Crowdsourcing	Performance	n/a	Klaipėda University Marine Biology Department	n/a	<a href="https://latit.eu/esmic/">https://latit.eu/esmic/</a>	Interreg	Arunas Balciunas
Eye on Water	Not available externally but internally good	Crowdsourcing	Descriptive	n/a	NIOZ	As part of project Citizens' Science	<a href="https://www.eyeonwater.org/">https://www.eyeonwater.org/</a>	National funding	Unknown
FPCLUP EO-Crowd	For on-going SYKE projects: A lot of feedback	Crowdsourcing	Performance	Next phase will be completed in 2023	FPCLUP EO-Crowd	FMI, SYKE Marine Centre and Data & Information Centre	<a href="https://www.ymparisto.fi/en">https://www.ymparisto.fi/en</a>	National funding	Timo Pyhälähti
Gears, lost and found	Unknown	Crowdsourcing	Descriptive	n/a	Finnish Environment Institute	n/a	<a href="https://www.ymparisto.fi/en">https://www.ymparisto.fi/en</a>	National funding	Unknown
Goelley: a gelatinous solution to microplastic pollution	Unknown	Participatory science	Composite	n/a	SDU	n/a	<a href="https://www.submarine-robotics.com/">https://www.submarine-robotics.com/</a>	International funding	Jamileh Javidpour
Human Impacts @ coastal ecosystem	new knowledge, understand ecosystem	Participatory science	Descriptive	n/a	Ogres Valsts gimnazija (Ogre)	n/a	<a href="https://www.submarine-robotics.com/">https://www.submarine-robotics.com/</a>	International funding	Viktoria Galisa
I Live by the Sea Ocean Action	Positive	Participatory science	Descriptive	<a href="http://www.todaywehave.com/">http://www.todaywehave.com/</a>	Today we Have	n/a	<a href="https://www.todaywehave.com/">https://www.todaywehave.com/</a>	Other	Johanna Kotynska-Zielinska
Keep Sweden Tidy Foundation	Unknown	Crowdsourcing	Descriptive	Guidance for citizen scientists	Keep Sweden Tidy Foundation	Statistics Sweden and the Swedish Environmental Protection Agency	<a href="https://www.hsr.se/keep-sweden/">https://www.hsr.se/keep-sweden/</a>	National funding	Jannes Germishuys
Killer Shrimp Invasion Challenge	There was an FAQ page and a lot of feedback	Distributed intelligence	Performance	This is a Kaggle InClass competition	Ocean Data Factory	n/a	<a href="https://www.kaggle.com/c/killer-shrimp-invasion-challenge/">https://www.kaggle.com/c/killer-shrimp-invasion-challenge/</a>	Other	Björn Kallstrom
Koster Seafloor Observatory	There is an FAQ page on the website	Distributed intelligence	Performance	Crowdsourcing but also distributed intelligence	Koster Seafloor Observatory	wildlife.ai, Swedish Biodiversity Centre	<a href="https://www.zoorniverse.org/">https://www.zoorniverse.org/</a>	Other	Maria Ojane
Lake and Sea Wiki	Positive - many discussions on the wiki	Crowdsourcing	Descriptive	Thanks to your annotation	Kansalaisvaikennot@syke.fi	The Finnish Agricultural and Horticultural Societies	<a href="https://www.lakeandseawiki.fi/wiki/">https://www.lakeandseawiki.fi/wiki/</a>	National funding	Sara Egemose
Lakes in your spare time	Positive and engaged	Crowdsourcing	Descriptive	n/a	yes	AU and Danish Societies, Institute of Agricultural and Horticultural Societies	<a href="https://www.sdu.dk/sgerifritiden/">https://www.sdu.dk/sgerifritiden/</a>	National funding	Anke Vorlauf
Litter Explorer	Surprisingly good for having a simple app	Crowdsourcing	Composite	Cooperation with the "Maerl" project	ECCC Coastal Union German	Naturgesellschaft Schutzsta	<a href="https://www.litterexplorer.org/">https://www.litterexplorer.org/</a>	National funding	Lina Rasmusson
Mapping the presence of Maerl on Swedish Seabeds	Unknown	Distributed intelligence	Performance	We know that maerl exists	University of Gothenburg	Swedish University of Agricultural Sciences	<a href="https://www.gu.se/myheter">https://www.gu.se/myheter</a>	Other	Unknown
Marine Litter Watch	Feedback explicitly requested	Distributed intelligence	Composite	The data collected from the app	European Environment Agency	Marine Conservation Society	<a href="https://www.eea.europa.eu/">https://www.eea.europa.eu/</a>	International funding	Unknown

Name of project EN	Suggested by survey respondent or found proactively	Name of project original language	Duration of project	Start date of project	End date of project
My Ocean Sampling Day	Suggested by survey respondent	My Ocean Sampling Day	<1 year	2016	2016
Nature Data	Suggested by survey respondent	Dabas dati	Unknown - on-going	2018	On-going
Neat Bits	Found proactively	Sisti Bitsiin	Unknown - on-going	2013	On-going
No specific project name	Suggested by survey respondent	No specific project name	Unknown - on-going	2021	On-going
No specific project name (it is included in DCF and some national project)	Suggested by survey respondent	No specific project name	Unknown - on-going	2000	On-going
Observations on water quality produced with the help of a water test backpack	Suggested by survey respondent	Vestestirepun avulla tuotetut havainnot ve	Unknown - on-going	2019	On-going
Ocean of Changes	Suggested by survey respondent	Ocean Zmian	Unknown - on-going	2017	On-going
Plastic Pirates – Go Europe! Project (Germany)	Found proactively	Plastik Piraten	Unknown - on-going	2016	On-going
Project campaign My Sea	Suggested by survey respondent	Mana jära	Unknown - on-going	2012	On-going
Rappen - reporting of aquatic organisms	Found proactively	Rappen – rapportering av vattenorganismer	Unknown - on-going	2015	On-going
Report the Crab Sighting	Found proactively	Ilmoita rapuhavainto	Unknown - on-going	Unknown	On-going
Report the Fish Sighting	Found proactively	Ilmoita kalahavainto	Unknown - on-going	Unknown	On-going
River Watch	Found proactively	River Watch	3 years	2017	2020
Roots University of Kiel Citizen Science project	Found proactively	Roots University of Kiel Citizen Science project	Project upcoming - unknown	2022	Unknown
SEI Tallinn Marine Litter project	Found proactively	SEI Tallinn Marine Litter project	Unknown - on-going	01.03.21	Unknown
Smartfin	Suggested by survey respondent	Smartfin	Unknown - on-going	2018	On-going
Talvisauranta	Found proactively	Talvisauranta	Unknown - on-going	Unknown	On-going
Tang.nu	Suggested by survey respondent	Tang.nu	3 years	01. Apr 17	On-going
The Coastal Day	Suggested by survey respondent	Strandens Dag	>5 years	2010	31. Jul 21
The Great Nurdle Hunt	Found proactively	The Great Nurdle Hunt	Unknown - on-going	2013	On-going
VIRTUE-s	Suggested by survey respondent	VIRTUE-s	3 years	2017	2020
Water front	Suggested by survey respondent	Water front	Unknown - on-going	just starting	On-going
Who eats bladderwrack - Bridging the gap between science and society with an iconic Baltic Sea species	Suggested by survey respondent	Kuka syö rakkolevää? Vem äter blåstång?	2 years	Apr 20	March 2022

Name of project EN	Project finished or on-going	Scale of project	Location of project	Language of project	Frequency of data collection	Category	More precise information about topic of project data collection
My Ocean Sampling Day	Finished	National	Germany	English	Ad hoc / Continuous	Species	Marine microbes, concrete samples; microbes were collected on filters, auxilliary
Nature Data	On-going	National	Latvia	Latvian	Ad hoc / Continuous	Species	Litter, algae blooms, bladderwrack, all sorts of information as related to the B
Neat Bits	On-going	National	Finland	Finnish	Ad hoc / Continuous	Marine litter	Any kind of litter and debris, including cigarette butts
No specific project name	On-going	National	Latvia	Latvian	Once per year	Marine litter	Spread of microplastic in the beach, concrete samples that will be delivered to
No specific project name (It is included in DCF and some national project)	On-going	National	Latvia	Latvian	Once per month	Species	Records of rare species, age determination for trophy fish, tagging of salmon
Observations on water quality produced with the help of a water test backpack	On-going	National	Finland	Finnish	Ad hoc / Continuous	Environmental variable	Cyanobacteria, temperature of water and air, depth and turbidity of water, al
Ocean of Changes	On-going	Local	Poland	Polish	Once per week	Other	Information on the youth perception of ocean issues. Responses to the questi
Plastic Pirates – Go Europe! Project (Germany)	On-going	Local	International	English	Unknown	Marine litter	Most of the litter found by the children and young people was plastic (27%), f
Project campaign My Sea	On-going	Local	Latvia	English	Once per year	Pollution (Other)	The campaign has gained recognition mainly through the annual Green Exped
Rappen - reporting of aquatic organisms	On-going	National	Sweden	Swedish	Ad hoc / Continuous	Species	marine mammals, fish, plants, invertebrates such as crustaceans and mussels,
Report the Crab Sighting	On-going	National	Finland	Finnish	Ad hoc / Continuous	Species	crab stocks, crayfish, spotted crab or invasive species
River Watch	On-going	National	Finland	Finnish	Ad hoc / Continuous	Species	honeyuckle, copper fish, alaska, spike, isosimppu, beakfish, sword shirt, turbot
Roots University of Kiel Citizen Science project	Finished	Subregional	Russia	Russian	Ad hoc / Continuous	Environmental variable	potential sources of nitrogen and phosphorus pollution of water bodies; water
SEI Tallinn Marine Litter project	Upcoming	Local	Germany	German	Unknown	Archeology	Test Pit Excavations" (TPE) will be carried out together with local residents. I
Smartfin	On-going	Local	Estonia	Estonian	Once per week	Marine litter	including small pieces of litter (glass fragments, cigarette butts, pieces of plas
Talviseuranta	On-going	International	Poland	Polish	Ad hoc / Continuous	Environmental variable	Temperature measurements
Tang.nu	On-going	National	Finland	Finnish	Once per year	Environmental variable	observations on winter phenomena, snow and ice observations
The Coastal Day	Finished	National	Denmark	Danish	Unknown	Environmental variable	salinity, how deep clarity of sea water, temperature of sea water
The Great Nurdle Hunt	On-going	National	Sweden	Swedish	Once per year	Marine litter	"We don't study we do beach cleanings collecting debris. We try to create a r
VIRTUE-s	On-going	International	International	English	Ad hoc / Continuous	Pollution (Other)	Nurdles are small plastic pellets about the size of a lentil. Countless billion are
Water front	On-going	National	Sweden	Swedish	Ad hoc / Continuous	Biodiversity	Saltwater Species: Leaf algae Filamentous algae Sea anemones (Actiniaria) Mar
Who eats bladderwrack - Bridging the gap between science and society with an	On-going	Local	Poland	Polish	Ad hoc / Continuous	Pollution (Other)	Mezoplankton litter. Quantity of plastic on rivers, lakes and sea shores, mezo an
	On-going	National	Finland	Finnish	Ad hoc / Continuous	Species	Fauna within bladderwrack (Fucus vesiculosus). Although the invertebrate fau

Name of project EN	What kind of data did the project collect and how?	How was the data sent to the project?	What is/was the aim of the project?	Is the data set available?	Lessons learned	Number of participants
My Ocean Sampling Day	Concrete samples	App	The Ocean Sampling Day is part of the EU project	Yes - externally	Great project, would do this again!	more than 100
Nature Data	Sighting reports of flora and fauna	Web portal	The aim of the project is to promote the identification of species	Yes - externally	Unknown	more than 100
Neat Bits	Pictures and sighting details	App	The purpose of Neat Bits is to clean the beach	Yes - externally	Unknown	more than 100
No specific project name	Concrete samples	Post	To estimate abundance and spatial distribution	Yes - externally	Project is not started yet	50-100
No specific project name (it is included in DCF and some national project)	Catch records	Email	Involving of citizen in the fishery science and conservation	Yes - externally	Most of fishermen and anglers are happy to participate	50-100
Observations on water quality produced with the help of a water test backpack	Sighting reports	Web portal	Reporting observations produced using a water test backpack	Yes - externally	Unknown	Unknown
Ocean of Changes	Other	Web portal	Increase awareness of ocean issues - Ocean Literacy	Yes - externally	Lessons learnt have been published in the peer-reviewed literature	more than 100
Plastic Pirates - Go Europe! Project (Germany)	Concrete samples	Unknown	In 2020 and 2021, 'capturing' this waste on the beach	Yes - externally	The Plastic Pirates published a new study in the peer-reviewed literature	more than 100
Project campaign My Sea	Concrete samples	Other	The campaign aims to unite the whole Latvian coast	Yes - internally	n/a	50-100
Rappen - reporting of aquatic organisms	Pictures and sighting details	App	Thanks to your reporting, we can get valuable information	Yes - externally	Unknown	Unknown
Report the Crab Sighting	Pictures and sighting details	Web portal	The management and control of crab population	Yes - externally	Unknown	more than 100
Report the Fish Sighting	Pictures and sighting details	Web portal	The Natural Resources Center collects information	Yes - externally	Unknown	more than 100
River Watch	Unknown	Web portal	We are developing public monitoring of water quality	Yes - externally	Unknown	more than 100
Roots University of Kiel Citizen Science project	Unknown	Unknown	"Test Pit Excavations" (TPE) will be carried out	Unclear	n/a	Unknown
SEI Tallinn Marine Litter project	Pictures and sighting details	Other	The programme is intended primarily for high school students	Unclear	n/a	Unknown
Smartfin	Other	App	The Project offers research-grade, data-collecting devices	Yes - externally	We need more experience with technical issues	less than 50
Talviseuranta	Unknown	Unknown	Talviseuranta is a winter monitoring campaign	Unclear	Unknown	Unknown
Tang.nu	Sighting reports	Email	to monitor parameters influencing growth of salmon	Unclear	n/a	less than 50
The Coastal Day	We count the the number of sacks( 15-25 kgs) we collect	Web portal	Collecting debris and creating awareness of the problem	Yes, internally	Never give up. By continuing beach cleaning	more than 100
The Great Nurdle Hunt	Pictures and sighting details	Web portal	Since 2014 we have been asking people across the coast	Yes - externally	Sometimes it is difficult for citizen scientists	more than 100
VIRTUE-s	Other	Web portal	Create a VIRTUE report: the result of your observations	Yes - externally	Unknown	more than 100
Water front	Pictures and sighting details	Email	Quantity of plastic on rivers, lakes and sea shores	Yes - externally	Raising awareness, one need to work with the media	less than 50
Who eats bladderwrack - Bridging the gap between science and society with an iconic sighting reports of flora and fauna	Pictures and sighting details	Email	Gather widespread information about fauna and flora	No	The project is still ongoing.	more than 100

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<b>Name of project EN</b>	<b>Participant feedback</b>	<b>Level of participation</b>	<b>Role of sustainability</b>	<b>Other comments</b>	<b>Project lead</b>	<b>Project co-leads</b>	<b>Project website</b>	<b>How is/was the project funded?</b>	<b>Project lead contact name</b>
My Ocean Sampling Day	extremely positive, motivated	Crowdsourcing	Descriptive	Data sent either via mobile	CWSS / Frank Oliver Glöckne	several universities and nat	<a href="http://www.my-osd.org">http://www.my-osd.org</a>	National funding	Julia Busch
Nature Data	Unknown	Crowdsourcing	Descriptive	n/a	Latvian Fund for Nature	n/a	<a href="http://www.dabasdati.lv">www.dabasdati.lv</a>	National funding	Ilze Priediece
Neat Bits	Unknown - but a lot of sightings	Crowdsourcing	Descriptive	n/a	Keep the Archipelago Tidy	Ålandsbanken, Nivea Pernod	<a href="https://www.slistibiitsi.fi/">https://www.slistibiitsi.fi/</a>	Other	Julia Jännäri
No specific project name	Project is not started yet	Distributed intelligence	Performance	n/a	Latvian Institute of Aquatic	cooperation with student un	Unknown	Other	Inta Dimante-Deimantovica
No specific project name (it is included in DCF and some national project)	Unknown	Distributed intelligence	Descriptive	n/a	Institute of Food Safety, Anir	n/a	Unknown	Other	Dizdis Ustups
Observations on water quality produced with the help of a water test backpack	Unknown	Distributed intelligence	Descriptive	<a href="https://www.ymparisto.fi/">https://www.ymparisto.fi/</a>	Finnish Environment Institut	In context of project 'han Pl	<a href="https://www.ymparisto.fi/">https://www.ymparisto.fi/</a>	National funding	Jari Silander
Ocean of Changes	Positive	Distributed intelligence	Descriptive	Frame their work with 17	IOPAN (Institute of Oceanogr	n/a	<a href="http://www.iopan.pl/">http://www.iopan.pl/</a>	Other	Tymon Zielinski
Plastic Pirates – Go Europe! Project (Germany)	Unknown	Crowdsourcing	Performance	n/a	German Federal Ministry of	Ecologic Institute, Kieler For	<a href="https://www.plastic-pirates.org/">https://www.plastic-pirates.org/</a>	International funding	Tim Kessing
Project campaign My Sea	Unknown	Crowdsourcing	Performance	n/a	Environmental Education Fo	Keep Baltic Tidy	<a href="https://www.manajura.lv/">https://www.manajura.lv/</a>	Local funding	Jānis Ulme
Rappen - reporting of aquatic organisms	Unknown	Crowdsourcing	Descriptive	n/a	Swedish Maritime Administr	n/a	<a href="https://www.havochvatten.se/">https://www.havochvatten.se/</a>	National funding	Unknown
Report the Crab Sighting	Unknown - but many sightings	Crowdsourcing	Descriptive	Crab sighting portal uses th	LUKE National Resources Ins	Finnish Food Agency	<a href="https://www.luke.fi/tietoa/">https://www.luke.fi/tietoa/</a>	National funding	Esa Erkamo
Report the Fish Sighting	Unknown - but many sightings	Crowdsourcing	Descriptive	If you suspect that you hav	LUKE National Resources Ins	Finnish Food Agency	<a href="https://www.luke.fi/tietoa/">https://www.luke.fi/tietoa/</a>	National funding	Lauri Urho
River Watch	Unknown	Crowdsourcing	Performance	n/a	Friends of the Baltic	Coalition Clean Baltic	<a href="https://baltfriends.ru/en/pr/">https://baltfriends.ru/en/pr/</a>	Other	Unknown
Roots University of Kiel Citizen Science project	Unknown	Distributed intelligence	Performance	n/a	Center for Baltic and Scandi	Schleswig-Holstein State Arc	<a href="https://www.elueter-roots.de/">https://www.elueter-roots.de/</a>	National funding	Claus von Carnap-Bornheim
SEI Tallinn Marine Litter project	Unknown	Crowdsourcing	Performance	<a href="https://cdn.sei.org/wp-co/">https://cdn.sei.org/wp-co/</a>	Stockholm Environment Inst	In framework of project Urb	<a href="https://www.sei.org/feature/">https://www.sei.org/feature/</a>	International funding	Unknown
Smartfin	Positive	Participatory science	Descriptive	Startup funded	IOPAN (Institute of Oceanogr	n/a	<a href="https://smartfin.org">https://smartfin.org</a>	Other	Tomasz Kijewski
Talvisuuranta	Unknown	Crowdsourcing	Performance	n/a	Finnish Environment Institut	Luonto-Litto in cooperation	<a href="https://www.syke.fi/download/">https://www.syke.fi/download/</a>	National funding	Unknown
Tang nu	Unknown	Crowdsourcing	Descriptive	Mette Jørgensen from Gul	Aarhus University, Bioeconol	Guldborgsund Bioeconomy H	<a href="https://orbik.dtu.dk/en/proje/">https://orbik.dtu.dk/en/proje/</a>	private national funding (Velux)	Mette Jørgensen & Annette
The Coastal Day	Very positive.	Crowdsourcing	Descriptive	n/a	Ståda Sverige	Municipalities following the	<a href="https://www.stadsverige.se/">https://www.stadsverige.se/</a>	Funded mainly by private compar	Mårten Heshyk
The Great Nurdle Hunt	Very positive.	Distributed intelligence	Composite	We use your images and n	Frida	n/a	<a href="https://www.nurdlehunt.org/">https://www.nurdlehunt.org/</a>	National funding	Unknown
VIRTUE-s	Unknown	Crowdsourcing	Performance	Funded by ERASMUS+ - hel	University of Gothenburg	Öckerö Seg	<a href="https://virtue.ipmbi.se/">https://virtue.ipmbi.se/</a>	International funding	Unknown
Water front	it's just starting, so far: mode	Participatory science	Descriptive	individual initiatives are po	Institute of Oceanology PA	n/a	<a href="https://www.ipmbi.se/">https://www.ipmbi.se/</a>	Local funding	Jan Marcin Weslawski, Tomasz
Who eats bladderwrack- Bridging the gap between science and society with an i	Unknown	Distributed intelligence	Performance	There seems to be a lot of	Åbo Akademi University, Lea	Cooperations to some exten	<a href="http://www.abo.fi/kukasyorakkole/">www.abo.fi/kukasyorakkole/</a>	National funding	Henna Rinne (& Lena Kautsky

Name of stakeholder organisation	Website	Type of organisation	Country of organisation	Name of individual contact
Åbo Akademi	<a href="https://www.abo.fi">https://www.abo.fi</a>	Academia (Other)	Finland	
Åbo Akademi	<a href="https://www.abo.fi">https://www.abo.fi</a>	Academia (Other)	Finland	
Academy of Finland	<a href="https://www.aka.fi/en/">https://www.aka.fi/en/</a>	Academia (Other)	Finland	
Acteon (EU4Ocean)	<a href="https://www.acteon-environment.eu/en/">https://www.acteon-environment.eu/en/</a>	Industry	International	
Alfred-Wegener-Institute	<a href="https://www.awi.de">https://www.awi.de</a>	Academia (Other)	Germany	
Aquaculture Stewardship Council	<a href="https://www.asc-aqua.org">https://www.asc-aqua.org</a>	Cluster/Network	Germany	
Baltic Environmental Forum	<a href="https://www.bef-de.org">https://www.bef-de.org</a>	Cluster/Network	Germany	
Baltic Sea Action Group	<a href="http://www.bsag.fi">www.bsag.fi</a>	NGO	Finland	
Baltic Sea States Subregional Co-operation (BSSSC)	<a href="https://www.bsasc.com">https://www.bsasc.com</a>	Cluster/Network	Poland	
Baltic University Programme	<a href="http://balticuniv.uu.se">balticuniv.uu.se</a>	University	Sweden	
Biophilia educational project	<a href="https://biophiliaeducation.org">https://biophiliaeducation.org</a>	Project (limited duration)	Sweden	
Blue Generation Project	<a href="https://www.bluegeneration.org/index.php/en/">https://www.bluegeneration.org/index.php/en/</a>	Project	Baltic-wide	
BONUS Advocates	<a href="https://www.banoscasa.org">https://www.banoscasa.org</a>	Other	Latvia	
BONUS Advocates	<a href="https://www.banoscasa.org">https://www.banoscasa.org</a>	Other	Latvia	
BONUS Advocates	<a href="https://www.banoscasa.org">https://www.banoscasa.org</a>	Other	Lithuania	
Bottenlusen	<a href="https://www.bottenlusen.se">https://www.bottenlusen.se</a>	Industry	Sweden	
Briggen Tre Kronor	<a href="https://www.briggentrekronor.se">https://www.briggentrekronor.se</a>	Other	Sweden	
Bund für Umwelt und Naturschutz Deutschland (Friends of the Earth Germany)	<a href="http://www.bund.net">www.bund.net</a>	Other	Sweden	
Capacity4MSP	<a href="https://www.submariner-network.eu/capacity4msp">https://www.submariner-network.eu/capacity4msp</a>	NGO	Germany	
Center of Maritime Technologies GmbH	<a href="http://www.cmt-net.org">www.cmt-net.org</a>	Project	Latvia	
Centre for Sea and Society - University of Gothenburg	<a href="https://www.gu.se/en/sea-society">https://www.gu.se/en/sea-society</a>	Industry (SME)	Germany	
Centrum Balticum	<a href="https://www.centrumbalticum.org">https://www.centrumbalticum.org</a>	University	Sweden	
Coalition Clean Baltic	<a href="https://ccb.se">https://ccb.se</a>	Other	Baltic-wide	
Common Wadden Sea Secretariat	<a href="http://waddensea-worldheritage.org">waddensea-worldheritage.org</a>	Cluster/Network	Finland	
Council of the Baltic Sea States	<a href="http://www.cbss.org">www.cbss.org</a>	NGO	International	
CPMR (Baltic Sea Commission)	<a href="https://cpmr-baltic.org">https://cpmr-baltic.org</a>	Inter-governmental	Sweden	
CRM Coastal Research Management Germany	<a href="http://crm-online.de/en/service-for-the-people-and-the-sea">http://crm-online.de/en/service-for-the-people-and-the-sea</a>	Government or Public Authority	Baltic-wide	
Deutsche Meeresstiftung / German Ocean Foundation	<a href="http://www.meeresstiftung.de">http://www.meeresstiftung.de</a>	Research Institute	Germany	
DTU Aqua	<a href="https://www.aqua.dtu.dk/english">https://www.aqua.dtu.dk/english</a>	NGO	Germany	
EAS-SG - European Aquaculture Society Student Group	<a href="https://www.aquaeas.eu/groups-new/eas-student-group">https://www.aquaeas.eu/groups-new/eas-student-group</a>	University	Denmark	
Ecologic	<a href="https://www.ecologic.eu/de">https://www.ecologic.eu/de</a>	Cluster/Network	International	
Estonian Maritime Academy	<a href="https://www.ecologic.eu/de">https://www.ecologic.eu/de</a>	Industry	International	
Estonian Maritime Academy TalTech	<a href="https://taltech.ee/en/estonian-maritime-academy">https://taltech.ee/en/estonian-maritime-academy</a>	Academia (Other)	Estonia	
Estonian Research Council	<a href="https://taltech.ee/en/estonian-maritime-academy">https://taltech.ee/en/estonian-maritime-academy</a>	Academia (Other)	Estonia	
EUCC - The Coastal Union Germany	<a href="https://www.etag.ee/en/estonian-research-council/">https://www.etag.ee/en/estonian-research-council/</a>	Research Institute	Estonia	
European Aquaculture Society	<a href="https://www.eucc-d.de/home.html">https://www.eucc-d.de/home.html</a>	NGO	Germany	
European Bureau for Conservation & Development	<a href="https://www.aquaeas.eu">https://www.aquaeas.eu</a>	Cluster/Network	International	
EuroRegionBaltic - Youth Board	<a href="http://www.ebcd.org">www.ebcd.org</a>	NGO	International	
Fenomenalen Science Centre	<a href="http://www.eurobaltic.org/category/youth-board-staff/">http://www.eurobaltic.org/category/youth-board-staff/</a>	Inter-governmental	Poland	
Finnish Environment Institute	<a href="https://www.gotland.se/fenomenalen?fbclid=IwAR1mNEBr">https://www.gotland.se/fenomenalen?fbclid=IwAR1mNEBr</a>	Museum/Aquarium/Education centre	Sweden	
FORMAS Swedish Research Council for Environment	<a href="https://www.syke.fi/en-US">https://www.syke.fi/en-US</a>	Research Institute	Finland	
Fraunhofer Gesellschaft	<a href="https://www.syke.fi/en-US">https://www.syke.fi/en-US</a>	Research Institute	Finland	
Gdynia Aquarium	<a href="https://www.formas.se">https://www.formas.se</a>	Research Institute	Sweden	
Geological Survey of Finland	<a href="https://www.fraunhofer.de">https://www.fraunhofer.de</a>	Research Institute	Germany	
GEOMAR Helmholtz Institute for Ocean Research Kiel	<a href="https://akwarium.gdynia.pl/en/">https://akwarium.gdynia.pl/en/</a>	Museum/Aquarium/Education centre	Poland	
German Marine Research Consortium	<a href="https://www.gtk.fi/en/front-page/">https://www.gtk.fi/en/front-page/</a>	Other	Finland	
Guldborgsund Kommune	<a href="http://www.geomar.de">www.geomar.de</a>	Academia (Other)	Germany	
Häll Sverige Rent / Keep Sweden Tidy Foundation	<a href="http://www.deutsche-meeresforschung.de">www.deutsche-meeresforschung.de</a>	Network	Germany	
	<a href="http://www.guldborgsund.dk">www.guldborgsund.dk</a>	Government (including public authority)	Denmark	
	<a href="http://www.hsr.se">www.hsr.se</a>	Other	Sweden	

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Havets Hus i Lysekil	<a href="http://www.firstcamp.se">www.firstcamp.se</a>	Other	Sweden	
Havhoest	<a href="http://www.havhoest.dk">www.havhoest.dk</a>	Cluster	Denmark	
Helmholtz-Zentrum Geesthacht	<a href="http://www.hzg.de">www.hzg.de</a>	Academia (Other)	Germany	
Hel sinki Commission (HELCOM)	<a href="https://helcom.fi">https://helcom.fi</a>	Academia (Other)	Finland	
HTX CELF high school	<a href="https://www.htxf.dk">https://www.htxf.dk</a>	School	Denmark	
ICES	<a href="https://www.ices.dk">https://www.ices.dk</a>	International Authority	International	
Innovation Fund Denmark	<a href="https://innovationsfonden.dk/en">https://innovationsfonden.dk/en</a>	Other	Denmark	
Innovatum	<a href="https://www.innovatum.se">https://www.innovatum.se</a>	Industry	Sweden	
Institute of Oceanology Polish Academy of Sciences (IO PAN)	<a href="http://www.iopan.gda.pl">http://www.iopan.gda.pl</a>	Research Institute	Poland	
Institute of Oceanology Polish Academy of Sciences (IO PAN)	<a href="http://www.iopan.gda.pl">http://www.iopan.gda.pl</a>	Research Institute	Poland	
Institute of Oceanology Polish Academy of Sciences (IO PAN)	<a href="http://www.iopan.gda.pl">http://www.iopan.gda.pl</a>	Academia (Other)	Poland	
John Nurminen Foundation	<a href="https://johnnurminensaatio.fi/en/">https://johnnurminensaatio.fi/en/</a>	Other	Finland	
Kattegatcentret	<a href="http://www.kattegatcentret.de/en">www.kattegatcentret.de/en</a>	Museum/Aquarium/Education centre	Denmark	
Kieler Forschungswerkstatt	<a href="https://www.forschungs-werkstatt.de">https://www.forschungs-werkstatt.de</a>	Academia (University)	Germany	
Kommunes Internasjonale Miljøorganisasjon	<a href="https://www.marisco.eu/partners/language/en/articles/kiel">https://www.marisco.eu/partners/language/en/articles/kiel</a>	Government or Public authority	Denmark	
International Environmental	<a href="https://www.kth.se/en">https://www.kth.se/en</a>	University	Sweden	
KTH Royal Institute of Technology	<a href="https://www.bodc.ac.uk/resources/inventories/edmed/org/">https://www.bodc.ac.uk/resources/inventories/edmed/org/</a>	Government or Public Authority	Latvia	
Latvian Fish Resources Agency	<a href="https://www.lfj.lv/en/">https://www.lfj.lv/en/</a>	Cluster/Network	Latvia	
Latvian Fund for Nature	<a href="http://www.lhei.lv/en/">http://www.lhei.lv/en/</a>	Academia (Other)	Latvia	
Latvian Institute of Aquatic Ecology	<a href="https://www.io-warnemuende.de">https://www.io-warnemuende.de</a>	Academia (Other)	Germany	
Leibniz-Institut für Ostseeforschung Warnemünde	<a href="https://lighthouse-foundation.org/en/">https://lighthouse-foundation.org/en/</a>	NGO	Germany	
Lighthouse Foundation	<a href="https://muziejus.lt/en">https://muziejus.lt/en</a>	Museum/Aquarium/Education centre	Lithuania	
Lithuanian Sea Museum	<a href="http://www.smkc.se">www.smkc.se</a>	Museum/Aquarium/Education centre	Sweden	
Marine Education Centre Malmö (Marint Kunskaps Center)	<a href="https://www.marinmuseum.se/en">https://www.marinmuseum.se/en</a>	Museum/Aquarium/Education centre	Sweden	
Marinmuseum Karlskrona	<a href="http://www.simrishamn.se">www.simrishamn.se</a>	Museum/Aquarium/Education centre	Sweden	
Marint centrum Simrishamn	<a href="http://www.mitthav.nu">www.mitthav.nu</a>	Museum/Aquarium/Education centre	Sweden	
Mitt Hav, Ängelholm (My Ocean)	<a href="http://www.skargardarna.se">www.skargardarna.se</a>	Network	Sweden	
National Association for the Swedish Archipelago (Skargardarna)	<a href="https://www.luke.fi/en/">https://www.luke.fi/en/</a>	Research Institute	Finland	
Natural Resources Institute Finland LUKE	<a href="http://www.naturskyddsforeningen.se">www.naturskyddsforeningen.se</a>	NGO	Sweden	
Naturskyddsforeningen (Swedish Society for Nature Conservation)	<a href="https://www.norden.org/en/nordic-council">https://www.norden.org/en/nordic-council</a>	International Authority	Sweden	
Nordic Council	<a href="http://www.norden.it">www.norden.it</a>	Government (including public authority)	Lithuania	
Nordic Council of Ministers Lithuania / Clean Nordic Oceans	<a href="https://nordicoceanwatch.no">https://nordicoceanwatch.no</a>	Network	Norway	
Nordic Ocean Watch	<a href="https://www.gu.se/en/sea-society/node/3937/ocean-blues">https://www.gu.se/en/sea-society/node/3937/ocean-blues</a>	Project	Sweden	
Ocean Blues (SE)	<a href="https://ovg.lv">https://ovg.lv</a>	School	Latvia	
Ogres Valsts ģimnazija (Ogre state gymnasium)	<a href="https://www.ozeaneum.de/en/">https://www.ozeaneum.de/en/</a>	Museum/Aquarium/Education centre	Germany	
Ozeaneum Stralsund	<a href="https://ocean.ru/en/">https://ocean.ru/en/</a>	Academia (Other)	Russia	
P.P. Shirshov Institute of Oceanology of Russian Academy of Science	<a href="https://archiwum.ncbr.gov.pl/en/">https://archiwum.ncbr.gov.pl/en/</a>	Government or Public Authority	Poland	
Polish National Centre for Research and Development	<a href="http://www.ptj.de/en">www.ptj.de/en</a>	Other	Germany	
Project Management / Forschungszentrum Jülich (Germany)	<a href="https://rg.aula.dk">https://rg.aula.dk</a>	School	Denmark	
Randersgades International school	<a href="https://www.regeneration2030.org">https://www.regeneration2030.org</a>	Youth organization	Sweden	
Regeneration 2030	<a href="https://www.lmt.lt/en">https://www.lmt.lt/en</a>	Research Institute	Lithuania	
Research Council of Lithuania	<a href="http://www.ri.se">www.ri.se</a>	Academia (Other)	Sweden	
RISE Research Institutes of Sweden	<a href="https://ruc.dk/en">https://ruc.dk/en</a>	University	Denmark	
Roskilde University	<a href="https://www.rfbr.ru/rffi/eng">https://www.rfbr.ru/rffi/eng</a>	Academia (Other)	Russia	
Russian Foundation for Basic Research	<a href="https://www.scouterna.se">https://www.scouterna.se</a>	Network	Sweden	
Scouterna	<a href="https://ahaa.ee">https://ahaa.ee</a>	Museum/Education center	Estonia	
Sihtasutus Teaduskeskus Ahhaa	<a href="http://www.sjofartsmuseetakarriet.se">www.sjofartsmuseetakarriet.se</a>	Museum/Aquarium/Education centre	Sweden	
Sjöfartsmuseet Akvariet	<a href="http://www.skansen.se">www.skansen.se</a>	Museum/Aquarium/Education centre	Sweden	
Skansen Baltic Sea Science Center	<a href="https://www.sdu.dk/da">https://www.sdu.dk/da</a>	University	Denmark	
Southern Denmark University SDU				

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Ståda Sverige	<a href="https://www.stadasverige.se">https://www.stadasverige.se</a>	Other	Sweden	
Ståda Sverige	<a href="https://www.stadasverige.se">https://www.stadasverige.se</a>	Other	Sweden	
State Education Development Agency	<a href="https://fundfr.fr/en/institutions/latvian-state-education-development-agency-viaa">https://fundfr.fr/en/institutions/latvian-state-education-development-agency-viaa</a>	Government or Public Authority	Latvia	
State Education Development Agency Latvia	<a href="https://viaa.gov.lv/eng/">https://viaa.gov.lv/eng/</a>	Government or Public Authority	Latvia	
Statens Naturhistoriske Museum	<a href="https://snm.ku.dk">https://snm.ku.dk</a>	Other	Denmark	
Stockholm Environment Institute	<a href="https://www.sei.org">https://www.sei.org</a>	Research Institute	Sweden	
Stockholm University Baltic Sea Centre	<a href="http://www.su.se/ostersjocentrum/english/">www.su.se/ostersjocentrum/english/</a>	Academia (University)	Sweden	
Swedish Agency for Marine and Water Management	<a href="http://www.havochvatten.se">www.havochvatten.se</a>	Government (including public authority)	Sweden	
Swedish Board of Agriculture	<a href="https://dlur.jordbruksverket.se/swedishboardofagriculture.4.6621c2fb1231eb917e680002462.html">https://dlur.jordbruksverket.se/swedishboardofagriculture.4.6621c2fb1231eb917e680002462.html</a>	Government (including public authority)	Sweden	
Swedish Board of Agriculture / BeUBio Project	<a href="https://nya.jordbruksverket.se/languages/english/beubio---">https://nya.jordbruksverket.se/languages/english/beubio---</a>	Project (limited duration)	Sweden	
Swedish Environment Institute	<a href="https://www.ivl.se">https://www.ivl.se</a>	Government or Public Authority	Sweden	
Swedish Environmental Protection Agency	<a href="https://www.swedish EPA.se">https://www.swedish EPA.se</a>	Government or Public Authority	Sweden	
Swedish Governmental Agency for Innovation Systems VINNOVA	<a href="https://www.flagera.eu/ourfunders/the-swedish-government">https://www.flagera.eu/ourfunders/the-swedish-government</a>	Government or Public Authority	Sweden	
Swedish Institute for the Marine Environment	<a href="https://havsmljainstitutet.se/english">https://havsmljainstitutet.se/english</a>	Academia (University)	Sweden	
Today We Have	<a href="http://www.todaywehave.com/live-by-the-sea-project.html">http://www.todaywehave.com/live-by-the-sea-project.html</a>	Museum/Aquarium/Education Centre	Poland	
Universeum	<a href="https://www.universeum.se/exhibitions/ocean-zone/">https://www.universeum.se/exhibitions/ocean-zone/</a>	Museum/Aquarium/Education centre	Sweden	
University of Helsinki	<a href="https://www.helsinki.fi/en">https://www.helsinki.fi/en</a>	University	Finland	
University of Liverpool, Marine Social Sciences Network	<a href="https://www.marsocci.net/people/">https://www.marsocci.net/people/</a>	University	International	
University of Southern Denmark	<a href="https://www.sdu.dk/en">https://www.sdu.dk/en</a>	University	Denmark	
VASAB	<a href="https://vasab.org">https://vasab.org</a>	Cluster/Network	Baltic-wide	
Västarvet	<a href="http://www.vastarvet.se">www.vastarvet.se</a>	Government (including public authority)	Sweden	
Vattenhallen Science Center	<a href="http://www.vattenhallen.lth.se">http://www.vattenhallen.lth.se</a>	Government (including public authority)	Sweden	
Vattenverkstaden	<a href="http://vattenverkstaden.se">http://vattenverkstaden.se</a>	Museum/Aquarium/Education centre	Sweden	
VELUX Foundation	<a href="https://veluxfoundations.dk/en/environment-and-sustainability">https://veluxfoundations.dk/en/environment-and-sustainability</a>	Government or Public Authority	Denmark	
Vides izglītības fonds	<a href="https://www.videsfonds.lv/lv/">https://www.videsfonds.lv/lv/</a>	NGO	Latvia	
Viva Maris	<a href="https://www.viva-maris.de">https://www.viva-maris.de</a>	Industry	Germany	
WWF Suomi	<a href="https://wwf.fi">https://wwf.fi</a>	NGO	Finland	