UNIVERSITY OF GOTHENBURG

DEPARTMENT OF MARINE SCIENCES

# THE ROLE OF THE SEA IN AN INNOVATION ECOSYSTEM

## A case study of blue community gardens

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# Abstract

Innovation ecosystems (IESs) describe the interactions and co-evolvement of actors that enable innovation. The purpose of this thesis is to explore the concept of IESs in a context where the biological ecosystem and ecosystem services are vital elements. The thesis investigates what values that can be generated from different actors collaborating around cultivation, promotion and utilization of edible resources from the sea, in accordance with the idea of IESs. It also seeks a more holistic understanding of IESs, by investigating the role of nature (in this case specifically the sea) in the context. This is done using the case of an ongoing project regarding the development of a blue community (BCG) garden in Strömstad, and actors involved in the network are interviewed. The research questions are approached by exploring the theoretical framework of IESs and adjacent concepts and analysing them in relation to the empirical results, in line with the idea of abductive reasoning. Findings suggest that several values can be generated from the collaboration, such as access to new knowledge, improved reputation and stakeholder relations, and reduced environmental impact. Another way of understanding these values is by grouping them into the ecosystem services classification of providing, regulating, cultural and supporting services. Additionally, the findings reveal that the role of nature in the innovation context is fundamental, but not sufficiently represented in the theoretical framework of IESs or in the BCG network. It is therefore suggested that more holistic viewpoints should be embraced – in theory as well as in practise.

# Popular scientific summary

The concept of blue community gardens (BCGs) is based on small-scale cultivation of food in the sea. In recent years, the phenomenon has spread, especially in Denmark, and other Nordic countries are now following suit. In Strömstad on the Swedish west coast, the municipality has initiated a network that works towards establishing a BCG in the central harbour. A diverse set of actors from different sectors are involved, collaborating towards a platform where innovative and sustainable ways of producing seafood can be showcased. This collaborative and innovative setting corresponds to the concept of innovation ecosystems (IESs), which is used to describe the interactions and co-evolvement of actors that enables innovation. In this thesis, the network working towards a blue community garden in Strömstad is used as an example of an IES. Through interviews with the involved actors, it is investigated what values that can be generated within such contexts.

Innovation can be considered influenced by and sensitive to the natural environment. This becomes especially evident in the context of BGCs, which is based on utilisation of sea resources. This thesis further investigates the role of nature in the innovation context, by recognising the biological ecosystem as a vital element of the IES. As a part of this, an attempt is made to understand the values that the IES generates, in terms corresponding to the original meaning of ecosystem services.

The findings reveal that benefits regarding new knowledge, stakeholder relations and reduced environmental impact are examples of values that can generate from collaborative use of the sea. The findings also confirm the fundamental role of nature in the innovation context, but that this aspect is not sufficiently represented in the current theoretical framework of IESs. It is therefore suggested that definitions of IES more explicitly should embrace more holistic viewpoints. The purpose of doing this goes beyond solely recognising what the sea can provide in the BCG context and the community of Strömstad. The sea could provide human society with resources to an extent far beyond what we utilize today, which calls for innovative and mobilising ways to transform supply chains and promote awareness around sea food potential. This thesis has indicated that IESs might be what is needed in order to achieve this, but if that potential is to be maintained, the role and values of the sea needs to be actively recognised, both in theory and in practise.

# Acknowledgements

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Furthermore, my research has fundamentally benefitted from interactions with the network planning for a blue community garden in Strömstad, led by Ingela Skärström, Leon Eriksson and Richard Holm, as well as involved actors who functioned as respondents and contributed with valuable results to this thesis.

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Anna Axelsson,
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# 1. Introduction

## 1.1 Background and problem discussion

With the sea accounting for half of the earth's biological production, it is positioned with considerable potential regarding global food provision (Costello et al., 2020). Despite this, issues such as food security are mainly treated through the terrestrial production point of view and only about 2% of our daily per capita calorie intake is generated from the sea. Consequently, there is a need to recognise the potential of using marine edible resources to feed a growing world population, requiring a 70% increased protein need by 2050 (European Union, 2017). This calls for innovative and mobilising ways to transform supply chains and promote awareness around sea food potential. One way of facilitating local and national food-security and self-sufficiency is through community gardens (Bennett, 2020). A concept that is currently being tested at Tjärnö Marine Laboratory in Strömstad, Sweden, is blue community gardens (BCGs), which are based on the idea of sea-based cultivation of food for private, public and/or collective use. The pilot facility is managed within the interregional project *Marint Gränsforum Skagerrak*, that aims at promoting marine business development in Skagerrak (Lundgren, Morf & Cedergren, 2020). The municipality of Strömstad is also planning a larger facility in the central harbour, with the purpose of showcasing innovative and sustainable ways of producing seafood, but also to promote collaboration among local aquaculture actors.

This innovative setting, with a diverse set of actors collaborating, align with the idea of *innovation ecosystems* (IESs). The concept has emerged within innovation and adjacent fields as an alternative to traditional ways of describing economic activities (Jacobides, Cennamo & Gawer, 2018). It builds on the concept of *innovation systems*, according to which cooperation among different actors and sectors is a success factor for innovation (Freeman, 1982; Lundvall, 1985). Stemming from biology, the ecosystem aspect describes the interactions and co-evolvement of actors that enables innovation (Ibid; Moore, 1993). The innovative success is determined by the level of collaboration (Su, Zheng & Chen, 2018), as well as creation and diffusion of knowledge (Hekkert, Suurs, Negro, Kuhlmann and Smits, 2007; Mercan & Göktas, 2011). In turn, a thriving ecosystem structure enables a higher degree of value creation (Li, 2009). It is the actors within the IESs that generate value, but it happens as a response to demands both within and outside the system (Fulgencio, 2017). The values

generated are determined by the interactions taking place, rather than operations of a single firm (Fulgencio, 2017; Adner & Kapoor, 2010).

According to Battistella, Colucci, De Toni & Nonino (2013), both tangible and intangible relationships are included in an IES, meaning both monetary and social/cultural values. However, values often tend to be discussed in financial terms, and there is a lack of research on the social aspect (Fulgencio, 2017). Consequently, this thesis takes on both the monetary and social approach, but also the ecological, since innovation can be considered influenced by and sensitive to the natural environment (Carayannis & Campbell, 2010). In the biological context, utilities generated from ecosystems are referred to as *ecosystem services*. These benefits are fundamental for human society, spanning from material goods to psychological contentment generated from nature (Daily, 2003; Reid & Mooney, 2005). Building on the idea of describing innovation through an ecosystem perspective, the thesis applies an interdisciplinary approach by applying the concept of ecosystem services within the IES context. Combining a traditionally economic and social oriented topic with elements of ecology could enhance a holistic understanding of IESs, beyond solely monetary values.

## 1.2 Purpose and research questions

The purpose of this thesis is to explore the concept of innovation ecosystems (IESs) in a context where the biological ecosystem and ecosystem services are vital elements, in order to generate a more holistic and ecologically sustainable understanding of the concept. The potential of value creation through different actors collaborating around cultivation, promotion and utilization of edible resources from the sea is investigated. This is done using the case of an ongoing project regarding the development of a blue community garden (BCG) in Strömstad. Thereby, the thesis aims at answering the following research questions:

RQ1: What values can be generated from collaborative use of the sea, in accordance with the idea of IESs?

RQ2: What role does nature (in this case specifically the sea) have in an IES, based on the values identified in RQ1?

The research questions are approached and answered through abductive reasoning, by exploring existing theories and analysing them in relation to empirical findings from qualitative interviews. The core of the analysis is the theoretical framework of IESs, knowledge and knowledge management, value creation and ecosystem services.

# 2. Theoretical framework

## 2.1 Innovation systems

With globalisation and advancing technology, the importance of innovation for the economy and development has increased. This has resulted in a growing need to also understand its mechanisms, including technology and investments combined with cultural and institutional factors (Mercan & Göktas, 2011). Not solely involving product development in single firms, innovation can be considered the forming of settings enabling innovative performance (Etzkowitz, 2003). Analysing innovation as an interactive process was first introduced by Freeman (1982), according to whom success within the concept of innovation is often found in coupling of different sectors. Informal settings where information can flow over long time periods is also considered a beneficial factor. Similarly, Lundvall (1985) broadens the way of viewing innovation as single events, by approaching the concept as a cumulative process of accumulated experience and knowledge. This is also a progress from viewing the innovation process as linear, starting with research and ending in economic growth, or demand as the leading factor stimulating innovation. Instead, a system of innovation is highlighted, where units from research and development as well as the production side, and the ones in-between, are affected by each other's activities and influence the innovative performance. It is even stated that elements of collaboration are involved in the most important innovations (Lundvall, 1985).

## 2.2 Innovation ecosystems

Building on innovation systems, the idea of ecosystems has emerged within business, entrepreneurship and innovation. Moore (1993, p. 76) introduces the concept by saying that "in a business ecosystem, companies co-evolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovation.". Reviewing and synthesising previous definitions of the concept, Granstrand and Holgersson (2020, p. 3) define the IES components as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors.". As evident in both these definitions, IESs are characterised by their components constantly evolving.

The ecosystem term originally stems from biology, where it describes the system of interactions in-between species as well as with their physical environment, and a thriving ecosystem correlates to species diversity and adaptation (Mercan & Göktas, 2011). Accordingly, the biological metaphor in the context of economy intends to describe a system of actors interacting and depending on one another's activities (Jacobides et al., 2018), as well as their surroundings (Moore, 1993). Carayannis and Campbell (2010), refer to this as societal ecosystems of interactions between actors and nature and according to Moore (1993), it is not possible for innovation businesses to evolve in vacuum. Just like species thrive from making use of sunlight, nutrients and other natural resources, a business ecosystem depends on factors such as capital, demand, and benefits from innovation (Ibid.). Companies recognising collaboration before pure competition are also more likely to be resilient against unforeseen events, just like biological ecosystems benefit from co-evolution (Moore, 1996).

As emphasised by Moore (1993), there are also shortages to the IES concept. In contrast to biological ecosystems, social systems of innovation and knowledge are complex and characterised by socially dynamic factors such as unpredictable choices and decisions – not purely co-evolving organisms (Ibid.; Papaioannou, Wield & Cathaway, 2009). Not explicitly referring to the concept of IESs, Etzkowitz (2003) similarly asserts that social evolution is determined by conscious intervention and formation of institutions, unlike the mutations and natural selections that drives biological evolution. However, the ecosystem perspective in innovation is still useful. It can be viewed as complementing the regular innovation systems approach, in describing the link between events and structures of innovation (Mercan & Göktas, 2011). The dynamics of ecosystems are better suited for describing adaptions after new circumstances that defines innovation and that evolves with changing conditions on the market (Ibid.).

## 2.3 Innovation and knowledge

Hekkert et al. (2007) as well as Mercan and Göktas (2011) assert that creation and diffusion of knowledge determine the level of innovation. This in turn is highly dependent on collaboration, through contexts enabling exchange of information and a heterogenous set of actors from different sectors in innovation networks (Ibid.). According to Carayannis and Campbell (2010), innovation applies knowledge and can be viewed as the fuel of bringing it into the economy and society. Successful innovation also requires different types of

knowledge (Ibid; Metcalfe & Ramlogan, 2008). Demarest (1997) distinguishes commercial from philosophical and scientific knowledge. Rather than "what is right", commercial knowledge reveals "what works" or "what works better" in competitive and financial terms. Another division is between tacit, shared and embodied knowledge. While tacit and shared knowledge are held by individuals and groups, respectively, embodied knowledge is made formal, explicit and distributional through, for instance, products and services or business practices and culture (Ibid.). Lundvall (2007) claims that a prerequisite for innovations to reach the market is experience-based learning, also referred to as learning by doing, using and interacting. Networks, participation of employees and competence building to acknowledge both tacit knowledge and accumulated organisational experience are necessary for innovation. It is also a way to recognise human resources and not only the quick and mobile knowledge characterising our globalising world (Ibid.).

Traditionally, creation of knowledge is coupled with the research function of universities (Carayannis & Campbell, 2010). Etzkowitz (2003) elaborates on viewing the innovation process as interactive rather than linear, when describing the *Triple Helix* concept. Building on the biological description of the double stranded DNA-structure (double helix), the term refers to the increased involvement and active participation of universities in innovation, positioned in making academic knowledge useful in governance as well as industrial production. The traditional role of the government is to provide solid interactions and exchange through contractual relations, whereas industry serve the producing function. However, the triple helix structure represented by industry, government and academia, symbolises not only interactions in the knowledge-based process that facilitates innovation, but also the increasing tendencies of partly taking each other's roles (Ibid.). This parallel coupling of sectors is a facilitator for new innovation networks and knowledge clusters (Carayannis & Campbell, 2009), where innovation is the linkage between production and application of knowledge (Carayannis & Campbell, 2010).

Building on the idea of a helix for describing innovation, additional structures have been proposed. Carayannis and Campbell (2009) suggest a fourth segment to account for culture-based, values-based and media-based public, resulting in a *Quadruple Helix*. This illustrates how innovation systems are impacted by culture and values (Carayannis & Campbell, 2010). Again, adding onto the quadruple helix, one more aspect of the model is proposed by Carayannis and Campbell (2010), where the natural environment is represented as the fifth helix (figure 1). This *Quintuple Helix* presents a framework of analysing innovation and

knowledge as influenced by and sensitive to nature. In decision-making regarding knowledge, innovation and environment, this model can serve as reference. As expressed by Carayannis & Campbell (2010, p. 52), its application requires involvement of perspectives from natural and social sciences as well as humanities: “Research questions and problem-solving in relation to ecology, the environment, environmental changes and environmental protection, increasingly depend on interdisciplinary and transdisciplinary network configurations of different knowledge and innovation modes.”. In this thesis, the idea of nature as a determinator for innovation is used to investigate what role the sea has in an IES.

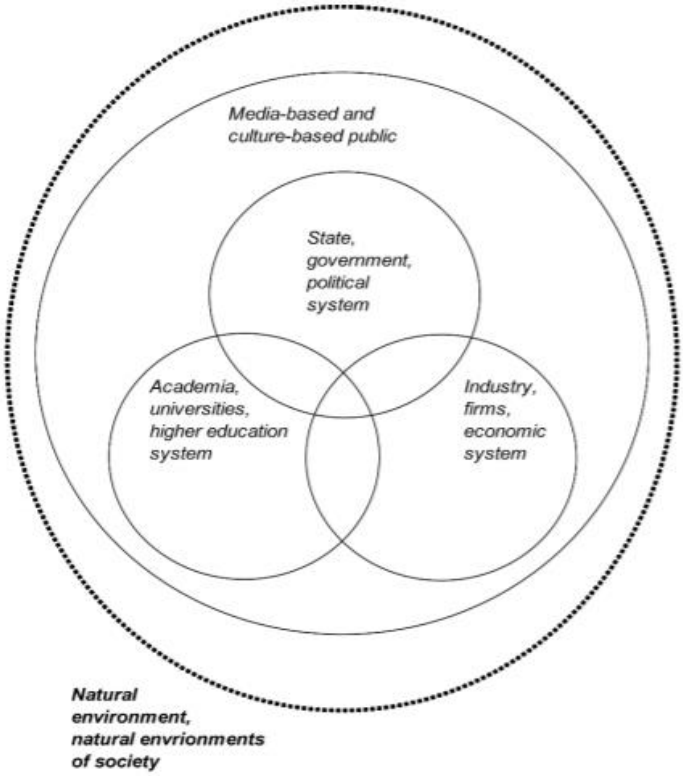


*Figure 1. The Quintiple Helix model (Carayannis & Campbell, 2010, p. 62)*

## 2.4 Knowledge management

Statements from Mercan and Göktas (2011) about innovation being dependent on creation and diffusion of knowledge, as well as Lundvall (2007) about recognising human resources, illuminate the importance of knowledge facilitating strategies. Due to this importance, this thesis uses the theory of knowledge management to investigate how knowledge can be created, identified and utilized within the IES.

Production and use of knowledge, or the flow of innovation, spans wide over society and the same person or institution can constitute both producers and users of knowledge (Carayannis & Campbell, 2010). Knowledge management concerns the action of actively recognising and utilising the ability, experience and judgement existing within and outside an organisation, thereby creating value (Ruggles, 1998). This could involve recognising the capability of people in solving a problem, before turning directly to rely on technology (Ibid.). For instance, sustainability related knowledge may often be found inherent in experiences, interactions and skills of human actors, rather than solely directives, documents and products (Vorakulpipat & Rezgui, 2008). Production and use of knowledge naturally occur in units like organisations and firms, but according to Demarest (1997), what distinguishes knowledge management is whether there exists an explicit objective associated to knowledge. In other words, it involves systematically managing the unit's knowledge resources by processes such as identifying, organising, applying and optimising them (Ibid.; Schiuma, Carlucci & Lerro, 2012). According to Ruggles (1998) applying a knowledge management perspective enables, for instance, generation of new knowledge, use of already available knowledge, facilitating growth of knowledge, and embedment of knowledge in processes, products and/or services. Improving efficiency within an organisation often means capturing, accessing and transferring already existing knowledge. To achieve growth, on the other hand, it is rather activities of generating new knowledge that are essential (Ibid.).

Knowledge management is a fundamental part of continuous innovation capacity, by revealing sources of potential (Demarest, 1997). According to Rezgui (2007), the social conditions facilitated by knowledge management, tying a team together, can potentially result in both increased value creation (Chapter 1.3.5) and innovation. Beside the aspects of generating and exchanging knowledge, Vorakulpipat and Rezgui (2008) therefore proposes value creation as an additional aspect of knowledge management. This means an approach aiming at full satisfaction and value of the customer, employee and society, by placing the customer and performance of product and services in centre (Ibid.). According to Schiuma et al. (2012) knowledge management enables an organisation to develop knowledge resources, whereas value creation is realised through products and services possessing value. In achieving this, formal and informal meetings and teamwork are examples of essential factors (Ibid.).

## 2.5 Value and value creation

The concept of value can be handled from a range of perspectives, spanning from abstract analysis to more practical contexts (Hirose & Olsen, 2015). In philosophy, it entails ethics through discussions of what is good and bad, metaethics in studying the nature of value, as well as fields such as epistemology and religion (Ibid.). A common division of value on the philosophical level is between intrinsic and extrinsic value. Intrinsic value is solely dependent on internal circumstances of the bearer, meaning for its own sake, whereas extrinsic value is determined and justified in relation to external factors (Rønnow-Rasmussen, 2015).

Apart from philosophy, value theory is also immensely relevant in economic contexts (Hirose & Olsen, 2015). The meaning of value is essential to customers and business, due to its centrality in economic activity (Ng & Smith, 2015). However, Hart and Milstein (2003) address that creating sustainable value requires recognition of not only economic, but also social and environmental benefits. Consequently, the holistic approach and purpose of this thesis inevitably also entails these aspects. The importance of including the social aspect is strengthened by Battistella et al. (2013), claiming that values within the context of IESs relates to both intangible and tangible relations, meaning both monetary and social/cultural values. The qualitative and non-monetary rather than quantitative construct of social value makes it a subjective matter (Murphy et al., 2014), and it is theoretically more complexly defined than economic value (Hazy, Moskalev & Torras, 2010). Social value generated by an organised activity can be defined as "the net benefit that accrues to all stakeholders including those in future generations" (Hazy et al., 2010, p. 135).

Some suggest that solutions to environmental problems exist in approaches and processes imitating markets, such as the natural environment and its resources being monetarily valued (O'Neill, 2017). By offering a universal yardstick comparing benefits and costs (values) of different policies, this aligns with the utilitarian approach of choosing actions that generate the greatest total value. However, the question is whether all dimensions of value relating to environment can be met using money as a measurement (Ibid.). The opposite perspective overlooks the human point of view and treats the issue of ecosystem health through a perspective of intrinsic value (Reid et al., 2005). According to O'Neill (2017, p. 229), rational solutions regarding the environment requires recognition that "there are a number of distinct intrinsically valuable goods, such as autonomy, knowledge, justice, equality and beauty which are irreducible either to each other or to some other ultimate value.". Drawing from today's global challenges, Hart and Milstein (2003) similarly address the need for businesses to

realise that driving shareholder value does not have to contradict environmental sustainability. Instead, the challenges can aid both aspects by identifying aligning strategies. One example is involvement of and interaction with external actors, aiming at decreasing environmental impact across the value chain and facilitating legitimacy and reputation (Ibid.). Murphy, Arenas and Batista (2014) as well, claim that value-based motivations can include benefits beyond the monetary and still result in competitive advantage. They define value in collaborative contexts as:

> […] benefits including, but not limited to, access to new knowledge, expertise, or networks; increased financial or technological resources; improved legitimacy, reputation, and name recognition; improved stakeholder relations (including increased employee mortale and retention); reduced environmental impact; and increased consumer patronage – all of which may lead to competitive advantage of one sort or another. (Murphy et al., 2014, p. 147-148)

The identification of values in this thesis is based on this definition, and groups values by means of these suggested benefits.

Ritala et al. (2013), address that value creation in the context of IESs can be enabled though shared goals and visions, often communicated through joint activities such as forums and labs. Maintaining collaboration and knowledge sharing through projects and other established structures is essential as well. This often creates an environment of "coopetition", meaning presence of both competition and collaboration among a set of actors, which is considered value creating (Ibid.). Caldwell and Roehrich (2017) distinguish value based on whether it is created for the private firm (economic value) or for a community or society (social value). This seems to contradict with Singh and Kathuria, 2017, according to whom social value creation can occur both internally and externally, meaning that the benefits can concern actors within a given system, such as employees, as well as external actors such as customers. Therefore, this thesis considers creation of values concerning both actors within and outside the established BCG network. This does not exclude benefits accrued in other aspects, such as on community level and for future generations. Relevant in the context is also the statement by Caldwell and Roehrich (2017), that in collaborative settings, value creation refers to outcomes that would not independently be achieved.

## 2.6 Ecosystem services

As described, the system of interactions between species, including animals, microorganisms and plants, as well as with their physical environment, constitutes an ecosystem (Reid et al., 2005; Mercan & Göktas, 2011). The interactions are of a dynamic nature and the pressures they are exposed to by human activities, in turn has consequences for human society. That is because the benefits derived from ecosystems, known as ecosystem services, are fundamentally essential for human well-being and survival (Reid et al., 2005). Daily (2003, p. 3) defines ecosystem services as "the conditions and processes through which natural ecosystems, and the species they make up, sustain and fulfil human life", indicating it as a prerequisite for sustainability. There are different aspects of the ecosystem services, spanning from production of material goods to provision of aesthetic and cultural benefits (Daily, 2003).

In the Millennium Ecosystem Assessment, carried out between 2001 and 2005, ecosystem services are investigated in terms of how they affect human well-being, which is made up by *security*, *basic material for a good life*, *health* and *good social relations* (Reid et al., 2005) (figure 2). A fifth constituent, that is impacted by the other ones, is *freedom of choice and action*. The services are classified as follows:

- *Provisioning*, which includes food and other material products derived from natural ecosystems.
- *Regulating*, meaning the benefits that we obtain from climate regulation, water purification and other regulating processes.
- *Cultural*, considering non-material benefits that we can experience through ecosystems. This includes aesthetic, cultural heritage and educational values; recreation, social relations and sense of place; among other things.
- *Supporting*, refers to more subtle benefits occurring over comparably longer time periods. These are crucial for the other services to function and in the natural environment concerns processes such as photosynthesis and nutrient cycling. Depending on time scale, a service can also be classified as being both regulating and supporting (Ibid.).

Developing and elaborating on the idea of describing innovation through an ecosystem perspective, this thesis will build on the Millennium Ecosystem Assessment framework to investigate how values generated through collaborative use of the sea in an IES can be classified and understood in accordance with the presented categories. These findings will be used to analyse how IESs are coupled with nature, in order to understand what role the sea has in the context.

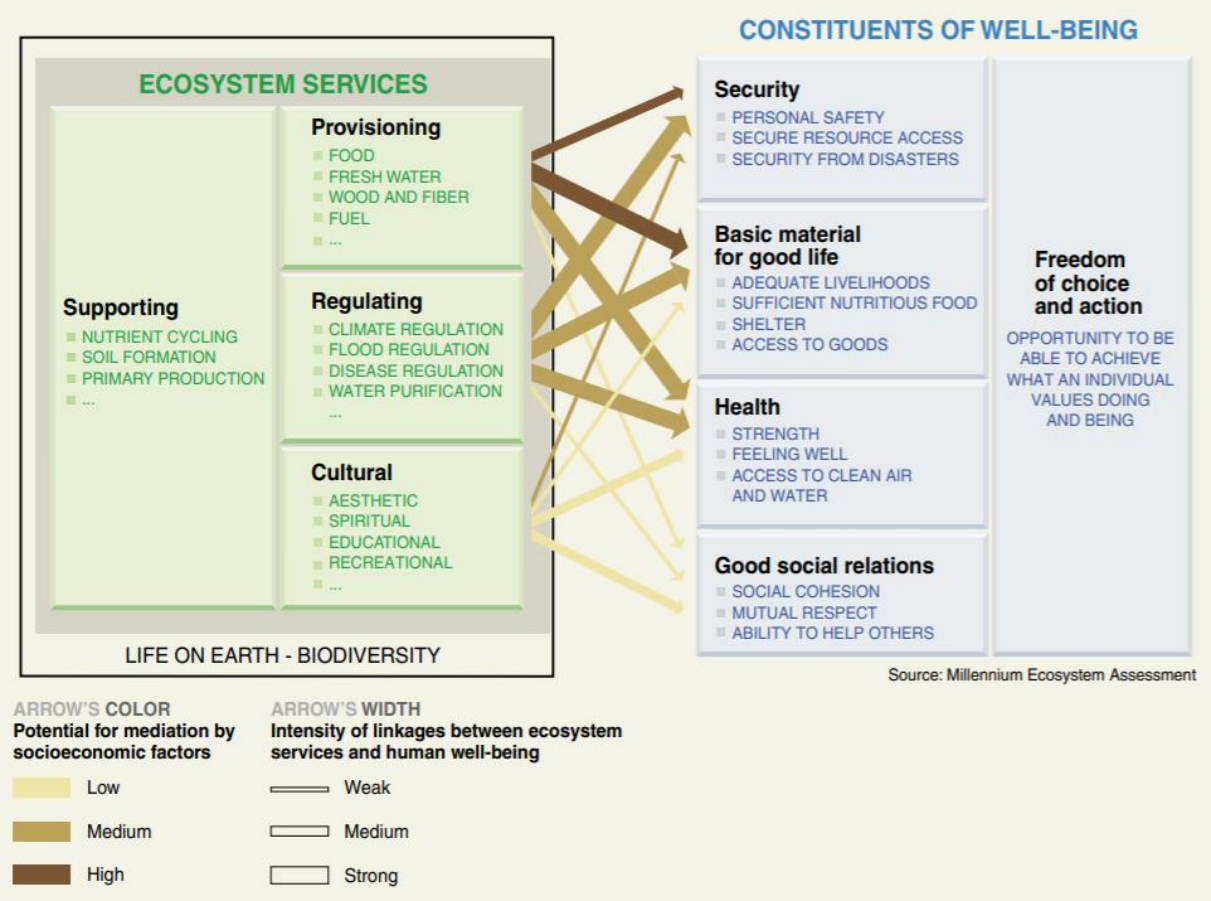


*Figure 2. Ecosystem services and how they affect human well-being (Reid et al., 2005, p. VI)*

# 3. Methods

## 3.1 Research design

According to Carayannis and Campbell (2010) studying sustainability and the interactions between human society (culture) and the material world (nature) require interdisciplinary analysis, which is applied in transdisciplinary problem-solving. More specifically, and relevant in the context of this thesis, a transdisciplinary framework can aid to integrate social and environmental ecosystems. By returning to the original meaning of ecosystems and ecosystem services, applying the concepts in an innovation context and thereby combining a traditionally economic and social oriented topic with elements of biology, this thesis applies such interdisciplinary analysis. A holistic approach is also attendant, since it is also investigated how collaborative use of the sea can contribute with different kinds of values – environmental as well as economic and social. A qualitative approach is regarded favouring, since that kind of research is generally characterised by an interpretivist viewpoint of understanding mechanisms through investigating participants' worldviews (Bryman, 2012). By claiming social structures to be shaped by human interactions rather than self-sufficing, it also takes on a constructivist approach.

The research questions were approached by exploring the theoretical framework of IESs and adjacent concepts and analysing them in relation to empirical results from interviews, in line with the idea of abductive reasoning. According to Bryman (2012) such an approach is suitable when the empirical starting point is the language, meanings and perspectives of the people providing data. The approach differs from pure inductive logic, in that the theoretical understanding is grounded in the worldview of the participants (Ibid.). Abductive reasoning applies a course of action where empirical and theoretical findings gained throughout the work, allows an evolving framework of the research. Rather than generating new theories, the aim is to develop existing ones (Dubois & Gadde, 2002). Since the thesis aims at finding junctures between theory and empirical findings, it also includes elements of deductive logic (Bryman, 2012).

The idea and theory of IES was considered appropriate to approach by using the BCG case, in order to generate a reality-based understanding of the concept. Case studies are suitable when seeking contextual and in-depth insights of an empirical phenomenon (Dubois & Gadde, 2002; Tracy, 2020). According to Flyvberg (2006, p. 221), "the case study produces the type

of context-dependent knowledge that research on learning shows to be necessary to allow people to develop from rule-based beginners to virtuoso experts". It is also a strategy of exploratory nature (Rowley, 2002), which aligns with the purpose of this thesis. It should be noted though, that case studies can also be disadvantageous concerning lack of rigour and objectivity (Ibid). In combination with the subjectivity of value as a concept (Murphy et al., 2014), bias among respondents as well as the author of this thesis cannot be excluded. Factors such as personal assumptions, loyalty to the represented organisation and that respondents were not randomised could possibly skew the qualitative results. As a single case study, the applicability could also be impacted by the focus on one network in a geographically limited area, characterised by local conditions. However, these limited number of units studied still generates a large extent of detail (Rowley, 2002), which is why a case study was considered the most appropriate strategy in the context.

## 3.2 Choice of case

The concept of blue community gardens (BCGs) is based on the idea of sea-based cultivation of food for private, public and/or collective use. Inspired by the small pilot plant at Tjärnö Marine Laboratory in Strömstad, Sweden, and the Danish project *Havhøst*, the municipality of Strömstad is planning a larger facility in the central harbour. The Danish example constitutes a network of companies, NGOs, schools and the general public, that collaborates around cultivation of seafood with basis at a physical platform in Copenhagen (Havhøst, n.d.). They also collaborate with other locally based farming associations. Besides cultivation, operations include education as well as spreading of their message through, for instance, campaigns and events. Thereby, the main purpose of Havhøst is to facilitate sustainable development by bringing people closer to the sea and enhance understanding of blue ecosystems and marine resources (Havhøst, 2020). Similarly, the purpose of the planned facility in Strömstad is to showcase sustainable ways of producing seafood, but also to promote collaboration among local aquaculture actors. These innovative and collaborative elements align with the idea of IESs, which is why the planned community garden and the network of actors surrounding it are considered a suitable case in this thesis. It also illustrates linkages between the sea and human society and is therefore considered suitable to also investigate the role of the sea in an IES.

## 3.3 Methodology

Literature on innovation ecosystems, IESs, ecosystem services and knowledge management were retrieved through the database of Gothenburg University Library and Google Scholar, sorting on relevance. Different combinations of specific search words where used, such as *innovation system(s)*, *innovation ecosystem(s)*, *value creation*, *knowledge management* and *ecosystem services*. Selected papers generally take on an introducing approach to the concepts and papers span from authors that first brought the concept into scientific literature, to more recent ones, in order to receive a wide comprehension of the fields.

In order to answer the research questions, the network working towards a BCG in Strömstad was used as case, representing a meeting point where economy, society and nature unite. Prior to the semi-structured interviews, the author participated in a digital network meeting of actors interested and involved in the planning of a BCG. At this meeting, the author had the chance to present the background, concept and purpose of the thesis, and invite actors to in-person interviews. This initially unstructured methodology was considered beneficial in order to introduce the actors to the process. Since the meeting also included informal briefing and discussions, it was also a way to familiarise the author to the actors and the context. Since everyone involved in the network could not participate at that specific time, the network coordinator also e-mailed meeting notes to all actors, with information about the possibility to participate in the study. Actors were then contacted personally by e-mail and/or phone to schedule an interview. The network includes a diverse set of representatives from the private sector, the public sector and academia/education. A sample was made to get an even distribution with three respondents from each sector. This resulted in respondents from two service/tourism companies (called *tourism actor 1* and *tourism actor 2*) and one sea farming company (*aquaculture actor*); two representatives from the municipality of Strömstad (*municipality actor 1* and *municipality actor 2*) and one from Kosterhavet National Park (under the County Administrative Board; *national park actor*); one marine biologist (*marine biologist*) and one researcher on seaweed aquaculture (*seaweed researcher*) from Tjärnö Marine Laboratory and one teacher in mathematics and physics from Strömstad Gymnasium (*teacher*).

*Table 1. The distribution of interview respondents from different sectors*

| **Sector** | **Respondent** |
|---|---|
| Private | Tourism actor 1<br>Tourism actor 2<br>Aquaculture actor |
| Public | Municipality actor 1<br>Municipality actor 2<br>National park actor |
| Academia/education | Marine biologist<br>Seaweed researcher<br>Teacher |

All interviews were carried out digitally, through the videotelephony platform Zoom. Similar to the overall framework, the approach of the interviews was qualitative, which tends to generate a richness of detail and nuance that is less demonstrated in quantitative interviewing. Semi-structured interview technique was applied, which adds flexibility and enables adjustments of the process, such as follow-up questions and interviews (Bryman, 2012). In accordance with guidelines for semi-structured interviews, a general interview guide was followed (Appendix), while also leaving room for follow-up, interpreting and specifying questions from the interviewer as well as the interviewee (Ibid.). The questions in the interview guide were divided into seven topic areas. In Topic area 1, the respondents were allowed to introduce themself, the organisation and how the interest for a BCG was awakened. Topic areas 2-5 investigated the different components of an IES, defined by Granstrand and Holgersson (2020, p. 3) as *actors*, *activities*, *artifacts* and *relations* (Chapter 1.3.2), whereas Topic area 6 investigated the role of the sea in an IES. The interviews were rounded off with an outlook on the future of BCGs. Eight interviews were carried out in Swedish and one in English. When a quote in Swedish was considered relevant, it was translated using Google Translate. It was also retranslated to avoid misconceptions on the part of the author.

## 3.4 Analysis

All interviews were recorded with consent from the interviewee and transcribed verbatim. The material was then reviewed and findings that were considered relevant from an IES perspective were marked. To answer RQ1, concerning what values that can be generated from collaborative use of the sea, the findings were first grouped in accordance with the three sustainability pillars (social, economic and environmental values). However, there were difficulties in separating distinctive values into these three categories, since especially social and economic were found to be closely interrelated in the context. Hence, findings were rearranged, and values were instead grouped based on the definition presented by Murphy et al. (2014, p. 147-148), which was considered more appropriate for the empirical findings. According to this definition, values in collaborative settings include benefits such as: "new knowledge, expertise, or networks; increased financial or technological resources; improved legitimacy, reputation, and name recognition; improved stakeholder relations (including increased employee mortale and retention); reduced environmental impact; and increased consumer patronage.". These successive reorientations of analysing the material can partly be explained by the complex and subjective matter of understanding value as a concept. However, allowing the theory and case analysis to evolve alongside the empirical findings during the process, is also a part of abductive reasoning (Dubois & Gadde, 2002). If the analytical framework evolves based on new insights and observations, it can widen the empirical as well as the theoretical understanding, since these are interdependent (Ibid.).

It should also be noted that separating the empirical results into the categories presented by Murphy et al. (2014), revealed that the respondents addressed some values to a larger extent that others. Hence, as evident in the next chapter, the length of the paragraphs differs and values that respondents focused more on were grouped into subcategories while others were not. Examples of subcategories are "diversity of knowledge", "benefits for the local community" and "importance of clear structures". This uneven distribution is partly because the definition presented by Murphy et al. (2014) was not initially used for designing the interview guide. Rather, the interviews focused on values from collaborative use of the sea in more general terms. However, the distribution is mainly explained by the fact that respondents emphasised some values to a larger extent than others.

Based on how Carayannis & Campbell (2009 & 2010) highlight the importance of nature in innovation contexts, it was considered crucial to also in this thesis investigate if and how this

importance is reflected in the BCG context and in the theoretical framework of IES. One analytical tool for analysing the empirical results was the Millennium Ecosystem Assessment classification of provisioning, regulating, cultural and supporting ecosystem services (Reid et al., 2005). The classification was used to illustrate how the societal ecosystem (the IES) is coupled with, and can be understood through the lens of, the biological ecosystem. Parallel to analysing and grouping the identified values in RQ1, it was therefore investigated how these can be understood in accordance with this original (biological) meaning of ecosystem services. This formed basis for answering RQ2, regarding what role the sea have in an IES, together with the overall findings from RQ1. Additionally, besides analysing the empirical findings, the IES definition presented by Granstrand and Holgersson (2020) was used to investigate if and how nature is represented in the theoretical framework of IESs. The analysis of RQ2 generally followed a more uniform process, since questions in the interview guide were more explicit and upfront concerning this matter (Topic area 6, Appendix), compared to questions regarding values.

# 4. Findings

## 4.1 Values from collaborating in an IES

Values that were addressed by the respondents, mainly concerned access to new knowledge, expertise, or networks; improved legitimacy, reputation, and name recognition; improved stakeholder relations; and reduced environmental impact. Hence, these are grouped into subcategories (figure 3).

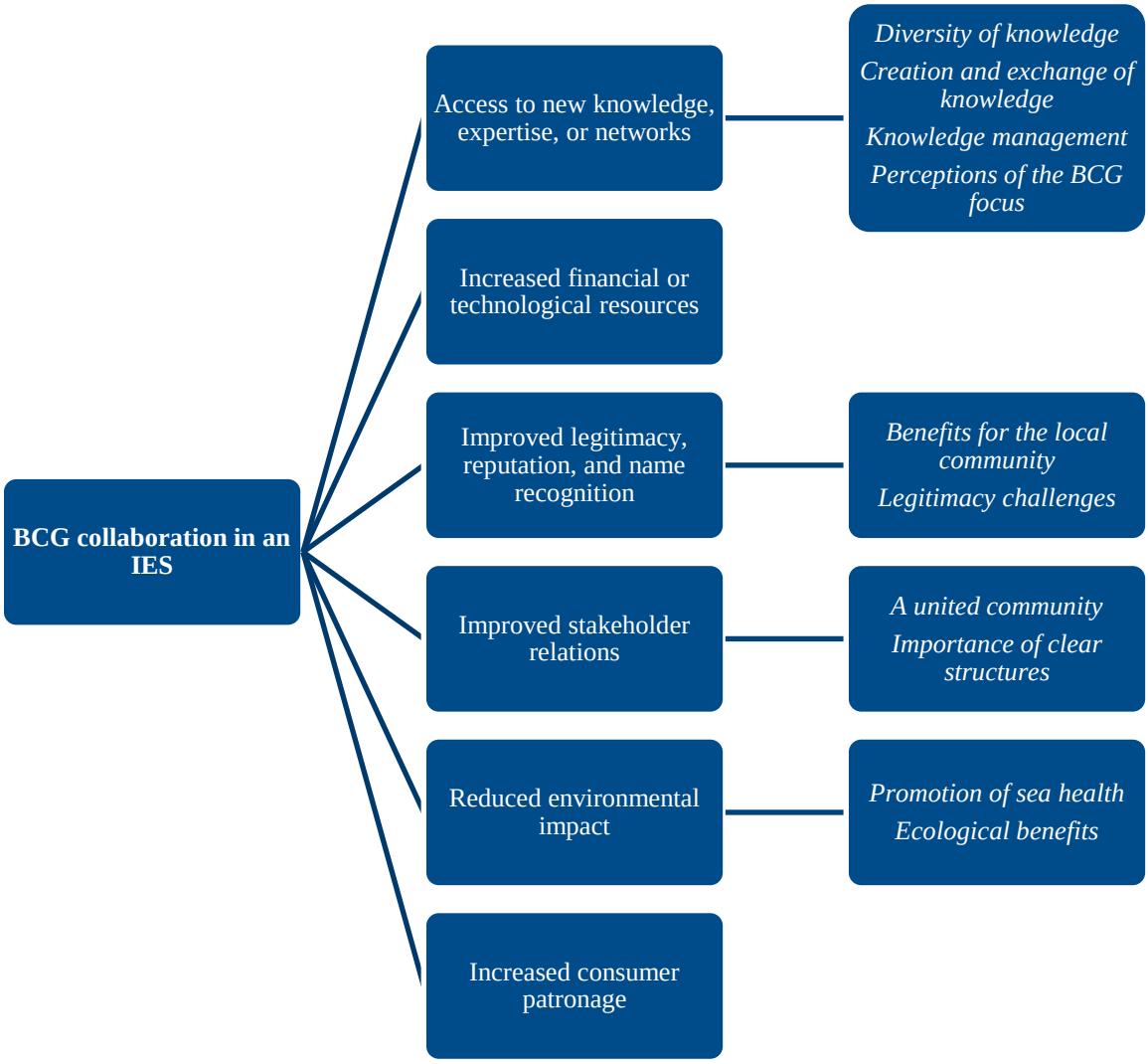


*Figure 3. Values that can generate from collaborating around a BCG in Strömstad, in accordance with the idea of an IES (own figure). The ones that were mainly addressed by the respondents include subcategories (italicized).*

### 4.1.1 Access to new knowledge, expertise, or networks

The interviews revealed that collaborating around a BCG would be a possibility to enfold and recognise the diversity of knowledge among the actors, as well as in the local community.

These benefits can be considered correspondent to supporting ecosystem services, since creation and diffusion is crucial for innovation (Hekkert et al., 2007; Mercan & Göktas, 2011) and hence also the other values these findings reveal that innovation brings. However, a knowledge management perspective is required if the concept should strive towards increased innovation and value creation (Demarest, 1997; Rezgui, 2007), as well as commercial growth (Ruggles, 1998). Value creating coopetition also requires dialogue to ensure shared visions of the concept (Ritala et al., 2013).

#### *4.1.1.1 Diversity of knowledge*

Knowledge is regarded one of the main values that could be generated within a BCG concept. As tourism actor 1 expressed it: "there can be a lot of knowledge that is spread between different disciplines and many different areas.". Regarding what competences the different actors possess, that the network could benefit from, the findings reveal diversity. Several respondents identified themselves and the represented organisation as communicators of knowledge. They also recognised the potential of collaborating for diffusion of knowledge. For instance, the national park actor described how the actors can collaborate to spread information in different forms and media formats. The respondent described how the BCG could be inspired by other local actors, arranging boat trips where passengers participate in and learn about catching crayfish or lobster, followed by cooking and dinner on board. Relating to this, tourism actor 2 described that the company possess the right competence to "eventify" projects like this, by packaging the concept combined with boat trips, guiding and similar, in cooperation with accommodation facilities and other relevant actors.

The role of the municipality, as described by the respondents, was rather of coordinating character by tying different actors and interests together. Coupling different sectors and making them learn from each other is a main goal according to the municipality respondents. One of them also mentioned that there are a lot of different competences within the municipality of Strömstad, that could be useful within the concept, such as construction. All respondents from the public sector also elaborated on how companies such as restaurants and tourism operators could be involved in different ways. Municipality actor 1 mentioned knowledge tourism, and the national park actor speculated in a scenario for tour boat operators:

> They could also work up a knowledge so that they can tell more about things when they pass, for example, algae cultivation out here and other things. Then it is not just that

> you stand outside this facility and work, but that you highlight aquaculture in general […]. (National park actor)

Tourism actor 2 described how the company could contribute with knowledge resources regarding development potential in the tourism sector. Such knowledge regards access and logistics that needs to be in place for tourism activities to operate functionally. Tourism actor 1 considered the transferring of knowledge from research to different target groups as crucial. Similarly, municipality actor 1 addressed the importance of including actors that knows about marine life and raw materials. Respecting and understanding what kinds of species can and cannot be cultivated locally was underlined by the marine biologist. According to both the seaweed researcher and the marine biologist, such biological understanding, as well as basic aquaculture methodology, can be provided by the university. They can also provide knowledge about aquaculture methodology, together with the aquaculture sector.

The diverse expertise and knowledge of the different sectors, described by the respondents, corresponds to how it is described in the literature, with knowledge of commercial and scientific as well as philosophical character. The answers from the aquaculture and tourism actors (the private sector) align with how Demarest (1997) defines commercial knowledge. Rather than expressing "what is right" it is focused on "what works" in terms of competitive advantage (Ibid.). Accordingly, entrepreneurship activities often catalyse innovation and, if knowledge and resources are shared, spread similar activities to other organisations (Simatupang, Schwab & Lantu, 2015). Since entrepreneurs concretise knowledge, networks and markets into new business opportunities (Hekkert et al., 2007), the commercial sector is essential in the IES. This is exemplified by how tourist actor 2 describe the ability of the company to package the BCG concept into events.

The traditional role of the government is to provide solid interactions and exchange through contractual relations (Etzkowitz, 2003), which translates to how also the municipality and the national park actor (the public sector) expressed their roles as coordinators and communicators of knowledge. The triple helix model describes the increased involvement and active participation of universities in innovation, positioned in making academic knowledge useful in governance and industrial production (Etzkowitz, 2003). This as well, corresponds to how the academic sector viewed their role in the IES, which was mainly focused on essential scientific knowledge. Respecting and understanding the needs of the sea, also touches upon

the philosophical issue of value (Rønnow-Rasmussen, 2015), which is further investigated in chapter 3.2, concerning the role of the sea in an IES.

Overall, these findings shows that a diversity of knowledge and expertise exists among the actors, as well as willingness to utilize the variety of competence. This in turn indicates that eligible conditions exist, for an environment within the network where new ideas can evolve, since the level of innovation depends on creation and diffusion of different kinds of knowledge (Metcalfe & Ramlogan, 2008; Carayannis & Campbell, 2010), among a heterogenous set of actors (Hekkert et al., 2007; Mercan & Göktas, 2011).

#### *4.1.1.2 Creation and exchange of knowledge*

Several respondents expressed optimism regarding the possibility to learn from other actors within the BCG network. Tourism actor 2 quoted a local marketer: "he said that 'you can never get a German, French or an Englishman to go north to swim'.", indicating the necessity of common innovative solutions. The marine biologist highlighted the value of bringing together people with different kinds of knowledge and from different generations, with the common denominator of being interested in the sea. This could include companies, universities, the public sector, NGOs, pensioners, students and other local inhabitants.

The marine biologist also mentioned the value of identifying and generating a shared understanding, not only about existing knowledge, but also about what kind knowledge is lacking. For instance, a longing to learn more about sea urchins could appear during a meeting, revealing that such knowledge is lacking. Then the network might be able to invite someone with that kind of competence. Tourism actor 2 similarly highlighted the benefits and importance of different sectors communicating each other's experiences:

> I always tell the researchers that you should listen to the fishers. But you should not listen to what they say because they use the expression "It goes to hell!". […], it is exactly the same thing they [researchers] say, it is just that you talk in different ways. (Tourism actor 2)

The teacher asserted that without an established network it is difficult to know what other people are up to, which could possibly inhabit generation of new ideas and opportunities. Accordingly, the marine biologist claimed that in order to cooperate you have to identify the needs and wishes of each actor respectively. The seaweed researcher had a similar view: "This is a new concept, and nobody has any experience, so it's good to pile up people in that way.".

Sustainability related knowledge is often found inherent in experiences, interactions and skills of human actors and knowledge management involves recognising the capabilities of people solving problem, before quick solutions such as technology (Vorakulpipat & Rezgui, 2008). This is especially important in times of globalisation, characterised by quick and mobile knowledge (Lundvall, 2007). This illuminates the importance of recognising non-traditional knowledge, which could involve local inhabitants such as pensioners, as suggested by the marine biologist. This could be particularly relevant in a town like Strömstad, which has a long tradition and culture of fisheries (Västsverige, n.d.), from which tacit knowledge can be enfolded and made formal by engaging local inhabitants (Demarest, 1997). Statements by the marine biologist as well as tourism actor 2, according to whom it is highly relevant to include competence and experiences from local inhabitants, fishers and other external actors, makes this evident.

#### *4.1.1.3 Knowledge management*

The addressed recognition and utilisation of knowledge, referred to as knowledge management (Ruggles, 1998), entails the importance of explicitly identifying what knowledge each actor in the network has, as well as what knowledge is lacking, as addressed by the marine biologist. These social conditions to tie a team together and reveal potential sources of knowledge within a network, can result in both value creation and increased innovation (Demarest, 1997; Rezgui, 2007). To achieve growth and reach the market, it is also crucial to focus on activities that generate new knowledge (Ruggles, 1998), for example through experience-based activities (Lundvall, 2007). The preconditions for achieving this within the BCG network are good, considering that actors and activities within an IES should be of evolving character (Granstrand & Holgersson, 2020).

Supporting ecosystem services are crucial for making the other ecosystem services function properly (Reid et al., 2005). The corresponding value within a BCG and IES context, is argued to be knowledge and how it is created, recognised and utilized. That is because innovation is highly dependent on creation and diffusion of knowledge, which in turn is dependent on collaborative settings (Hekkert et al., 2007; Mercan & Göktas, 2011). Knowledge management enables development of knowledge resources, whereas value creation is realised through products and services possessing value (Schiuma, Carlucci & Lerro, 2012). This means that the benefits from provisioning, regulating and cultural IES services would not be retrieved without the diversity of knowledge that a BCG could contribute with.

However, in opposition to biological ecosystems, IES cannot depend on natural selection and similar processes to remain functional (Papaioannou et al., 2009). This indicates that an intact BCG would require strategies of knowledge management, such as an explicit objective related to knowledge as well as formal and informal settings and teamwork (Demarest, 1997; Schiuma, Carlucci & Lerro, 2012). That would facilitate organising, optimising and similar processes related knowledge management (Ibid.). This is fundamental for continuous innovation capacity and can also increase the value creation (Demarest, 1997), which suggests that it could reenforce the benefits from IES services.

#### *4.1.1.4 Perceptions of the BCG focus*

The national park actor asserted that a main focus within the BCG should be possibilities for actors operating along the food chain. If the concept was arranged so that one could actually go out and harvest for the dinner, it would be a crucial advantage, according to the respondent. Therefore, the respondent claimed, the centre of gravity should perhaps be Tjärnö Marine Laboratory, in order to ensure that what is produced in the BCG is sustainable and scientifically based. On the contrary, municipality actor 1 and the marine biologist illuminated that the main purpose of the concept, rather than cultivating, is to showcase and collaborate around sustainable food production, thereby creating interest and knowledge about the sea and its resources. However, according to the marine biologist, the concept could have a food provisioning function in the future. The aquaculture actor also mentioned how seaweed can be used for production of bioplastics and animal feed.

According to municipality actor 1, a possible breakthrough for the concept would be for the municipality to fully realise its potential and orchestrate the implementation of BCGs. This could be done by setting aside physical space that is not covered by beach protection legislation, in the blue comprehensive plan. The aquaculture actor, on the other hand, claimed that the essential factor for breakthrough would be to establish cooperation with larger companies. The respondent addressed a gap in relation to the food industry, regarding knowledge about their needs and standards. Such knowledge is, according to the respondent, needed to commercialise seaweed and the values that seaweed has. Similarly, tourism actor 2 claimed that for the local and small-scale production to function, it needs to be preceded by a commercial breakthrough. Hence, the actors of the BCG would benefit from connecting with larger commercial actors:

> It is an ugly way of talking […] because it means that you also commercialize down to the community garden, but if you do not get in that way, the development on the other side will not accelerate. (Tourism actor 2)

These findings illustrate that collaboration of actors from different sectors can result in different perceptions of how an operation could or should be carried out, or what its main purpose is. It should be noted though, that the different perceptions are not necessarily colliding. For instance, the ideas of how to achieve a BCG breakthrough could possibly be realised parallel to each other. As defined by Granstrand and Holgersson (2020), the actors and the other components of an IES are always evolving. This indicates that the different perceptions and opinions that exist within the network, could be used to learn and develop common insights from. This illuminates the importance of a dialogue concerning shared visions, which can be communicated through joint activities (Ritala et al., 2013). Such efforts can form a good basis for value creating coopetition (Ibid.).

However, suggestions of cultivating food and possibly also other material goods, such as bioplastics and animal feed, also shows potential of the BCG in providing society with material goods. Even if this is a long-term matter that would require comprehensive upscaling before serving society-level impacts and benefits, it can be considered a provisioning ecosystem service (Reid et al., 2005). Besides basic material for good life, this also relates to issues of security, such as secure resource access (Ibid.).

### 4.1.2 Increased financial or technological resources

Findings reveal that collaborating around a BCG could enfold a diverse set of physical resources, possessed among the interviewed actors. Human power is a resource that the national park could provide, through arranged activities and information packages in collaboration with other actors. Tourism actor 1 described that they could provide physical space for different activities related to the BCG, such as cooking and education. The respondent from the aquaculture company asserted that they could contribute with equipment related to sea-based cultivation as well as seaweed spores for cultivation. The spores are eco labelled, which in turn could benefit the other actors and the system through commercial advantage.

The aquaculture respondent also described that they have recently received permit for sea-based cultivation in another town along the Swedish west coast. On the contrary, the issue of

getting permission to cultivate, with regards to regulations such as the Swedish statutory beach protection, was addressed by tourism actor 2 as one of the main challenges in the BCG context. The fact that what is considered a main challenge by one actor, is a main asset of another, illuminates that collaborating can enfold access to new resources.

These findings make it evident that financial and technological resources were not addressed by the respondents to the same extent as the other values. This can be due to various factors. One explanation could be the interview focus and a lack of financial and technological focus in the choice of questions, in combination with the interview technique that allowed the respondents to elaborate quite freely. Additionally, the BCG is not established yet, which might make it difficult for the actors to speculate on concrete matters. However, this aspect should be taken into account in the further development, since artifacts is addressed by Granstrand and Holgersson (2020) as an essential component of IESs.

### 4.1.3 Improved legitimacy, reputation, and name recognition

The interviews indicate that a BCG concept has potential concerning values for the local community, by enhancing a marine and sustainable profile and potentially attracting inhabitants and tourist. It is argued that these benefits, generated from the IES, can also be expressed as regulating ecosystem services (Reid et al., 2005). However, the findings also reveal challenges regarding political legitimacy of the BCG collaboration.

#### *4.1.3.1 Benefits for the local community*

Several respondents illuminated the huge potential of a BCG concept in favouring Strömstad as a community, for instance by attracting tourists and new inhabitants. The national park actor asserted that the concept could be interesting for inhabitants, including school children, as well as tourists. Tourism actor 1 mentioned how the concept could constitute a puzzle piece in a goal that has been set up by the municipality of Strömstad, saying that they are going to increase the number of inhabitants: “And there I think it can be something completely new, which can put this area on the map properly.”. It was also speculated on commercial potential through exhibitions and course activities, and a future dream scenario where apartments combined with small BCGs could be offered. The aquaculture actor similarly highlighted the economic benefits of making individual companies as well as the region more visible through the concept: “this is a fun idea, both for the visibility of the company, but also for the region and to show that one can grow sustainable food from the sea, which does not just have to be

fish.”. The marine biologist also addressed the community benefits of linking different sea related actors, such as aquaculture and restaurants, and making that visible as a profiling function.

The description of a marine or maritime profiling of Strömstad is recurring among respondents. Municipality actor 2 considered the BCG to be an important “development leg” for the town, which can generate positive ripple effects. For instance, the importance of having something concrete to gather around was illuminated, and how a BCG could constitute a “marine meeting point” for whoever is interested: “and it should be able to be used on many levels, both very seriously and perhaps in terms of research, but also perhaps as a wonderful place to stay and learn more.”. The same respondent also elaborated on how the concept could include food guides where the cultivation is introduced, followed by tastings at a restaurant, thereby connecting different actors. Already existing local town walks and several other concepts were described where a BCG could add another layer to promote the marine theme of the town. The teacher, who is privately engaged in a local community association in a closely located municipality, specifically expressed optimism regarding the easy tools that could characterise the concept, inviting and engaging tourists and local inhabitants to collect and harvest different species.

The teacher speculated that collaborating around a BCG possibly in the future could result in job opportunities for students, for example as guides during summer. It could also constitute a platform for school activities and teaching, both lectures for students and presentations held by themselves. According to municipality actor 2, there have been several young adults in Strömstad starting small seaweed enterprises, making teas, crisps and similar, which is something that could be further promoted through a BCG concept. Schools were generally claimed to be essential, in order to establish sufficient interest within the local community at an early stage. The fact that the BCG was discussed in terms including the future, makes the claim by Hazy et al. (2010) relevant, that value can refer to net benefits of all stakeholders, including those of future generations. The national park actor had identified and welcomed the tendencies in the municipality of Strömstad, of wanting to profile and create job opportunities around sustainability:

> If you boil it down a little towards the sea and human, then this can create the added value and employment and further diversification of how you can live and be in our fantastic coast and archipelago areas. So it could be another leg to stand on, from a business perspective or what to say, employment in any case. (National park actor)

However, the national park actor highlighted the importance of profiling a BCG concept as something else than just the marine theme, since that attribute is already present in Strömstad, represented by Tjärnö Marine Laboratory and Kosterhavet Marine National Park. The respondent claimed that the town needs to delve into this niche even further:

> The business manager in Strömstad started talking about "USP's" and such, "unique selling points", which is interesting if it can be achieved. Then it requires a lot of collaboration and perhaps also that you profile Strömstad as the town of seafood, and not just as selling burgers and Coca Cola to Norwegians. (National park actor)

Value creation in collaborative settings means outcomes that would not be achieved independently (Caldwell & Roehrich, 2017). The interviews showed that there was a general conception and belief among respondents, that several actors collaborating around a BCG concept would result in benefits for the community of Strömstad. The fact that values can be generated outside the network, align with the claim by Singh and Kathuria (2017), that value can be created both within and outside a given system. Enhancing the maritime theme is believed to attract both tourists and new inhabitants and benefit local businesses. This strengthens the statement that value-based motivations can include non-monetary benefits and still result in competitive advantage (Murphy et al., 2014), since the main purpose of the BCG is not explicitly monetary. Improved reputation and relations among actors are examples of such motivations (Ibid.), which correspond to one respondent's idea that the concept could reduce tendencies of polarisation between the municipality and other actors. It also aligns with the fact that creation of value can be enabled through shared goals and visions (Ritala et al., 2013). The findings suggest possible improved reputation and name recognition for actors as well as the local community. This is argued to correspond to the meaning of regulating ecosystem services (Reid et al., 2005), since it aids to maintain a functional society.

#### *4.1.3.2 Legitimacy challenges*

In contrast to a majority of the respondents, tourism actor 2 identified a great deal of challenges and problems connected to the BCG. These were for instance found in the optimism characterising strategies of networking and clustering diverse actors and sectors. As previously addressed, the respondent described that these settings often face headwind regarding permissions of putting things to concrete action. According to the respondent, ideas in reality do not harmonise with legislation and the result is that innovations often remain at idea level. This was even addressed by the respondent before the question of potential challenges connected to collaborating in this context:

> And that's what I think of when you come in and talk about maritime community gardens and collaboration with different cluster systems – they have no formal political significance, that is the problem. […] And that does, I think, if I am to be really, really honest, if you do not turn these equations and start at the other end, talking about what is possible for all these organisation and groups and time which is put on these meeting, and the same things are investigated time after time, then we have a lot of work. (Tourism actor 2)

These concerns, stemming from experience of similar processes, indicates possible deficiencies in political legitimacy and competence gaps. Such competence should be considered highly important to include in the network in order to address development opportunities. In this case, it could perhaps concern involving actors with political and legal competence.

### 4.1.4 Improved stakeholder relations

It is suggested from the interviews that a BCG concept has potential in reducing polarisation among actors within the community of Strömstad, as well as enhancing involvement of students and other inhabitants. Benefits like these, if they could be generated by the IES, relates to the essence of cultural ecosystem services (Reid et al., 2005). However, maintaining a functional collaboration where relations can keep thriving, requires clear structures, which becomes evident from literature as well as empirical findings.

#### *4.1.4.1 A united community*

Tourism actor 1 mentioned that there have been tensions between the municipality and some of the actors in Strömstad. The respondent speculated that more explicit work towards a common plan and object such as the BCG, could possibly unite Strömstad and remove "us and them" tendencies within the town, since the concept requires collaborating and taking part of each other's knowledge. As previously mentioned, the marine biologist addressed the possibilities of including the broad mass – such as pensioners with experience of the sea, researchers and teachers. Including local inhabitants align with how Carayannis and Campbell (2009) describe the public as an important part of innovation performance. This, the marine biologist believed, could also have a uniting force and contribute to enhanced feelings of belonging to a community:

> That we have a marine national park, we have the University of Gothenburg, that you sort of make the whole municipality aware, that you feel that it is something you are proud of. That you can contribute too, everyone can be a member and you can contribute. (Marine biologist)

These findings indicate potential of non-material values, which corresponds to the essence of cultural ecosystem services (Reid et al., 2005). The feelings of unity, belonging and local pride, could enhance both social relations and sense of place, which are examples of cultural ecosystem services. The potential of the BCG in recognising tacit knowledge inherent in the community of Strömstad, could potentially also facilitate preserving of cultural heritage.

The teacher also stressed the value in having a network tied to the school, with new actors introduced to the school and vice versa, thereby creating networking possibilities for the students. Both the teacher and the marine biologist mentioned the usefulness of a BCG for pedagogic reasons. It could constitute a platform where students have the possibility to integrate different subjects related to the sea – not only the biological and environmental subject but also elaborate with aspects of physics: "one could hang down different metals for example, to see corrosion. You could hang pieces of wood to see shipworm infestations. […] Scientific labs so to speak, during a summer or a year or something like that." (Teacher). Municipality actor 1 similarly speculated around collaboration with the schools and how the cultivated species could be used in school kitchens as well as cooking classes. These ideas about bringing different school subjects into the BCG, shows that relations can be strengthened with, and values can be created for, actors also outside the network. This is an example of how innovation is coupled with diffusion of knowledge, which adheres to how Carayannis and Campbell (2010) describe innovation as the fuel of bringing knowledge into society. The ideas also suggests that the BCG could be a platform for interdisciplinary learning and practising, which is beneficial since networks characterised by interdisciplinary knowledge can facilitate orchestration of the Quintuple Helix model (Ibid.).

#### *4.1.4.2 Importance of clear structures*

Both tourism actor 1 and the aquaculture actor mentioned the importance of clarifying roles of different actors and having someone to coordinate the network. According to the aquaculture actor, it is important to identify which actor could potentially be confided ownership to operate a BCG, to achieve clear goals. Such goals could in the long run involve visions beyond purely farming together, according to the respondent. This indicates potential in improving relations among the actors even further. The aquaculture actor asserts that one

challenge is that single actors may already have too much on their table to participate. Apart from that, it was claimed that there are no serious obstacles related to the collaboration aspect: “it is clear that for the most part it is positive that you get input from other actors, what they can and what they want, quite simply.” (Aquaculture actor). Accordingly, neither the national park actor nor the municipality actors believed there are any major challenges related to the collaboration aspect, as long as the relevant actors are clearly addressed, including their expectations and responsibilities. Municipality actor 1 believed that the road towards a functioning collaboration may involve obstacles, but once a functioning organisation is reached, the effects are thought to be positive.

These findings underline potential structural hindrances of collaboration and that clear structures are considered important by several actors within the BCG network. For instance, definitions regarding the role of each actor respectively are needed. For instance, it is important to ascertain who has the main responsibility. This aligns with the fact that established structures such as shared goals and visions are a way to maintain collaboration, knowledge sharing and value creation in an IES (Ritala et al., 2013). This in turn lays foundation for value creating coopetition (Ibid.). The expressed visions of future activities and goals beyond farming together, aligns with the definitions by Moore (1993) and Granstrand and Holgersson (2020), where the evolving character of actors is central when working in an ecosystem characterised setting. This indicates the potential of new values to be created in the future if the BCG network continues to collaborate. It should be stated, however, that due to the complex and unpredictable nature of innovation and other social systems (Moore, 1993; Papaioannou et al., 2009), the development of IESs and in this case the BCG, can never be fully anticipated. Whereas evolution in ecological terms is characterised by natural selection and mutations, social evolution involves more conscious actions (Papaioannou et al., 2009). As described by Moore (1996), companies recognising collaboration can enhance their resilience unforeseen events. If this is applicable also on a societal level, remains to be seen.

### 4.1.5 Reduced environmental impact

Despite the initially small scale of the BCG, it is revealed in the interviews that the BCG concept could result in values for the natural environment. Collaborative and sea-based cultivation could aid to promote sustainable use of the sea (its extrinsic values) as well as sea health through species cleaning the water and providing habitat for other species (its intrinsic

values). However, these ecological benefits as well as promotion of better caretaking of the sea depends on diffusion of knowledge about the sea, and hence the importance of generating educational (cultural) ecosystem services from the IES.

#### *4.1.5.1 Promotion of sea health*

Several actors agreed that a BCG concept would be a way to promote resources provided by the sea and how they can be used sustainably. According to municipality actor 1, it is becoming increasingly important to create interest and knowledge about resources from the sea. Even if it currently is not an issue of becoming self-sufficient, there are values in taking advantage of local resources and managing them sustainably.

> We who live close by, in coastal communities, it is a natural, a natural step to look out for how we can manage these resources in a good way, in the sea as well. (Municipality actor 1)

Tourism actor 1 similarly believed that a BCG could illuminate ocean health among several target groups and that the food aspect strengthens the environmental argument. Several respondents also underlined the importance of considering local conditions and not introducing foreign species. The national park actor even considered this aspect necessary if the national park is to be involved, since sustainable use of the sea is a part of their mission. The marine biologist addressed that it is essential to inform people about the ecosystem services provided by algae, mussels and oysters – that these species are not just something that you want to avoid when you go swimming, but rather something to promote, consume and spread knowledge about. The teacher mentioned the beneficial aspect of integrating such environmental thinking already at the school level.

> The more knowledge you get about the sea and life in the sea, of course you think before you throw garbage or do anything, of course. You get more understanding, and more understanding may make you more careful. (Teacher)

These findings illuminate how possible environmental benefits are closely related to knowledge and that information about the sea is thought to enhance better caretaking of it. This related to educational values, which can be considered a cultural ecosystem service (Reid et al., 2005). Interviews with the BCG actors also revealed potential in strengthening the relationships between the sea, the actors and the general public. Activities such as town walks could introduce inhabitants and tourists to the cultivation and the marine history of the local community. Tasting of seafood grown in a BCG could enhance understanding regarding

origin of food. Such knowledge could, as addressed by tourism actor 1, potentially strengthen the environmental argument.

#### *4.1.5.2 Ecological benefits*

Several respondents described how cultivating seaweeds, mussels, oysters and other edibles connected to the BCG can contribute to a cleaner ocean through carbon and nutrient capture. Tourism actor 1 also mentioned how this makes us active cleaners of the water. Some, however, also included the reservation of not being fully educated on the subject. The seaweed researcher further described the fact that cultivating species such as seaweeds benefits the sea through its ability of providing nesting areas for fish and other marine organisms.

> So, regardless the fact that it won't be a huge effect, because this garden is supposed to be relatively small, it's still something. And if we think of applying that to a large amount of population, it could actually be something. […] I see many ecosystem services that might come with it. (Seaweed researcher)

The aquaculture actor also addressed the potential benefits for the environment, in that sea-based cultivation contribute with these benefits while not claiming any terrestrial land. Contrary, one of the actors claimed that the scale is too small to make a difference. The respondent also added that if BCG facilities were to be established in a volume that could benefit the sea, other obstacles would appear, "because then you would cover large areas with facilities where you are not allowed to do so, quite simply.". The national park actor believed that the concept could benefit the sea, even if it is not the solution to all sea related issues.

> One answer to that question is to clarify the values that the sea can give us, even though it may be a relatively narrow sector, to place all that responsibility on a marine community garden. But it can be added to other values that the sea [provides]. Yes, the sea is absolutely crucial for our human presence on Earth as well. So this is something positive from a marine and environmental perspective. (National park actor)

The respondents describe several ecosystem services that could be provided by species in a functioning BCG, including supporting services of providing habitat and regulating services of cleaning the water (Reid et al., 2005). The opinions regarding the scale of this varies, regarding which effect the concept could have. However, the seaweed researcher pinpoints the fact that ripple effects can appear if it could spread and make actual difference, which strengthens the collaboration argument. This proves that involving a large set of actors can

result in benefits for the environment, while also generating economic value, which align with Hart and Milstein (2003) saying that economic return does not have to stand in opposition to environmental sustainability.

### 4.1.6 Increased consumer patronage

The BCG concept was also believed to contribute with values on individual level. Consumer patronage in the BCG context is interpreted as these benefits, which relates to the probability that the general public, including both inhabitants and tourists will participate in and perceive values from BCG activities.

The marine biologist asserted that the innovation aspect, the fact that BCGs are something entirely new, also could aid a feeling among participants of contributing to history. The seaweed researcher speculated that "every normal citizen, even without any understanding of underwater life, would probably be into this", and that it could enhance physical as well as mental health. Some respondents also mentioned change in behavioural and consumption patterns that can be promoted through the concept. Social benefits on the individual level, according to both the marine biologist and the seaweed researcher, also involves getting access to a new context, forming new human relations: "In the most meaningful way, it could generate a social value, because a nice underwater garden could be a nice excuse to go snorkelling or diving, for family and friends and everybody" (Seaweed researcher). This relates to the perception of municipality actor 1, who encourages the fact that people from different contexts could meet and that people generally interested in farming receives access to a platform where experiences can be exchanged:

> I think there are only positive effects of collaboration, where people from different backgrounds, different ages, different social strata and so on, have an opportunity to meet and do something together. […] It is precisely this social [aspect], […] where, children and the elderly, fishermen and restaurant owners or all sorts of people can gather around an activity, to cultivate. (Municipality actor 1)

This indicates a potential of the BCG in contributing to several social values for the individual participant. It could enhance the feeling of fellowship within the BCG context, but also within a family or town. Additionally, it could generate access to new contexts and human relations. These can be considered what Battistella et al. (2013) refer to as intangible values that can be generated within an IES. The suggested recreational and educational values are also argued to

correspond to the essence of cultural ecosystem services (Reid et al., 2005). The access to new social contexts and the enhances feelings of contributing to history, can also be considered cultural ecosystem services.

## 4.2 The role of the sea

Drawing from how actors viewed the role of the sea in the BCG concept and what linkages that were revealed between the natural environment and human society, this ending section of the findings argues for the importance of recognising the role of nature in the theoretical framework as well as in practical contexts of IESs.

### 4.2.1 The BCG context

Regarding the question of the role of the sea and whether the respondents consider it an actor, the thoughts varied. Some speculated in scenarios where the sea is assigned legal rights, while others considered it a resource more than an actor. The aquaculture actor did not explicitly title the sea as an actor, but still addressed the importance of giving back to nature, which could be done through the BCG and its possible benefits for the sea. The national park actor described how the County Administrative Board's central focus is society and the individual, aiming for a sustainable nature where humans are part of the diversity. The respondent however did not consider nature to be an actively participating actor, but in a BCG context rather a supplier. Still, the respondent addressed the value of the sea, decoupled from human.

> But no, not actor, that I don't think. At the same time, of course nature has an intrinsic value, notwithstanding human. But it is no one to call into a stakeholder meeting, rather we have a task to interpret the state of nature. (National park actor)

Both municipality actors similarly considered the sea to be of crucial importance in terms of not making any severe harm to it, but however did not explicitly tune in to the perception of nature as an actor. Municipality actor 2 addressed the importance of competence on how to use the sea and its resources. According to the respondent, the sea is essential for Strömstad due to its importance regarding the marine profile of the community. Therefore, caring for and protecting it is considered crucial. In this context, collaborating and especially involvement of science was mentioned as essential, in order to not carry out activities that disrupt the sea. Some considered observing and listening to the nature important, to understand what the sea and the cultivated species need in order to thrive. Tourism actor 1

addressed the importance of recognising that we as humans have mistreated the sea for a long time and that a BCG could possibly be a game changer:

> One has always taken of, not only the interest rate but from the capital in the sea, […]. In this case it will be a bit like cultivating on land, you make an effort to take out the interest rate, not just grab what is available there and shovel up and say that you have produced something, which is completely crazy. And it may be that the more people who open their eyes to this opportunity, will also cherish that opportunity. (Tourism actor 1)

Both tourism actor 2 and the marine biologist talked about the sea as an actor before that question was asked. The tourism actor described how the sea will remain a resource that gives back to us, only as long as it is managed in the right way. Responding to the question of the sea as an actor in the network, the respondent even entitled the sea as the world's largest actor – impossible to tame but possible to destroy, where the latter is what we mainly do. The marine biologist similarly discussed the sea in terms of being the ruling actor:

> Just because […] I as a human have a lot of ideas and want to show what I grow […] it is still the sea that rules, with waves, wind, salinity, what you can do. It doesn't matter what I wish I could grow. […] So it is absolutely an important actor (The marine biologist)

A majority of the respondents agreed about the importance of caring for the sea, as well as interpreting it in order to not make any severe harm. However, among some respondents the argument for doing this seems to be that humanity depends on its health and resources. One respondent mainly connects the role of the sea to its supplying function. This indicates that in the context of collaborating around a BCG concept, the sea is to a large extent valued in terms of extrinsic values, meaning that its value is defined by its utility (Reid et al., 2005). However, some respondents explicitly talked about the sea as an actor, and one in terms of possibly even be worth legal rights. These diverse perceptions can be viewed as an indicator that the sea in the BCG context have both extrinsic and intrinsic values.

Despite various perceptions about the role of the sea, the overall findings from interviews show that the sea provides human society with values in more than one way. Several respondents considered the community of Strömstad to depend on the sea, not only for its resources but also for branding and profiling the town. Respondents also addressed the importance of listening and interpreting the sea, to understand its conditions and how to not

cause severe impact on it, which indicates that human society expects the sea to also provide knowledge. Parallel to our need for extraction of materials and knowledge, the interviews additionally revealed that the actors want to give back to nature, at any rate by at least not harming it. Some respondents even highlighted the importance of recognising that in the BCG as well as other context, we are ruled by the sea and not the other way around. Using the Millennium Ecosystem Assessment classification as an analytic tool for understanding values that can be generated through the BCG, also showed that these values can be understood through the lens of ecosystem services, and classified accordingly. This further indicates connections between the societal and the biological ecosystem, and that the understanding of ecosystem services could benefit from a more holistic interpretation.

These findings suggest that linkages between between the sea and human society, that can be considered highly important in the context of the BCG and hence the IESs. It is therefore relevant to acknowledge whether the importance of nature is reflected in the theory of IESs.

### 4.2.2 The theory of IESs

Granstrand and Holgersson (2020, p. 3) define the IES components as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors.". Considering that the definition is a review and synthesis of previous definitions, it is assumed to be a good indicator for the state of the concept. With its lack of any reference to nature or ecological sustainability, the definition makes it evident that the role of nature is not sufficiently present in the theory of IESs. Carayannis and Campbell (2010), refer to innovation ecosystems as societal ecosystems of interactions between actors and nature, which can be viewed as an argument to have nature represented in IES definitions. They argue that the Quintuple Helix can serve as reference in decision-making regarding innovation, to illustrate how it is influenced by and sensitive to nature.

Rational environmental solutions also require recognition that "there are a number of distinct intrinsically valuable goods, such as autonomy, knowledge, justice, equality and beauty which are irreducible either to each other or to some other ultimate value" (O'Neill, 2017, p. 229). This can be coupled with the issue of recognising that the sea may posit values that we have not discovered or do not utilize yet, especially concerning the number of "societal ecosystem services" that inhabitants, the municipality and other actors could obtain from the IES, as

revealed by this thesis. With regards to issues of autonomy, justice and equality, such services could in the future possibly be coupled with food security and the potential of seafood in feeding a growing population (European Union, 2017). This further prompt explicit recognition of the role of nature and the sea in the BCG, in the theory of IESs and in human society. Moreover, the understanding of values through a biological concept such as ecosystem services, further shows the interrelation between IESs and the natural environment, which in turn strengthens the argument for a more holistic approach and interpretation of IES definitions and values.

# 5. Conclusion and future research

The purpose of this thesis was to explore the concept of IESs in a context where the biological ecosystem and ecosystem services are vital elements. Doing this has revealed that several potential values can generate from collaborative use of the sea, in accordance with the idea of an IES. Based on where the respondents gravitated their answers, these values mainly concern generation and recognition of diverse knowledge resources; improved reputation and name recognition (both for involved actors and the local community); and improved stakeholder relations (both within and outside the network). This is no surprise since innovation is closely related to collaboration (Su, Zheng & Chen, 2018), as well as creation and diffusion of knowledge (Hekkert, Suurs, Negro, Kuhlmann and Smits, 2007; Mercan & Göktas, 2011).

However, findings also revealed linkages between human and the sea that are crucial in the IES context, for instance flow of knowledge, material resources and other ecosystem services, and the fact that a BCG collaboration could reduce environmental impact. This suggests that the role of nature is fundamental in innovation contexts. Analysing the theory in relation to these empirical results, however, reveal that this importance is not sufficiently represented in the current theoretical framework of IESs. It is therefore suggested that the theory as well as the practising of IES, more explicitly should embrace holistic viewpoints. As addressed in the introduction, the sea could provide human society with resources to an extent far beyond what we utilize today (European Union, 2017; Costello et al., 2020), which calls for innovative and mobilising ways to transform supply chains and promote awareness around sea food potential. Adding to this, the findings revealed that collaborative use of the sea in an IES can enfold several extrinsic values of the sea and provide benefits in additional perspectives, for the actors involved in context such as the BCG as well as for the surrounding local community.

However, the purpose of holistic approaches goes beyond solely recognising what the sea can provide humans and how we can utilize it. Besides viewing the sea as a resource with large potential, the findings also revealed the importance of understanding that in some cases, humans are not the rulers but rather ruled by the sea. Hence, besides only avoid harming the sea when using it, it is rather a matter of also acknowledging its intrinsic values. A first step towards such recognition could be to listen to it and interpret what it needs. This thesis has indicated that IES contexts such as the BCG, might be what is needed to achieve this, and at the same time provide values for the sea as well as society. If that potential is to be maintained though, the role of nature needs to be explicitly recognised – in theory as well as in practise.

Since the general applicability of the findings could be impacted by the focus on one network in a geographically limited area, an encouraged avenue for studying the role of nature in IES contexts further, could be to compare more than one network of actors in diverse settings. There is also room for approaches aiming at reviewing more numerous definitions of IES, with focus on the holism and presence of ecological perspectives. However, the main concern for further research on IESs, is that the importance of involving the natural environment in the analysis is actively embraced.

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# Appendix

## Interview guide

***Topic area 1: Background***

- Would you please like you start by introducing yourself?
- Name:
- Position:
- Would you please introduce your organisation?
- Name:
- Location?
- How did you first come across the concept of blue community gardens (BCGs)?

***Topic area 2: Relations (collaboration and knowledge exchange)***

- What values do you think can generate from collaborating around a BCG?
- Could you see that the collaboration aspect brings any challenges?

- What knowledge could you/your organisation bring into a collaboration around a BCG?
- What knowledge could you/your organisation benefit from other actors in a collaboration around a BCG?

***Topic area 3: Actors***

- What actors do you consider valuable including in a collaboration around a BCG?
- What actors do you consider a BCG to be *for*?

***Topic area 4: Activities***

- Which activities do you consider valuable in a collaboration around a BCG?
- Which activities could you/your organisation contribute with in a collaboration around a BCG?

***Topic area 5: Physical resources***

- What physical resources could you/your organisation contribute with in a collaboration around a BCG?
- What physical resources could you/your organisation benefit from others in a collaboration around a BCG?

***Topic area 6: Ecosystem services and the sea as an actor***

- What resources and services from the sea would be valuable when collaborating around a BCG?
- Sometimes nature (and in this case the sea) is considered an actor, what is your thoughts about that?

- Do you think collaborating around a BCG could benefit the sea as an actor? How?

***Topic area 7: Future outlook and other thoughts***

- What is your outlook on the BCG? How would you wish it to have developed in five years?

- Do you feel that you have said everything you want to say or is there anything you would like to add?