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Turning the tide on marine biodiversity loss

How Swedish coastal cities are leveraging citizen interaction to improve conservation outcomes

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Abstract

Rapid coastal urbanization and declining marine biodiversity rates are complex problems that require broad, integrated sets of solutions. Although isolating nature from human impact prevails as the standard conservation approach, social-ecological systems require more holistic solutions. Coastal cities have the opportunity to encourage human interaction with nature – while still achieving positive biodiversity outcomes. Current literature establishes a connection between citizen interaction and conservation through causal links such as increased awareness, increased understanding, and developing a connection to the ocean. These outputs can then change mindsets and behavior, fostering stewardship and pro-environmental actions.

Using a case study approach, this research explores three publicly-funded organizations and institutions in southern Sweden – Naturum Kosterhavet, Malmö's Marine Education Center, and the municipality of Helsingborg. Each of these cases provide marine-based activities that leverage citizen interaction. Through eight interviews with five different project leaders, it is established that ocean literacy, citizen science, and direct stewardship actions are the predominant forms of marine conservation activities available to citizens in the south of Sweden. Organizations base the causal mechanisms that link activities and outcomes on assumptions that are largely confirmed through current literature, although this is not contextually verified through monitoring or measuring tools by any of the organizations. Using an adapted form of program theory, logic models are created for each case to link the activities to outputs and outcomes.

The research also highlights drivers of the activities in order to assist municipalities and organizations in justifying the establishment or expansion of socially interactive marine activities. These include aligning ocean literacy programs with school curriculum requirements, pursuing collaborations with other departments, organizations, and municipalities, and positioning a champion in a leadership role. The main barrier identified through the research is the lack of funding or local municipal support. The findings support public investment in activities leveraging citizen interactions with coastal areas as a means to contribute to positive conservation outcomes.

Keywords: Marine spatial planning, urban planning, blue space, program theory, citizen interaction, coastal conservation

Executive Summary

Problem Definition

While the human population is increasing, marine biodiversity rates – alongside the life-sustaining ecosystem services they provide – continue to decline. Human impacts on the oceans are significant, despite decades of policies and targets intended to address them. Coastal cities are at the crux of these issues. Coastal areas host a disproportionately high percentage of the world's population, while coastal ecosystems are particularly vulnerable to human impacts. These areas provide habitats, sustenance, and nurseries for 80-90% of the world's marine fish and shellfish, and serve as valuable natural carbon sinks. As coastal cities densify and expand, their coastlines become a frequent target of change. Human-built infrastructure encroaches on marine ecosystems, disrupting the provision of ecosystem services. As habitats are altered or destroyed, native biodiversity rates decline.

In Sweden, these issues actively persist. The nation has one of the longest coastlines in Europe, and over 90% of the population lives less than 100km from shore. Urban coastal areas continue to experience population growth, trends which further jeopardize the state of coastal marine biodiversity in these areas. National biodiversity targets are not being met, and the nation has recognized that biodiversity and climate must be politically prioritized. Despite having a comprehensive national marine spatial planning strategy, the responsibility of Sweden's coastal areas – from the coastline to the territorial sea – is delegated to municipalities. Municipalities include the planning of the sea in their own comprehensive plans, which cover both terrestrial and land areas. This decentralized approach, often commended in ecosystem-based management, has resulted in inconsistency in the completeness and ambition levels of coastal marine planning.

As coastal cities continue to grow, the need to address biodiversity conservation in these areas intensifies. Yet the conventional approach to conservation – isolating nature from human impact – is not a reasonable solution in dense urban areas. Human impact and interaction with nature is an inevitability, thus there is a need to increase understanding of how these interactions can be leveraged for the benefit of conservation.

Aim and research questions

The overall purpose of this research is to support healthy coastal marine ecosystems and their capacity to deliver ecosystem services. Understanding how citizen interactions are being leveraged for conservation outcomes in urban coastal areas can identify a potential means of achieving this.

This research aims to assist policymakers and practitioners design more effective interactive marine conservation activities and projects by strengthening the understanding of different means through which conservation outcomes can be achieved. It also aims to justify investment in – and the uptake of – projects that leverage citizen interaction to achieve positive conservation outcomes. The final aim of this research is to contribute knowledge to a relatively new area of study, and develop insights on the application of program theory in the context of understanding and improving conservation projects.

These aims are addressed through the following four research questions:

1. What activities are leveraging citizen interaction to contribute to conservation outcomes?
2. How are citizen interactions contributing to conservation outcomes in these activities?
    a. What monitoring and measuring tools and methods are used to determine the effectiveness of the activities in achieving conservation outcomes?
3. How are municipalities supporting citizen interaction-based coastal marine conservation activities?
4. What are the drivers and barriers for municipalities to support these activities?

a. What are success factors and learnings of projects using citizen interaction as a means to achieve conservation outcomes?

Research design, materials, and methods

A qualitative, multi-case research study was conducted to address these research questions. The cases include Malmö's Marine Education Center, Naturum Kosterhavet, and the municipality of Helsingborg. Five respondents in managerial and organizational capacitates in these organizations were interviewed through semi-structured interviews. Data collected through these interviews, in addition to a literature review and project documentation, was analyzed using a thematic content analysis method. The coding software "Nvivo" was then used to identify recurrent themes and categorize the data through a deductive-inductive approach.

To answer the first research question, data provided by practitioners was used to identify different activities and the interactive approach (i.e., education, stewardship, advocacy, citizen science) through the thematic content analysis. Using program theory, these activities were then linked to conservation outcomes in order to answer RQ2. Program theory highlights the assumptions, logic, and expectations behind an intervention by identifying the causal links between its inputs, activities, outputs, and outcomes (Crabbé & Leroy, 2008; Rossi et al. 2014). In this research, program theory was used to understand the intended causal links between social interaction and biodiversity outcomes in activities facilitated by the case studies. To improve understanding and highlight the connections, the program theory was visualized through a logic model adapted from Funnell & Rogers' (2011) outcomes chain and pipeline logic model. This model provides a summarised version of the theory behind the interactive activities, and allows for a clear visual presentation of activities and their connection to outputs and initial, intermediate, and long-term outcomes.

Research question 2a, 3, and 4 were answered based on the thematic content analysis of interview data, where means of municipal support, barriers and drivers for this support, and success factors and learnings were identified.

Overall findings

RQ1: What activities are leveraging citizen interaction to contribute to conservation outcomes?

Two types of activities were identified: direct and indirect. The direct approach involves engaging citizens through interactive activities with nature. The case studies facilitate direct activities from three main groups: education (i.e., ocean literacy), citizen science, and stewardship. Educational activities included guided beach tours, an interactive algae education station, guided snorkelling tours, informational snorkelling trails, touch-tank aquariums, wading and netting activities, guided algae collection/changing algae in aquariums, sea safaris, sea trekking, boat tours, an underwater camera, a temporary informational "local catch" fish pond, and a collaborative community project on farming mussel colonies. A Bioblitz was the only one citizen science activity offered by the case studies. This activity is an organized event where experts and the public work together to find and record as many species as possible within a selected area and time frame [M1]. Stewardship activities involved beach litter picking and marine litter picking, with one activity integrating art to repurpose the collected litter.

The indirect approach involves governments or organizations improving ecosystems in an effort to encourage citizen interaction and engagement. The activities involve improving ecosystems through protection, restoration, or enhancement measures, which can result in the realisation of social goals related to accessibility, equality, and inclusivity (WHO, 2021, Raymond et al., 2017). Activities using the indirect approach included the installation of living sea walls, the installation of a stone reef and the re-shallowing of harbour areas.

RQ2: How are citizen interactions contributing to conservation outcomes in these activities?
Interviewees identified a high number of causal links connecting activities to positive conservation outcomes. Some of the outputs were increased knowledge of the ocean's challenges and its value, increased recreational value of the ocean, increased connectedness to the ocean, increased social value, data on biodiversity (for the citizen science activity), and increased curiosity.

Some of the initial outcomes were pro-environmental behaviour, increased understanding and acceptance of conservation initiatives, a fostered sense of stewardship, and a fostered sense of local pride and interest in local nature. Intermediate outcomes included ocean literate policy-makers, company leaders and politicians, positive environmental impacts through reduced harm, and more effective conservation interventions. Long-term outcomes were generally healthy, high-functioning coastal marine ecosystems.

Indirect pathway activities improved the environment, which was thought to directly improve or restore ecosystem functions, increase recreational value, and be more aesthetically pleasing. This would lead to both conservation outcomes as well as increased citizen interactions.

RQ2a: What monitoring and measuring tools and methods are used to determine the effectiveness of the activities in achieving conservation outcomes?
The study identified no examples of activity monitoring or measuring, and the causal pathways in the logic models are based on informed assumptions. All interviewees recognized the importance of following up on activities to validate their assumed impacts, but have not yet completed any studies.

RQ3: How are municipalities supporting citizen interaction-based coastal marine conservation activities?
Each case study had different funding structures and sources, thus the municipal input varied from case to case. Municipalities were found to support activities through funding, providing transportation to the case study locations, and engaging in project and activity collaborations.

RQ4: What are the drivers and barriers for municipalities to support these activities?
A number of drivers were identified to contribute to municipal support, including the associated social, recreational and economic benefits of activities, knowledge development through student research projects, and collaborations with various internal departments and external organizations. The only barrier identified through the research was funding.

RQ4a: What are success factors and learnings of projects using citizen interaction as a means to achieve conservation outcomes?
A high number of success factors were identified. These include: engaging youth and children in interactive coastal activities, catering to school classes (through the integration of curriculum requirements), providing free access, taking advantage of events to host events, fostering innovation, experimenting with temporary activities, hiring and supporting champions in leadership positions, choosing a coastal location to host activities, and streamlining decision-making processes.

Conclusions and recommendations

Coastal cities have a rare opportunity to improve conservation outcomes while advancing social, recreational, and economic goals. Citizen interaction activities offer an integrated method of addressing the complex problem of coastal urbanization and biodiversity declines. Municipalities are investing in interactive activities, and are supporting them through different means, although

to varying extents in different contexts. The case studies have provided an understanding of the best practices in this context, and are not representative of all of Sweden. Much work is yet to be done, and with recent national budget cuts to nature conservation in Sweden, there is an urgent need to engage citizens, raise awareness, foster stewardship, and advocate for the conservation of nature.

Future research should look at the role of activities not dependent on the coast, and how the impacts of facilitating these activities in non-coastal areas compares to those included in the study. Understanding the importance of coastal proximity in fostering ocean literacy and pro-environmental behaviour would better support activity and project planners.

The use of program theory and logic modelling in this research has outlined the theory of the activities, which can be used as a basis for evaluation. A greater focus should be placed on creating an empirical understanding the value of activities, through monitoring and measurement of outcomes. It is also recommended that an understanding of marine governance responsibilities in municipalities – in terms of the delegation and awareness of coastal conservation responsibilities – be developed, as this would better illuminate the current state of MSP governance in municipalities and facilitate the sharing of knowledge and best practices between municipalities and researchers.

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Abbreviations

BE – blue economy

BGI – blue-green infrastructure

CAB – County Administrative Board [*Länsstyrelsen]*

CBD – Convention on Biological Diversity

EbAp – ecosystem-based approach

EU MSF – EU Marine Strategy Framework Directive

IMP – EU Integrated Maritime Policy

MEC – Marine Education Center [*Marint Kunskapscenter]*

MSP – marine spatial planning

NbS – nature-based solutions

OL – ocean literacy

SwAM – Swedish Agency for Marine and Water Management [*Havs- och Vattenmyndigheten*]

UNCLOS – United Nations Convention on the Law of the Sea

1 Introduction

Coastal ecosystems harbour the pantries and nurseries of the ocean, which are valuable sources of ecosystem services supporting both marine biodiversity and human life (Petrişor et al., 2020; Troell et al., 2005; Crossland et al., 2005; Kuwae & Hori, 2019; Huber et al., 2021). A variety of human factors and activities are contributing to the rapid decline of marine biodiversity, such as the overexploitation of resources, disruptive infrastructure projects (e.g., installation of offshore wind farms, dredging of harbours), habitat destruction, poor wastewater management, shipping traffic, aquafarming, and nearshore development (Lotze, 2021; Neumann et al., 2015). Although global, regional, and national actors are regulating some of these activities and encouraging conservation efforts, it is not enough to curb the deterioration of the world's oceans (Habibullah et al., 2021; Kelly et al., 2020; UN, 2019).

The stress placed on coastal ecosystems by urban development is also contributing to their decline, and the subsequent loss of ecosystem services (IPBES, 2019; Todd et al., 2019; He & Silliman, 2019; Lotze, 2021). As coastal cities pursue sustainable development for both the environment and its inhabitants, the paradigm of conservation requiring isolation between humans and the environment is becoming increasingly unrealistic (Walsh, 2021; Büscher & Fletcher, 2020). Cities are recognizing the importance of their coastal areas – both for the ecosystem services they provide, and for their potential in addressing social and economic challenges. Urban marine areas generally lack protected area status because environmental protection is not their sole purpose, and they do not meet conservation criteria for marine protected areas (MPAs). This should not, however, discourage urban areas from pursuing conservation goals.

Healthier marine areas can be supported by targeted actions that facilitate citizen interactions (Thorbjørnsen et al., 2023; Wyles et al., 2017; McKinley et al., 2017; Couvet et al., 2008; Mameno et al., 2020; Dehez, 2023; van de Wetering et al., 2022; Guiney & Oberhauser, 2009; Settar & Turner, 2010). Such approaches to coastal marine management have the potential to improve foster citizen awareness, stewardship, and pro-environmental behaviour. Outlining this positive pathway between citizen interaction and conservation outcomes could also incentivize public institutions and organizations to fund urban planning and eco-engineering projects that encourage citizen interactions with marine areas. The importance of citizen interactions is highlighted throughout the literature. Interactions can foster knowledge (Dopko et al., 2019), awareness (Wyles et al., 2014), a sense of stewardship (Davies et al., 2009), and a sense of connection (Collado et al., 2013). These outcomes can then further inspire pro-environmental attitudes and behaviour (van de Wetering et al., 2022; Settar & Turner, 2010; Haywood, 2015; Koss & Kingsley, 2010; Mayer & Frantz, 2004; Barrera-Hernández et al., 2020; Fehnker et al., 2022; Lokhorst et al., 2014; Dutcher et al., 2007; Stedman, 2002; Vaske & Kobrin, 2001; Davis et al., 2009; White et al., 2016), support for ocean and coastal protection (Steel et al., 2005), and information sharing (McKinley et al., 2017).

This research will analyse urban coastal marine-based activities in southwestern Sweden that leverage citizen interaction with coastal areas as a means to achieve conservation goals. By outlining practitioner perspectives of the pathways through which conservation outcomes are achieved, the current roles of citizens in coastal conservation can be better understood. Through interviews with activity facilitators, including two organizations and one municipal department, the current understanding and application of citizen interaction is mapped out, and success factors for activities and their facilitators are identified to support current and future activities.

1.1 Marine conservation in Sweden

With a clear need for action to address a complex problem, some of Sweden's municipalities provide a glimpse of opportunities to address biodiversity loss in urban coastal marine areas, and

how the governance of marine planning in both the nation and the municipalities allows conservation activities to take place.

Sweden, a nation with one of Europe's longest coastlines and over 90% of its population living less than 100km from the coast, is one of many countries working to balance expanding cities with healthy marine ecosystems (Grip & Blomqvist, 2021; Strömbäck et al., 2013; Enander et al., 2008). The protection and restoration of marine areas is one of the nation's environmental priorities, as it relates to both the preservation of ecosystem services and the interconnected health of economies and communities (Strömbäck et al., 2013; Kraufvelin et al., 2018). One of Sweden's Environmental Objectives [*Miljökvalitetsmål*] states: "Coasts and archipelagos must be characterised by a high degree of biological diversity and a wealth of recreational, natural and cultural assets" (Naturvårdsverket, 2018). This intention is not new – Sweden has integrated marine planning into its legislation since 1987 (Grip 1992). As shown in Figure 1-1, Sweden borders a number of marine areas: the Skagerrak and Kattegat regions, the Öresund (the strait between Denmark and Sweden), the Baltic Sea, and the Gulf of Bothnia (SwAM, 2019). Despite planning efforts, marine biodiversity rates have continued to decline and the nation's conservation goals are not being met (Strömbäck et al., 2013). Urbanization is prevalent in most of the country, with a greater increase in urban growth in cities along the coasts of the Skagerrak/Kattegat and Baltic Sea regions (SCB, 2020). The ecological status of the Skagerrak/Kattegat and Baltic Sea coastal regions, which are already more densely populated than the northern coastline of the Gulf of Bothnia, are correspondingly lower (Naturvårdsverket, 2023; SCB, 2020). Trends in coastal urban growth further jeopardize the state of marine biodiversity in these areas, and demands clear action to restore and protect coastal areas.

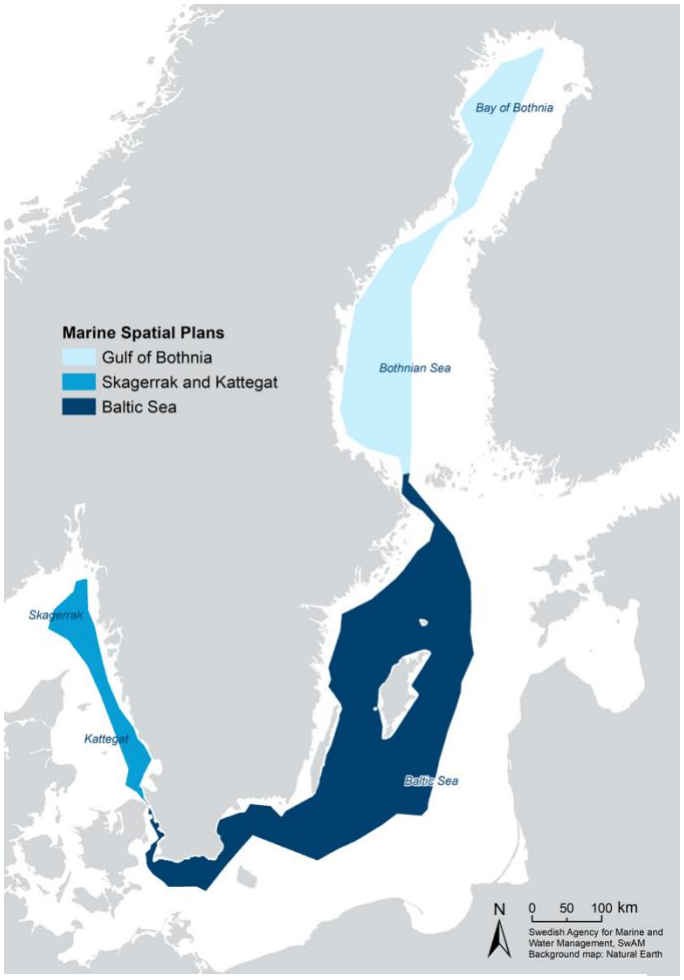

Figure 1-1. Sweden's marine spatial planning areas.

Source: SwAM, n.d.

Despite having a comprehensive national marine spatial planning (MSP) strategy, Sweden's coastal marine governance is delegated to the municipal level (SwAM, 2019; MCE, 2008). This decentralized approach has resulted in inconsistency in the completeness and ambition levels of coastal planning (Enander et al., 2008). In the most recent evaluation of Sweden's environmental goals, it was recognized that the biodiversity-related environmental quality objective would not be met by 2030, and the report stated that biodiversity and climate must be politically prioritized (Naturvårdsverket, 2023).

A few Swedish municipalities have detailed MSPs, and are working to assess, restore, and protect urban coastal areas (EU MSP Platform, 2022b). Given their proximity to – and often integration

into – communities and public spaces, plans for these urban areas have to account for the social dimension of conservation. One approach that municipalities are exploring is facilitating citizen interactions with the coastal marine environments. The paradigm of conservation requiring isolation between humans and the environment is becoming increasingly unrealistic (Walsh, 2021; Büscher & Fletcher, 2020), and the benefits of connecting humans to nature extend beyond the social and economic realms. In fact, the positive impacts have been found to benefit nature itself (Gallay et al., 2016; Turnbull et al., 2020).

1.2 Problem definition

Biodiversity loss has been named one of the greatest global challenges, leading scientists to question whether the Earth is experiencing its sixth mass extinction event (Steffen et al., 2015; UN, 2019; Barnosky et al., 2011). Despite interventions on international, regional, and national levels, biodiversity rates have continued to decline (IISD, 2023; EEA, 2020). The oceans are not immune: increasing pressure from anthropogenic activities is resulting in ubiquitous changes in marine biodiversity (Luypaert et al., 2020; Williams et al., 2021; Bindoff et al., 2019). Coastal areas are particularly vulnerable to human impact (Petrişor et al., 2020; Taussik, 1997; Millennium Ecosystem Assessment, 2005; Bindoff et al., 2019), and a recent study has identified that human activity has already significantly impacted 47.9% of the world's coastlines (Williams et al., 2021). These impacts have detrimental effects on highly valuable ecosystems. Coastal areas provide sustenance, habitats, and nurseries to 80-90% of the earth's marine fish and shellfish, and serve as important climate and nutrient cycle regulators (Petrişor et al., 2020; Troell et al., 2005; Crossland et al., 2005). Shallow areas, particularly those with seagrasses and other vegetation, are also effective carbon sinks (Kuwae & Hori, 2019; Huber et al., 2021). As critical as shallow areas are in fighting climate change, they are also highly sensitive to the impacts of climate change, with increasing sea levels and storm surges threatening the stability of coastal areas (SECOA, 2014; EC, 2022). Due to the vital life-sustaining ecosystem services provided by marine biodiversity, there is an urgent need to increase the capacity of global marine conservation efforts (Habibullah et al., 2021; Kelly et al., 2020; UN, 2019; Williams et al., 2021). Such efforts are particularly urgent in areas where marine ecosystems are the most vulnerable: coastal cities.

Coastal areas, home to a disproportionately high percentage of the world's population (Neumann et al., 2015), are experiencing high levels of urbanization (Small & Nicholls, 2003; Petrişor et al., 2020). By 2030, 50% of the world's population is expected to live within 100kms of the coast (Petrişor et al., 2020). Urbanization is often accompanied by activities disruptive and destructive to marine ecosystems, such as nearshore development, increased pollution, and exploitation of marine resources (IPBES, 2019; Todd et al., 2019; He & Silliman, 2019; Stepanova, 2014; Bindoff et al., 2019). Ocean sprawl – the expansion of human-built infrastructure into marine environments – often results in reduced biodiversity (Todd et al., 2019; Momota & Hosokawa, 2021; McKinney, 2006). This is partly due to the direct destruction of marine ecosystems, but there are consequent effects as well. Seawalls and other artificial infrastructure can promote the spread of invasive species and provide travel corridors for hard-bottom species, driving out remaining native biodiversity (Fauvelot et al., 2009). Urban development projects can also change the water currents of surrounding marine areas, exponentially altering natural ecosystems (Dafforn et al., 2015). As cities expand, the concept of nature-based "blue" solutions will play an increasingly important role in ensuring sustainability and resilience through the retention of ecosystem services (Andersson et al., 2019).

Marine governance in the modern sense has a relatively recent history, with national boundaries and responsibilities having undergone major adjustments and expansions post-WW2 (Alexander & Haward, 2019). With motivations evolving alongside these changes, from purely economic to an integrated combination of economic, environmental, social, cultural, and recreational, governance and management approaches for coastal marine areas continue to develop (Alexander

& Haward, 2019; EEA, 2000). Marine governance is also notoriously difficult due to challenges related to monitoring and measuring, defining long-term environmental objectives, and appointing the appropriate institutions to take responsibility for these objectives (Alexander & Haward, 2019). Conventional approaches used for terrestrial natural resource management do not have the same effect in marine areas (Alexander & Haward, 2019). Different approaches, such as ecosystem-based management, integrated coastal zone management, and stakeholder engagement in municipal planning, are being applied with varying levels of success (Alexander & Haward, 2019; Stepanova, 2014).

Despite increasing occurrences of integrated strategies being implemented, and abundant research on the problems facing coastal areas, research on practical solutions is limited (Baztan et al., 2015). The lack of knowledge on strategies and their success factors leaves a gap for cities and policy makers. Current literature lacks an overarching view of what types of activities are available and how they are perceived to impact conservation outcomes. Considering the challenges urban coastal areas are facing in relation to conservation, there is a need for advancing such knowledge and guidance to accelerate the pace of actions. The complexity and magnitude of climate change impacts demands a need for a more generalized intervention to change the way humans see and interact with the world (Mayer & Frantz, 2004). As cities are experimenting new ways of meeting social and environmental needs in order to respond and adapt to urban population growth and a global climate crisis, now is a convenient time to articulate success factors and support knowledge sharing. Demonstrating potential pathways between citizen interaction and positive conservation outcomes also provide a basis for practitioners to identify causal mechanisms to verify through monitoring tools.

1.3 Aim and research questions

This research aims to support healthy coastal marine ecosystems with the capacity to deliver ecosystem services. This is done by creating a map of linkages for future studies – or practitioners – to verify through monitoring and measurement tools. It will also contribute knowledge on what types of interactive activities municipalities are supporting, and the pathways (i.e., activities leveraging citizen interaction, projects promoting citizen interaction) taken to reach conservation outcomes. Although this research does not seek to contextually prove the underlying assumptions supporting the linkages in the pathways, it does aim to provide grounding in existing literature. The purpose of this research is multifaceted. First, it aims to help policymakers and practitioners design more effective interactive marine conservation activities and projects. By strengthening the knowledge of these interventions in regards to their intended ecological impact – which may not be something the project designers and managers have explicitly considered or intended – the environmental and social values of projects can be improved.

Second, this research aims to justify investment in – and the uptake of – projects that leverage citizen interaction to achieve positive conservation outcomes. By identifying the potential pathways to conservation through logic modelling, and highlighting both the possible social and environmental impacts of these projects, Swedish municipalities can be better informed about their benefits.

Third, beyond the practical applications of this research for ongoing and planned projects, this study also seeks to contribute knowledge to a relatively underdeveloped area of study, and develop insights on the application of program theory in the context of understanding and improving conservation projects. The use of program theory in this research facilitates understanding, and can provide learning opportunities for this tool's adaptability and applicability. The use of program theory also aims to allow for the clear identification of pathways that can be further researched and validated in future studies.

The research questions (RQs) are centered around the first two aims, which seek to cast a wide net of understanding around marine conservation projects leveraging citizen interaction. The RQs are as follows:

1. What activities are leveraging citizen interaction to contribute to conservation outcomes?
2. How are citizen interactions contributing to conservation outcomes in these activities?
    a. What monitoring and measuring tools and methods are used to determine the effectiveness of the activities in achieving conservation outcomes?
3. How are municipalities supporting citizen interaction-based coastal marine conservation activities?
4. What are the drivers and barriers for municipalities to support these activities?
    a. What are success factors and learnings of projects using citizen interaction as a means to achieve conservation outcomes?

1.4 Scope and delimitations

Activities leveraging direct human interaction come in a variety of forms, from educational beach tours to voluntary invasive species control (e.g., Mameno et al., 2020; Dehez, 2023). For the sake of this study, activities using the **direct approach** are defined as physical interactions with coastal marine ecosystems, organized or motivated by a third party. The activities can have social and/or environmental goals, but must have a focus on seeking out interactions with the ecosystem (i.e., playing volleyball on a beach or going for an exercise-focused swim do not count, while exploring creatures on the beach and snorkelling to see species on the ocean floor do).

There are also projects that indirectly promote citizen interaction, such as reef restoration (i.e., encouraging recreational diving) and harbour re-shallowing (i.e., encouraging public swimming and observation). The **indirect approach** refers to such projects that have a primary focus on improving ecosystems, with secondary social benefits.

Sweden has three MSP regions: the Baltic Sea, the Skagerrak/Kattegat regions, and the Gulf of Bothnia (SwAM, 2019), as shown in Figure 1-1. The latter is situated to the northern part of the country, which has a polar climate and less densely populated cities (SBC, 2021). The remaining marine regions are in a temperate climate, with more densely populated coastal cities and correspondingly lower ecological marine status (Naturvårdsverket, 2023). Due to research respondent distribution, this research will focus on the Skagerrak/Kattegat region to capture activities that are more transferrable to densely populated warmer climatic areas.

In Sweden, the management of national marine areas is divided between national, regional, and municipal authorities (EU MSP Platform, 2022b). The territorial seas (baseline to 12 nautical miles) fall under the jurisdiction of municipalities, although there is some overlap with the national MSP area (EU MSP Platform, 2022b). This research will focus on activities happening within waters under the jurisdiction of municipalities, particularly those on or near the coastline. This is done to focus on activities that are both more accessible to the general public, and more practically – and perhaps financially – feasible for organizations and municipalities.

In multi-case study analysis, 6-10 cases are recommended in order to highlight different contexts and compare results, while 3-4 case studies are recommended per context (Yin, 2014). However, given that the main purpose of this research is to gain insights into interactive coastal marine activities, not to compare different contexts with the expectation of similar or different results, this research uses 3 case studies (Yin, 2014). Although more case studies would have added value in terms of gaining a more comprehensive view of activities, limited responses from practitioners resulted in a lower number of cases. Three cases suited the limited time period allotted to this thesis research, and also allowed each case study to be analyzed to a greater depth – with two to

three interviews per case. The case studies will be presented from the perspectives of practitioners (i.e., managers, employees), rather than the users (i.e., activity participants). This is done because the aim of the research is learning and understanding at operational and management levels, rather than conducting causal experiments based on user experience.

Although there is no limitation on the start date of projects, through which some activities are facilitated, they should be in the planning or operational stages at the time of the interviews. This allows for greater details on activities and better access to stakeholders. It also means this research can have a more transformative and impactful effect on projects and activities, as lessons learned can still be applied.

1.4.1 Defining citizen interaction

This research focuses on intentional physical interactions with coastal marine areas (encompassing both the beach, coastline, and coastal marine area), and thus the term "interact" is used. Citizens are defined in this study as members of society – the general public – who engage with the ocean on a voluntary basis. In this sense, citizen interactions are voluntary physical interactions with coastal areas.

The interactions that this research focuses on are social activities with conservation impacts facilitated by municipalities and publicly financed programs or organizations. The activities can be directly targeted at citizens, such as an organized beach clean-up, a touch-tank aquarium in a nature center, or guided tours. They can also indirectly prompt citizen interaction, such as the installation of a stone reef or an eel grass meadow to improve water quality, visibility, and biodiversity and encourage waders and divers to explore the area.

This research is positioned to capture the benefits of citizen interaction. The negative impacts of human interaction with natural environments are well-researched, and certainly not to be overlooked. This research thus acknowledges that conservation in social-ecological contexts is complex, and governments, organizations, and individuals must seek to understand the nature of their impacts on a case-by-case basis.

1.5 Ethical considerations

Throughout the research process, measures have been taken to ensure the research, interviews, and findings are conducted and presented in an ethical manner. First, collected data – including names and associations – has been protected to ensure no harm comes to participants. For participants who agreed to be recorded, Zoom recordings were converted into textual transcriptions which were checked for accuracy and saved on a password-protected computer and external hard drive. Once the recordings were converted to text, the audio and video files were deleted. The transcription was anonymized with an identification number, so that it did not include any personal participant information, and the identification numbers and corresponding names was stored in a separate file on a password-protected computer (Bryman, 2016). The participants had the right to request a copy of their transcription and request editing of errors. In the research paper, names are kept confidential, and interviewees are identified by their affiliation and general role (i.e., management, operations). The transcripts will be kept on an external hard drive for one year following the submission of the Master's thesis.

Second, informed consent was ensured through an information and consent form, which was sent to participants a week prior to interviews (Bryman, 2016). All interviews were conducted voluntarily (Farthing, 2016), and participants were informed of their right to back out of the study any time before May 1st without cause. For case study selection interviews, consent was obtained verbally, while the formal interviews required participants to sign a consent form and verbally re-acknowledge consent at the start of the interview. Information about the research was provided

on the consent form, and ensured that participants understood the purpose of the research and how their input would be used. The information and consent form can be found in Appendix A.

Third, bias was addressed through transparency. Since this research did not receive any funding from external organizations, the only bias informing this research comes from the researcher. Although bias was minimized by taking measures to ensure validity and reliability (discussed in more detail in Chapter 3.4), all research is influenced by researcher bias (Farthing, 2016). Thus, the researcher's worldview is outlined in Chapter 3.1, and research methods are clearly detailed throughout Chapter 3.

1.6 Audience

This research is directed at three main audiences: municipalities, practitioners, and researchers.

Since municipalities can initiate and fund interactive activities with conservation outcomes, either through their own operations or by funding affiliations or external organizations, this research can provide investment justification by identifying and supporting the causal linkages between activities and conservation outcomes. In addition, the research aims to provide drivers and barriers for municipalities, allowing them to understand where the opportunities and challenges lie when investing in these activities. Similarly, success factors and lessons learned from current projects can provide guidance to municipalities that are in the planning stages, have ongoing projects, or are considering investing in these types of activities.

Practitioners involved in this research will benefit from having their projects analysed, and may gain a better understanding of how their programs are theoretically structured. Mapping out the activities of the different case studies could also assist practitioners in highlighting weak or underexploited causal links in their own operations, and allow them to develop knowledge of the other cases, which may be used as guidance or inspiration. The research may also provide practitioners with a framework for further evaluating their own activities.

This research also aims to contribute new knowledge about both the application of program theory as it is used in this study, and about the ways that current activities are achieving conservation goals through citizen interaction.

1.7 Disposition

Chapter 1 of this research paper introduces the nature of the problem to be addressed. The specific aims of the study are then identified and the scope of the research delineated. With a clear topic and justification, the content then discusses the ethical considerations of the study and the intended audience for the paper.

Chapter 2 (Theory and background) provides an extensive overview of the theory related to the topic. First, the global, regional, and Swedish policy realms of MSP and urban planning are discussed to understand the regulatory drivers for social engagement and coastal marine planning and conservation. Next, the role of urban planning in conservation is explored through the lenses of public participation, the ecosystem-based approach, nature-based solutions, and blue-green infrastructure. Finally, the links between citizen interaction-based activities and conservation outcomes are outlined. The main activity types – education, citizen science, and stewardship – are explained, and drivers for activities are presented.

Chapter 3 (Research design, materials, and methods) outlines the research design and methods applied in this study. The multi-case study analysis method is presented, in addition to interviews as a data collection method. Data analysis methods are then discussed, and the concepts of

thematic content analysis and program theory are introduced. This chapter also addresses research validity and reliability, outlining the measures taken to ensure both.

Chapter 4 (Case study profiles) details the three case studies analysed in this research: Naturum Kosterhavet, Malmö's Marine Education Center, and Helsingborg.

Chapter 5 (Findings) presents the research findings. The research questions are answered by analysing data collected from the interviews.

Chapter 6 (Discussion) discusses the significance of the findings, and highlights a number of insights and understandings derived from considering the findings in connection with the theory discussed in Chapter 2. Limitations affecting research – which may not have been predicted or present during the design stage of the research – are also explained.

Chapter 7 (Conclusions) highlights the main learnings conceived through this research, and contextualizes their importance. This chapter also discussed topics for future research.

2 Topic background

To understand the context surrounding citizen interaction and urban marine conservation, multiple fields of research are elucidated in this chapter. First, the policy and governance realms of MSP and urban planning are explored in order to understand which instruments and institutions are driving marine conservation and public participation. The progression of policies relating to MSP have determined its role and importance for nations, and continues to shape the way MSP practices are evolving. These MSP policies, together with urban planning policies, determine how urban centres approach the creation, restoration, and protection of blue spaces. The governance perspective will define which institutions (i.e., cities, regions, countries) are responsible for urban coastal marine conservation planning. By understanding this topic's policy and governance environment from international, regional, and Swedish perspectives, the case studies can be better understood and the transferability of results improved.

The second area of research explored in this chapter is the practical approach to urban blue space conservation, and how cities are utilizing public participation, the ecosystem-based approach, nature-based solutions, and blue-green infrastructure for conservation.

Third, this chapter explores the different types of urban citizen interaction activities found in the literature, and how the outcomes of interactions with nature contribute to conservation. The activities researched in this section are not limited to marine areas. This is done based on the understanding that there are elements of land-based activities that can be transferred to coastal marine areas. This section provides the theoretical foundations for RQ1 and RQ2, as it seeks to determine whether the literature supports causal links between citizen interaction and positive environmental outcomes.

Lastly, the social and economic benefits of citizen interaction with nature are outlined to identify drivers for public institutions. The topic of conservation outcomes from citizen interactions with nature is interdisciplinary in nature, as it is rooted in both social and conservation sciences, and thus benefits beyond the environmental realm are expected. These associated benefits can further motivate public investments, and are thus deemed important for this research.

On this theoretical grounding, the case studies can be effectively analysed in Chapter 5.

2.1 Policy and governance

Since coastal areas lie at the land-sea interface, urban coastal conservation can be approached from two main policy and governance perspectives. One approach is MSP, which focuses solely on the planning of marine areas. MSP is mandated internationally, regionally, and nationally, and actionized by national, state, and local authorities. MSP involves deciding what activities should take place – or be restricted – to meet an area's goals (Pikner et al., 2022). It is generally defined as "a process of public authorities of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives" (EC, 2011, p. 3). The evolution of MSP policy creates a base for understanding who is responsible for governing marine areas, and how and why MSP has been put on global and regional agendas.

The other perspective, that of urban planning, focuses more on terrestrial and blue spaces in cities. There is little progression towards a clear global agenda on urban planning, although the value of planning coastal areas is recognized.

Since the MSP and urban planning realms converge at the coastline, there is an acknowledged need for integrated marine and terrestrial planning (Pikner et al., 2022). MSP focuses on marine areas, including any terrestrial infrastructure affecting the marine environment (EU MSP Platform,

n.d.). Urban planning, although primarily concerned with terrestrial areas, is also concerned with infrastructure at the interface of water and land, in addition to grounded and floating infrastructure at sea (Jerzak et al., 2019). While there is considerable overlap between MSP and urban planning, there is a recognized need for integrated planning in areas where the sea and land interact (Pikner et al., 2022). There has been progression towards an integrated approach referred to as integrated coastal zone management (ICZM). According to the EEC (now the European Community [EC]), ICZM ideally addresses more than just the integration of terrestrial and marine planning – it also seeks to balance social, environmental, economic, cultural, and recreational objectives and all related instruments (EEA, 2000). Progression towards ICZM can be seen in sustainable development and urban planning policies, and in the trend towards integrated blue-green infrastructure planning (Varbova, 2022).

2.1.1 Marine spatial planning

MSP in global and regional contexts

The **United Nations Convention on the Law of the Sea** (UNCLOS), the first legally binding international framework on the governance of the sea, was adopted in 1982 and entered into force in 1994 (Grip & Blomqvist, 2021). This framework outlined marine governance and management responsibilities, clarifying the jurisdictional roles of nations (Grip & Blomqvist, 2021). From an environmental perspective, UNCLOS focused primarily on pollution prevention (UNCLOS, 1982). In 1992, at the United Nations Conference on Environment and Development (UNCED; commonly referred to as the Rio Conference), the importance of biodiversity added another theoretical layer to marine management, with the introduction of new natural resource management principles – the **Rio Principles** – and the adoption of the **Convention on Biological Diversity** (CBD; Grip & Blomqvist, 2021). The importance of MSP was stressed at the Rio Conference as a means to achieve, amongst other outcomes, sustainable development and the conservation of coastal biodiversity (Grip & Blomqvist, 2021). Despite being on the global agenda, regional action on MSP was limited.

In 2000, the Lisbon Strategy spurred the EC to improve the social, environmental, and economic state of the region (Ivan-Ungureanu & Marcu, 2006). Environmental improvements were to be underpinned by a holistic approach that integrated social and economic elements, a strategy which aimed to – amongst other outcomes – halt biodiversity loss by 2010 (Ivan-Ungureanu & Marcu, 2006). In 2006, following the policy path set out by the Lisbon Strategy, the EU Maritime Policy Green Paper was adopted (EC, 2007c). This prompted the European Union (EU) to conduct a consultation process to determine stakeholder views on maritime policies, the results of which reiterated a demand for MSP (EC, 2007a; EC, 2007b). The consultations resulted in the adoption of the **EU Integrated Maritime Policy** (IMP) in 2008 (EC, 2007b).

The IMP outlined MSP as one of its main policy fields, and the 2008 EU Marine Strategy Framework (MSF) Directive was enacted to ensure the sustainable development of coastal economies (EC, 2021a; Breuer, 2022). The EU MSF Directive established a framework for community action regarding the protection and conservation of the region's marine environment, paving the way for MSP (Directive 2008/56/EC). Unlike previous European marine policies, the MSF Directive explicitly aims to preserve marine biodiversity, while it also outlines the need to protect "social activities" (EC, 2021a). Member States were required to conduct environmental assessments and develop targets and indicators by 2012, implement environmental monitoring programmes by 2014, and have operational MSP by 2016 (Directive 2008/56/EC). Despite setting the standard for MSP at this point, the MSF Directive lacked specific measures, targets, and clear monitoring of specific species, making its overall goal difficult to achieve (Dodds et al., 2012; EC, 2022).

Recent years have seen an even greater push for biodiversity conservation and coastal protection, although clear achievements remain minimal. 2015 saw the adoption of the **2030 Agenda for Sustainable Development** and the 17 corresponding **Sustainable Development Goals** (SDGs). Goal 14 – Life Below Water – includes a target that aims to "sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts…and take action for their restoration in order to achieve healthy and productive oceans" by 2020 (Target 14.2; UN, n.d.). Achievement of Goal 14 has thus far been minimal, and by 2020, Target 14.2 had been achieved by less than 5% of nations (Andriamahefazafy et al., 2022).

The Convention on Biological Diversity (CBD) declared the **UN Decade on Biodiversity** from 2011-2020, adopting the Strategic Plan for Biodiversity and releasing a set of 20 targets – "Aichi Biodiversity Targets" – that aimed to promote the implementation of the CBD (CBD, 2010). As of 2020, all 20 Aichi Targets have failed to have been met (CBD, 2020). Following a resolution in 2019, the UN announced the **UN Decade on Ecosystem Restoration**, with runs from 2021 to 2030 (UN, 2019). Aichi Target 11, which aimed to protect "at least 17[%] of terrestrial and inland water areas, and 10[%] of coastal and marine areas" has been updated, and now determines to effectively conserve a joint 30% of terrestrial and inland water and coastal and marine areas by 2030 (CBD, 2010, p. 9; Jones et al., 2020). The UN Decade on Ecosystem Restoration has explicitly recognized the need for restoration "to be carried out in ways that balance social, economic and environmental objectives," highlighting the importance of local communities (UN, 2019, p. 6). The CBD has also highlighted the importance of decentralizing ecosystem management, which increases "responsibility, ownership, accountability, participation, and use of local knowledge" (CBD, 2007).

The 2019 **European Green Deal** recognizes conservation as one of the main priorities for the region, and sets a legally binding commitment by the EC to restore habitats (Hermoso et al., 2022; EC, 2019). The Green Deal serves as a response to the regional socioeconomic and environmental challenges faced by the region after policies and interventions had – up to that point – been insufficient (Hermoso et al., 2022).

This regional measure was followed in 2020 by the **EU Biodiversity Strategy for 2030**, which reinforces aforementioned policies and commitments on biodiversity restoration and conservation (EC, 2021b; Hermoso et al., 2022). This strategy sets regional targets for land and water protection – 30% of land and 30% of water – while also recognizing the need to couple conservation with restoration (EC, 2021b). By 2022, the EU had accepted a proposal for the **EU Nature Restoration Law**, which complements the EU Marine Strategy Framework and the EU Biodiversity Strategy for 2030 (EC, 2022). The proposal highlights the connections between ecosystems restoration – including marine, coastal, and urban areas – and socio-economic benefits (EC, 2022).

Generally, the trends in MSP are positive, moving towards increasing regulatory oversight and guidance from both international and national instruments. The actual implementation of – and adherence to – these guidelines differs however. As the concept of MSP has progressed and expanded, interpretations and approaches to marine governance have differed. With an increasing number of stakeholders interested in the social, economic, and environmental values of the oceans, the ownership over marine areas has become fragmented (Jerzak et al., 2019). In the pursuit of sustainable coastal management, this fragmentation is thought to have a major impact on the ability to create effective marine spatial plans (Jerzak et al., 2019). This is especially prominent in Sweden, where waters are divided between public and private, with both the nation and municipalities responsible for their own – but overlapping – marine spatial plans (EU MSP Platform, 2022b).

MSP in Sweden

Sweden, a country with long coastlines and a long history of managing them, presents an interesting case for coastal management (Grip & Blomqvist, 2021; EU MSP Platform, 2022b). Despite the presence of national policies guiding MSP, studies have determined that Sweden's progression towards achieving the aforementioned SDG 14 Target 14.2 is insufficient (EU MSP Platform, 2022b; Qery, 2022; Andriamahefazafy et al., 2022).

Sweden introduced its first national MSP legislation into the **Swedish Environmental Code**[1] [*Miljöbalk*] in 2014, although elements of MSP had already been integrated into the Swedish **Planning and Building Act**[2] [*Plan- och bygglag*] in 1987 (EU MSP Platform, 2022b). In the Planning and Building Act, marine planning is delegated to municipalities, which are required to produce non-binding comprehensive plans that provide details on the use of marine and terrestrial areas (Boverket, 2006). These strategic plans are "intended as a guide and support for municipal decisions on all levels," and are revised and updated as necessary (Malmö Stad, 2018, p. 2).

Sweden's marine areas are delegated as either public or private waters. Public waters belong to the public, while private water owners can include municipalities, individuals, the State (e.g., marine areas in Swedish National Parks), or a joint number of any of these (EU MSP Platform, 2022b). Activities in private coastal areas are regulated by a number of policies, which means that activities in these areas may be restricted by these existing policies or the landowners (Blicharska & Rönnbäck, 2018). Since 2014, the responsibility of national MSP in Sweden has fallen on the Ministry of Environment[3] and the Swedish Environmental Code, and is executed by the Swedish Agency for Marine and Water Management (SwAM) (EU MSP Platform, 2022b). These plans cover the public waters of three areas: The Gulf of Bothnia, the Baltic Sea, and the Skagerrak/Kattegat regions (SwAM, 2019). The boundaries of national plans include waters from 1 nautical mile from the baseline (coast) up to and including the Exclusive Economic Zone (EU MSP Platform, 2022b).

Despite many nations approaching marine management solely as a national responsibility, Sweden has delegated coastal marine management – from baseline (coast) to territorial sea (12 nautical miles from the baseline) – to municipalities (SwAM, 2019; Grip & Blomqvist, 2021). It is notable that national marine spatial plans and municipal comprehensive plans overlap, although the Planning and Building Act, which dictates municipal marine planning, provides guiding principles and objectives to harmonize the marine planning under the Swedish Environmental Code (EU MSP Platform, 2022b). County Administrative Boards (CABs) [*Länsstyrelsen*], which deal with the management of natural resources, have the responsibility of overseeing the municipal plans to ensure they align with national interests (EU MSP Platform, 2022b; SwAM, 2021; Hongslo et al., 2016). The decentralized approach to coastal marine conservation in Sweden is attributable to a number of reasons, including the nation's tradition of decentralization in other policy realms, conflicts between central and municipal governments relating to resource management, and international nature conservation management trends (Hongslo et al., 2016). Although decentralizing natural resource planning aims to improve outcomes, this approach has resulted in inconsistent completeness and ambition levels of coastal planning (Enander et al., 2008).

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[1] SFS 1998:808. Miljöbalk [Environmental Code]. https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/miljobalk-1998808_sfs-1998-808

[2] Now SFS 2010:900. Plan- och bygglag [Planning and Building Act]. https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/plan--och-bygglag-2010900_sfs-2010-900

[3] As of 2023, this ministry no longer exists, and its main responsibilities have moved to a new ministry: Ministry of Climate and Enterprise [*Klimat- och näringslivsdepartementet*]

Historically, municipalities also have varying interpretations of coastal management in their comprehensive plans (Taussik, 1997). Some plans only cover the management of surface water, and not the seabed, while others do not identify coastal areas as necessary components of the comprehensive plans at all (Taussik, 1997).

2.1.2 Urban marine planning

Urban marine planning in regional and global contexts

There is a clear lack of urban marine planning legislation at the global and regional levels. Global and regional shifts towards sustainable development have catalyzed progression towards a more integrated urban planning approach. In 2015, the UN Member Sates adopted the **2030 Agenda for Sustainable Development**, which sets out to address social, economic, and environmental sustainability (Carrillo, 2022). This action plan, guided by the SDGs, recognizes the urgent need to address urbanization through sustainable construction and the creation of public spaces (Government of Sweden, 2015). The UN mobilized and localized this action plan through its 2016 **New Urban Agenda** (UN, 2017). In the Agenda, coastal areas are highlighted as being a priority due to their environmental sensitivity and high ecological service provision (UN, 2017). The EU mobilized their own **Urban Agenda** in 2016, which has a specific focus area on funding and building knowledge on greening cities (Varbova, 2022). The need for integrated planning approaches is highlighted throughout these international and regional documents, although actual examples of this integration are limited and, when present, scattered (Varbova, 2022).

There is also a clear focus on engaging the public in urban planning. The New Urban Agenda recognizes the importance of "preserving and promoting the ecological and social function of land, including coastal areas that support cities and human settlements…" (UN, 2017, p. 19). This highlights the role of cities in protecting the ecosystem services that urban coastal areas provide. The EEA, in its "Conceptual framework for urban environmental sustainability," provides the "how." It lists participation and empowerment, public open space, and collaborative and community-led initiatives amongst the elements required for a sustainable city (EEA, 2022).

Urban marine planning in Sweden

Sweden currently does not have a national urban policy, instead relying on other national initiatives – primarily the framework legislations of the Environmental Code and the Planning and Building Act – to regulate urban development and integrate stakeholders in different sectors (Petersson-Forsberg, 2014; OECD, 2017b; OECD 2019). The national attitude towards urban planning aligns with ICZM, as recommendations for an urban policy highlight the need for an integrated, comprehensive approach that considers the socio-economic elements of biodiversity conservation (Andersdotter Fabre, 2017). The recommendations also stress the need for more green and blue areas to balance densification trends (Andersdotter Fabre, 2017). Currently, the national government – through the Planning and Building Act – regulates urban sprawl and the management and protection of natural resources (including blue-green infrastructure planning), and delegates the actual "planning" element of urban planning to the regional and local levels (GOS, 2021; OECD, 2017a). The national government's interests are represented on a regional level by County Administrative Boards (CABs) (OECD, 2017a). The CABs ensure that municipal plans align with national legislation like the Planning and Building Act (OECD, 2017a). Regional spatial plans are not required by any regions aside from Stockholm, Skåne, and Hallands, although counties do need to create regional development strategies (which may contain elements of spatial planning) (OECD, 2017a; Boverket, 2023). Municipalities integrate their urban planning into Comprehensive Plans alongside MSP (OECD, 2017a). These strategic plans guide decisions on land and water use, development, and preservation for the entire municipality, and are reviewed at least once per legislative period (2017a; Boverket, 2023).

This is the point where urban planning and marine planning in Sweden intersect. Both are bound and guided by the Environmental Code and the Planning and Building Act, and are primarily the responsibility of municipalities. The Comprehensive Plans are required to include both urban planning and marine planning, which naturally lends itself to an integrated terrestrial-marine planning and management approach (Alexander & Haward, 2019).

2.2 Urban planning for marine conservation

Urban planning can increase the social, economic, and ecological values of cities by protecting, restoring, or improving the ecosystem services of natural spaces (Kowarik et al., 2020; Göransson et al., 2021). Urban planning as a tool for sustainable development considers both environmental and social sustainability (Carrillo, 2022). Coastal areas are widely recognized for their importance in the provision of ecosystem services to meet economic, social, and environmental needs (Strömbäck et al., 2013; Kraufvelin et al., 2018; Petrişor et al., 2020; Troell et al., 2005; Crossland et al., 2005; Kuwae & Hori, 2019; Huber et al., 2021; Habibullah et al., 2021; Kelly et al., 2020; UN, 2019). Increasingly, their relevance to mitigating and adapting the effects of climate change is being highlighted (EC, n.d.b). Urban planning policies and projects can provide significant influence on climate change mitigation and adaption in coastal areas, although at present they face various barriers and have not been used effectively (Ocean & Climate Platform, 2022; Hurlimann et al., 2021).

There is a growing body of literature – and applications – of how the ecosystem-based approach[4] (EbAp) and blue-green infrastructure (BGI) can enhance conservation outcomes in urban settings (UN, 2017; Ocean & Climate Platform, 2022; EEA, 2021). This section will explore the EbAp's role in urban planning, and explain how BGI is being used to enhance the value of blue spaces.

2.2.1 The ecosystem-based approach for urban planning

The EbAp has been increasingly prominent in natural resource – and particularly marine – planning (UN, 2017; Ocean & Climate Platform, 2022; EEA, 2021). Endorsed through the 2000 Convention on Biological Diversity and the New Urban Agenda, the EbAp aims to conserve "ecosystem structure and functioning, in order to maintain ecosystem services" (Roe, 2021, p. 1; EEA, 2021). The EbAp recognizes that humans are an integral component of ecosystems, and that ecosystem management should protect the intrinsic value of natural spaces in addition to their value provided to humans (CBD, 2004).

The EbAp is more frequently being promoted through Swedish national legislation, and in 2013 the national government proposed both short and long-term measures to ensure ecosystem services would be considered in decision-making (Schubert et al., 2018; SOU, 2013). Despite an increasing political acceptance and policy presence, the integration of the EbAp into practice has been challenging (Schubert et al., 2018). In Sweden, the decentralized element of the EbAp and NbS has long been integrated into national legislation through the allocation of urban planning and actions towards mitigating and adapting to climate change[5] to municipalities (SwAM, 2019; GOS, 2021). Municipal comprehensive plans have also evolved to include a more holistic view of ecosystem services (Schubert et al., 2018). However, there is no clear definition amongst municipalities of the EbAp, and a lack of a national urban planning policy means there is no requirement to consider the EbAp or NbS; instead, these concepts are merely encouraged through national targets and objectives (Beery et al., 2016; Wamsler et al., 2020; Schubert et al., 2018). Municipalities are then responsible for translating the targets and objectives into action in their comprehensive plans, resulting in a range of interpretations and approaches (Beery et al., 2016).

[4] Used synonymously with the CBD's ecosystem approach (see CBD, 2004)

[5] Apart from taxes and fees (GOS, 2021)

The EbAp has been developed alongside other related concepts over the past decades. Some of these – nature-based solutions (NbS), climate change adaptation and mitigation, and sustainable management – strongly influence how coastal areas are developed and managed (EEA, 2021). NbS have gained momentum alongside (or, arguably, as a result from) the EbAp (Roe, 2021). NbS and the EbAp are viewed as two separate – albeit related – concepts. NbS is a more action-oriented framework, and looks beyond conservation to greater societal challenges such as climate change adaptation, while the EbAp is a more general approach based on maintaining ecosystem services (Roe, 2021). Although the concepts of the EbAp and NbS differ, they both leverage nature as a tool to address societal challenges, and focus on decentralizing management over natural resources, giving more autonomy to local groups and governments (Roe, 2021; Shepherd, 2004). The EbAp has been integrated into EU strategies, and NbS have a strong presence in an increasing number of regional legislations, including the European Green Deal (EC, 2019), the EU Biodiversity Strategy for 2030, (EC, 2020), the Green Infrastructure Strategy (EC, 2013), and the EU Floods Directive (Directive 2000/60/EC) (EEA, 2021). One common method of promoting EbAp and NbS through urban planning is blue and green infrastructure (BGI) projects (EC, n.d.). Both EbAp and NbS are increasingly justifying and guiding urban BGI projects, particularly in valuable ecosystems like coastal areas (Ocean & Climate Platform, 2022; EEA, 2021; Pontee et al., 2016).

2.2.2 Blue-green infrastructure

BGI projects offer urban planners the opportunity to create or restore ecosystem services, improving conservation outcomes while also providing citizens with opportunities to connect with nature. Green infrastructure in Sweden is the combined responsibility of the National Board of Housing, Building and Planning and the Environmental Protection Agency (von Post et al., 2023), while the CABs are responsible for creating green infrastructure action plans (BISE, n.d.). Municipalities, in turn, create the plans and strategies for green infrastructure (BISE, n.d.). As of 2019, most municipalities had integrated green infrastructure strategies, while only 60% had actual plans (Nordh & Olafsson, 2021).

The EC defines green infrastructure as "a strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity"[6] (EC, n.d.). The EU Biodiversity Strategy for 2030 recognizes the benefits of BGI, and promotes the development of blue infrastructure and its integration into urban planning (EC, n.d.b).

Historically – as is the case in Sweden – the focus of research has been on the benefits of green space, although in recent years the value of blue space has been increasingly highlighted (Georgiou et al., 2021). Blue spaces can provide benefits to citizens on wide environmental levels (e.g., climate change mitigation, carbon sequestration), social levels (e.g., providing space for recreation activities, social cohesion), and economic levels (e.g., home values, health benefits) (Andersson et al., 2019; Hamann et al., 2020). Restoring and protecting these blue spaces is a topic intersecting the social, economic (political), and environmental sciences, thus drawing on multiple disciplines and policy realms (Jerzak et al., 2019). This transdisciplinary characteristic is one that makes BGI so appealing to governments. Besides the aforementioned benefits, BGI in urban coastal areas can bridge the gap between terrestrial and marine, allowing citizens to see and interact with the ecosystem services provided by the marine environment.

[6] The EU definition of GI implicitly implies both green and blue infrastructure (EC, n.d.)

Another method of applying the EbAp through BGI is eco-engineering, which uses ecological principles in the design of built infrastructure to improve its environmental value, and seeks to improve marine environments by artificially altering the physical ecosystem (Strain et al., 2017). This may include the creation of stone reefs in an area where they were not naturally found, or placing soft structures such as rope in ecosystems to serve as habitats (Vivier et al., 2021; Strain et al., 2017). A study on microhabitat-enhancing interventions found that eco-engineering can be leveraged as a means to attain biodiversity goals in coastal areas (Strain et al., 2017). The research did note however, that natural-based solutions should be prioritized over artificial solutions, as in most cases, eco-engineering is not able to fully compensate for the effects of urban infrastructure on natural ecosystems (Strain et al., 2017).

2.3 Approaches to citizen interaction

Despite progressions towards more involved societies, supported by Swedish urban planning legislation and BGI strategies, the roles of the public are still unclear. Understanding how citizens are being engaged to interact with the environment can clarify their potential roles. This section seeks to understand the ways citizens are interacting with marine environments in ecologically positive ways, and the linkages between the social (citizen interaction) and ecological (conservation) elements of this topic. The interactions between these two elements is a well-studied field, underpinned by social-ecological systems theory, which views humans as being an integral aspect of nature (Redman et al., 2004; Kareiva & Marvier, 2012; Büscher & Fletcher, 2020). In urban areas, the interactions between citizens and nature are inevitable, but not always positive. Research has shown that humans can have detrimental impacts on natural environments through activities such as walking (i.e., trampling over natural communities), littering, and disturbing ecosystems (e.g., picking up species or structural parts of ecosystems), and that less-visited natural areas have higher rates of biodiversity (Wyles et al., 2014). In the complexity of factors (e.g., ecosystem type, resiliency, and function; human activity type, frequency, and duration) dictating the degree of negative impact that human activity has on ecosystems, there is an opportunity for balance.

A number of researchers in the social-ecological and conservation science realms maintain that balance between humans and the environment is possible. Research has found that fostering and maintaining a connection between humans and nature can mitigate unsustainable behaviour (Nisbet & Zelenski, 2013). This supports a study on municipalities in southern Sweden, where participants noted that addressing nature protection and conservation from an anthropogenic lens increased the strength of conservation initiatives (Beery, 2016). A study comparing the psychological benefits of different natural areas found that there may be more opportunities to foster social-ecological connections in coastal areas: the UK participants identified that rural and coastal areas fostered a greater connectedness to nature than urban green areas (Wyles et al., 2019). Understanding the interactions of citizens in marine and coastal areas – and how they are facilitated – is a complex topic, however.

Much of the planning surrounding citizen interactions with the environmental happens in MSP and urban planning. Although MSP and urban planning are approached in different ways, with varying governance structures, responsibility delegations, and disciplinary perspectives, they share the recognition of the importance of stakeholder engagement, which is increasingly encouraged and required (EC, 2011; Directive 2014/89/EU; EC, 2007b; E.C., n.d.b). The nature of stakeholder engagement is broadly defined, however, and can include consultations for resource and management conflicts (e.g., Carlberg, 2005; Bruckmeier, 2014), using citizens for environmental enforcement (e.g., Roberts et al., 1992, Turnbull et al., 2020), stakeholder engagement in the planning process (Ferreira et al., 2020; Burton & Mustelin, 2013; Brown, 2003), providing input in management processes (Brown, 2003), and multi-stakeholder initiatives

(Raymond et al., 2017). Participation in these situations is often limited to certain groups, and is not freely available to the public (Bruckmeier, 2014).

Another form of stakeholder engagement also exists: facilitating citizen interactions with marine ecosystems. This method is less prevalent in the current body of research, but rapidly emerging as a body of literature with a focus on the benefits of citizen-nature interactions. Citizen interaction with coastal areas is a phenomenon that has been explored for its social, environmental, and economic benefits. This section seeks to explain how citizen interaction is applied in urban coastal settings and the ways through which it can positively impact conservation.

2.3.1 Citizen interaction activities with conservation impacts

The literature identifies two main pathways through which the facilitation of interactive activities can lead to conservation outcomes: by directly targeting citizens, or by improving the environment to encourage citizen interaction. Activities from both pathways can have both social and environmental goals, although the latter can have immediate positive impacts on ecosystems. Within the pathways, there are numerous different ways of connecting citizen-nature interactions to conservation, and pro-environmental actions can be fostered through a variety of immediate and secondary means (Bennett et al., 2018).

The direct approach involves engaging citizens through interactive activities with nature. These activities are facilitated by a third party with a particular set of environmental knowledge. The activities provide people with an accessible and positive way of learning and interacting with the environment. Some activities, like litter picking, have an immediate positive impact on the environment. Other activities, like educating citizens on invasive species control, may support direct stewardship actions (i.e., removal of invasive species), but do not benefit the environment directly (Bennett et al., 2018). Another example of this is seen in The Blue Gym initiative in the United Kingdom, which was created to explore and understand the connections between blue space and human health, and whether citizens can be engaged to protect these areas (White et al., 2016). Early results show that innovative engagement methods could foster a "marine mind-set," leading an increased adaptation of pro-marine behaviour (White et al., 2016). This supports a study by Wyles et al. (2014) which found that exposure to marine areas improved marine awareness.

Although some research studies have analysed citizen interaction activities, providing in-depth understanding on how impacts are generated and what capacities are required to ensure activity success, organizations serving as facilitators of stewardship activities are often not explicit in regards to the different actors, motivations, local and institutional capacities, and nature of the stewardship actions, or how these different elements interact (Bennett et al., 2018).

The indirect approach involves governments or organizations improving ecosystems in an effort to encourage citizen interaction and engagement. The activities involve improving ecosystems through protection, restoration, or enhancement measures, which can result in the realisation of social goals related to accessibility, equality, and inclusivity (WHO, 2021, Raymond et al., 2017). Urban governments may also recognize the social and economic benefits of fostering community engagement with outdoor spaces, and develop green and blue areas as a means to provide opportunities for tourism or to reduce health care costs (Stronza et al., 2019; Tonin & Lucaroni, 2017; WHO, 2021; Wang et al., 2023; Mishra et al., 2023). The indirect approach includes BGI and bio-engineering activities, as well as restoration activities like re-shallowing harbours or re-planting carbon-sequestering vegetation like eel grass.

As the indirect activities have already been explored in Chapter 2.2, the following sections will focus on some key types of direct citizen interaction activities resulting in conservation outcomes identified in the literature, including stewardship, advocacy, citizen science, and education.

Stewardship activities

Stewardship is a direct means through which citizen interactions can contribute to positive conservation outcomes. Stewardship actions can occur on a variety of scales and both in urban and rural settings. At the local level, environmental stewardship is defined as "actions taken by individuals, groups or networks of actors, with various motivations and levels of capacity, to protect, care for or responsibly use the environment in pursuit of environmental and/or social outcomes in diverse social–ecological contexts" (Bennett et al., 2018, p. 597). Various factors influence if and how stewardship is carried out. Bennett et al. (2018) outline a number of these factors:

1. Capacity of local resources - e.g., infrastructure, knowledge, education, connections to place
2. Local governance factors - e.g., formal and informal institutions, local institutions, social learning
3. Intrinsic motivation - e.g., personal values and morals, autonomy to affect one's future, concerns for future generations (Robinson et al., 2012), site attachment (Power, 2021)
4. Extrinsic motivation – e.g., health and well-being benefits, economic benefits, social recognition

Certain stewardship activities provide immediate environmental benefits. Examples include litter picking in coastal areas, which reduces the amount of plastic entering and harming the marine environment (Lincoln et al., 2022), and recreation or leisure seekers participating in the control of invasive aquatic species, which addresses local biodiversity loss (Mameno et al., 2020; Dehez, 2023). Often, stewardship activities such as these are accompanied by a secondary element, such as education or a fostered sense of place attachment. Although immediate environmental effects are not associated with indirect activities (Bennett et al., 2018), a number of studies have been undertaken to create causal links between theses secondary elements and conservation (Dopko et al., 2019; van de Wetering et al., 2022; Steel et al., 2005; Settar & Turner, 2010).

Citizen science activities

The second key type of citizen interaction activity is citizen science, also referred to as participatory monitoring, which involves the engagement of citizens in collecting and sharing data with scientists (Pecl, 2017; Garcia-Soto et al., 2017). Research has identified two main ways through which citizen science projects affect conservation outcomes and policies: the collection of scientific data and changed mindsets and behaviour.

By gathering relevant and accurate information at an accelerated pace with the help of citizens, scientists can more effectively support the development of marine conservation policies and management practices (McQuatters-Gollop, 2019). Examples of coastal applications include the collection of specimens, marine biodata collection, photographs, and monitoring of water temperatures (Micaroni et al., 2022; Reef Check, n.d.; Koss & Kingsley, 2010). A project by the Norwegian Institute of Marine Research involved recreational divers removing and recording lost fishing gear from coastal marine areas (Thorbjørnsen et al., 2023). Other projects included a study which involved participants recording and removing litter from beaches to understand the full impact of beach cleans (Wyles et al., 2017), and the platform Litterati (https://www.litterati.org), which gathers data through volunteers around the world geotagging litter as they remove it.

Citizen science can also impact conservation through changed mindsets and behaviour, which can stimulate policy formulation, advocacy, and enforcement (McKinley et al., 2017; Couvet et al., 2008). Citizen science projects have been found to engage and educate participants in natural resource management, environmental literacy, sustainability, and environmental protection and conservation (Evans et al., 2005; Bravo et al., 2009; Eastman et al., 2013; Kordella et al., 2013;

McKinley et al., 2017; Cooper et al., 2007). Examples include the ecosystem monitoring and management activities carried out by volunteer stewards through Sweden's Ecomuseum Kristianstads Vattenrike (Schultz et al., 2007), the experiment on warming effects conducted by 250 Swedish classrooms (Sandén et al., 2020), and the voluntary contributions citizens make to The Swedish Species Observation System (Kasperowski & Hagen, 2022) or the Algal Blooms Sweden project for surveying and forecasting algae blooms (Göteborgs Universitet, 2021).

Studies have linked these interactive projects to a desire of participants to protect marine and coastal environmental by engaging in pro-environmental behaviour (Haywood, 2015; Koss & Kingsley, 2010). Participants engaged in citizen science may also share information with their communities and encourage other citizens to become involved in conservation efforts (McKinley et al., 2017).

Education: Ocean literacy

A number of studies have found that ocean literacy (OL), the understanding of how humans impact the oceans and how the oceans impact humans, can have positive environmental impacts by fostering pro-environmental behaviour (van de Wetering et al., 2022; Guiney & Oberhauser, 2009; Settar & Turner, 2010) and raising awareness about the oceans (Tonin & Lucaroni, 2017; McKinley & Fletcher, 2012). In 2005, a guide for OL was developed based on an ocean curriculum guide developed by the National Geographic Society and the College of Exploration in 2002 (Mokos et al., 2022). By 2012, OL had evolved from a knowledge concept into a multi-perspective approach (Santoro et al., 2017), and the first international conference on ocean literacy was held. OL is based on 7 principles, which highlight the importance and unique nature of the world's oceans as a collective whole (Mokos et al., 2022):

Principle 1: Earth has one big ocean with many features.
Principle 2: The ocean and life in the ocean shape the features of Earth
Principle 3: The ocean is a major influence on weather and climate
Principle 4: The ocean makes Earth habitable
Principle 5: The ocean supports a great diversity of life and ecosystems
Principle 6: The ocean and humans are inextricably interconnected
Principle 7: The ocean is largely unexplored

To be ocean literate means to understand these principles, and to have the ability to meaningfully communicate about the oceans and make responsible, informed decisions about the ocean and its resources (NOA, 2021). The OL framework aligns with environmental literacy, which has been evolving since the 1970s (UNESCO, 1984), and defines participation as a cornerstone of environmental education. It can thus be said that OL, as with environmental literacy, should "provide social groups and individuals with an opportunity to be actively involved at all levels in working towards resolution of environmental problems" (Molloy et al., 2021).

Sweden played a significant role in the process of formalizing OL in higher education in Europe, and is the only Baltic country with a national OL initiative (Mokos et al., 2022). Despite the attention support directed towards OL, five of the seven OL principles are sparsely covered by the Swedish curriculum (Leitner, 2022). The push to put ocean literacy on the public agenda can be motivated by different fronts, such as disaster risk prevention/climate change mitigation and adaptation or creating an emotional link to the ocean (Malmö Stad, 2022a). Some municipalities recognize a greater need to provide opportunities outside the requirements of the curriculum to foster OL, as is the case for Malmö, although this does require adequate funding and the engagement of relevant stakeholders (Malmö Stad, 2022a; M1).

Although ocean literacy is meant for all ages, emphasis on children and youth can be seen throughout the literature. The education system provides an easy channel to disseminate information, making it a natural method for fostering environmental knowledge. Student-led environmental and participatory action research also provide learning opportunities for youth, allowing for the facilitation of relevant and possibly impactful projects and activities (e.g., Mordock & Krasny, 2001). Research has found that targeting this age group has farther-reaching positive implications than other audiences, as sparking an interest in nature in younger children may lead to pro-environmental behaviour in adulthood (Guiney & Oberhauser, 2009). A study conducted on nature conservation volunteers determined that 73% had become interested in nature at age 10 or younger (Guiney & Oberhauser, 2009).

Students in coastal areas have the advantage of direct interaction, which may foster a greater sense of connection to the natural environment (Dopko et al., 2019; Collado et al., 2013). However, one of these studies found that environmental education had no impact on the participants' affinity to nature or ecological beliefs, and that it was the exposure to nature which fostered a changed mindset and increased intentions to carry out pro-environmental behaviours (Collado et al., 2013). Another study did find a connection between environmental education in children and adolescents and improved outcomes in environmental knowledge, attitudes, intentions, and behavior (van de Wetering et al., 2022). The authors had not hypothesized a behaviour change, but results were consistent with a study conducted in 1999 (Zelezny, 1999).

Although the direct link between environmental education and changed behaviour is not clear in the literature, other studies – not limited to children – have found that citizen knowledge about the conditions of the ocean is associated with support of ocean and coastal protection (Steel et al., 2005). A study by Settar & Turner (2010) linked engagement in outdoor activity to general knowledge of local fauna, which in turn was linked to positive ecological behaviour. This suggests that the link between education and behaviour change may be moderated by factors such as developing a certain level of knowledge or fostering of a sense of connection to natural areas.

Ocean literacy research also highlights the importance of generating awareness, as developing accurate knowledge and perceptions about a marine area can impact pro-environmental behaviour and support protection activities (Tonin & Lucaroni, 2017). McKinley et al. (2023) argue that ocean awareness should go beyond establishing basic knowledge of a related issue – it should also involve the ability to identify problems, develop suitable solutions, and understand individual and societal responses (McKinley et al., 2023). Being aware in this sense allows individuals to establish an environmental baseline, enabling then to recognize negative changes in their environment (McKinley & Fletcher, 2012).

2.3.2 Linking activities to conservation outcomes

Stewardship, citizen science, and education activities do not always cause immediate conservation outcomes. Some stewardship (e.g., cleaning beaches) and citizen science (e.g., invasive species control) activities fall into this rare category, but the literature indicates that activities with less immediate effects are far more common. To impact conservation, these activities must have a mechanism linking the interactions to conservation outcomes. Some of these have been identified in the previous section (2.3.1), such as fostering awareness (Tonin & Lucaroni, 2017), increased knowledge through education (Settar & Turner, 2010; van de Wetering et al., 2022), support of conservation initiatives (Steel et al., 2005), and changed behaviour and mindsets (van de Wetering et al., 2022; Haywood, 2015; Koss & Kingsley, 2010; McKinley et al., 2017; Couvet et al., 2008). The two major mechanisms identified in the literature that link interactive activities to conservation outcomes are connectedness to nature, place attachment, and advocacy.

Connectedness to nature

There is a long-standing theory that feeling connected to nature fosters positive ecological behaviour (Leopold, 1949). This connectedness can be measured and defined in various ways, but in essence it describes the extent to which a person views themselves as part of the greater natural world (Mayer & Frantz, 2004). It is worth noting that measuring a connection to nature and the corresponding changes to well-being, happiness, and quality of life is difficult to measure (Olivos & Clayton, 2017), but amongst various methods and approaches to the topic, similar results have been found. The reverse phenomenon - a disconnectedness from nature resulting in unsustainable behaviour - has also been identified (Nisbet & Zelenski, 2013). As a highly relevant research topic given the global climate crisis, connectedness to nature is being more frequently researched, and a number of recent studies are confirming the positive correlation between connectedness to nature and pro-environmental behaviour (Mayer & Frantz, 2004; Barrera-Hernández et al., 2020; Fehnker et al., 2022; Lokhorst et al., 2014; Dutcher et al., 2007). Not all researchers agree with this generalized perspective however (e.g., Beery & Wolf-Watz, 2014), and focus instead on what elements of specific nature areas foster feelings of connection.

Place attachment

Studies have found that place attachment – the connection or emotional bond a person holds for a particular place – is linked to pro-environmental behaviour (Lokhorst et al., 2014; Stedman, 2002; Vaske & Kobrin, 2001). Environmental psychologists and environmental managers have identified two dimensions through which place attachment is comprised: place identity and place dependence (Raymond et al., 2010). The first has to do with a sense of self, and the emotions and symbolic connections a person may have about a physical space, while place dependence has more to do with the functions a space provides – or can provide – for a person (Raymond et al., 2010). Researchers have argued that this approach is insufficient from a socio-cultural perspective, and that social contexts needs to be considered (Raymond et al., 2010). The interactions and social bonds experienced in a specific area also contribute to place attachment, strengthening people's connections to that place (Raymond et al., 2010). These psychological connections can foster a sense of commitment to the natural environment, which has been shown to result in greater pro-environmental behaviours (Davis et al., 2009; Stedman, 2002; Vaske & Kobrin, 2001; Weaver, 2013). Stedman (2002) found this to be especially true when change threatened areas that had specific symbolic meanings. Locals in coastal areas often have a stronger attachment to the marine environment, fuelled by economic and social values (Tonin & Lucaroni, 2017). A deeper connection to – and dependence on – the sea allows a more critical understanding of the threats facing marine areas, which can affect the way these individuals engage with environmental issues, promote and accept conservation policies and efforts, and adopt pro-environmental behaviour (Tonin & Lucaroni, 2017).

Advocacy

Another way citizen interaction with the environment can affect conservation outcomes is through fostering a sense of advocacy. Through the dissemination of accurate scientific knowledge, the perceptions and attitudes of community members towards marine environments can be changed, increasing support for conservation measures (Tonin & Lucaroni, 2017; McKinley et al., 2017). Support can foster a number of pro-conservation actions, including advocacy for change. Children and youth have taken on a significant role in climate advocacy, with people like Greta Thunberg, Autumn Peltier, Licypriya Kangujam, and Xiuhtezcatl Martinez spreading awareness across the globe, creating a movement of children, youth, and adults advocating for access to clean water, energy transition, air pollution laws, climate change literacy, and government action on international climate agreements (Earth.org, 2022).

Advocacy can also be instigated through the generation of new knowledge and awareness. Citizen interaction – particularly citizen science – can produce empirical justification for policy change

(McKinley et al., 2017). Mordock and Krasny (2001) present a number of cases where students gained awareness of local environmental issues, researched the problems, and advocated – often successfully – for change. A number of case examples presented by Ardoin et al. (2020) also involve students – both through school and extra-curricular programs – researching a particular issue and using their findings to justify change. The participant groups vary in the literature, showing that fostering advocacy is not limited to youth. Adroin et al. (2020) also provide examples of locals engaging in citizen science, creating a justification for change, and then advocating for it.

A recurrent theme in the literature is the importance of empowering communities through participation (Mordock & Krasny, 2001). Participation, alongside education and raising awareness, promotes understanding of the existence of environmental problems, and empowers people to advocate for change (Ardoin et al., 2020).

2.4 Associated social-economic benefits of citizen interactions

The associated benefits of citizen interactions with nature can act as drivers for public investment and support. It has long been recognized that addressing environmental conservation can have benefits – and costs – beyond the realm of nature. From an individual's perspective, the benefits may be social – related to, for example, health, social inclusion and belonging, and social justice. For governments, the benefits may have economic value, such as reduced health care costs, reduced crime, and opportunities for tourism. The associated benefits can act as motivation for individuals to out into nature (Hartig et al., 2007), and justify municipalities to fund activities that promote the public to interact with nature. The key associated benefits identified in the literature include health, recreational, equality and inclusivity, and economic benefits.

2.4.1 Health benefits

The benefits that engaging and interacting with natural spaces can have on health and well-being are well-researched (Maas et al., 2009; Barton & Pretty, 2010; Coon et al., 2011; Thompson et al., 2014; Faber Taylor & Kuo, 2011; Hansmann et al., 2007; Mayer et al., 2009; McMahan & Estes, 2015; Sandifer et al., 2015). In fact, doctors in some countries are now prescribing outdoor activity to promote healthy lifestyles (Kondo et al., 2020; Bradley, 2021; PaRx, n.d.). The justification for the positive effects of blue space is a complex topic, but speculations include evolutionary affinities towards aquatic areas, the appeal of an alternative mode of interaction with nature (i.e., swimming or bathing), the association of aquatic areas with restorative sounds, and the aesthetic qualities of aquatic areas (McMahan & Estes, 2015; White et al., 2010).

Literature on visiting blue areas had found that exposure can have positive impacts on life satisfaction (Brereton et al., 2008), self-esteem (Barton & Pretty, 2010), mood (Barton & Pretty, 2010; MacKerron & Mourato, 2013; Wyles et al., 2014), mental well-being (Wang et al., 2023), stress and emotional and behavioural difficulties in children (Amoly et al., 2014), restoration (i.e., recovering from the daily demands of life) (Georgiou et al., 2021; White et al., 2013), and psychological distress (Nutsford et al., 2016). Studies on residential proximity to aquatic areas have found a link between living near blue spaces and better mental health (Yannick et al., 2022; Garrett et al., 2019; Brereton et al., 2008; Wang et al., 2023), as well as self-reported general health (Wheeler et al., 2012; Hooyberg et al., 2020; Ballesteros-Olza et al., 2020). White et al. (2021) found that residential proximity was moderated by visits, however, indicating that the benefits may extend to visitors.

Research on stewardship activities has produced similar results on health, identifying a connection between citizen science (volunteer) activities and improved attitudes of participants towards their health and well-being (Evans et al., 2005).

The literature on the relationship between blue space and health is growing, but also disparate (White et al., 2020), and not all research supports these findings. For example, studies by Gascon et al. (2018) and Helbich et al. (2018)[7] found no connection between blue spaces and mental health. The premise of the concept is generally justified, however. Gascon et al. (2017) conducted an extensive systematic review of literature on how blue spaces affect the health and well-being of humans. The results concluded that despite the limitations of the reviewed quantitative studies, scientific evidence does support the use of outdoor blue space to improve human health and well-being (Gascon et al., 2017).

2.4.2 Recreational benefits

Recreational benefits are associated with a variety of interactive activities, particularly outdoor activities like snorkelling, walking tours, and litter picking. Outdoor recreation – closely linked to health – is an activity commonly encouraged and promoted by governments (Petersson-Forsberg, 2014). In Sweden particularly, outdoor recreation is highly valued by both the public and by governments (Petersson-Forsberg, 2014). The health benefits of physical activity are well-established, and can be more prominent in natural environments (Hartig et al., 2007; Coon et al., 2011). Researchers linking blue spaces to health often recognize physical activity as a moderator, partially attributing higher rates of well-being of individuals living in closer proximity to the coast to higher levels of engagement in physical activity on the coast (Pasanen et al., 2019; Hartig et al., 2007). This is because good quality blue spaces promote physical activity by offering safe, accessible recreational space and diverse opportunities for exercise (Georgiou et al., 2021; Hall et al., 2020).

2.4.3 Equality and inclusivity benefits

Citizen interaction with blue spaces has the opportunity to foster social inclusion and address inequalities (WHO, 2021; Raymond et al., 2017). Research has indicated that poorer communities have less access to natural environments, resulting in health disparities, and that the creation of urban green areas can lead to gentrification (WHO, 2021; Triguero-Mas et al., 2021). Yet the health benefits of blue spaces are higher for the poorest in society (Hall et al., 2020). Engagement from marginalized social groups can be fostered by improving the accessibility and social value of coastal areas through restoration and development, and creating safe, welcoming, and accommodating spaces (Hall et al., 2020). Organizations like Sweden's Naturums embody this need for social inclusion, ensuring that language, accessibility, and financial barriers are reduced (Naturvårdsverket, 2015).

The development of blue spaces for social activities (e.g., providing seating) has the potential to influence greater public interest in these areas. A UK study found that the installation of a small open-air theatre near a blue space "attracted more visitors, brought more people close to the water, increased healthy forms of behaviour and socialising, and improved visitor diversity and inclusivity" (Mishra et al., 2023, p. 17). This shows that developing coastal areas with the goal of attracting visitors (i.e., creating an aesthetically appealing space for relaxation, recreation, and socialization) will likely result in a greater number of individual interactions with the environment. This, in turn, will allow for a greater distribution of the "blue benefits" provided these areas.

2.4.4 Economic benefits

Coastal marine conservation is an activity of high economic interest, especially as coastal regions are becoming increasing aware of the value of their marine environments. The economic benefits arising from citizen interaction activities can thus act as drivers for public support. Some coastal urban areas are adopting the economic paradigm of the Blue Economy (BE) to change the way

[7] Helbich et al. (2018) used a proxy of suicide risk to determine mental health

they interact with and manage marine resources (Martínez-Vázquez, 2021). As a recent field of study, BE is still an evolving concept, but its overarching focus is on sustainable marine development (Martínez-Vázquez, 2021; Midlen, 2021). Despite being founded on sustainability, BE as a development paradigm has been contested for its focus on economic growth, which can overshadow the protection of marine resources (Martínez-Vázquez, 2021). BE focuses largely on the use of marine areas. Thus, using these areas to create spaces where interactive activities with conservation outcomes can be facilitated would suit cities adapting the BE paradigm (Tegar & Gurning, 2018).

The interactions between humans and the environment have long been monetized, and healthy environments can also provide opportunities for economic growth. In addition to reduced health care costs, as discussed previously, tourism can provide an appealing way for governments to grow their economies. Tourism can impact conservation through the facilitation of the aforementioned activities (see section 2.3.1), and provide an opportunity to increase the economic and social value of blue spaces (Stronza et al., 2019; Tonin & Lucaroni, 2017). Tourism can encompass outdoor recreational tours and activities, education-focused guided activities, and unique interactions and sights - although these have also been criticized for doing more harm than good (Stronza et al., 2019). Eco-tourism emerged as a concept in response to calls for sustainable development, providing tourists the opportunity to experience something unique without disturbing nature (Gössling & Hultman, 2006; Stronza et al., 2019). Eco-tourism – under certain conditions – can be leveraged as a tool for conservation, and also fits under the BE paradigm (Krüger, 2005; Tegar & Gurning, 2018). Stewardship measures can include donating funds to conservation projects and organizations (Powell & Ham, 2008), engaging tourists in citizen science activities like invasive species management and beach clean-ups (Mameno et al., 2020; Brosnan et al., 2015; Schaffer & Tham, 2019; Axelsson & Hansen, 2022), and raising awareness and improving knowledge of marine environments (Axelsson & Hansen, 2022). Research has also denoted the relationship between ecotourism development and community participation in pro-environmental actions, which links socio-economic values with biodiversity values: when communities perceive social and economic benefits, management practices improve and biodiversity benefits (Rahman et al., 2021).

3 Research design, materials, and methods

3.1 Research design

This research topic is conceived from social-ecological systems theory, which holds the view that humans are an integral part of nature (Redman et al., 2004), and thus should play a vital role in its recovery and conservation. Nature conservation theorists have suggested that progression towards an integrated social-ecological system is inevitable, and that the social dimensions of conservation are essential in the present-day Anthropocene (Walsh, 2021; Büscher & Fletcher, 2020). Especially in the context of urban environments, social-ecological theory is the underpinning of conservation planning. Urban systems at large have been considered disconnected from nature, although current policy trends (e.g., green and blue space requirements for urban developments, green roof policies), government projects (e.g., replacing motorways with parks), and grassroots projects (e.g., urban horticulture and beekeeping) are pointing towards a re-integration of nature into these spaces. This leads to projects that not only consider society, but integrate citizens into the planning and management processes for urban nature.

This research is framed by a constructivist worldview, which believes that knowledge is socially constructed by humans (Farthing, 2016). Subjective meaning is thus created by individuals through lived experiences (Blaikie & Priest, 2019), and to understand any topic, these subjective meanings must be explored (Farthing, 2016). By gathering the different experiences and perspectives of individuals, a generalized reality can be drawn (Blaikie & Priest, 2019). In the context of this research, the perspectives of practitioners will determine how different applications of human interactions are contributing to conservation outcomes. Given that constructivists view individuals as subjective, this research will naturally be influenced by the researcher's understanding of the world. The effect of this bias is minimized through validity and reliability measures, which are outlined in section 3.4.

The nature of this worldview and the research topic lend themselves to a qualitative multi-case study research approach (Creswell & Creswell, 2018; Yin, 2014). In this study, the research approach follows an iterative-parallel design, where information gathered throughout the study informs and shapes previous stages of research (Verschuren, 2003). For example, information gathered from case study selection interviews prompted revisions to the project's scope and RQs. This allows for a more meaningful inclusion and representation of data. The various design elements are discussed in detail below.

3.1.1 Multi-case study analysis

Case studies can take on different forms. Since the aim of this research is to understand *how* activity facilitators are leveraging social interaction to achieve conservation goals, a comparative multi-case study design is used (Yin, 2014). This design allows a phenomenon to be studied in a real-life context, providing valuable details and multiple perspectives (Yin, 2014). In the case of urban marine conservation, which is a relatively young and evolving subject[8], understanding how different organizations and municipalities are approaching this topic can provide valuable insights into project design patterns and broaden the scope of current practical knowledge (Bryman, 2016). Barring this, the aim of the study is not to compare the case studies, but rather to generate knowledge and reflect on program theory (Bryman, 2016).

To ensure a broad conceptualization of how organizations and institutions are integrating interactive activities with conservation outcomes, and to improve the generalizability of results, multiple case studies were analysed (Verschuren, 2003). Although generalizations about empirical

[8] Based on a lack of relevant literature.

data collected in case study research (i.e., statistical generalizations) cannot be reasonably made due to an inadequate sampling structure, multi-case study analyses do have the benefit of providing analytic generalizations (i.e., generalizations relating to the theory) (Yin, 2014).

3.1.2 Case-study selection

The selection of case study participants was based on geographical, functional, and funding structure similarities. This was done to increase the transferability of success factors in RQ4 to other projects in Sweden, and to highlight the importance of differences between cases (Bryman, 2016). Basing the selection of case studies on similarities also allows for a greater attributability of outcomes (Bryman, 2016). Therefore, criteria for case studies include:

1. Geographical location: Baltic Sea and Skagerrak/Kattegat coastal areas[9] of Sweden
2. Urban population density: the largest coastal municipalities in Sweden
3. The inclusion of both social and conservation goals or outcomes

Ideal case study participants were identified in Stockholm, Gothenburg, Malmö, and Helsingborg. These municipalities have a history of cooperation and information sharing when it comes to urban marine projects (Naturum Kosterhavet manager, personal communication, January 25, 2023), indicating that the similarities between these municipalities justifies a transferability of success factors to similar areas. To limit participants purely to urban areas may, however, limit the variety of activities. Less densely populated areas could present a different set of public engagement opportunities. To bolster the study, Naturum Kosterhavet, which is located in a low-density area – was also included. Although its location (i.e., low-density, on an archipelago) is a key difference that could potentially impede the transferability of data, the adjacent nature of this case can also provide learnings from a more rural perspective that can be applicable in urban settings. In the case study method, the inclusion of variability is also sometimes necessary to improve validity (Verschuren, 2003). The differences in low- and high-density areas are likely to be minimal in terms of potential activity offerings, as the three case study participants are either located on the coast (i.e., Malmö and Naturum Kosterhavet) or have direct access to the coast for facilitating activities (i.e., Helsingborg). However, accessibility to the areas will make significant impacts on visitor socio-demographics (e.g., income, education), which can affect the relevance of equality as a driver.

Case studies were found through online research and snowballing (Verschuren, 2003). Since the evaluative component of program theory is not being exercised in this research, and the aims relate to understanding, the stages (i.e., planning, operational, complete) of projects and programmes through which the activities are administrated are deemed to be irrelevant. Semi-structured interviews were conducted with shortlisted participants to gain a deeper understanding of the project's goals, funding and governance structures, and public offerings. Based on this information, participants were then refined using the criteria listed above. The case studies included in the research are: Malmö's Marine Education Center [*Marint Kunskapscenter*], Helsingborg, and Naturum Kosterhavet.

The Helsingborg case is provided from the perspective of the Environmental Strategic Unit of the Environmental Department. Since coastal interaction activities may be facilitated by other departments (or collaborations with other departments), this case will simply be referred to as "Helsingborg." The exact department or unit facilitating activities is not vital in achieving the

[9] Coastal areas are defined as "[the] part of the land affected by its proximity to the sea, and that part of the sea affected by its proximity to the land as the extent to which man's land-based activities have a measurable influence on water chemistry and marine ecology." (EEA, 1969)

outcomes of the research, and as there are many collaborations with departments and units, the outcomes would be unnecessarily complex.

The case studies will be further explored in Chapter 4.

3.2 Data collection methods & materials collected

This study gathered primary data from three main sources: a literature review, project documentation, and interviews.

3.2.1 Literature review

The literature review consisted of both academic research articles and published grey literature. Academic articles were found through Google Scholar, Scopus, and the Lund University library search engine "LUBSearch"[10]. Relevant articles were identified through searching a combination of keywords including, but not limited to, "social-ecological", "citizen interaction", "environmental impact", "marine conservation", and "public participation". The snowballing method of finding articles was also used (Verschuren, 2003). Research saturation was reached when there was no longer new geographically relevant research available or when no new information was found, The literature was filtered based on the content of the abstract, with specific focus on geographical and contextual relevance.

3.2.2 Project documentation

Project documentation was accessed to gain a broader understanding of the intended project goals and outcomes and to inform interviews. Clear, direct language and the prioritization of goals and activities can be a benefit of documentation (Creswell & Creswell, 2018), although authenticity, credibility, representativeness, and comprehensibility are not guaranteed (Bryman, 2016). Project documents were therefore reviewed in consideration of these four factors, and supported by other sources when necessary (Bryman, 2016). The comprehensibility was especially relevant in this research, as many of the documents were translated to English from Swedish through Google Translate, and no secondary translations supported the quality of the translated documents. Since the documentation was already in a textual format, it could easily be integrated into NVivo (Creswell & Creswell, 2018). For some projects, the related documents were not readily available and needed to be requested, although the project representatives distributed these documents in a timely manner that did not inhabit the progression on the research (Creswell & Creswell, 2018).

3.2.3 Interviews

This research is shaped by the perspectives and knowledge obtained through individual interviews with representatives of the case studies. Research respondents are involved in the activities in a managerial or facilitator role. The semi-structured interview format provides the benefits of increased control over the questions asked and flexibility to clarify information that was unclear or implicit in project documents (Farthing, 2016; Creswell & Creswell, 2018). An interview protocol was developed according to Creswell & Creswell (2018), and included a set of general questions that were asked to all interviewees (Farthing, 2016). The interview protocol can be found in Appendix B. Although theory guided the protocol, interviews are inherently susceptible to bias from both interviewers and responders (Creswell & Creswell, 2018; Yin, 2014). To minimize perspective bias, this study aims to conduct two interviews per case study (Blaikie & Priest, 2019).

To determine the case studies to be included in this research, a preliminary case study selection interview was conducted. These interviews focused on the general nature of the case, and aimed to determine the fulfilment of criteria mentioned in the case study selection section (3.1.2). Once

[10] https://www.lub.lu.se/en/find/lubsearch

a case study was selected, interviews were conducted with relevant members of the organization/institution according to the interview protocol. For an overview of the interviews, as well as the interview codes that will be used throughout this paper as references, see Table 3-1. The interviews were held over Zoom and lasted approximately 60 minutes, a relatively short time frame that required more structure and a closer adherence to the interview protocol (Yin, 2014). Interviews were recorded via Zoom for the purpose of transcription and analysis. Although recoded interviews are criticised for altering interviewee behaviour and response patterns, as they may feel pressured by the recording (Bryman, 2016), the transcriptions were necessary for thorough and valid analysis. For this reason, in the consent forms – and again at the start of interviews – it was stressed that the purpose of the recording was for audio transcription, and that recordings would be deleted post-transcription.

Table 3-1. Interview overview

Interview Code	Interview Type	Interview Length (approx.)	Organization	Interviewee
M1	Preliminary	60 minutes	Malmö Marine Education Center	A
M2	Semi-structured	60 minutes	Malmö Marine Education Center	A
M3	Semi-structured	60 minutes	Malmö Marine Education Center	B
H1	Preliminary	60 minutes	Helsingborg Environmental Strategic Unit	C
H2	Semi-structured	100 minutes	Helsingborg Environmental Strategic Unit	C
K1	Preliminary	60 minutes	Naturum Kosterhavet	D
K2	Semi-structured	60 minutes	Naturum Kosterhavet	D
K3	Semi-structured	60 minutes	Naturum Kosterhavet	E

3.3 Data analysis methods

As data was collected, it was prepared for analysis. This parallel approach to collecting and analysing data improved the awareness of emergent themes in the research (Bryman, 2016). Creswell & Creswell's (2018) qualitative data analysis process was followed, and data was (1) organized and prepared, (2) reviewed, (3) coded, (4) categorized into themes, and (5) integrated into and represented in the research. Recorded interviews were transcribed using the software "Trint" due to its accessibility and ease of use, followed by a review and editing for accuracy (Creswell & Creswell, 2018). Notes and transcriptions were then transferred to NVivo (Version 1.7.1), a software used for organizing and analysing qualitative data, in preparation for content analysis. Thematic content analysis was utilized to analyse the data, and the program theory

framework was applied to organize and contextualize the data in a coherent way for comparison (Braun & Clarke, 2006).

3.3.1 Thematic content analysis

The thematic content analysis method can be used to identify and analyse patterns in data (Braun & Clarke, 2006). Its flexibility allows for a holistic understanding of a problem, which can result in rich and complex data (Braun & Clarke, 2006). Some social theorists claim that the thematic categorization of elements can retract from the holistic and flexible nature of this research approach (Schreier et al., 2019; Braun & Clarke, 2006), although the categorization of data into themes can more effectively achieve the aim of this research study (Mayring, 2000). The themes in this research were generated using a deductive-inductive approach; that is, the themes were derived from the presence and recurrence of information in the data as it related to each RQ (Braun & Clarke, 2006). Following Mayring's (2000) models of inductive and deductive category development, categories were created, reviewed, and revised according to the research aim and RQs. Coding agendas were created for all codes to ensure relevance and avoid scope creep – the phenomenon where the scope of the code grows in response to new data (Mayring, 2000).

Data from interviews was sorted into themes relating to the main proponents of program theory: inputs, activities, outputs, outcomes, and impacts (Rogers, 2008) – as explained in section 3.3.2 – as well as monitoring methods and tools, municipality support structures, and project successes and failures. To answer RQ1, "What activities are leveraging citizen interaction to contribute to conservation outcomes?", the activities were further explored through thematic sub-categories in the findings. RQ2: "How are citizen interactions contributing to conservation outcomes in these activities?" was answered through analysing and organizing the thematic lists into a logic model with supporting explanations (Rogers, 2008). RQ2a: "What monitoring and measuring tools and methods are used to determine the effectiveness of the activities in achieving conservation outcomes?" focused on methods and tools used by case study projects, which were thematically organized into sub-categories. RQ3: "How are municipalities supporting citizen interaction-based coastal marine conservation activities?" identified different ways municipalities were supporting the projects, and the findings were also structured as thematic sub-categories. RQ4: "What are the drivers and barriers for municipalities to support these activities?" and RA4a: "What are success factors and learnings of projects using citizen interaction as a means to achieve conservation outcomes?" focused on project successes and failures, and the findings are thematically listed [this might change, depending on the type of data].

3.3.2 Program theory

To address RQ2, elements of program theory will be applied. Program theory is the theory or model that explains how outcomes are achieved by a program or project (Rogers et al., 2000). Program theory comes in various forms, but in essence it highlights the assumptions, logic, and expectations behind an intervention by identifying the causal links between its inputs, activities, outputs, and outcomes (Crabbé & Leroy, 2008; Rossi et al. 2014). This information forms the theory of the intervention, which can then be used as a basis for evaluation (Rogers, 2008). Program theory has two main components: a theory of change and a theory of action (Funnell & Rogers, 2011). The theory of change is the "central mechanism by which change comes about…", while the theory of action is the explanation of what is needed to achieve the theory of change (i.e., activities) (Funnell & Rogers, 2011, p. 31). Both components can then be represented in a logic model diagram (Funnell & Rogers, 2011). In this research, program theory will be used to understand the intended causal links between social interaction and biodiversity outcomes (RQ2) (Bickman, 1997; Rogers, 2008). Although it does not attempt to thoroughly evaluate the projects, as is the aim of program theory evaluation (Crabbé & Leroy, 2008), it may inform future evaluations.

Since little research has been conducted on marine projects leveraging social interaction to achieve biodiversity goals, this research will focus on understanding the general construct and completeness of these projects using the logic of program theory. Bickman (1997) explains the rarity of programs actually founded on theory, and that programs are often created by designers who are not experts in social science (Chen & Rossi, 1983). Understanding the program theory of projects can therefore facilitate learning among stakeholders (Mickwitz, 2003), promoting increased understanding and improvements of the project's design and administration.

There are different approaches to outlining a program theory: deductive, inductive, and user-focused (Crabbé & Leroy, 2008). The inductive approach will be used in this research due to its relevance to the nature of this study as well as time limitations. In the inductive approach theories are built through fieldwork, including document review and interviews (Crabbé & Leroy, 2008). The information from these sources will then be used to generate a logic model, which is a summarised version of the theory (Rogers, 2008). Logic models visually present the theory in a standardized format, allowing for comparisons and conclusions to be drawn more effectively.

In order to establish program theories for the studied cases, this study applies an outcomes chain and pipeline logic models, proposed by Funnell & Rogers (2011, p. 244). The adapted logic model will have the benefit of highlighting feedback loops and the interactions between individual results, as is the case for outcome chains (Funnell & Rogers, 2011). This will allow a deeper understanding of the theory of change (Funnell & Rogers, 2011). To ensure the theory of action is also incorporated, activities will be integrated into the logic model (Funnell & Rogers, 2011). Figure 3-2 below provides an example of the logic model applied in this research, supplemented by examples from the literature.

The logic models in this research will be a reflection of both the interviewee and the researcher, as not all intermediate and long-term outcomes are expected to be clearly identified in the interviews.

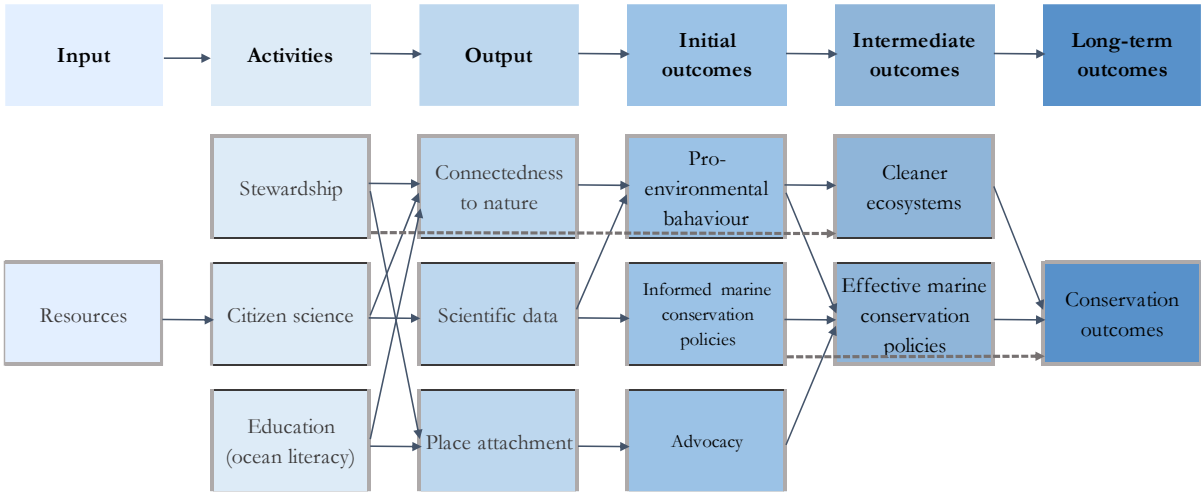

Figure 3-1. The logic model applied in this research

Source: Author's own, as adapted from Funnell & Rogers, 2011, and supplemented with examples from Chapter 2 of this research

3.4 Reliability and validity

In the context of qualitative research, reliability – the consistency of the research approach across different case studies – and validity – the accuracy of the research from various perspectives – are vital in ensuring credibility and accuracy (Creswell & Creswell, 2018).

Although qualitative content analysis is an inherently iterative process, with feedback processes improving the credibility of categorical organization (Mayring, 2000; Drisko & Maschi, 2016), a number of measures have been taken to improve research reliability. First, since high researcher independence and control over research methods makes qualitative research prone to bias (Verschuren, 2003), thematic content analysis categories have been clearly defined in coding agendas (Drisko & Maschi, 2016; Mayring, 2000). Second, transcripts of interviews were reviewed for errors (Creswell & Creswell, 2018), and information from interviews integrated in the research was reviewed by corresponding interviewees to ensure the contextual accuracy of the data and improve credibility of findings (Bryman, 2016). Third, since context is vital for transferability and replicability (Blamey & Mackenzie, 2007, Bryman, 2016), contextual indicators and attributes are included throughout the research when possible (Funnell & Rogers, 2011).

Triangulation, the practice of accessing various data sources and perspectives to create a holistic and complete understanding of a perspective, is employed as a tool to improve the validity and credibility of the research (Creswell & Creswell, 2018; Bryman, 2016). Triangulation is particularly important in qualitative studies, as different perspectives and research methods provide a particular understanding of a problem (Verschuren, 2003). Therefore, two interviewees from each project are interviewed, and multiple sources of information – interviews and project documentation – are accessed (Creswell & Creswell, 2018; Yin, 2014). In addition, the presence of contradictory information is used to present a more realistic representation of the research (Creswell & Creswell, 2018).

4 Case study profiles

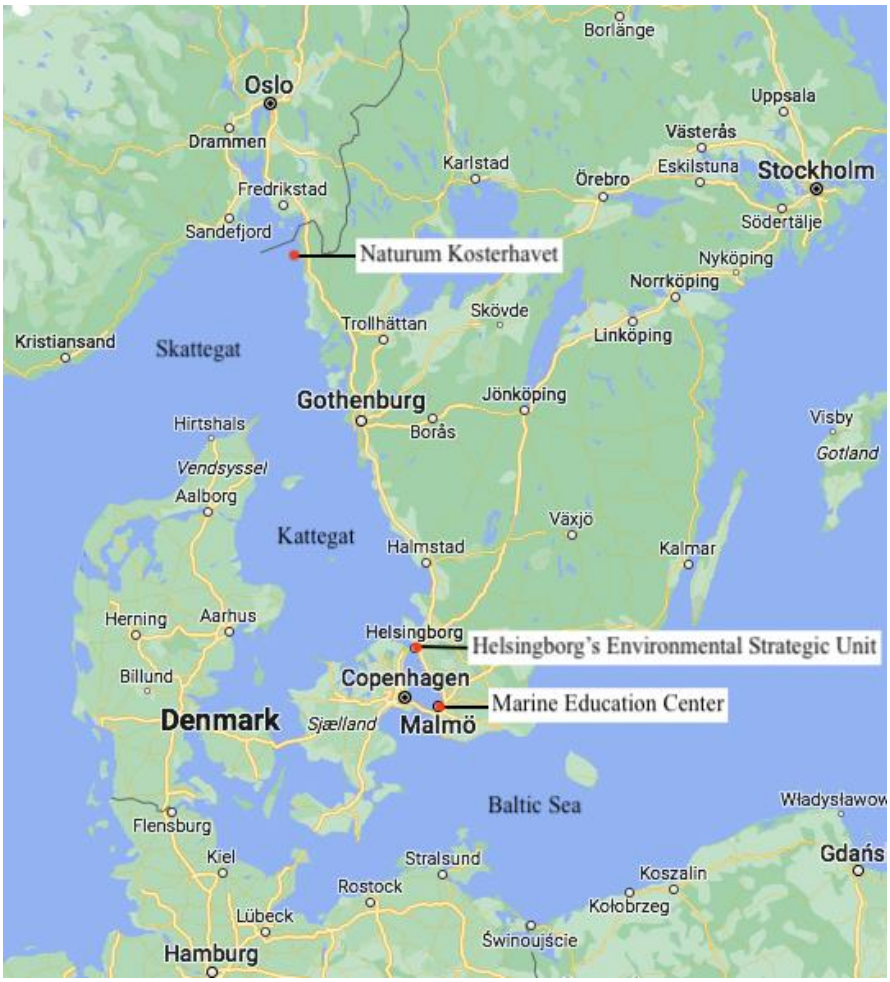

*Figure 4-1. Map of Southern Sweden indicating the locations of the three case studies and their relation to the area's marine regions. Note, the Öresund strait is not labelled - it is the narrow strait separating the Swedish mainland from Denmark's Zeeland [*Sjaelland*]. Source: map background retrieved from Google Maps.*

The case studies in this research include two organizations, Malmö's Marine Education Center (MEC) and Naturum Kosterhavet, and the municipality of Helsingborg. Their locations and relative proximities are outlined in Figure 4-1 above. Detailed information on all cases is provided in this chapter to enhance understanding and relevance of the research findings. The organizations, Malmö's Marine Education Center and Naturum Kosterhavet, are both related to Swedish national park visitor centers [*Naturums*]. This attribute provides unique opportunities for the two cases, and thus the concept of Naturums will be explored prior to the more detailed case study profiles.

Sweden was the first European country to start establishing national parks – large protected areas with the dual goal of safeguarding nature and providing visitors with the opportunities for enjoyment and relaxation (Naturvårdsverket, 2020). The Swedish Environmental Protection Agency [*Naturvårdsverket*] selects National Park locations based on scientific data for nature conservation and attraction value for visitors (Naturvårdsverket, 2020). The National Parks have visitor centers referred to as Naturums [*Nature Rooms*], which host various exhibitions and activities based on the local nature (Sveriges Nationalparker, n.d.). The concept of Naturums being solely associated with national parks has evolved over the years, and some Naturums have been established without links national protected areas. The principal administrative authorities

[*Huvudmän*] responsible for Sweden's 33 Naturums can be state authorities (i.e., CABs), municipal administrations, or other similar organizations (Naturvårdsverket, 2015). Naturums are either fully or partially funded based on their principal authority [K1]. Approximately half of Naturums (including Naturum Kosterhavet) are governed by CABs, and receive full funding [K1]. Those governed by municipalities – also approximately half – and those governed by foundations/organizations – only 3-4 of all Naturums – are partially funded. The Swedish Environmental Protection Agency is the main financer of Naturums, with the distribution of funding handled by the CABs [*Länsstyrelsen*] (Naturvårdsverket, 2015).

Naturums offer visitors a chance to interact with nature in a positive way (Naturvårdsverket, 2015). Nature interpreters are available to interact with visitors, answer questions, and facilitate activities (Sveriges Nationalparker, n.d.). All of Sweden's Naturums follow a set of criteria, which must be met before being designated as a Naturum. These criteria relate to number of opening hours, goals, location, and design (Naturvårdsverket, 2015). The goal of Naturums is to provide visitors with a positive nature experience resulting in strengthened environmental knowledge, a fostered connection to nature, and a desire to spend more time in nature (Naturvårdsverket, 2015). Each individual Naturum must develop their own corresponding goals to ensure contextual value and relevance (Naturvårdsverket, 2015).

4.1 Naturum Kosterhavet

This case study profile will be looking at Naturum Kosterhavet, a visitor center in western Sweden. The center has a dual focus on social and environmental goals, and offers a number of activities that facilitate citizen interactions with the local coastal environment (Sveriges Nationalparker, n.d; [K3]). The main goals identified in the interviews are: "to engage people with nature, and teach them about biology, biodiversity, nature, and environmental and cultural history" [K1], as well as teaching visitors how to interact with nature in a way that does not damage ecosystems [K2].

Naturum Kosterhavet is located on an archipelago at the main entrance to Kosterhavets National Park (established in 2009) in the Swedish region of Västra Götaland (Sveriges Nationalparker, n.d.b). The group of islands is located in the Skagerrak marine region, less than ten kilometres from the Norwegian border. Parts of the area have been established as a nature reserve since 1984 in an effort to protect the archipelago's rich biodiversity, which hosts over 12,000 different species (Sveriges Nationalparker, n.d.b). The continental mainland has a relatively low population density, with the closest town of Strömstad having a population of 13, 290 (SCB, 2023).

The Naturum's building, which is located directly on the harbour, houses the offices of both the Naturum and the National Park. The two entities are integrated under the CAB and work together on some projects and management duties [K2, K3]. The Naturum offers a wide number of activities, both inside the Naturum and outdoors. Inside, there is a rotating exhibition, as well as a touch tank aquarium, video projector area, and informational material [K1, K2]. Outdoors, activities include a snorkelling trail, guided tours, and a recurring event where visitors learn about algae and how to eat it [K2]. The Naturum also rents out equipment (e.g., for crab fishing and snorkelling) to encourage visitors to explore the marine area [K2].

Naturum Kosterhavet's principal authority is the CAB of Västra Götaland, which also manages the Kosterhavets National Park and the Koster Islands nature reserve, and is thus fully funded (Sveriges Nationalparker, n.d.b; [K1]). The funding covers the activities, employee salaries, and other operating expenses. As nature funding has been cut nearly in half by the new national administration, the Naturum management is prioritizing citizen interaction and accessibility through maintaining their offering of interactive activities and face-to-face interactions, and continuing to provide support access to the Naturum [K3].

The Naturum's island location means that the Naturum – and its activities – are less accessible than other case studies in this research. A survey on visitor demographics showed that the average income and education level of visitors is quite high [K3], which is likely due to its remote location. The Naturum aims to overcome the accessibility barrier for school children and recent immigrants (reached through the Swedish for Immigrants [SFI] language course) by providing these groups with support for transportation costs (i.e., ferry) [K2, K3].

4.2 Malmö Marine Education Center

The second case study looks at the Marine Education Center (MEC), an organization in Malmö focused on marine education and development. The MEC facilitates both direct interactive activities as well as indirect marine development projects [M1]. Addressing both of the approaches identified in Chapter 2 (i.e., direct and indirect pathways to conservation outcomes) makes the MEC an interesting case to research. To understand the MEC, the context of the city of Malmö will first be provided.

Malmö is the largest city in the southern state of Skåne and the third-largest city in Sweden, with a population of over 357,000 (SCB, 2023). The city is a primary example of an environmentally progressive coastal city, as sustainability is embedded in the city's plans and policies. Malmö views social, economic, and environmental sustainability as integral components to the long-term health of the city and its citizens, and aims for social improvements and economic growth, while minimizing its environmental impact (Malmö Stad, 2018). The city has adopted the 17 SDG goals, integrated them into the municipality's steering and management systems (e.g., the budget), and applied them as evaluation criteria for the content of the city's comprehensive plan (Malmö Stad, 2022d).

Like many Swedish cities, Malmo is experiencing population growth, and has catered its comprehensive plan to adapt to the growing number of citizens. Malmo's principal development strategy is, accordingly, densification. With increasing built infrastructure to accommodate its growing population, the city has highlighted to need to create urban green areas (Malmö Stad, 2018). Alongside the green areas – which are recognized for the dual benefits of environmental and social health – the importance of protecting coastal ecosystem services is recognized (Schubert et al., 2018). Over half the municipality's surface area consists of the highly trafficked Öresund – the strait running between Denmark's Zeeland and Sweden (Malmö Stad, 2018). With increased development along the coast, Malmö's comprehensive plan recognizes the opportunity to develop natural coastal spaces to improve their social, economic, and ecological values. Amongst these values, education, aesthetics, and coastal leisure activities are highlighted (Malmö Stad, 2018).

Since 2017, the city has an Office for Sustainable Development responsible for planning, managing, supporting, and communicating all work related to the Agenda 2030 (Malmö Stad, 2021). The city has released a Voluntary Annual Review (a localized version of the UN's Voluntary National Review), in addition to its annual Sustainability Reports (Malmö Stad, 2021). Due to the city's efforts to enact local sustainable marine practices, as well promoting global cooperation to pursue sustainable local management of marine areas, Malmö was declared a UN Local Action Hub (Malmö Stad, 2021). This provides the city with a larger platform to share their experiences and knowledge, contributing on a wider scale to the promotion of ocean literacy, knowledge on coastal cities, and anthropogenic impacts in these areas (Local2030, n.d.).

The city has a strong focus on collaborations and partnerships with other municipalities and organizations, such as the 2022 Ocean Literacy Action Conference, co-hosted by the City of Malmö and SwAM (Malmö Stad, 2022). Malmö's close proximity to a number of large universities also enables the city to have close connections with the academic sector [M1]. At the intersection of collaboration and education lies Malmö's Marine Education Center [*Marint Kunskapscenter*].

Inaugurated by the City of Malmo in 2017, the Marine Education Center (MEC) is an association pursuing marine education and development projects and programs [M2, M3]. The MEC is located in a modern building on the southern end of a long beach on Malmö's coastline. Inside, there are multiple aquariums, interactive sensory learning stations, maps, and a laboratory with microscopes and various samples. Outside is a large play area, a rocky shore, and a jetty. The water is shallow enough to wade in for several meters.

The Center has a vision to "influence the conditions for a viable sea by promoting the knowledge, awareness and responsibility of citizens, business and decision makers" (Marint Kunskapscenter, 2018). MEC works with the 7 principles of ocean literacy and creates school programs that cater to the curriculums and interests of the various age groups. Within the building housing MEC, which is located on Malmö's coastline, the Naturum Öresund also operates. Established in 2020, the Naturum Öresund is governed by the municipality of Malmö's Cultural Administration, and is thus partially funded by the Swedish Environmental Protection Agency (Naturum Öresund, 2019).

The MEC and Naturum Oresund are two independent organizations, but work together towards common environmental and social goals (Marint Kunskapscenter, 2019). Both focus a great deal on ocean literacy, increasing citizen awareness of the ocean, and teaching schoolchildren (Marint Kunskapscenter, 2019). Where the major difference lies is in the marine development element of the MEC. Marine development involves the undertaking of climate change adaption and restoration projects – such as the re-shallowing of sea bottoms in harbours – to both directly impact the health of the coastal ecosystems and to generate knowledge and understanding of marine areas (Marint Kunskapscenter, 2019). The distinction of what activities fall under the umbrella of MEC versus Naturum Öresund is not integral in this research, but it is important to understand the opportunities this unique collaboration gives rise to. This research thus considers the activities of the MEC and Naturum Öresund as synonymous, as their resources overlap.

The MEC is unique in its funding structure, as activities are run by both the MEC and Naturum Öresund. While the latter is partially funded by the Swedish Environmental Protection Agency, other expenses – as well as the MEC – are funded by Malmö City. The municipality also funds bussing to and from the MEC for schools. Since the MEC also works with marine development, some work is funded by external project grants.

4.3 Helsingborg

The third case study analyzed in this research is Helsingborg, particularly its Environmental Strategic Unit – a municipal governmental division dedicated to understanding and improving the local environment.

Helsingborg is Sweden's seventh largest city, with a population of over 150,000 (SCB, 2023). It is located in the region of Skåne on the country's southwestern coast and borders the Öresund Strait. Helsingborg recognizes its responsibility to the marine environment, as is reflected in ÖP 2021, the city's latest comprehensive plan (Helsingborg Stad, 2021b). The coastal areas are valued for their biological diversity, cultural values, and recreational and aesthetic qualities (Helsingborg Stad & Landskrona Stad, n.d.). Helsingborg, like all coastal areas, is faced with conflict use challenges for its marine areas. Wind power projects, shipping traffic, nature conservation, port dredging, nearshore development, and recreational spaces (e.g., beaches) are all competing for coastal space (Helsingborg Stad & Landskrona Stad, n.d.). The city has developed clear, thorough MSP information, which is available online as a digital knowledge platform (Helsingborg Stad, 2019).

Marine planning and projects are primarily the responsibility of the Environmental Strategic Unit of the city's Environmental Department. This unit is composed of a group of specialists and strategists, with backgrounds in limnology, marine biology, and sustainable urban planning – amongst others [H2]. The unit has marine biologists fully dedicated to the health and management of the ocean [H1]. Through this unit, Helsingborg has been measuring and monitoring its marine biodiversity for decades to understand the impacts of urban development and human activities on the marine ecosystem (Helsingborg Stad, 2021). Collaborations between other municipal departments, such as the department for Environmental Education and Behavioural Influence [*Miljöutbildning och Beteendepåverkan*], as well as other entities, such as local fishing organizations, local artists, and Danish marine organizations, are common, and support the facilitation of interactive marine activities [H1, H2]. To ensure accuracy, this case study, including the Environmental Strategic Unit and other municipal departments, will simply be referred to as "Helsingborg." The exact department or unit facilitating activities is not vital in achieving the outcomes of the research, and as there are many collaborations with departments and units, the outcomes would be unnecessarily complex.

Helsingborg is currently working on a project called "The Ocean is Your Neighbour," which seeks to "make life below the surface visible and accessible to people living in the city, and by doing so create a stronger connection and a willingness to care more about the marine environment" (Helsingborg Stad, 2021, p. 60). Smaller projects developed through this undertaking were showcased in last year's H22 City Expo, a welfare and innovation initiative focused on the 2030 Agenda's Sustainable Development Goals (Helsingborg Stad, 2021). The H22 Expo, funded by the Port of Helsingborg [*Helsingborgs Hamn*], was held at a time when a new sustainability-oriented residential harbour area in the city – Oceanhamnen – was undergoing landscaping and green space development. This allowed an opportunity for projects to be integrated into the development of this area. A number of coastal projects were undertaken, including the Havoteket Pavilion – an open-air pavilion dedicated to ocean literacy and fostering a connection between the public and the sea [H2]. Another project focused on revitalizing harbour marine areas for ecological and social benefits through the installation of living sea wall structures and a stone reef (Helsingborg Stad, 2020a, 2020b, 2020c).

Funding for Helsingborg's municipal projects and activities comes directly from the municipality. Some are fully funded by a single unit while others are a joint effort with other departments. The installation of the stone reef, for example, was a collaboration between the Environmental Strategic Unit and the City Planning Department [H2]. In certain cases, it is also possible to apply for funding from the CAB, which distributes it from a bond overseen by the Swedish Environmental Protection Agency. The bond collects money as environmental compensation from projects in which environmental damage is unavoidable, and distributes it to projects which address national environmental priority areas [H2].

Helsingborg does not have a designated building for facilitating coastal-based activities near the shoreline, although the Havoteket Pavilion from the H22 Expo is being considered as a permanent structure [H1, H2]. The public's attendance and feedback were overwhelmingly positive, and visitors to the Pavilion reported a high level of interest in a permanent operation [H2]. The department for Environmental Education and Behavioural Influence also has a building in a park located in a park further inland, where some activities such as an open aquarium and netting and observation of pond species. Since the scope of this research only includes activities facilitated on the coastline and harbour areas, this building and its activities are not included in the activities. Coastal activities are facilitated at locations along Helsingborg's coast, such as outdoor informational Nature Points [*Naturpunkter*], or wherever there is space and accessibility for the public to come and interact with the marine area in a safe and responsible manner.

5 Findings

5.1 Activities facilitating citizen interaction with coastal nature

To identify what activities are leveraging citizen interaction to contribute to conservation outcomes (RQ1), the various interactive activities provided by each case study are described. The three main modes of citizen interactions identified in the interviews include: education, stewardship, and citizen science. Education-based activities are defined as activities involving ocean literacy as a primary environmental outcome of the interactions. There may be secondary benefits, such as recreation and social interaction, but the goal is generally to connect people to the sea in order to understand its value [H1, H2, K1, K2, M2, M3] . Citizen science activities are those in which scientific data is the primary outcome, while stewardship activities are defined as activities whose primary aim is to support positive environmental outcomes.

The activities are displayed in Tables 5-1, 5-2, and 5-3, alongside descriptions and which target group the activities are available to. Some activities are seasonal (e.g., guided snorkelling tours are only offered in summer), or require a certain set of skills (e.g., snorkelling experience is needed for sea safaris). These features are not innately relevant to this research, but when applicable will be mentioned to broaden understanding.

5.1.1 Activity summary: Naturum Kosterhavet

Activities at Naturum Kosterhavet are generally targeted at the public, with most being offered during the summer when the Naturum has longer opening hours [K1]. School groups are accommodated year-round, with a focus on local schools [K2]. The Naturum aims to meet each student in the nearest two localities – Strömstad and Tångenn – at least once over the course of their education. The Naturum currently meets with Strömstad's students in year 4, 8, and once in secondary school, while Tångenn's year 4 students are met [K2].

There is a great emphasis on education at the Naturum, with all recreational and interactive activities having some element of ocean literacy [K2, K3]. As one interviewee stated, in relation to feeling connected to the ocean and understanding its values, "what you know, you want to protect" [K1]. Table 5-1 identifies the interactive elements that aim to achieve these outcomes.

Table 5-1. Overview of citizen interaction activities offered by Naturum Kosterhavet

Activity	Description	Target Group
Education		
Guided beach tours	A guided tour to get to know the different things you might see on the coastline, and observe the marine ecosystem with aquascopes [K1]	Schools, public
Algae education station	A station with different algae where nature interpreters explain the value of algae and how it can be consumed [K1]	Public
Guided snorkelling tours	Snorkelling trips led by a guide [K2]	Public
Snorkelling trail	An underwater trail with rope along the bottom to guide snorkellers, with informational signs indicating what can be found [K2, K3]	Public

Recreational equipment rental	Free rental of snorkelling gear, crab-fishing gear, and waders [K1, K3]	Public
Touch tank aquarium	An open aquarium in the Naturum with local species that can be touched and interacted with [K3]	Public, schools

5.1.2 Activity summary: Malmö Marine Education Center

The MEC (in coordination with the Naturum Öresund) provides a wide array of different activities and programs, with activity types including education, citizen science, and stewardship. All activities have educational elements, delivered through direct face-to-face interactions with nature interpreters and information material.

The organization has a significant focus on providing ocean literacy education to students. School programs are available for all grades, including some university classes, as well as Swedish For Immigrants (adult) courses. Specific activities and pedological methods differ, but all have a strong focus on teaching ocean literacy through interactions with marine areas. Table 5-2 provides descriptions of the activities and identifies which audiences are engaged.

Table 5-2. Overview of citizen interaction activities offered by the Marine Education Center

Activity	Description	Target Group
Education		
Guided beach exploration/tour	Nature walks/explorations with a nature interpreter, discussing the local nature and things found on beach/in the water [M2, M3]	Public, schools
Wading, netting, and observation	Guided and unguided activity, involving wading through shallow areas, observing the ecosystem in its natural state through aquascopes, or collecting specimens and observing them in an open aquarium [M2, M3]	Public, schools
Guided algae collecting & change algae in aquariums	Wading and netting to collect seaweed, then using it to change the seaweed in the aquarium [M2]	Public
Sea safari	A species-specific snorkelling trip where the goal is to observe certain species (e.g., "eel safari") [M3]	Public
Snorkelling	Snorkelling in shallow areas to explore the ecosystem [M2, M3]	Public, schools
Sea trekking	A farther-range, multiple-hour guided snorkelling trip [M3]	Public, non-beginner
Citizen Science		

Bioblitz	An organized event where experts and the public work together to find and record as many species as possible within a selected area and time frame [M1]	Public
Stewardship		
Beach litter picking	Guided or independent litter picking along the coast [M3]	Public, schools

5.1.3 Activity summary: Helsingborg

The activities offered by Helsingborg are similar to those of non-municipal organizations, with the main difference being that collaborations other governmental departments and initiatives (e.g., I love Hbg[11]), and organizations (e.g., Hall Sverige Rent) are often necessary to facilitate them. There is generally an even spread of activities targeted at schools and the public, although some (e.g., guided boat tours, nature guiding on beaches) are offered year-round to schools while only being available to the public during the summer months [H2]. Nearly all the activities – with the exception of unguided litter picking – all have an education component. The activities can be categorized into two main types – education and stewardship – as explained in Table 5-3.

Table 5-3. Overview of citizen interaction activities offered by Helsingborg

Activity	Description	Target Group
Education		
Guided boat tours	A boat trip where participants are educated about the values of the ocean, and learn about local marine species [H2]	Schools, public
Nature guiding on beaches	Guided tour to look at and learn about species found on the beach [H2]	Schools, public
Touch tank aquarium [Project complete; part of H22 Havoteket pavilion]	Large open aquarium with local species, information signs, and a nature interpreter on site to answer questions. The public could freely enter the pavilion and touch the fish, crabs, and other species in the tanks [H1, H2]	Public
Underwater camera	A 360-degree underwater camera, viewable through "binoculars" on the walkway beside the harbour [H1]	Public
Learning about fish as a resource ("local catch" fish pond)	Collaboration with a local fishery organization from a neighbouring area, where a pond with local fish was put out, and the fisherman explained how they fished with the nets [H2]	Schools

[11] https://helsingborg.se/trafik-och-stadsplanering/renhallning-och-snorojning/i-love-hbg/

Community collaboration: marine farming (mussel colonies) [Project in planning and consultation stage]	Collaboration between the public and Helsingborg City, to install floating platforms with ropes suspended in the water to host and harvest mussel colonies [H2]	Public
Stewardship		
Litter picking	Unguided and guided litter picking along beaches [H2]	Schools, organizations/clubs
Marine cleaning	Divers from the local SCUBA diving club voluntarily clean the harbour marine area with litter-picking equipment provided by Helsingborg municipality [H2]	Public (diving club in Helsingborg)
Marine litter collection and art project [planning stage]	Collaboration with a local artist, Håll Sverige Rent [*Keep Sweden Clean*], and another municipal department in Helsingborg. Citizens assist in collecting marine litter for art creation [H2]	Public

5.1.4 Activities using the indirect approach to support citizen interaction

The indirect pathway to achieving conservation outcomes involves improving the natural environment in an effort to encourage citizen interactions and foster awareness of the area's ecological value. Helsingborg and Malmö's MEC have engaged in this type of activity through harbour revitalization projects in local residential areas. Helsingborg's activities include the installation of living sea walls and a stone reef. Both are bioengineering projects – altering the environment for improved ecosystem function – and have an aesthetic element, allowing them to add value to the blue space by making then more visually appealing and interesting, while simultaneously improving ecosystem function [H1, H2]. The MEC's marine restoration project involves filling in a harbour and restoring eel grass to the area. All activities are approached with the understanding that improved marine ecosystems will have positive social outcomes in addition to ecological improvements. Table 5-3 provides an overview of the three activities, including activity descriptions and locations, as well as the intended social and ecological outcomes.

Table 4-4. Overview of activities leveraging the indirect approach

Activity/Project	Description	Location	Outcomes
Install living sea walls	This activity is part of a project working on revitalizing the harbour, and involves the installation of a living sea wall on the side of the harbour to create habitats for marine species[H1]	Helsingborg's Oceanhamnen	Aesthetic appeal [H1], draw attention to marine areas (i.e., increased visibility) [H1], increased citizen connection to marine areas [H1]
Install a stone reef	Create a stone reef along the side of a recently developed harbour, in an area where it is visible to the public [H1]	Helsingborg's Oceanhamnen	Draw attention to the marine area (i.e., increased visibility) [H1], create fish habitat [H2], foster awareness and knowledge about the ocean's values [H2]

Re-shallow harbour areas	Fill in deep areas of the harbour to allow sunlight to penetrate to the bottom, enabling eel grass to grow [M2]	Malmö's Nyhamnen/south wharf basin	Recreate and increase the city's biodiversity [M2], increase the area's recreational and social values (e.g., swimming, canoeing, paddle boarding, fishing, sitting) [M2]

5.2 Linking activities to conservation outcomes

This section presents the findings on RQ2, which seeks to understand how citizen interactions are contributing to conservation outcomes in the activities outlined in the previous section. The pathways from activities to conservation outcomes vary. Some activities have immediate positive benefits on ecosystem health (e.g., stewardship, some citizen science), and some initiate a chain of outcomes that ultimately leads to conservation outcomes (e.g., education, citizen science). Interviewees often spoke about the benefits and outcomes of the activities in a collective sense. For example, one interviewee stated: "We hope by doing these things [i.e., the activities], we raise awareness and raise a sense of belonging" [H2]. Thus, the activity types – education, stewardship, and citizen science – and some outputs and outcomes are grouped together.

It is vital to note that since no monitoring methods were being used at the time of this research to measure the impact of activities (see Chapter 5.2.5 for more), this section of the findings is based upon assumptions made by representatives of the respective projects and organizations. Thus, although the impacts and connections are assumed to be present, and have intermittently been verified through feedback from activity participants, the majority of impacts and connections in the logic models have not been tested.

The following three sections will present the program theory logic models for the case studies – Naturum Kosterhavet, the MEC, and Helsingborg. A fourth logic model will outline the logic model for activities using the indirect approach (i.e., changing the environment to promote citizen interaction).

5.2.1 Naturum Kosterhavet

The Naturum Kosterhavet case presents a wide range of outputs and outcomes, all accessed through educational activities. Due to this commonality, there is only one pathway connecting the different elements of the logic model. Figure 5-1 outlines this pathway, which involves 20 different outputs and outcomes. The interviews highlighted two main points – the power of the experience and the role of pride.

The interviews identified a clear link between activities and outcomes, and in some cases identified mechanisms that facilitated a behaviour or mindset change. Interviewees recognized the importance of experiencing nature in order to gain awareness: "if you can hold a starfish in your hand, you will be more aware of the fact that this creature's living environment is shrinking or being in some way threatened" [K3]. The idea of providing a fun, positive experience was re-iterated by both interviewees as an important mechanism in bridging activities and outputs [K2, K3].

There was also a unanimous affirmation that fostering pride in the local area – even for locals who already engaged with local nature – was important in changing mindsets about the ecological, social, and recreational values of the area [K2, K3]. These changed mindsets can then change behaviours [K3], and make people more eager to protect the area's values [K2].

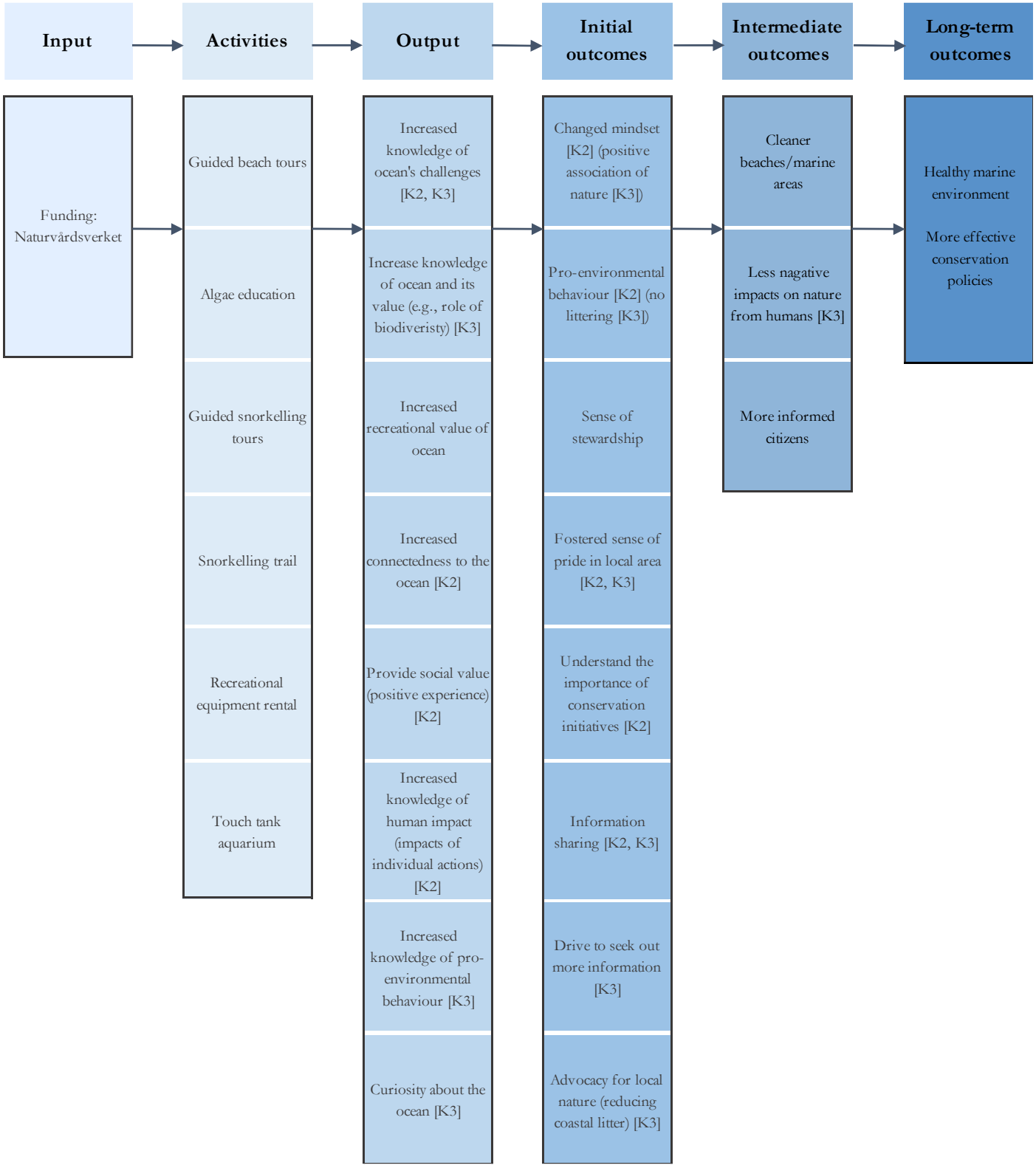

Figure 5-1. The program theory logic model for Naturum Kosterhavet, connecting inputs to interactive activities, outputs, and outcomes

5.2.2 Malmö Marine Education Center

Since the MEC has interactive activities that fall into the education, stewardship, and citizen science groups, it offers a broad perspective of the different pathways linking inputs to outcomes. Figure 5-2 outlines the pathways identified by interviewees. The more direct links, identified through dashed arrows, are associated with stewardship and citizen science activities. These activities are found to foster similar outputs to education in addition to their more direct links, creating a greater number of impact pathways per activity. Many of the outcomes in the logic model relate to initial outcomes, which constitute changed behaviour and mindsets. This is consistent with the MEC's wide offering of different types of activities, which broadens the diversity of impacts.

Three interesting points were identified through the interviews and will be further elaborated on: the importance of creating a positive experience, the potential for fostering hope, and the collaboration opportunities with students in the higher education system.

The importance of the interaction experience is highlighted by an interviewee, who explained that the netting and snorkelling activities often resulted in excitement and wonder at the knowledge of all the different species living in the Öresund. The interviewee explained: "*I want to believe that is the way of really caring about the ocean. When you look below the surface and you realize this whole new world*" [K3].

One interviewee also discussed how fostering a sense of hope in the face of the climate crisis could lead to a sense of empowerment [K3]. Negative news about the state of the ocean and the implications on human life is abundant – and can overwhelm people with anxieties about their futures. The MEC does not disregard the challenges facing the oceans today, but it does focus on sharing information about what can be done to reduce the harm [K3]. Providing people with some tools to contribute to conservation outcomes (e.g., through changed behaviour) may foster a sense of empowerment, spurring action [K3].

A third point highlighted in this case study was that a number of higher education students had written their theses on topics addressed by the MEC [M3]. As one interviewee explained,

> actually a few students that we've been working with for the last two and a half years, they've come back and written their thesis on the topic of the ocean and also on engaging citizens […] Some of them have become quite engaged and it's super fun to see that they got so stuck. [M3]

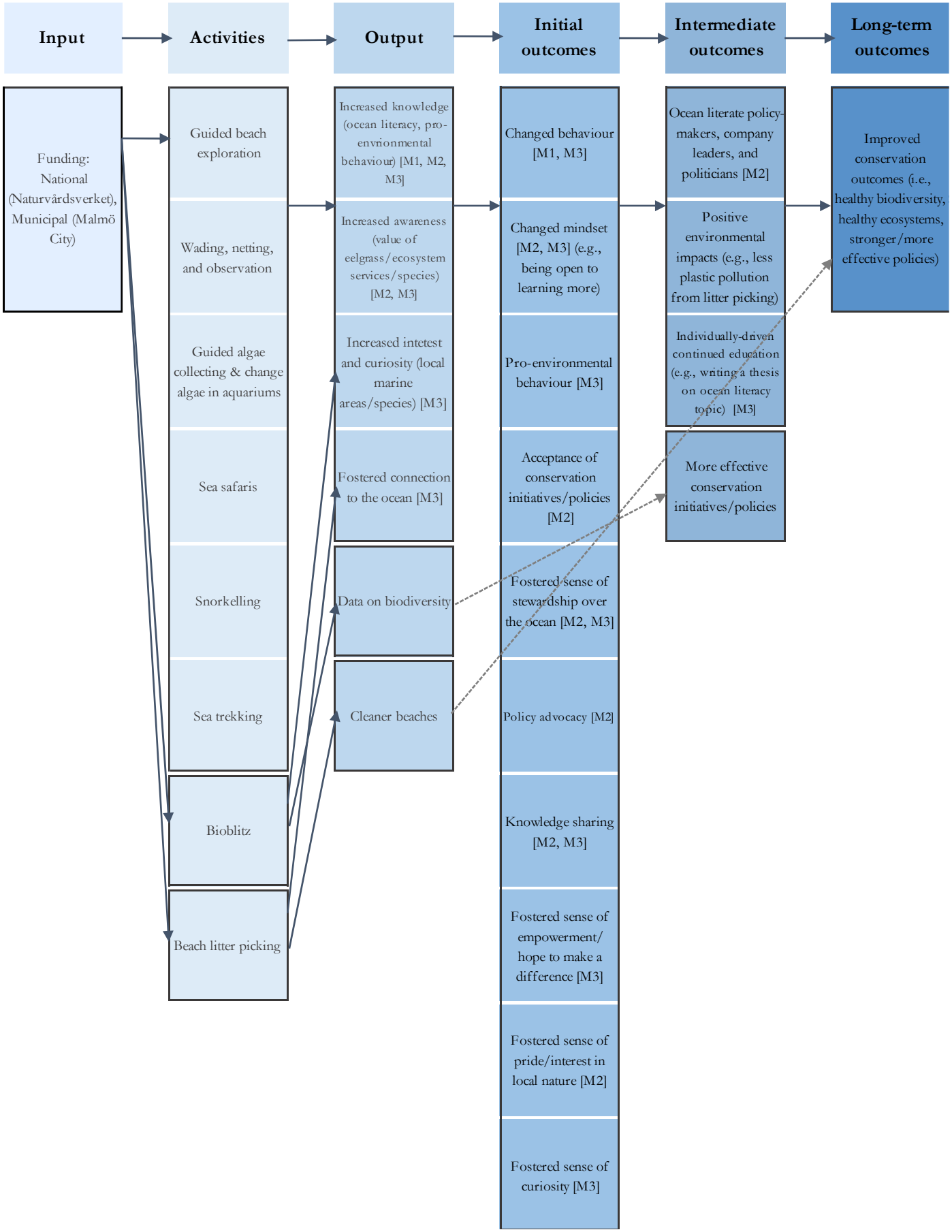

Figure 5-2. The program theory logic model for Malmö's MEC, connecting inputs to interactive activities, outputs, and outcomes

5.2.3 Helsingborg

Helsingborg, like the MEC, offers activities focused on education, stewardship, and citizen science. The pathways are outlined in Figure 5-3, and present a similarly complex model to that of Malmö's MEC. A number of key areas were highlighted in the interviews with a member of Helsingborg's Environmental Strategic Unit, including making marine spaces more visible, setting an environmental baseline, and the value of information.

An interviewee noted the importance of making the marine areas more visible in order for people to understand their value [H2]. If citizens can see marine areas and their species, habitats, and other features similarly to how they see a green space, a stronger sense of connection and understanding can be fostered [H2]. Increasing this visibility also allows people to set a baseline for what the ocean should look like [H2]. An interviewee explained, *"people have to create their own baseline of what nature is. If they don't do that, then then no one will raise an alarm when things disappear*" [H2]. Thus, a baseline is seen as a critical aspect of the pathway, particularly in terms of advocating for coastal conservation [H2].

Another key point highlighted in this case is the importance of the information in changing people [H2]. People have become dependent on knowledge to inform their decisions, and desire an understanding of why they should change their actions [H2]. This "why" is found in the logic model's output column: the knowledge and understanding fostered though the activities allows people to be convinced that change is needed.

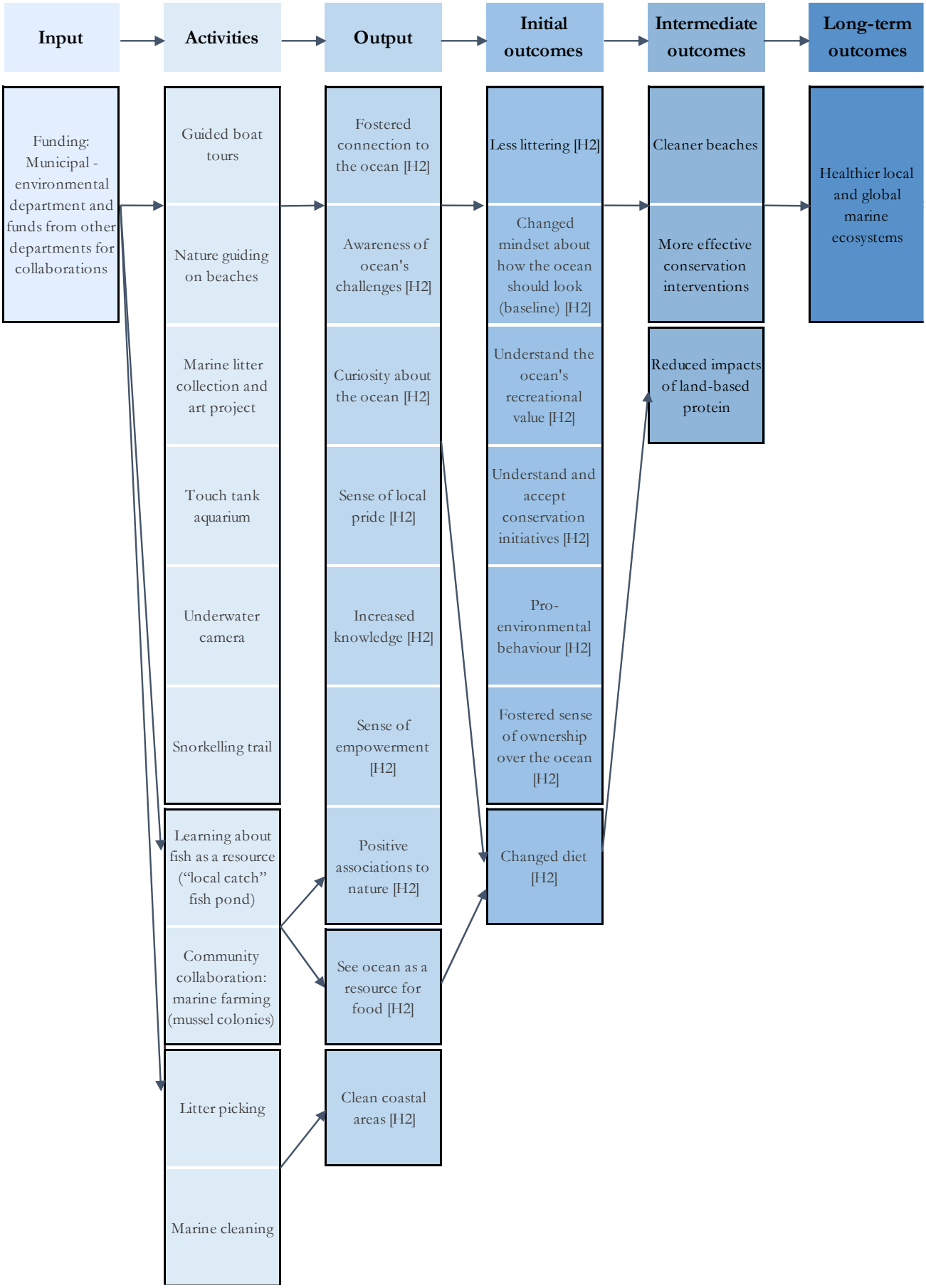

Figure 5-3. The program theory logic model for Helsingborg, connecting inputs to interactive activities, outputs, and outcomes

5.2.4 Pathways to conservation through the indirect approach

The indirect approach to citizen interaction – improving the environment to encourage interactive activities – presents a more complex logic model. Figure 5-4 outlines the various elements and pathways of Helsingborg's and Malmö's harbour revitalization efforts. An interesting characteristic of indirect approach pathways is that they have a more diverse impact. The more direct environmental benefits of the projects are indicated in the blue boxes in Figure 5-4. The yellow box presents an additional set of benefits, established by a pathway similar to those presented in Figures 5-1, 5-2, and 5-3.

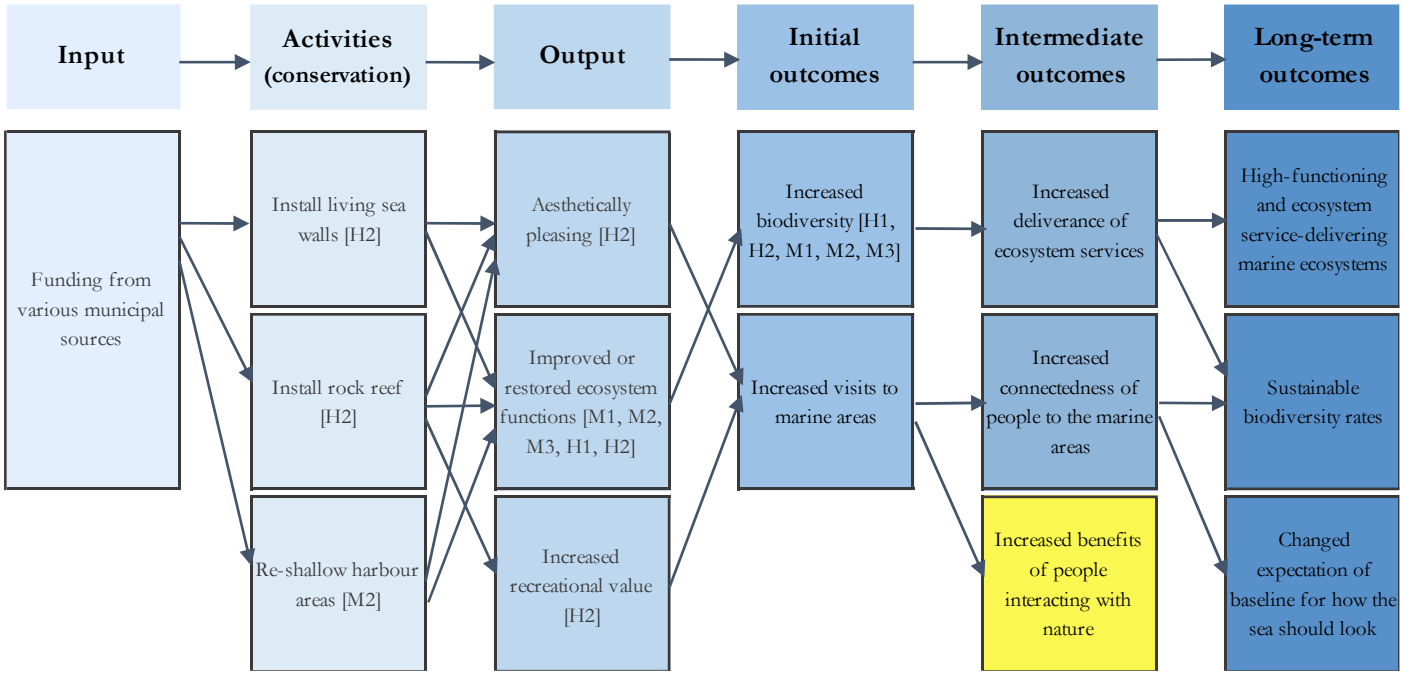

Figure 5-4. The program theory logic model for Helsingborg, connecting inputs to conservation activities, outputs, and outcomes. The yellow box indicates where the outputs and outcomes from activities using the direct approach can be integrated

5.2.5 Monitoring and measuring tools

To determine the application of any monitoring or measuring tools being used to empirically verify the links in the logic models (RQ2a), interviewees were asked about how the success of the activities was being measured. Currently, no monitoring and measurement tools and methods are being used to determine the effectiveness of the activities in achieving conservation outcomes [M2, M3, K2, K2, H2]. Rather, their impacts are based on assumptions. Many of these assumptions have been validated through current literate (see Chapter 2), although in practice none of the activities are measured or monitored for environmental impacts. Some assumptions were determined – or strengthened – by activity participant feedback. Interviewees gave examples of times when children in multi-day programmes would return with news of having changed a household behaviour, for example [M2, M3, K2, K3].

Interviewees did express understanding of the importance of monitoring impacts, and are curious about their impact [M3, H2, K3]. As the interviewee from the Helsingborg Environmental Strategic Unit stated: *"we have been talking about how we can try to understand what happened when [the activity participants] left. Did they become more aware? Are they ocean literate? So we're actually working on that"* [M3]. Helsingborg has already established a baseline on the health of its marine areas through measurement and monitoring in an effort to better support the city's goals of improving the state

of these areas [H1]. The city is planning to start evaluating marine life in the coming year to identify progress [H1], but as of yet no data has been collected on environmental outcomes from interactive activities. The nature of the data would also make it difficult to attribute outcomes to specific activities. Helsingborg's Environmental Strategic Unit has also consulted with environmental psychologists to understand how activities are contributing to an increased interest in the ocean, although this research has not been initiated [H2].

5.3 Public support for citizen interaction

The third research question aims to determine how municipalities are supporting citizen interaction-based coastal activities with conservation outcomes. Given the varying nature of the case studies, this question will look at the different cases individually.

In the case of Helsingborg, the municipality itself – through various funding arrangements discussed in section 4.3 – supports all activities identified in Table 5-3, by providing the financial, administrative, and physical resources required to engage citizens with marine areas [H2]. Besides the Environmental Department's budget, support can also come from other municipal institutions. For example, the Havoteket Pavilion project (as part of the H22 Expo) was funded by the Port of Helsingborg, a municipally owned company (personal communication, project representative, May 16, 2023).

The MEC is partially funded by the municipality. The city of Malmö provides financing for the administration of various educational programmes, and supports transportation costs for school classes to get to the center. The MEC considers its relationship with the municipality as positive, and views this as being an important factor in advancing marine development [M1].

Naturum Kosterhavet has significantly less support from their local municipality, as funding is solely from the national level. Municipal support may come in the form of organizing funding for transporting students from school classes to the Naturum, or collaborating to get certain target groups (i.e., students in Swedish for Immigrants courses) to the Naturum [K2, K3].

5.3.1 Understanding municipal drivers and barriers for engaging in citizen interaction

Drivers

Three key drivers were identified to be essential in all – or most – cases, regardless of their governance.

Associated social, recreational, and economic benefits

All three case studies discussed the associated benefits of engaging citizens in coastal conservation activities. The interdisciplinary nature of social-ecological conservation lends itself to providing co-benefits beyond the realm of the environment. Helsingborg's stone reef, viewed by the Environmental Strategic Unit as a means of making the ocean visible to residents and fostering a sense of connection and stewardship [H2], provided value to the City Planning Department by improving the social value of the built environment (Helsingborg Stad, 2020c).

Providing space to explore, learn, and engage in artistic and educational activities was also recognized as contributing social value to the community [H2, M1, M2, K2]. Naturum Kosterhavet and Helsingborg's Havoteket Pavilion engage(d) marginalized societal groups such as refugees, fostering social inclusion [H2, K2]. A MEC interviewee also highlighted a positive social feedback loop relating to mental health: by providing practical tools to empower citizens to mitigate their environmental impact – by, for example, not flushing chemicals down the drain,

picking litter, or avoiding improper disposal of plastics – a sense of hope can be fostered [M3]. This hope can then act as a buffer to climate anxiety [M3]. Engaging citizens in their local nature was also connected to a sense of local pride and stewardship, prompting them to care more about the local nature [K2, K3, M3, H2].

Interviewees stated recreational values to be amongst the benefits of both some direct activities (e.g., snorkelling, beach explorations) and indirect activities (e.g., incentivising recreational use of the harbour by improving water visibility and biodiversity). Engaging the public in coastal marine conservation activities is encouraged through national outdoor recreation regulation (Petersson-Forsberg, 2014), thus the recreational value further incentivizes funding the organizations like Naturums, which are both nationally-owned and offer access to recreation.

The coast's economic value as a source for sustenance is also recognized by Helsingborg, primarily through its mussel cultivation project [H2]. The possibility of sustainable mussel cultivation in coastal areas provides a unique opportunity for municipalities to gain economic value from these spaces (e.g., by renting out allotments) [H2].

Knowledge development

The second driver is that of developing local knowledge. By conducting studies for academic purposes, students provide municipalities with a broader understanding of the social and ecological aspects of their communities. Both Helsingborg and the Marine Education Center have been involved with student research and benefited from data produced by thesis studies [H2, M3]. Limited time, personnel, and financial resources in municipalities means the effects of projects and activities cannot always be monitored, leaving little evidence of their benefits and costs [H2]. If this evidence can be provided through student researchers, municipalities and organizations can use it to gain useful knowledge about their investments, which could justify and endorse positively impactful projects [H2].

Collaborations

Collaborations were highlighted by all of the interviewees, with both external and internal counterparts. Collaborations offer unique possibilities to facilitate projects, providing opportunities for increased funding, knowledge sharing, and distribution of tasks. Helsingborg's Environmental Strategic Department actively collaborates with other municipal departments, such as Landscaping and City Planning, to facilitate activities that would otherwise be difficult to justify financially [H2]. Through cross-departmental collaborations, municipalities are able facilitate a broader range of activities with limited resources.

Collaborations with external organizations is also common amongst the three cases. Helsingborg collaborates with organizations and companies such as Naturums, local fishing organizations, and animal parks [H2]. Naturum Kosterhavet has an ongoing collaboration with the Kosterhavets National Park office, since the two organizations are integrated and operate from the same building [K3]. The collaboration allows for shared tasks like creating and maintaining the snorkelling trail, and sharing knowledge and resources on park management [K3].

Malmö's MEC has a wide array of collaborations with far-reaching benefits. The collaborations are primarily focused on developing and sharing knowledge and best practices in urban marine conservation, and are fostered with organizations like the Intergovernmental Oceanographic Commission of UNESCO and the University of Malmö [M1]. These collaborations, in addition to the progressive efforts of the MEC in advancing urban marine development, have made the center – and thereby the city – a key player in urban marine conservation.

Collaborations are extending beyond governments and organizations, modelling public participation-based conservation approaches. Helsingborg is exploring a collaboration with the public where resources are shared to enable mussel farming [H2]. The initiative will likely require resource commitments from both the environmental department (e.g., platform, sample analysis) and citizens (e.g., time) [H2].

Barriers

Funding

The only clearly identifiable barrier among the cases is a lack of funding. The facilitation and monitoring of activities requires resources, but consistent and adequate funding is limited. In the case of Naturum Kosterhavet, a recent cut to funding has limited some of the organization's operations, although the focus remains on promoting social-ecological interactions [K3, K2]. Helsingborg was able to facilitate a range of activities with H22 Expo funding, although beyond this, regular budgets are also limited [H2]. Lack of funding is one off the reasons the Environmental Strategic Unit has not yet been able to justify the monitoring of activities [H2].

Malmö's interviewees did not identify lack of funding as a barrier, claiming strong municipal support in addition to the funding from the Swedish Environmental Protection Agency for operating Naturum Öresund [M3]. Some marine development projects are externally financed through project grants, which allows the MEC to pursue activities beyond the requirements of funders [M3].

5.4 Success factors and learnings of citizen interaction activities

The fourth research question aims to identify the success factors and learnings from interaction-based activities, to allow for the development of best practices in this topic. Ten key points were highlighted by the interviewees relating to target audience, accessibility, operations, management, and governance. The points are outlined in more detail below.

1. Engage children and youth

All three case study locations have a strong focus on educating youth and children. Interviewees highlighted the importance of teaching ocean literacy to younger children, who have fewer notions of what can and can't be done [M1, M3]. Children are still forming ideas of how the world works, and there is an opportunity to teach them that caring for the oceans is the "norm" [M2]. This is reflected through interviewee testimonies of where they have seen change happen [M2, M3, K2, K3]. Examples were provided of children educating their families about ocean literacy in an effort to prevent unsafe disposal of plastics into the wastewater system (e.g., flushing cotton swabs down the toilet) [M3, K2]. One interviewee also highlighted that "someday those six-year-olds that we had here will became company leaders, policymakers, politicians. And they will remember. It might take a few years, but there will be ocean literate people on board" [M2].

2. Cater to school classes

All three cases have a heavy focus on providing activities to school classes. This enables for a unique learning opportunity for the students, while teachers are given support in reaching curriculum goals in a setting they may not be comfortable exploring on their own [M2]. Naturum Kosterhavet has made it a mandate to be open to all schools, with a specific goal of meeting all the school children in the local schools at least once during their time in primary and secondary school [K2]. The programmes for the school classes involve ocean literacy, as well as generalized understanding of why nature needs to be protected and how this can be done [K2]. Helsingborg, through the department for Environmental Education and Behavioural Influence, organizes "the water journey," which takes fifth year students on an educational tour of urban water journey [H1]. The last stop on the journey is the ocean, where students go on a boat tour, learn ocean literacy, and become more aware of the ocean's values [H2].

Academic targets from the Swedish curriculum can be met through ocean literacy and interactions with coastal areas [M2, M3]. The MEC is a prime example of this, as university students in teaching programs were consulted to ensure that the programs offered by MEC to schools met curriculum criteria [M2]. This alignment allows for a more unique learning opportunity for school children, and providing ocean literacy to students from preschool to university is a primary reason for Malmö's inauguration of the MEC [M2].

3. Provide access

Free access to activities makes nature – and related education and interactions – accessible for citizens. When asked about success factors of activities, the most consistent and frequent answer was related to accessibility: "it's free of charge, everyone can participate" [M2], "that we're free" [M3], "one of the hits was that [the Havoteket Pavilion] was for free" [H2], "there is no entrance fee" [K2].

4. Take advantage of events

Events can provide opportunities – both in terms of funding and in terms of public interest – to initiate projects and facilitate activities. Helsingborg's annual celebration of World Ocean Day promises educational, interactive activities that foster knowledge and awareness [H2]. The city's H22 Expo provided a much larger platform – and significant funding – to initiate projects, while encouraging innovation and collaborations [H2]. Leveraging events to create opportunities for interactions can thus improve the rate and reach of interactive activities.

5. Make it personal

The case study participants interviewed in this study all highlighted the importance of fostering a connection to the ocean [H2, M2, M3, K2, K3]. Making the coast personal, and capturing people's interest in their local coastal areas, allows for changed mindsets [H2]. According to what the Malmö MEC has seen from its visitors, people tend to have an interest in the coast – they just need to be given the opportunity and means to learn [M3]. Interviewees identified the importance of immersing in nature (e.g., through wading or snorkelling in the ocean, or observing species) to allow individuals to truly experience and appreciate nature's values [K3, H2, M3].

6. Foster innovation

Innovation is leading to creative and meaningful approaches to engaging citizens in interactive marine-based activities. Overly specific targets and goals can limit innovation and ambition [H2]. Employees in Helsingborg's Environmental Strategic Unit and Malmö's MEC both have the flexibility to pursue their own projects. For Helsingborg, this flexibility comes in the form of ambiguous department goals. While adherence to overarching environmental goals and targets is maintained, employees are able to interpret the goals into their own specialty settings (e.g., the marine environment), resulting in ambitious outcomes [H2]. The Port of Helsingborg provided funding for innovative ideas, and projects such as the Havoteket and living sea walls were realized [H2]. MEC employees are also able to pursue their own projects, granted they secure funding [M2]. This allows for a wider range of collaborations and outcomes for the Center [M2].

7. Test the waters

Helsingborg has been testing projects for feasibility and public interest before investing in long-term projects (e.g., Havoteket, mussel colonies) [H2]. This approach allows budgets to be used more effectively, as the concept of social-ecological marine conservation projects is still relatively new, and examples of successful projects and activities are limited. With innovative projects, testing activities temporarily to justify long-term investments allows for more impactful outcomes. Concept testing is more common for larger project investments, thus is particularly relevant to activities using the indirect approach.

8. Hire and support champions

The three case studies all had strong organizational leaders championing change. Helsingborg has at least one committed champion employee advocating for the ocean, ensuring coastal values are prioritized, and facilitating projects that enhance these values [H1, H2]. Naturum Kosterhavet's upper management champions have to be strategic in facilitating citizen interaction, as their funding depends on public engagement [K2]. The MEC would not be what it is today without its ambitious management securing funding, initiating projects, and fostering collaborations [M1, M2, M3]. When asked about the MEC leader's role in driving change, one interviewee answered: "the [Marine Education Center] wouldn't exist without him. I mean, the whole association wouldn't exist without him because he had his passion for the ocean. And I think that everyone – all seven of us working here – share this passion and love for the ocean … we all share the same vision and ideas. And I think that's also a winning concept" [M3].

9. Choose an ideal location

This study focused primarily on those activities that involved coastal features (e.g., snorkelling, beach exploration, boat tours), hence the location of the organizations is central. The two case studies with structural buildings where activities can be facilitated (MEC and Naturum Kosterhavet) both have locations on the coast. This is not the case for all Naturums or marine centers, and enables both locations to administrate activities where citizens directly interact with the marine environment. Some activities – such as the touch tank aquariums – do not require coastal proximity.

10. Streamline decision processes

Municipal decision-making can be drawn-out due to bureaucratic processes. For the MEC, reflective of non-governmental organizations, a major success factor is the top-down approach to administering conservation activities [M2]. This approach is critical in gaining support to make conservation interventions possible [M2]. Bypassing the bureaucracy of middle managers and strengthening relationships with the actual decision makers means projects can get approved and facilitated at a more rapid rate. The "top" in this sense can refer to municipal representatives, national authorities like SwAM, and global organizations such as UNESCO [M2].

One employee did express the need for scientific support of activities that alter the natural environment (through the indirect approach; e.g., installing artificial underwater shelters for fish) [H1]. In cases such as these, bureaucratic shortcuts should not constrain scientific processes.

6 Discussion

6.1 Pathways to conservation

This study aimed to understand the role of citizens in urban coastal marine conservation. It assessed the causal pathways to conservation outcomes of various activities from the perspective of activity managers and facilitators. Two main pathways were identified: the direct approach, which focuses on improving the environmental mindsets and behaviours of citizens, and the indirect approach, focused on improving the environment for the sake of citizens (e.g., creating aesthetically pleasing marine areas).

The direct approach

The first pathway involves organizing and facilitating activities for citizens, providing individuals with opportunities to engage with, learn about, care for, and connect with nature. As has already been outlined in Chapter 2, literature supports that this increased sense of connection to nature – as well as associated health, recreational, and social benefits – ultimately leads to conservation outcomes. The activities assessed in the study fall into three main categories: citizen science, education, and stewardship. The outcomes of the three categories intersect. For example, education is a secondary focus of the citizen science activity (i.e., Bioblitz) observed in the study, and thus contributes to the benefits of ocean literacy in addition to generating scientific data. Also, all three categories were found to lead to outputs in recreation and understanding the ocean's value. The program theory logic models were thus generalized, reflecting the extensive impacts. Although this makes exact links (e.g., guided beach tours to a fostered sense of local pride) less clear, it does provide an overview of the possibilities that organizations and municipalities like the MEC, Naturum Kosterhavet, and Helsingborg can explore for measuring impacts.

The direct approach to citizen interaction requires the continuous facilitation of activities, necessitating a continuous stream of resources. The benefits of interactive activities are supported by the literature however, and the associated benefits render it an integrated solution to a complex problem.

The indirect approach

The second pathway involves implementing conservation measures in coastal areas to improve ecosystem services, thus indirectly encouraging citizen interaction. The cities of Helsingborg and Malmö (through the MEC) have both invested in these measures – Helsingborg through the installation of a stone reef and living sea walls, and Malmö by re-shallowing developed harbour areas and planting eel grass. The aim of these projects is multifaceted, with both social and environmental outcomes. The logic model outcomes of the indirect approach include increased visitations to the revitalized marine areas, which overlaps with the direct approach (as found in Chapter 4.3). This intersection creates a positive feedback loop. Improving nature encourages people to interact with it, which can in turn improve nature. Naturally, there is also cause to believe that increased interaction may deteriorate nature (Wyles et al., 2014), but with organizations and governmental institutions acting as environmental agents to minimize harm to the ecosystems, these risks can be controlled.

Both approaches contribute to conservation outcomes, and this study aims to look at them holistically rather than compare them. This is done by identifying the different pathways and the way they intersect. Understanding these interactions can better allow planners, designers, and managers to facilitate the most environmentally effective activities.

6.2 Role of the education system

The main emphasis of current socially interactive marine activities with conservation outcomes is education. Programming for school classes is a major component of the MEC, Naturum Kosterhavet, and Helsingborg, likely due to the fact that education system is an obvious and accessible audience for ocean literacy – and a responsibility of Swedish municipal governments. The case study participants are able to engage students in a structured, organized group setting, while teachers are given support in reaching curriculum goals in a coastal environment – a setting they may not be comfortable exploring on their own [M2].

With studies showing the positive impacts of ocean literacy on awareness and pro-environmental behaviour (Steel et al., 2005; Tonin & Lucaroni, 2017), and the promising feedback from interviewees about the engagement and interest of students in ocean literacy programs that were found in the study, there is a strong argument to be made for including ocean literacy in curriculums. Sweden already has a longstanding tradition of caring for the environment, and this is reflected in its education system (Breiting & Wickenberg, 2010). Understanding nature and the impacts humans have on it is a recurring theme in the country's public-school curriculum (Skolverket, 2018). Although the responsibility of delivering the content rests with those in the education system, it is common for external organizations such as NGOs and foundations to provide educational activities outside the classroom. These "nature schools" provide students with the opportunity to experience nature outside the classroom (IOC & UNESCO, 2022). For many young Swedes, this is where ocean literacy starts. Publicly-funded organizations and institutions primed to facilitate interactive social-ecological coastal activities are positioned to provide ocean literacy education to students. The role that MEC plays in Malmö should be replicated in other communities, ensuring that the benefit potential – for the environment and beyond – is realized.

6.3 Methods of engaging the public

All three case studies focus on reaching the public in addition to students. Engaging the public is different than school classes, since there is no institutional incentive to provide ocean literacy outside the classroom. For all the importance placed on teaching ocean literacy to students, and given the environmental benefits of aware and knowledgeable citizens (as outlined both in literature and through the interviews), it is mystifying that more efforts are not in place to improve ocean literacy in adults. As coastal city populations expand, and with it their environmental impact, fostering a connection to the ocean becomes increasingly imperative.

This prompts the question of which necessary measures are dependent on municipal action and which measures are dependent on individuals. If fostering a connection to nature is critical in establishing necessary pro-environmental behaviours and mentalities, is it the responsibility of municipalities to foster this connection, much the same as it is to ensure that development projects mitigate environmental harm? Sweden has a long history of MSP planning and providing access to outdoor recreation. Certain nature-based activities are already funded and facilitated to engage the public. At what point does the responsibility of engaging in outdoor spaces and fostering a connection to nature fall upon the individual? It is difficult to discern this, although the inclusion of ocean literacy into school curriculums is a vital first step. For citizens not of school age, the responsibility must be shared. Offering accessible, visible methods of drawing citizens to coastal spaces is currently the responsibility of municipalities, while it falls upon the citizen to engage, learn, and improve.

Strategies on how municipalities can approach public engagement in the conservation of coastal areas are still in the early stages of development. This has not deterred the case study participants from engaging the public, however, and many of the same activities offered to school classes are also offered to the general public. All three case study locations focus heavily on ocean literacy through a variety of guided and independent activities. Guided activities can include snorkelling,

beach, and boat tours, sea safaris, and guided wading and observation, while independent activities can include renting snorkelling gear to swim the snorkelling trail, as well as interacting with touch tank aquariums.

The diversity of interactive marine activities that can be facilitated also allows organizations to cater to groups of people who may not normally go out into nature. Naturum Kosterhavet found that many of their visitors are well-educated and economically well-off, and have made accessibility to their island nature center a priority in order to welcome a wider range of visitors. Such efforts are crucial as it has been shown that making nature accessible to everyone, regardless of economic status, decreases the inequalities inherent in nature accessibility (Singleton, 2021).

Respondents also emphasized the importance of focusing on local communities. The Swedish Environmental Protection Agency has explicit goals for Naturums (including Naturums Kosterhavet and Öresund) relating to creating community spaces and engaging locals (Naturvårdsverket, 2015). All three cases provide programming to local schools, with the understanding that individuals will grow proud of their local nature and foster a stronger connection to it. This concept is supported by the literature, which found that place attachment is stronger in locals and allows for a more critical understanding of threats facing these areas (Tonin & Lucaroni, 2017).

6.4 Consistent practitioner understanding

An interesting observation from the findings is the consistent number of outputs and outcomes identified in the logic models. The outputs and outcomes totalled 20, 20, and 21 in each logic model. Respondents primarily had similar answers (e.g., changed mindset, changed behaviour, fostered sense of pride/ownership, fostered sense of curiosity), with some deviations (e.g., changed diet, individually-driven continued education) that resulted from specific educational activities or opportunities (i.e., internship positions, progressive marine development projects). This indicated that organizations generally have a similar understanding of the impacts of engaging citizens in interactive activities. It could also indicate that this research adequately covers the outputs and outcomes of interactive coastal-based activities, and that a general level of data saturation has been achieved.

6.5 A need for monitoring

All three case studies recognized a need to measure and monitor the impacts of activities. Helsingborg's Environmental Strategic Unit is planning to do a follow-up assessment of the state of the municipality's marine areas. This will provide some inputs into how the areas have changed, and whether the various efforts to restore ecosystem services and build community awareness and support for ecosystems have had an impact. Attributing changes in marine conditions to specific activities is not possible however, as marine areas can be influenced by a wide number of other factors (e.g., restoration projects in nearby areas, improved wastewater treatment practices, changes in currents from nearby offshore projects, policy changes reducing pollution from ships). Ecological measurements and monitoring should therefore be combined with qualitative research on changes in the knowledge, behaviour, and mindsets of participants after engaging in interactive activities. Having empirical data validating positive correlations between the activities and positive conservation outcomes (or the causal links connecting them) will further support the justification for public investment into interactive activities.

6.6 Reflections on research approach and results

Organizations like the MEC are not common in Sweden, and municipal approaches to marine planning and conservation vary between localities (Enander et al., 2008). The cases included in this study are not an adequate representation of all of Sweden. Naturums in general take great

initiative in caring for nature, as many are located in national parks, and all Naturums are required to engage with visitors. Not all Naturums are located directly on the coast however, thus only a few have the ability to integrate marine-based activities. Helsingborg is considered a progressive city, and the recent H22 Expo has significantly boosted the activities facilitated by the city. Without the event and its corresponding funding, the activities facilitated through this event would not have occurred. The MEC is the largest municipal organization of its kind, and sets a precedent rather than the serving as a representative example. Since this thesis aims to understand rather than compare, this is not a relevant factor; however, it must be noted that these cases may not be reflective of the general sample of activities offered across Swedish coastal cities.

This research is an underrepresentation of the number activities offered by the case studies.
All three case studies involved activities that did not directly engage citizens with the marine areas. The Malmö Marine Education Center, for example, provides school programs where classes are met on up to three separate occasions. Often one or more of the sessions take place in a classroom, where representatives of the center might discuss ocean literacy or show videos. In the center there are also a range of auditory, tactile, and visual activities to engage in, and visitors can even taste the different salinity levels of water bodies. Naturum Kosterhavet engages people through video presentations, exhibitions, and a range of hands-on activities at the Naturum. Helsingborg City has hosted lectures and land-based activities involving microscope observations, educational sheltered seating areas, and habitat-building art projects. These activities do not involve the direct interaction value in terms of curriculum support, but the value provided by the MEC, Naturum Kosterhavet goes far beyond these impacts. This study is therefore limited in its scope and generalizability.

A limitation revealed throughout the process of data collection that may have an impact on the breadth and detail of interviewee responses was the language barrier. Although all respondents spoke good English, the meaning of the questions was at times misunderstood, or examples had to be provided to give context. Examples could introduce bias and skew responses from the respondents, while miscommunications sometimes resulted in missing information.

Another notable point to highlight is that this research has also focused primarily on the positive impacts of human interactions. However, there are also negative impacts of increasing human interactions with natural areas. These should be considered and weighed against the benefits in any individual case. This thesis does not aim to draw results about the effectiveness of the interactive social-ecological activities offered by the case study participants however, as this requires contextual user and ecological data. Rather, this paper has aimed to explore and understand these activities and how they are perceived to be related to conservation outcomes. In the greater scheme of things, this research has identified causal links, explored current literature related to these links, identified the divers and barriers for municipalities to invest in these activities, and gathered learnings from past, current, and future projects.

7 Conclusions

As biodiversity rates continue to decline, and coastal urbanization continues to increase, the paradigm of conservation in urban areas needs to evolve. Current global, regional, and Swedish national policies relating to coastal marine management are not sufficient enough to compensate for the declines in ecosystem services – including biodiversity (Naturvårdsverket, 2023; Ströimbäck et al., 2013). Swedish municipalities hold the responsibility of coastal marine planning, which is included in comprehensive municipal plans. This decentralized approach has resulted in inconsistency in the completeness and ambition levels of coastal planning, however (Enander et al., 2008).

Coastal cities have a rare opportunity to improve conservation outcomes while advancing social, recreational, and economic goals. The aim of this research is to support healthy coastal marine ecosystems with the capacity to deliver ecosystem services by understanding how citizen interaction activities are contributing to conservation outcomes. Research questions aimed to identify examples of coastal citizen interaction activities supported by Swedish municipalities (RQ1), as well as how they were linked to conservation outcomes (RQ2). The research then explored which drivers and barriers influenced municipal support for these activities (RQ3), and what success factors and learnings can be applied to improve the effectiveness of current and future activities (RQ4).

The research shows that municipalities are pursuing a range of different activities that leverage citizen interactions with the marine environment. Activities were categorized as being either direct (i.e., directly facilitating interactions between individuals and coastal marine areas) or indirect (i.e., improving coastal marine areas to encourage citizen interactions).

Direct activities were found to relate to education, stewardship, and citizen science. Education – or ocean literacy – is by far the most prominent activity type, and is directed both at school classes and the general public. Research respondents identified a clear connection between the activities and conservation, linked by moderators such as a fostered connection to nature, a fostered sense of local pride, changed behaviour, changed mindsets, and increased awareness. The links are based primarily on informed assumptions, and have not been measured or monitored to empirically determine their effectiveness.

The indirect activities were fewer, but presented an interesting perspective. Because improvements to environments, such as installing stone reefs or re-shallowing harbours, can encourage future citizen interaction, the benefits of the indirect approach are multifaceted. First, restoring or enhancing ecosystems can improve the deliverance of ecosystem services by, for example, providing habitats for marine species. These improvements will add social and recreational value to the spaces as well, enabling a second source of benefits. The second set of benefits comes from the activities that utilize the direct approach mentioned above. The interconnectedness of two sets of benefits boosts the potential of these projects to have an impact on conservation.

This research has identified a number of divers for municipalities in supporting both direct and indirect activities. The more influential of these include the associated health, social, recreational, and economic benefits of activities. With a clear need for action to conserve coastal biodiversity, and extensive benefits reaching beyond the ecological realm, the time is ripe for municipalities to invest in interactive activities with conservation outcomes. The case studies have provided an understanding of the best practices in this context, and are not representative of Sweden. Much work is yet to be done, and with recent national budget cuts to nature conservation in the country, there is an urgent need to engage citizens, raise awareness, and foster stewardship and advocacy.

7.1 Practical implications and recommendations

The results of this research aim to assist municipalities, practitioners, and researchers with planning, facilitating, and evaluating activities that leverage citizen interaction as a means to achieve conservation outcomes. For municipalities, this research outlines a method of advancing towards sustainable development, and provides a list of activities currently being pursued by different organizations and institutions as a guide for replicating similar efforts. It maps out the policy environment of these interactive activities in the contexts of MSP and urban planning, and highlights the gap in planning for citizen engagement beyond the planning process. This research also outlined the drivers, barriers, success factors, and learnings of these activities. By understanding why interactive activities are beneficial to support, and what factors to consider for increased effectiveness, activities can be better understood and facilitated.

Practitioners gain similar benefits as municipalities: increased understanding of interactive activities and their potential contributions to conservation, justification for public funding (i.e., drivers for activities), and success factors and learnings to support the design, planning, and facilitation of current and future activities. The use of program theory also presents the activities in a way that is conducive to evaluation by identifying links that can be monitored and measured.

For researchers, this study demonstrates the application of program theory for mapping the pathways between social-ecological projects and activities and conservation outcomes, and how current activities are perceived to contribute. This research may serve as a starting point for further research exploring the role of citizen interaction in coastal conservation.

7.2 Recommendations for future research

This study has created a map of linkages for future studies – or practitioners – to verify through monitoring and measurement tools. The use of program theory allows for a clear understanding of which assumptions can be tested and explored further. Key drivers for municipalities to support these activities are outlined to provide justification for increased funding or project development.

Participants were able to draw connections to their activities and environmental outcomes, indicating that practitioners consider citizen interaction to have a positive impact on the environment. Much of the current research supports positive environmental impacts resulting from environmental education and fostering connectedness, as is outlined in Chapter 2. The impacts of the activities in this study have not been monitored and measured however, and the causal pathways are based on assumptions and current research. Study participants did see the value in monitoring, but lack the resources – namely time and finances – to measure impacts. Data verifying the assumptions made by practitioners would bolster the justification for public investment into these social-ecological activities, and contribute to a rapidly growing field of knowledge.

Although environmental measurements and monitoring can contribute reliable information supporting causal links, measuring change in humans is difficult, and may be accompanied by validity challenges with self-reporting (e.g., the knowledge-action gap: people may understand pro-environmental behaviour, but may not act on this knowledge). The validity of monitoring impacts thus needs to be addressed in order to effectively understand the impacts of citizen interaction as a tool for conservation.

This research has explored the activities that involve direct interactions with coastal environments. However, the opportunity to visit coastal areas is not a realistic option for many. It would be beneficial for future research to determine the role of off-site ocean literacy, and how it compares to on-site educational activities. It would also be valuable to understand whether direct contact with the marine environment (e.g., wading and netting in shallow areas, picking letter from the

beach) provides greater benefits to conservation outcomes than activities such as looking at aquariums or looking at different species through microscopes. Research on these two topics could uncover the most effective ways to teach ocean literacy in coastal areas, as well as non-coastal areas where the ocean is a more abstract concept.

Another question born from this study is whether governments realize the potential of achieving environmental conservation-related goals through public interaction activities. Since these activities have many associated benefits, including health, recreation, and social inclusivity, it is unclear whether environmental outcomes are driving these activities. MSP and urban planning in Sweden are the responsibility of municipalities, and local governments should be aware of the environmental benefits of social-ecological conservation activities.

Lastly, a major challenge faced in this research was finding municipal representatives responsible for marine conservation activities. Even in large cities like Stockholm and Gothenburg, the search for a representative was unsuccessful. Gaining an understanding of marine governance responsibilities in municipalities would illuminate the current state of MSP governance in municipalities, and facilitate the sharing of knowledge and best practices between municipalities and researchers.

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Appendix

A. Participant consent and information form

Information sheet and consent form for online interviews

Thank you for showing interest in being part of this Master's thesis research project. Involvement in this research is completely voluntary. The hope is that this research will not only contribute knowledge to the field of urban conservation planning, but that participants will gain insights and new perspectives to their projects as well. The following section aims to provide all the necessary information for you to make a decision about participating in the research.

Project information
This thesis research is conducted as part of my fulfilment of the Environmental Management and Policy Master's programme at the iiiee at Lund University. This project does not have any external support or influence, and was chosen based on personal interest.

This research aims to understand how citizen interaction with urban coastal marine areas is helping to achieve biodiversity conservation goals. Since coastal cities are more frequently developing and re-developing coastal marine areas, the role of citizens in marine conservation is changing. Marine conservation has typically focused on minimizing human interaction and activities – but what if the marine area is part of a city?

Opportunities arise for cities to both improve the seascape and to address citizen health and well-being by investing in projects that improve marine ecosystems. This research looks at the ways that this is currently done: what is the role of citizens in coastal marine conservation? And in what ways are projects engaging the public? Four to five projects and organizations in Sweden offering activities to citizens that in some way provide benefits to coastal marine biodiversity will be interviewed in order to answer these questions.

It's also important to understand how exactly the interactions aim to contribute to improved marine biodiversity. To figure this out, I will use a concept called "program theory," which can be used to identify the steps between an activity (e.g., interacting with a touch tank) and improved biodiversity. These steps are often based on assumptions, which is not necessarily a bad thing since they can be based on common knowledge. However, to ensure a project is operating as effectively as possible, it is important for practitioners to understand what these assumptions are. This research does not aim to evaluate whether these assumptions are true or not, but rather to see whether the steps between activity and biodiversity outcome are complete.

After looking at the practitioner's perspective, the research will also look at four large coastal municipalities in Sweden. How are the municipalities supporting these types of projects? And why are they – or aren't they – investing in them? This will provide some insights into motivations for investing in urban marine conservation projects.

Lastly, the research will compile the success factors and lessons that have been gained from practitioner and municipality perspectives to provide guidance for current and future projects.

What happens to the data collected from interviews?
For ethical reasons, the following information will explain how data from interviews will be collected, processed, and stored.

Participants will again be asked for consent to record at the beginning of the interview. If the participant agrees to be recorded, the Zoom recording will be converted into a textual transcription using the software "Trint", which will then be checked for accuracy and saved on a password-protected computer and external hard drive. As soon as it has been converted to text, the recording will be deleted. The transcription will be anonymized with an identification number, so that it does not include any personal participant information. The participants have the right to request the transcription and request editing of errors. Names are kept confidential, and interviewees will be identified by their position in their affiliated organization. The transcripts will be kept on an external hard drive for one year following the submission of the Master's thesis.

Participants have the right to request withdrawal from the research any time before May 1st without question or reason. As soon as I am notified (through the contact information listed below), your respective recording and/or transcription will be deleted.

Consent form
I, the undersigned, have read and understand the information provided above. I consent to being interviewed, and understand that what I say in the interview will contribute to the Master's thesis described above. I understand that my name and contact information will be kept confidential, although absolute anonymity is not guaranteed since my affiliated organization or project will be stated in the research.

Please sign below to confirm your consent:

Participant name:
Date:
Signature:

Researcher information
Name: Martine Deinum
Contact: ma8618de-s@student.lu.se; +46 72 015 8652
Institution: International Institute for Industrial Environmental Economics (iiiee), Lund University
Project: Master thesis research exploring how citizen interactions are contributing to urban coastal marine conservation in Sweden

B. Interview protocol

Note: this interview protocol is based on a sample provided in Creswell & Creswell (2018, p. 267). Interviewees will be asked one of two sets of question ("questions: case study projects" and "questions: case study municipalities") based on their role.

Interviewee:

Time:	Audio reference:
Date:	Confirmed consent:
Location:	Confirmed recording:

Introduction

Thank interviewee for agreeing to be interviewed
Introduce my name and affiliation with Lund University
Provide brief overview of thesis topic

- Understanding the role of citizen interaction in coastal marine conservation and how it contributes
- Understand the projects from the perspective of both practitioners and municipalities
- Identify barriers and drivers for these projects from municipality perspective

Reminder that interview should take approximately 1 hour

Recording

Confirm consent to record, remind that video recording will be deleted within a week
Ask if there are any questions before recording begins
Start recording

Questions: Case study projects

[opening] Please tell me about your role in the organization. How are you involved in the project?
[project/organization focus] In order to better understand the focus or your project/organization, what problem(s) do you feel your organization/project is addressing?
[project/organization goals] Does your organization/project have any explicit goals relating to solving these problems?
[prioritization of project/organization goals] Do you feel the project/organization is more strongly committed to one of these goals? Is one more prominent for any reason? (i.e., political, funding requirements, etc)

[RQ1] How is your organization contributing to these goals? (i.e., which activities)

- Prompt: educational, direct engagement, person-to-person interactions, tours, lectures, audiovisual media, sensory

[RQ2] For each activity:

- What factors to you believe are key to bridge the activity with conservation outcomes?
- What do you think people will gain from participating in the activity?
- What do you think will change after people participate in the activity?
- How do you think conservation will be improved through the activity?

[RQ2a] Are any monitoring tools being used to determine the impact of your project/organization on conservation?

- What is being measured/monitored?
- Does it relate to a specific activity?

[RQ3] Is your project/organization being funded? If so, by whom?

- What does this funding structure look like?
- Which municipality?
- Is the municipality providing support in other ways?

[RQ4] What factors have led to positive/intended/unintended outcomes?

- Prompt: practical, management, funding, support, etc

[RQ4] What have you learned while working with this project?

Closing questions

Is there any part or aspect related to the implementation of your project that we *haven't* talked about that you would like to highlight or that is important?

Is there any project documentation you would be able to share with me that is not currently publicly available? (e.g., project proposal, project management plans, annual reports)

Do you know of any other projects in Sweden that use citizen interaction to improve conservation outcomes?

- Has this been important for your own project? (Prompt: as a reference, inspiration, model)

If you mentioned any literature or referenced any other projects/material, could you please send me the names/links?

Closing remarks

Stop recording

Ask interviewee if they have any questions

Thank interviewee for interview

Offer to provide an abstract of the final study