# Understanding circular economy: Analysing the concept of a circular phosphorus economy in the Baltic Sea region

## A frame analysis of stakeholder perspectives on a circular phosphorus economy and collaboration between involved actors

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# Abstract

In the last 50 years the issue of eutrophication has become more and more prevalent. The increasing input of phosphorus into the Baltic Sea had led to an increase of algae and plant growth which caused an oxygen depletion, changes in the composition of species as well as increased grime. Furthermore, the algae growth has favoured the development of dead zones across the Baltic Sea. To stop the excess input of nutrients into the Baltic Sea many strategies have been discussed, one being the concept of circular economy. This concept is defined as economic system that focuses on a restorative and regenerative design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business. In 6 semi-structured interviews various stakeholders involved in the phosphorus economy in the Baltic Sea region with connection to the Commission for the Protection of the Marine Environment of the Baltic Sea in have been asked to give their perspective on certain topics to gather information the answer the research questions:

Q1: How is the concept of a circular phosphorus economy within the Baltic Sea region understood and made sense of by members and partner organizations of the Baltic Marine Environment Protection Commission?
Q2: How do these stakeholders frame collaboration regarding the establishment of a circular phosphorus economy and possible difficulties that might hinder a successful implementation?

To make sense of the findings a frame analysis has been conducted to understand how the stakeholders view the concepts resulting in the formulation of two frames, defining circular phosphorus economy as a system based on processes that recycle and reuse nutrients rather than import new ones as well as focusing on how responsibly use existing phosphorus sources and apply measurements to determine where which amount of phosphorus needed and where waste can be avoided. Furthermore, the framing process has been examined, showing that the professional environment greatly impacts the understanding of circular economy. Regarding the framing of possible challenges regarding establishing collaboration between stakeholders it could be concluded that the main hindrances perceived by the actors include lack of trust and motivation as well as language barriers. Future research is recommended to focus on examining the perspectives of a wider range of stakeholders.



*Keywords*: frames, frame analysis, circular economy, Baltic Sea, phosphorus flows, circular phosphorus flows, stakeholders' perspectives, environmental communication

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# Abbreviations

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| HELCOM | Commission for the Protection of the Marine Environment of the Baltic Sea |
| IP | Interview partner |

# 1. Introduction

The European Baltic Sea is known to be the largest body of water containing brackish water, characterized by being a mix of salt and fresh water. It covers an area of approximately 377 000 km2 and its drainage basin is circa fourfold larger as well as being populated by roughly 85 million people (Andersson et al., 2014). In current times, one of the biggest threats to the ecosystem of the Baltic Sea is eutrophication. This global phenomenon has become increasingly dangerous for water bodies all over the world, especially during the last 50 years, reaching its peak increase between the 1950s and late 1980s and causing the deterioration of the ecosystem (Rönnberg & Bonsdorff, 2004; HELCOM, no date). Eutrophication occurs when an excessive amount of nutrients enters the sea. The greatest danger comes from excessive imports of phosphorus and nitrogen caused for example by agriculture and municipal wastewater treatment plants. However, even though the "anthropogenic fertilization of marine systems by excess nitrogen has been linked to many ecosystem-level changes, there are natural processes that can lead to nutrient enrichment along continental margins that produce similar ecosystem responses" (Diaz & Rosenberg, 2008, p. 926). Nevertheless, the main source for over-fertilization of the Baltic Sea, especially along the coastlines, is known to be caused by anthropogenic influences.

The consequences of this oversupply of nutrients can be diverse such as "elevated levels of algal and plant growth, increased turbidity, oxygen depletion, changes in species composition and nuisance blooms of algae" (HELCOM, no date). One of the most noticeable effects of eutrophication are cyanobacterial blooms. These algae are in need of a high amount of oxygen during their degradation process and are subsequently causing the development of so-called dead zones across the Baltic Sea, which are characterized by an absence of marine life as well as very little or no oxygen (Diaz & Rosenberg, 2008). Currently, more than 80 000 km2 of the Baltic Sea are suffering from hypoxia, a reduced supply of oxygen, or anoxia, the complete absence of oxygen, making it the biggest problem of the region (Race for the Baltic, no date).

Over the last five decades, this problem has received increasingly more attention in science, politics and the media. Non-governmental environmental organisations have tried to publicise this issue as well as raise awareness of the consequences of human actions among those responsible for the excessive imports of phosphorus

into the Baltic Sea. Furthermore, attempts have been made by an independent body to formulate environmental targets, regulations and recommendations to encourage the Baltic Sea states and their industries to examine their influence on the nutrient content of the semi-enclosed sea. These guidelines are aimed at motivating stakeholders to adapt their working methods accordingly in order to operate more sustainably and reduce the excess of phosphorus emitted into the sea. The Commission for the Protection of the Marine Environment of the Baltic Sea (HELCOM), to which all Baltic Sea states belong, has therefore formulated so-called measures to reduce nutrient pollution, in particular phosphorus inputs. These actions were agreed upon by the 1988 HELCOM Ministerial Declaration and included the goal to establish a Baltic Sea which is not affected by eutrophication. Since this decision came into force, several eutrophication assessments have been carried out to examine the status of eutrophication in the inland sea (HELCOM, no date). The last report published by HELCOM has shown that the total amount of leakage of phosphorus in the Baltic Sea has been reduced. However, it is "still among the most influential and long-lasting environmental pressures in the Baltic Sea" (Axe et al., 2023, p. 9). The assessment covered at least 93.8% of the region showing the environmental status for the eutrophication levels is still below the set goal and that "all of the open sea areas and 82.8% of the coastal waters" (Axe et al., 2023, p. 9) have shown to have high levels of phosphorus and nitrogen impacting the ecosystems. To combat these issues and to reduce the nutrient leakage into the Baltic Sea many attempts have been made by scientists, companies, politics and environmental organisations to find strategies supporting a reduction of the negative impact on the water body.

## 1.1 The concept of circular economy

One particular concept that has been looked at in a few research projects and is cited as a promising approach to reduce the surplus of phosphorus in the sea is the model of circular economy. Guided by the dissatisfaction in current economic practices and the following destruction of nature, this idea has been widely portrayed as a promising solution to solve many prevalent environmental challenges as well as support a transition towards sustainability in a variety of different branches of industry (Corvellec et al., 2020). The concept of circular economy refers to the idea of creating an economic model that abolishes linear principles of production and consumption. Instead, the prime directive is working towards a regenerative as well as restorative economy (Ellen MacArthur Foundation, 2013). Consequently, any impact on nature caused by industrial practices and consumption is supposed to be minimised and the environment itself restored. Methods such as recycling, for example, are intended to help extend the life of extracted raw materials and return them to the economic cycle in various forms. Furthermore, special attention is paid

to the use of renewable energies and waste management as practices supporting a circular economy.

However, the discussion about and the analysis of the concept of circular economy has been primarily led by policy makers and business advocacy bodies (Korhonen et al., 2018). Literature research shows that "the notion of CE is loosely based on a fragmented collection of ideas derived from a variety of scientific disciplines and semi-scientific concepts" (Korhonen et al., 2018, p. 545). And to this day the number of scientific papers attempting to do research on circular economy is still scarce.

Nonetheless, in recent years an increasing number of scholars are paying attention to this approach as well as dare to try and find a binding definition of the concept. In the following, an attempt is made to provide a brief overview over existing understandings of the concept of circular economy as well as to find a working definition of this concept for the work at hand. Furthermore, the chapter aims at shedding light on how the approach has been studied and applied in relation to the economic sectors that use phosphorus and contribute to the eutrophication of the Baltic Sea as well as in the field of social sciences, providing a transition to the problem formulation of this thesis.

The development of the idea of circular economy dates back to the 1960s and 1970s and the beginnings of the modern environmental movement. Ekins et al. (2019) mention that the concept of circular economy has been emerging from two conceptual streams, "the first relating to the flow of materials through an economy, and the second concerned with thinking about the economic conditions that might bring about" (p. 4). These streams were related to the concepts of industrial ecology and system optimization which called for a beneficial "location of industries in order to make efficient utilisation of resources and avoid waste" (Ekins et al., 2019, p. 4). The first formal use of the term 'circular economy' however was made by Pearce and Turner (1990), followed by numerous attempts of defining the concept. These definitions were influenced by several other perspectives creating for example resource-oriented definitions alongside interpretations that focus on closing the system creating a loop of material use, transformation and reuse of resources without creating waste (Rizos et al., 2017). In order to fully understand the scope of the term it is worth looking on a few different attempts of a definition. Sauvé et al. (2016) takes up the idea of a closed-loop system focusing on circular material-flows which reduce the extraction of so-called virgin resources and therefore minimize waste. Preston (2012) defines circular economy as an approach to reevaluate the function of resources and so what would currently be defined as waste could become a valuable input for another production process. His idea would furthermore include strategies to repair products, recycle or upgrade them to extend their service life. Heck (2006) takes up a quite different perspective on circular economy. The author emphasises that a crucial element for the concept is

the use of sustainable energy. A transition from a linear economic concept towards a circular one would therefore require a conversion of energy generation. The Ellen McArthur Foundation (2013) provides the definition that Circular economy is "an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models'' and therefore "enable[s] effective flows of materials, energy, labour and information so that natural and social capital can be rebuilt'' (p. 22). For this thesis the working definition of Circular economy will follow the interpretation given by the European Commission (2015), stating circular economy is a form of economy "where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised" (no page) by using techniques to recycle resources and reuse certain products.

These few attempts of defining the concept of circular economy show how broad the general understanding of this term is. Rizos et al. (2017) points out that because of the variety of definitions the term of circular economy has often been criticised. Due to diverse interpretations and therefore various possibilities of applying the concept it can cause confusion. Furthermore, it can be challenging to evaluate how successful the implementation of certain strategies to promote circular material flows is as the interpretative measures can vary depending on the definition used. Additionally, there has been voices criticising the exclusion of a social dimension as the concept of circular economy often rules out social equality aspects such as gender, financial equality and equality of social opportunities according to Murray (2017). This however will not be further explored within this thesis.

## 1.2 Problem formulation

The notion that there has been little research regarding the social dimension of circular economy plays an important role for the problem formulation of this thesis. With their literature analysis Korhonen et al. (2018) highlight that until 2017 the majority of scientific articles about circular economy are published in the fields of "green, sustainable and environmental sciences" (p. 546) with focus on conservation and recycling, industrial ecology, technology and waste management. There hasn't been much research done that approaches the concept of circular economy from a social science perspective or even communication science perspective. Mies & Gold (2021) attempted to map the scope and relevance of the social dimension of circular economy drawing on a literature analysis to point out social sustainability aspects and their interrelations. The topic of social inclusion in

relation to circular economy was in focus of the research of Piao et al. (2023). They analysed how current circular economy practices are inclusive towards socially disadvantaged groups as well as the importance of consumer and community engagement when implementing those practices. Wali et al. (2021) looked at how supply chains for a circular phosphorus economy impact social sustainable goals such as malnutrition, child labour and eradicating poverty to name a few. They focused local and global levels. Some scholars such as Mishra et al. (2019), Danvers et al. (2023) and Gomes et al. (2024) conducted studies on collaboration between stakeholders as key tool to implement circular business strategies. They all point out that multilevel collaboration is essential for a successful development circular economy. However, they also highlight that establishing cooperation between involved parties comes with a lot of challenges which depend on various variables. Relating to the element of communication, the researchers such as Geissdoerfer et al. (2016) and Goyal et al. (2020) with the aim of understanding circular economy as concept as well as its development and strengths briefly touched aspects such as communication processes or public engagement and acknowledged their importance for a successful practical implementation of a circular economy. However, they did not purely focus on communication as the key element of their research. Vargas-Merino et al. (2022) aspired to examine the role of communication as a key element for effectively implementing circular economy in various sectors. These papers show that there is an increasing amount of research been done on circular economy from a social science or communication science perspective. Nevertheless, on a greater scale the amount of social scientific literature on the topic remains scarce.

Taking it a step further and analysing literature about the concept of circular economy in connection with the phosphorus economy in the Baltic Sea it becomes clear that in recent years a lot of research has been done to determine possibilities to apply this concept and turn it into practice. The following paragraph serves as a quick overview over existing research regarding circular approaches within the phosphorus industry in the Baltic Sea region. Furthermore, it functions as an illustration of the research gap which is attempted to be filled with this thesis.

The previous discourse about a circular phosphorus economy mainly evolves around how specific strategies to achieve circularity can be applied. The authors Altamira-Algarra et al. (2022) and Guedes et al. (2017) for example analysed and reviewed technologies used to remove and reuse phosphorus from agricultural surfaces while taking on a circular economy approach. Ayeyemi et al. (2023) took this research one step further and tried to assess how recovered phosphorus sources impact agriculture and which fertilizer effect reused phosphorus has on crops. It was attempted to examine if fertilizers made from phosphorus which was recovered from wastewater can ensure agricultural sustainability when mineral phosphorus is no longer available in the future. In 2017 Case and Jensen also attempted to shed

light on how different types of organic material such as manure, sludges and composts save and release phosphorus into the soil (Case & Jensen, 2017). In addition, researchers such as Lorick (2019) and Mehr et al. (2018) tried to examine how the application of a circular phosphorus economy in Sweden and Switzerland could look like and if a transition is possible.

When narrowing the scope to research projects in this field with focus on the Baltic Sea region several projects such as the study performed by Rana et al. (2021) could be found. It focuses on how waste management in Baltic Sea region should be reformed to reduce the input of inorganic and organic pollutants such as phosphorus into the Sea. The authors used their results attempting to formulate recommendations on how to control pollution in the Baltic Sea. Another study worth mentioning is the work of Smol et al. (2020) which analyses the InPhos project which "adopted a holistic approach considering technical, political, economic, environmental and social aspects of [phosphorus] management" and aims at recommendations to improve phosphorus management in the Baltic Sea region.

When reviewing these scientific contributions, it quickly became apparent that again the application of the concept of circular phosphorus management has essentially only been viewed from an economic and scientific perspective. Previous projects have mainly focused on the analysis of specific phosphorus recovery technologies, the impact of recycled phosphorus on agriculture and the implementation of specific management strategies to establish circular phosphorus flows. One of the few examples of studies approaching a circular phosphorus economy from social science angle was conducted by Burgman and Wallsten (2021) which examines why political efforts to increase nutrient circulation in Sweden have barely been successful as well as how so-called chemo-social relations between phosphorus and stakeholders influenced the policy processes. Apart from this contribution, the social science perspective on the circular phosphorus economy in the Baltic Sea region remains almost non-existent.

Throughout these scientific papers use has be made of the variety of different understandings of the concept of circular economy, tailored towards the specific research goals. Researchers such as Korhonen et al. (2018) point out that this abundance of definitions can pose a big challenge when comes to aligning of stakeholders for example in the Baltic Sea region to work together, create dialogue about sustainable business practices and, in a last step, implement strategies or concepts such a circular economy. Westin et al. (2014) point out that a first step to create an arena for dialogue and discussion is to develop a shared understanding of the situation or topic that is to be looked at by the stakeholders involved. This requires collaboration between the parties. If a common definition of the underlying issue in discussion is found between the stakeholders, the involvement of several

actors, the process of formulating key aspects as well as common goals and lastly taking action to create change is more likely to be successful.

## 1.3 Research aim and questions

Therefore, this research project will take on the topic of a circular phosphorus economy from a communication science perspective. I would like to take a step back with my research and try to shed light on how the stakeholders involved in the industry understand the concept of "circular economy" itself and its implementation. In doing so I would like to find out if different perspectives of this concept exist and how these views differ from each other. The aim is to shed light on whether the stakeholders use a generally applied definition of the circular economy or whether they deviate from it. Secondly, since in previous research on communication in a circular economy context is highly intertwined with collaboration as key elements, this paper shall furthermore focus on this as aspect as well. Collaboration will be necessary for stakeholders to formulate and work together towards common goals for a circular phosphorus economy in the Baltic Sea region. Therefore, I would like to elaborate on how the interview participants perceive the need for collaboration to reach a circular nutrient flow within the phosphorus economy. Additionally, I aim to get an insight into how stakeholders frame difficulties connected to establishing collaboration between actors and achieving the goal of establishing a circular phosphorus economy. This research aim may also allow me to draw conclusions if the stakeholders see the differing understandings of circular economy as hindrance for collaboration and the step to take action for creating a sustainable circular phosphorus economy. Furthermore, I will examine if the different understandings of the concept of circular economy influence which difficulties are expected by the stakeholders.

As there are many different actors involved in many areas of the phosphorus economy, e.g. fertiliser production processes, resource transport and wastewater treatment, it was deemed necessary to narrow down the scope of this research and primarily work with a specified group of stakeholders. Therefore, it was decided that to focus the research on actors that work at or partner with HELCOM, The Baltic Marine Environment Protection Commission. This organisation aims at connecting science and policy to provide guidelines which member states are obliged to follow in order to ensure a healthy Baltic Sea, with the aim of capturing their views on this topic. The partner organisations mainly included environmental organisations that combine knowledge about the eutrophication issue with concrete projects to get one step closer to solving the problem and developing strategies for establishing circular phosphorus flows.

Therefore, the research questions that guide my thesis research are:

*Q1: How is the concept of a circular phosphorus economy within the Baltic Sea region understood and made sense of by members and partner organizations of the Baltic Marine Environment Protection Commission?*

*Q2: How do these stakeholders frame collaboration regarding the establishment of a circular phosphorus economy and possible difficulties that might hinder a successful implementation?*

# 2. Theoretical framework

The purpose of the following chapter is to provide an overview of the theoretical concepts underlying this research and used to analyse the gathered empirical data. Consequently, the presented framework is utilized to answer the previously named research questions. Therefore, this chapter contains a description of the philosophical approach applied in this thesis as well as provides an outline of frame theory and frame analysis as they form the theoretical framework for this thesis. Considering that several interpretations of frame theory exist in the field of social sciences, it only provides an overview over relevant concepts, which are applied in the following chapters.

## 2.1 Philosophical approach

The topic of this thesis focuses, as previously mentioned, on how stakeholders understand and make sense of the concept of circular phosphorus economy in the Baltic Sea region as well as how they perceive the importance for collaboration as an element to achieve circular phosphorus flows. As the focus lies on capturing different views and perceptions the underlying philosophical assumption chosen for this thesis is a constructivist worldview.

According to this worldview there is no objective truth. Rather, multiple truths or perceptions exist based on the idea that each human being creates their knowledge while interacting with their surroundings and a human community as well as interpreting their experiences (Moon & Blackman, 2014). Therefore, the same situation can be interpreted differently by each individual as they make sense off occurrences or situations based on their own "cultural, historical and social perspectives" (Moon & Blackman, 2014, p. 1172). As social constructivists follow the assumption that "individuals seek understanding of the world in which they live and work" (Cresswell & Cresswell, 2018, p. 46), the research focus therefore lies on capturing the subjective meanings that individuals develop based on their own experiences.

Cresswell and Cresswell (2018) point out that within constructivist research the researcher aims at relying on the participants' views of the situation that is being examined. Following this approach, techniques such as open-ended questioning are used to shed light on the complexity of views shown by the individuals that take

part in the research rather than narrowing them down into a small number of categories. Therefore, constructivism is mostly associated with qualitative research and an inductive research approach. This entails that knowledge is created by examining a research topic and generating a pattern of meaning without having a specific theory to start with (Cresswell & Cresswell, 2018). As constructivist researchers intend "to make sense of (or interpret) the meanings others have about the world" (Cresswell & Cresswell, 2018, p. 46), they are also acknowledging that their own cultural, historical and social backgrounds shape their interpretation of the views of the participants and influence the research results.

I have chosen this research perspective as the guiding philosophical approach for my thesis because it aligns with my research goal – to work out the different views of stakeholders on a circular phosphorus industry and shed light on how they make sense of it based on their work experience. Furthermore, I follow an inductive approach, as I do not aim to test an existing theory or a scientific concept, but to work out new connections based on the collected data using the concept of frame theory. This is also reflected in the methodology applied, the questionnaires used and the way in which the interviews are conducted. This type of scientific research is often found in constructivism, as described by Cresswell & Cresswell (2018), among others, and convinced me to choose this philosophical approach. As I will be exploring the issue of attempting to create a more sustainable phosphorus industry, the research approach used for this thesis will be the qualitative research approach. This will be further elaborated on in the methodology chapter of this thesis. Nonetheless, given the explorative nature of this research project and overall research aim, a constructivist worldview seemed to be the fitting perspective to guide the research.

## 2.2 Frame theory

To be able to interpret the views and perspectives collected from the empirical data the chosen theoretical concept is framing theory. This choice of a theoretical framework makes it possible to identify, systematise and interpret the perspectives mentioned by the participants with regard to the concept of the circular economy and the stakeholder cooperation with the help of the frames, as well as to examine the process of the emergence of these cognitive structures and their effects.

Framing theory or frames are widely applied within several disciplines such as communication science, sociology and political science and are "preoccupied with how ideas, culture and ideology are used, interpreted, and spliced together with certain situations or phenomena in order to construct particular ideative patterns through which the world is understood by audiences" (Lindekilde, 2014, p. 5). In various social research projects frames have been applied as overarching conceptual lenses to organize and give meaning to the perspectives of people participating in

the research. They have been discussed and redefined by various scholars over time and have shown to be versatile and broadly applicable in numerous research fields. The following paragraphs serve as a brief summary of the most important interpretations of frame theory and frames leading up to specific concept used as theoretical framework in this thesis.

The idea of framing respectively frames was first introduced by Bateson in 1972. He used the term psychological frames in his research and defined them as "a spatial and temporal bounding of a set of interactive messages" (Bateson, 1972, p. 197) which emerge when two individuals interact and exchange messages.

In 1974, the sociologist Erving Goffman took up the concept of frames and followed a tradition introduced by William James back in 1869 who in his work "The perception of reality" raised the question under what circumstances we perceive things as being real. The Austrian sociologist Alfred Schutz continued this tradition in his publication "On multiple realities" in 1945. He introduced the idea that each person creates their own reality which can lead us to experience a kind of shock when we are confronted with another reality that does not align with ours (Goffman, 1974).

Based on these previous scientific traditions Goffman formulated his frame analysis which is aimed at analysing how we organize our perceptions of what is going on in our everyday life (Hill, 2014). Consequently, Goffman defined frames as "definitions of a situation […] built up in accordance with principles of organization which govern events – at least social ones – and our subjective involvement in them" (p. 10 f.). Put simply, frames according to Goffman's definition are mental scripts that help us to recognize situations "which organize/identify experience and guide perception and action" (Lindekilde, 2014, p. 7).

Another scholar working with frame theory is Robert M. Entman. He applied frame theory in a news analysis context and therefore uses the term "news frames" which he defines as "mentally stored principles for information processing" (Entman, 1991, p. 7). Furthermore, frames can also be understood "as characteristics of the news text" which are "constructed from and embodied in the keywords, metaphors, concepts, symbols and visual images emphasized in a news narrative" (Entman, 1991, p. 7). While comparing narratives these news frames can help to examine how events are commonly interpreted and made sense of (Entman, 1991).

The main concept applied within this thesis is the approach of policy analytic framing introduced by Van Hulst and Yanow (2014). The authors tried to negate the focus from frames as a static concept towards framing as an "interactive, intersubjective process through which frames are constructed" (Van Hulst and Yanow, 2014, p. 93). Frames are defined as an important analytic tool "for those seeking to understand for instance, issues in the mismatch between administrators' implementation of legislated policies and policy intent" (Van Hulst & Yanow, 2014, p. 92). The authors refer here to a definition that defines 'frames' as relatively

fixed perspectives or cognitive structures which are used by individuals to interpret policy issues. They can be compared to mental filters which give people the ability to understand and systemize information while highlighting certain aspects and ignoring others. This understanding is rooted in Erving Goffman's attempt to define frames. However, the authors argue that these frames, even though shaped by a dynamic process, can become restrictive and limit the potential to explore alternative perspectives. In contrast, Van Hulst and Yanow (2014) argue that framing is a dynamic process which leads to the construction of these frames. During a continuously ongoing process, the developed frames can be modified and reshaped. This re-modelling of cognitive structures can be triggered by interactions, changing circumstances or the political context. Therefore, based on their understanding framing is a "many-dimensional socio-political process grounded in every-day practices and beliefs" (Van Hulst & Yanow, 2014, p. 105) which forms and further develops these frames. In their paper, the authors advocate for a shift of focus from examining "frames" towards paying closer attention on "framing", highlighting that the framing process indicates how certain meanings are constructed as well as negotiated among involved actors. Consequently, this change of focus enables a more nuanced analysis of the role of power, context and narrative in policy discussions, allowing the complexity and fluidity of the policy-making process to be worked out.

Van Hulst & Yanow (2014) introduce three concepts of framing. Firstly, framing can be understood as sense-making which, in a policy-making context, would describe a process through which participants construct and develop meanings of relevant situations by highlighting certain aspects and downplaying others in order the shape the perception of certain issues. These meanings are based on previous experiences as well as their own personal background and help individuals to interpret a complex situation, understand possible implications of policies or clarify certain issues. This process can aid individuals in organizing perceptions, identifying problems as well as possible solutions. Frames generated from this form of framing are always based on the specific situation while being inherently social as well as political and mirroring the interactions and mutual influence between the stakeholders (Van Hulst & Yanow, 2014). Secondly, framing can be seen as selecting, naming and categorizing when within framing processes one selects from a range of relevant features and names those features that require attention as well as categorizes them. During this process relevant elements can be highlighted, be pushed into the background or left out completely if they are not relevant for the situation. The authors point out that this process involves a more active role of the actors as they determine how policy issues are presented and understood. Lastly, framing can be viewed as storytelling. While working out frames the framing process can include binding salient features together into a pattern or narrative frames which achieves storytelling (Van Hulst & Yanow, 2014). This form of

framing allows actors to convey complex information in a coherent and engaging manner as well as put focus on elements such as specific values, experiences and emotions. Framing as storytelling can help to create shared meanings between stakeholders and influence their perceptions of policy issues.

## 2.3 Applying frame and framing analysis

During the implementation of a research project one can analyse the framing process as well as the frames itself. Framing analysis focuses on the process in which frames are created. As previously mentioned, Van Hulst and Yanow (2014) point out that framing analysis is less static as it considers "dynamic processes rather than treating policy frames as stable, self-contained entities whose component elements can be taxonomized and generalized" (Van Hulst & Yanow, 2014, p. 103). As part of this thesis, I will be looking into the process of framing drawing on Van Hulst & Yanows (2014) understanding of framing as a sense-making process to analyse how meanings are constructed. The focus of the analysis will be set on the process of how the stakeholders interpret the situation respectively the concept of circular economy and need for collaboration as well as how problems and possible solutions are identified. Furthermore, it will be analysed if their interactions between stakeholders created perceivable influences on how stakeholders frame issues surrounding the establishment of a circular economy in the Baltic Sea region.

Frame analysis, which will also be applied within this thesis, "offers an analytical tool to grasp the discursive practices of particular actors" (Lindekilde, 2014, p. 14) and focuses more on describing the frames used by actors at a particular moment. In the following explanations of this work, frames are understood as the fixed perspectives of the participants, which, according to Van Hulst & Yanow (2014), support individuals in understanding and categorising certain (policy) issues. They will be used to systemize and highlight the perspectives of the interviewees as well as interpret them. Entman (1991) mentions that frames can be found and analysed by searching for specific words or images that emerge consistently within a narrative. Since Van Hulst and Yanow (2014) also note that "actors draw on language that reflects their understanding" (p. 96), Therefore, I will focus on the use of language as well as reoccurring key words to be able to reconstruct the frames.

The frames are found by focussing on the content of the communication collected during the interviews to highlight important elements of the statements of the interviewees while leaving out unimportant details. Therefore, the combine the findings into the cognitive structures or categories which represent the perspectives of the participants. This aligns with understanding of frames that Van Hulst and Yanow (2014) presented. In their paper was pointed out, as previously mentioned,

that as part of a sense-making process the interviewees develop understandings of the concept which were transported through their statements as well as details in between the lines. To make it possible to analyse these understandings they were combined into frames which serve as overarching conceptual lens to organize and give meaning to the found information.
To apply the explained theoretical framework and analyse the frames and framing process of the interviewees the choice of research method plays an important role in the research process.

# 3. Methodology

Traditionally, scientific research has been perceived to be the "creation of true, objective knowledge following a scientific method" (Alvesson, 2018, p. 16). Through methods it is possible to collect data and subsequently draw conclusions about certain topics. These conclusions can be used to formulate generalizations and lastly theories which can be tested to be applied in similar contexts and situations (Alvesson & Sköldberg, 2018). The choice of research design and method greatly impacts how the research can be conducted, and which type of data can be collected. The following chapter therefore contains a description of the research design as well as the concrete research method chosen to acquire data as part of this master thesis project. Furthermore, arguments will be presented to underline why the chosen research design is suitable for the aim of this thesis.

## 3.1 Research design

Research designs are the underlying plans and procedures that guide research projects "from broad assumptions to detailed methods of data collection, analysis and interpretation" (Cresswell & Cresswell, 2018, p. 40). The choice of a particular research design is influenced by several variables such as the research problem addressed in the study, the audience that is examined and personal experiences of the researchers involved in the project (Cresswell & Cresswell, 2018).
In social research, which is commonly referred to as studies focusing on people in a specific social setting, there are traditionally two types of research designs that are used. They are specified as qualitative and quantitative research approaches, also named quantitative respectively qualitative research paradigm. (Robson & McCartan, 2016). A quantitative research type "typically relies on the collection of data in numerical form" (Robson & McCartan, 2016, p. 5). Furthermore, research methods allocated to this research type are used to test objective theories "by examining the relationship among variables" (Cresswell & Cresswell, 2018, p. 41) that can be measured to be able to generalize and apply the findings on a larger group of people. Qualitative research approaches on the other hand often include an inductive style, collecting and analysing data in a first step to then be able to develop theories and concepts based on the findings (Cresswell & Cresswell, 2018). These types of methods collect data that are "typically non-numerical, often in form

of words" (Robson & McCartan, 2016, p. 5) and allow researchers to explore and make sense of "the meaning individuals or groups ascribe to a social or human problem" (Cresswell & Cresswell, 2018, p. 41). Hence, qualitative researchers often focus on exploring things in a natural setting when attempting to understand certain social phenomena (Alvesson & Sköldberg, 2018). The authors Cresswell and Cresswell (2018) introduce a third research design, the mixed methods approach which includes approaches to collect quantitative as well as qualitative data. By combining research methods this design follows the assumption that "the integration of qualitative and quantitative data yields additional insight beyond the information provided by either quantitative or qualitative data alone" (Cresswell & Cresswell, 2018, p. 41f.).

For this thesis the qualitative research design was deemed the most suitable. The first variable which was considered when deciding about the design was the philosophical worldview guiding the research project. As previously discussed in the theory chapter above is the chosen philosophical perspective of this thesis the constructivist worldview which focusses on understanding the subjective perspectives made by individuals based on their experiences as well as cultural, social and historical backgrounds (Moon & Blackman, 2014; Cresswell & Cresswell, 2018). Following the notion that qualitative research explores which meaning individuals or groups assign to certain situations or social phenomena, it appeared to be a fitting approach. Furthermore, the research style spoke in favour for the chosen design. Based on the research question (see chapter 1.3), this master's thesis followed an inductive approach in which empirical data was first collected and analysed before conclusions could be drawn. The focus was on understanding the different perspectives of the participants and not on testing a theory or a specific concept. This is also in line with the characteristics of the qualitative research design and confirmed its choice. Lastly, the decision to use semi-structured Interviews as a method to collect data and learn about the perspectives of the interviewees was another reason why the qualitative research approach proved to be the most useful for this study.

## 3.2 Qualitative Interviews

Interviewing is method often used in social science because "because it builds a holistic snapshot, analyses words, reports detailed views of informants" (Alshenqeeti, 2014, p. 39) as well as allows the interviewees to "speak in their own voice and express their own thoughts and feelings" (Berg, 2007, p. 96). Therefore, they are considered to be one of the most familiar approaches to collect qualitative data and can be categorized in various ways. One of the most common ways to distinguish between different types of interviews includes their level of structure or standardisation. Most authors differentiate between unstructured, semi-structured

and structured interviews. However, structured interviews are usually categorised as quantitative survey methods, whereas qualitative research tends to use unstructured or semi-structured surveys (DiCicco-Bloom & Crabtree, 2006). Another way to set apart different types of interviews is to look at their setting such as Telephone interviews, online surveys or face-to-face interviews. In the following section, I will describe the chosen interview setting and explain why the chosen type of interview was considered suitable for this master's thesis.

### 3.2.1 Interview type

As previously mentioned, was the chosen research method for this research project was conducting semi-structured interviews. This type of interview is quite flexible and gives the interviewer the freedom to adapt to the circumstances of the interview situation. Typically, the interviewer has a guide with open-ended questions, topics or key words that should be covered in the interview. However, the researcher can adjust or add to the wording of questions if the situation requires it, allowing the interviewer to listen to the participants and respond to their answers creating a more dynamic conversation (Robson & McCartan, 2016). This flexibility gives the researcher the opportunity to inquire in-depth about certain topics and explore the perspectives of the interviewees with a wide range of questions. Commonly these types of interviews can be "conducted once for an individual or group and take between 30 minutes to several hours to complete" (DiCicco-Bloom & Crabtree, 2006, p. 315).

Due to the advantages outlined above, the decision was made to conduct semi-structured interviews for this study. The previously established guidelines made it possible to ensure that the topics important to the research question were covered in the interviews. At the same time, this method offered the opportunity to interact more freely with the participants and to adapt the sequence of questions or to skip questions if the interviewees had already addressed and answered them themselves. Furthermore, it was possible to respond to individual experiences based on the interviewees' professions and organisational backgrounds and ask specific questions about them. Given the qualitative nature of this thesis these types of in-depth interviews deemed appropriate as a research method.

### 3.2.2 Interview structure

The next aspect when considering the research method was deciding on the interview structure. Given the semi-structured nature of the interview, it was necessary to write down key points and important questions in an interview guide which can be found in appendix 2. When thinking about the order of questions and the structure of the interviews I took inspiration from the guidelines for conducting

interviews written by Carter McNamara (2009). The author suggests starting with questions that get respondents easily involved in the interview. These questions should touch upon controversial topics and enable a gentle introduction to the conversation. Therefore, I decided to open the interview with ice braker questions relating to the profession of the interviewees, their field of work and the general field of work of the organisation for which the participants work (s. Annex XY).
For the main part of the interview, I designed questions relating to the research problem of this thesis and included the topics circular phosphorus flows, collaboration as well as challenges while implementing strategies for a circular phosphorus economy. While formulating them I again tried to follow the suggestions about the wording of interview questions made by McNamara (2009):

> *"1. Wording should be open-ended. Respondents should be able to choose their own terms when answering questions.*
> *2. Questions should be as neutral as possible. Avoid wording that might influence answers, e.g., evocative, judgmental wording.*
> *3. Questions should be asked one at a time.*
> *4. Questions should be worded clearly. This includes knowing any terms particular to the program or the respondents' culture.*
> *5. Be careful asking "why" questions. This type of question infers a cause-effect relationship that may not truly exist. These questions may also cause respondents to feel defensive, e.g., that they have to justify their response, which may inhibit their responses to this and future questions." (p. 3)*

To finish off the interview I decided to end with questions regarding hopes for the future development of their own work as well as the phosphorus economy in the Baltic region. McNamara (2009) also proposed to give the participants the opportunity to "provide any other information they prefer to add and their impressions of the interview" (p. 2) as well as ask any additional questions they have about my research project which I include in my research guide.

### 3.2.3 Interview setting

After deciding the concrete research method and preparing the interview guide, the next step was to determine the interview setting. As previously mentioned, interviews can be conducted face-to-face, on the phone, within a focus group or as an online survey (Cresswell & Cresswell, 2018). Each setting has its advantages and disadvantages. To give an example, an online survey can reach a big audience in a short amount time, gives the opportunity to write down answers one would not have given with another person in the room and the interviewees have time to think about their answers. On the other hand, there could be difficulties with gathering a representative sample, nonverbal cues can not be observed, and this interview style

leads to a certain impersonality, which can cause distortion of answers (Robson & McCartan, 2016).

For this thesis the choice was made to conduct face-to-face interviews. Conducting interviews face-to-face again supports flexibility during the interview process and allows the researcher to react to non-verbal cues to adjust the setting (Robson & McCartan, 2016). Face-to-face settings can therefore also help to create a more relaxed atmosphere in which the interviewee is comfortable to talk about certain things since those cues can help the interviewer to take notice when to change the topic. Another advantage of face-to-face interviews is that they can take up more time compared to other interviews giving the possibility to have a more in-depth talk about certain questions which is beneficial for the research question of this thesis and the goal to explore how stakeholders make sense of a circular phosphorus economy. However, this type of interview also comes with challenges. Face-to-Face interviewing can require a substantial among of travelling for either the interviewer or the interviewees. Furthermore, due to the presence of the interviewer the participants can feel pressure to answer the questions in a certain way (Robson & McCartan, 2016). Given the limited time frame of this study and chosen sample of participants, which will be explained in the next chapter, it was not feasible to travel far to meet the interviewees. Therefore, it was made use of a modified version of the face-to-face interviews. To make it more convenient for both parties it was decided to conduct the interviews online via Zoom. The author Steve Mann (2016) mentions that this way of conducting qualitative interviews is quite helpful to achieve the desired sample size and to create a certain closeness between interviewer and interviewee despite the distance. For this reason, this method has been used more and more frequently in various research disciplines in recent years. In the case of this study this type of interview had the advantage that the interviewees could arrange more easily to fit the interview in their daily schedule as no travelling was required. However, one must be prepared that these types of online interviews come with the risk of being interrupted due to technical difficulties. Nonetheless, the choice of conducting semi-structured interviews in an online setting proved to be a suitable choice for collecting the data needed for this thesis.

# 4. Data collection process

Once the necessary parameters for conducting the interview had been established, the data collection phase began. This involved determining the sampling, contacting potential interview partners and organising the interviews. The following chapter describes the sampling strategy used and the field phase.

## 4.1 Sample

Sampling is an important part of a study, particularly in a social science context when certain social groups are examined. Robson & McCartan (2016) mention that "the idea of 'sample' is linked to that of 'population'" (p. 276). In this context 'population' refers to research cases that show the needed characteristics, for example all children living in Sweden. The term does not only refer to humans but also to objects that are studied. The process of sampling is therefore a selection of cases from a population.

In the case of this master's thesis, the population consisted of employees of HELCOM and its partner organisations, which are involved in the phosphorus cycle in the Baltic Sea region in various ways. To determine a reasonable sample, I decided to use Snowball sampling as a strategy to reach out to participants. This method requires the researcher to identify one or several individuals from the population at question. After the interview "they are used as informants to identify other members of the population, who are themselves used as informants, and so on" (Robson & McCartan, 2016, p. 281). This is a helpful approach in situations when it is difficult to find enough people that could partake in the interview. For the present study, this sampling strategy meant that it was possible to reach interview participants who had expertise in the field in question, phosphorus cycle in the Baltic Sea region, and who collaborate with HELCOM.

## 4.2 Field phase

With this strategy, it was possible to reach and interview 6 members of HELCOM and four other organisations with environmental background. They all are involved in projects relating to the phosphorus industry in the Baltic Sea region and therefore could resort to knowledge gained during their work with issues related to eutrophication. In preparation of reaching out to the possible interview participants it necessary to think about how to bring across the aim of contacting and address certain concerns that could come up on the part of the interview participants. Therefore, an attempt was made to ensure that the cover letter outlined the aim of the study, the time frame of the interview and the main topics of the survey. Furthermore, it was conveyed that the anonymity of the participants was guaranteed and that their answers, which are discussed in the next chapter, could not be traced back to them personally. For this the interviewees received a consent form which they could fill in to determine whether they, their profession or their organisation want to be mentioned by name in the final thesis.

During the field phase, the first step was then to contact a number of members of various organisations working in the desired field, which enabled initial contacts to be made and interview dates to be set. After difficulties arose in being able to conduct the hoped-for number of interviews, further contact was made with an interviewee to enquire whether they knew any other potential participants and their contact details. This enabled further interview partners to be found and interviewed. The following table illustrates this process and the position of all interviewees in their organisation and their field of expertise according to their desired level of anonymity.

| **Interviewee** | **Position in their organisation** |
|---|---|
| **IP1** | Business manager for fertilizer production and port projects |
| **IP2** | Senior advisor with expertise in phosphorus use in agriculture |
| **IP3** | Executive officer with expertise in the policy advocacy field and reduction of nutrient loads in the Baltic Sea |
| **IP4** | Professional secretary in the Baltic Marine Environment Protection Commission secretariat |
| **IP5** | Involved in projects regarding the marine environment and agri-environment |

| | |
|---|---|
| **IP6** | Senior specialist with expertise in reducing nutrient input into the Baltic Sea |

*Table 1: Overview over interview participants*

In total it was possible to secure 5 interviews with participants based in Sweden and Finland. All interviews were conducted in English which was not the native tongue but often the working language of the participants. One Interview was conducted with two interviewees who worked at the same organisation in two different positions. Therefore, this interview took double the time as predicted. Even though it was planned to do all interviews in face-to-face setting via Zoom, one contact asked to answer the questions in a written format due to time constraints which I agreed to, so some questions were altered and send to the contact person via e-mail (s. appendix 3) which resulted in shorter, but still useful answers. The other 4 interviews however were conducted as planned with a length varying between approximately 20 minutes and circa 1 hour. After the previously mentioned coding process it was possible to reach the following results.

## 4.3 Coding process

To apply framing- respectively frame analysis in this thesis, I drew up transcripts of the interviews to be able to analyse the statements of the participants. Firstly, I performed a content analysis as suggested by Entman (1993) to determine salient elements in the text. As often done within qualitative research I reviewed my data and while trying to make sense of the information I attempted to organize important features and keywords in form of codes (Cresswell & Cresswell, 2018). During my first round of coding, I focused on statements showing the participants' understanding of circular economy as well as circular phosphorus economy. I also tried to connect my findings to when participants were using the term "circular economy" but were referring to previous answers or to what a more sustainable phosphorus economy should be like or need in order to be established. In a second walk through I focused on statements relating to challenges when it comes to collaboration between stakeholders as well as implementation of strategies to achieve a more circular phosphorus economy. In a third read-through I focused on working out how personal experiences influenced and therefore impacted stakeholders' the process of creating frames and making sense of the situation. This step highlights how external influences from other actors effected the framing process of the individuals and consequently their perception of possible challenges and their solutions. In order to emphasise my findings, I used a method called colour

coding to accentuate important passages, key words or linguistic images. These steps were repeated several times until I was able to conclude my findings which will be presented in the following chapter.

# 5. Results

The results of the interviews that emerged from the coding process described above are analysed in the following chapter. In line with the two research questions that underpin this master's thesis, the following part is also divided into two sections. In the first section, the perspectives of the interview participants regarding the concept of a circular phosphorus economy are analysed. The frames that emerged from the interviews are described. Subsequently, the answers regarding the cooperation of the stakeholders are analysed and the frames regarding the challenges in establishing collaboration between the actors involved in the phosphorus economy are presented.

## 5.1 Circular economy frames

With regard to the views and understanding of the concept of the circular phosphorus industry in the Baltic Sea region, it can generally be stated that the interview participants showed very similar perspectives. Some frames were taken up in several conversations held with the interviewees. As previously mentioned, these frames were constructed by focussing on the content of the communication collected during the interviews to highlight important elements of the statements of the interviewees. The frames presented in the following paragraphs combine the findings into the cognitive structures or categories which represent the perspectives of the participants and serve as an overarching conceptual lens to organize and give meaning to the found information. In the following, the two fames that I was able to work out from the interviews will be presented and discussed in more detail.

### 5.1.1 Recycling frame

The most prominent frame shown the interviewees and shared by all participants explicitly was the recycling frame. This frame refers to the idea that a circular phosphorus economy can be established when the current resources are reused or transformed into a new resource for different purposes instead of being lost and left out to pollute the environment. Consequently, this frame calls for strategies within the Phosphorus economy in the Baltic Sea region that collects the surplus of phosphorus not used in production processes or on agricultural fields for example

to reuse it as well as recycle byproducts that are resulting from the production processes. One interviewee framed circular economy as following:

> "Fully circular would mean for me no input and no output from the system, all materials circulating and all waste becoming feedstock for processes and no new resources taken from the environment. In reality of course there are many limitations to what is possible, so in practice it means maximising recycling" (IP5)

Another interviewee mentioned:

> "It's a circular economy. You know? Like, you… you're still able to recover phosphorus. You don't have to import as much, phosphate rock then because you can reuse this phosphorus" (IP1)

Generally, all interviewees referred to this frame and connected to their work experiences, highlighting strategies they perceive suitable to recycle phosphorus. They shared the understanding that recycling especially includes the reuse of organic substances to extract phosphorus und return it to the nutrient cycle. Another strategy mentioned by the interviews to achieve reuse of materials included to find ways to make use of the byproducts:

> "So, they can kind of, it's a circuit here, you know, like a circular use of phosphors. So that's, that's one thing. Another idea is to kind of when you produce this byproduct, which is a phosphor gypsum, which is, you know there is not really, like, a commercial method to use phosphor gypsum." (IP1)

It can be noted that this frame was addressed by all participants and that most of them provided many examples of attempts to put this understanding into practice. This frame thus reflects a general understanding of circular economy, which also correlates with the discussion of previous research on this topic. It can be assumed that the projects and discussions in which the interviewees participate through their involvement in their respective projects and in the Commission for the Protection of the Marine Environment of the Baltic Sea have given them a similar understanding of the topic.

### 5.1.2 Resource management frame

This can also be stated for the second frame that came to light during the analysis of the interviews which is named the resource management frame. During the conversations it was mostly referred to as "decreasing the inputs" (IP4) and therefore "decreas[ing] the amount of waste" (IP1) introduced into the

environment. It followed the idea that before attempting to build circular economic structures within the phosphorus economy by recycling resources and use technologies to transform them into new products, attention should be paid to the responsible use of existing raw materials. This frame was also mentioned by all members of the environmental organisations and the member of HELCOM:

> "Before you discuss recycling of phosphorus, you first have to look at how to save phosphorus because there is so much use of phosphorus in the agriculture that is over-fertilization. You put out so much phosphorus on the agricultural land that much of it will leak out. So, we have to first to save phosphorus and have a balanced fertilization in agriculture" (IP2)

This frame was often related to agricultural practices and fertilizer production processes including transportation of phosphate rock to production facilities. IP2 mentioned that there has been a lot of research regarding optimizing the needed output of phosphorus to set an upper limit for the maximum amount of phosphorus fertiliser to determine the optimum yield and prevent farmers from using too much of the raw material and causing more damage to the environment. Some interview partners did not go into detail about this perspective and focused on more on the recycling frame mentioned above. However, in this case it was also noticeable in this frame that all interview participants expressed similar perspectives on this topic. However, this usually only happened in the margins of the conversation and was less prominent than in the recycling frame. In some cases, this perspective was only implied.

## 5.2 Collaboration frames

Collaboration between stakeholders formed the second section of the main part of the interviews. Similar to the circular economy frames, the collaboration frames were reconstructed by analysing the statements of the interviews as well as what could read between the lines. They again serve as overarching conceptual lenses that highlight the specific aspects mentioned by the interviewees and organizes them in form of a frame. When analysing the answers regarding this topic it became clear that some of the interviewees shared different perspectives on this topic. All participants agreed that collaboration is a crucial part of establishing a circular economy, however when it came to their understanding of challenges that can occur when trying build a collaboration with other stakeholder's different views were mentioned.

### 5.2.1 Trust frame

The first frame I was able to work out from the interview material is the trust frame. Applying this frame interviews perceived on of the biggest challenges to be the lack of trust between stakeholders which results in the in ability of forming long-term relationships and establishing cooperation to work towards common goals. IP1 one stated during the conversation:

> "It might be lack of trust, that, you know, that some stakeholders might be accused that that they cooperate with some companies, then they just want to earn money. So, it's, I think it's a lack of trust" (IP1)

It was also pointed out that due to different interests from companies, government and non-governmental organizations this trust is hard to establish between stakeholders with different professional backgrounds and therefore different economic interests:

> "I think, one of the barriers and hindrances is just lack of trust, unfortunately. And, for example, it takes a while for us being on one side, being environmental NGOs that are quite often considered as, well, not to say green terrorists, but at least not being very friendly with the with the industry and being the ones on the accusation side, being the watchdogs, being blaming that, someone else is not doing, right" (IP2)

This kind of framing was only done by members of the environmental organisations. The representative of HELCOM did use this frame. They mentioned that due to their role as a policy organisation and the advantage that they already established a network of collaboration partners they did not view trust as challenge when it comes to cooperation with other stakeholders. They already have an established position in the industry. However, smaller organisations as well as companies and farmers working with phosphorus fertilisers seem to feel this challenge when it comes to building relationships with other stakeholders.

### 5.2.2 Motivation frame

Another frame that could be determined during the analysis process is the motivation frame. It refers to the lack motivation from some stakeholders to engage with collaboration practices and projects to establish a circular economy. Some of the statements of the interview participants were showing that lack of motivation can be an hinderance on several levels. One interviewee, working as a senior advisor for an environmental organisation perceived a "lack of political will" (IP2) as a challenge when it comes to collaboration. This can result into exerting less

pressure on companies, farmers and other stakeholders, which reduces their motivation to act and exchange ideas with others regarding possible solutions:

> "I guess it starts from the motivation that, some
> times motivation comes from financial benefits, but in this case, that is still lacking because of the cheap price of mineral fertilizers. Another option is the motivation comes from legislation so that, the use of phosphorus is somehow limited" (IP6)

Another approach to this frame included the perspective that due to lack of motivation not only the Efforts to get in touch with other stakeholders are less present but also the will to apply for support regarding implementing measurements for nutrient inputs for example:

> "They get special support, you know, area support when it's come to the CAP policy and so on. And, also, then when it comes, to try to introduce this. You know? There's been lot of money put up in the regional development program within CAP, for example, that you can have, support them to doing nutrient ballast calculations and on your farms for different fields. But farmers are not interested in this. They don't apply for this because there's no requirement of this." (IP3)

This frame illustrates how the absence of motivation on the part of the producers, the farmers and other actors towards collaboration. As a solution several actors mentioned was that help on the part of the government in form of incentives to promote knowledge exchange between stakeholders to find solutions in line with the circular economy could support the actors individually but also motivate them to get in contact and cooperate with other stakeholders from the same economic field.

### 5.2.3 Language frame

The last frame I was able to determine is the language frame. It is based on the idea the cooperation can be impaired or prevented completely by missing language skills. This can be detrimental as the phosphorus industry extends across all Baltic states and co-operation beyond national borders is necessary to reduce the eutrophication of the Baltic Sea to a level that allows the inland sea to regenerate itself. However, the perspective was only brought up by one interview participant who mentioned:

"I don't know if I guess that, you know, might be language barrier, for example, really simple thing, that, you know, that you have people working in the fertilizer

factories that they just simply don't understand, you know, the research papers or they cannot hold meetings, you know. I can see it as a problem" (IP1)

The interviewee was referring to his experiences while working with a port and a production company abroad where they noticed that language can be a barrier preventing collaboration between stakeholders as well as knowledge exchange regardless of the selected platform. As shown in the quote above, the challenges can be related to not being able to understand research papers or hold meetings with other stakeholders which can be an hinderance. The responses of the other participants showed no sign of similar experiences. They did not share the perspective of language being a hindrance to collaboration. It can be argued that actors whose work includes more involvement in policy processes and projects taking place abroad are integrated into an environment where language barriers are far less prevalent. Therefore, their perspectives might not include on these kinds of hindrances. This assumption would be consistent with Goffmann's (1974) understanding of framing, as he defined in his research paper that frames, especially primary frames, are shaped by individual experiences and life realities. To further discuss how the frames determined in this frame can be connected to the theoretical framework of this thesis and the research questions the next chapter picks up on similar lines of thought.

# 6. Discussion

This thesis aims at providing insights into stakeholders' sense making of the idea of circular economy, how the understanding of the concept influences cooperation between stakeholders in the phosphorus economy as well as their understanding of challenges when it comes to establishing collaboration. The following chapter provides a theorization and discussion of the findings in relation to the theoretical framework presented in chapter 2.

## 6.1 Sense-making of a circular phosphorus economy in the Baltic Sea region

As previously mentioned, to answer the first research question focusing on how stakeholders make sense of the concept of a circular phosphorus economy two frames could be determined: the recycling frame and the resource management frame. When analysing how the stakeholders make sense of the concept of circular economy the more prominent interpretation of this term relates to recycling processes. The current phosphorus economy is greatly reliant on linear production processes. One Interviewee brought up the example of a fertilizer production plant in Poland they are working with. The company is facing the challenge that byproducts of the fertilizer manufacturing are placed on so called phosphor gypsum stacks that remain as form of waste collection taking up space and impacting the surrounding vegetation as rain washes out chemicals from the phosphor gypsum that can negatively affect the environment. Currently, there is no way to reuse these materials as there is no procedure that separate phosphor gypsum into useful parts while removing harmful substances. Circular economy, according to the understanding from the interview participants, would require strategies to re-enter these substances into the production cycle and keep their value in the system. This is in line with how many standard definitions are explaining the concept of circular economy some of which were discussed in the first chapter of this thesis. As previously shown, researchers such as Preston (2012) or Rizos et al. (2017) used the recycling and reuse of resources as the main characteristic of the circular

economy in their definitions. Similarly, the working definition of this master's thesis by the European Commission (2015) also focuses on an economy "where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised" (no page). A comparison with these definitions shows that the interviewees share the common, publicly discussed image of the circular economy as an economic model focusing on a closed system that re-enters and repurposes resources. Through the interviews it became clear that their understanding of the circular economy was generally shaped by the personal experiences of the interviewees. Their work within non-governmental environmental organisations with focus on restoring a healthy Baltic Sea provides them with great insights into both environmental challenges as well as how the industry works as they connect with stakeholders within different fields such agriculture and fertilizer production. In their respective fields of work, they seek cooperation with stakeholders that use or produce products made from phosphorus. Their idea of a circular phosphorus therefore was often based on what they could see to be possible in those industry fields or which strategies for recycling resources are currently tested. These findings also align Van Hulst's and Yanow's (2014) understanding of framing as a sense-making process. The results of the interviews show that the interviewees are drawing past experiences to understand the situation and make sense of the concept of circular economy. Considering their similar professional background, it is plausible for the participants to share the same understanding of the concept with slight variations based on their fields of expertise. The previous analysis of existing literature on circular economy has also shown that the professional background or research field greatly influences how the concept is understood and defined, which elements are highlighted, and which aspects are not included. The findings from the interviews reflect this approach which becomes more obvious when including the second frame into the discussion. The second frame, focusing on managing resources and minimizing a wasteful use, was only mentioned occasionally which also corresponds with how of circular economy is generally defined. While most attempts of defining the concept focus on reuse of resources and their repurpose, only few such as Ekins et al. (2019) who mentions the importance of a responsible use of resources for minimizing waste. This perspective is represented much less compared to the much more frequently communicated understanding of the circular economy as a cycle through recycling and reutilisation of already used resources. It was only brought forward by interviewees from two organisations which worked with strategies to define the needed amount of phosphorus fertilizer to reduce wasteful use of resources in the agricultural sector and to minimize waste when loading phosphate rock from cargo ships in the ports.

These examples show how the understanding of circular economy is tightly tied to the professional experiences of the stakeholders, which also corresponds with the

previously mentioned possible obstacles in the discussion about circular economy. Rizos et al. (2017) mentioned the excess number of definitions of the concept can pose as a significant challenge, which developed due to industry-dependent explanations of the concept and led to much criticism of the idea of circular economy as a whole. This variety of definitions can cause further challenges when comes to determining what practical steps that need to be taken to establish a circular phosphorus economy. The interviews showed that very similar definitions as well as approaches to action exist within parts of the phosphorus industry in the Baltic Sea region which was also extended to their perception of collaboration.

## 6.2 Perception of collaboration within the phosphorus industry

As the literature overview has shown, collaboration between stakeholders is seen as a key element of a successful circular economy. The phosphorus economy can only become a closed system if actors in multiple fields and on various levels of the industry collaborate such as researchers, farmers, fertilizer producers and politicians. The analysis of the interviews reflects this perspective as all participants - from the environmental organisations and from HELCOM - viewed collaboration to be an important component. When asked about possible difficulties which might arise in the course of cooperation, a mixed picture emerged.

Based on their professional backgrounds and experience working on projects related to the reduction of phosphorus infiltration into the Baltic Sea, different perspectives were presented. The difficulties mentioned included low trust in each other as potential partners. The interviewees mentioned that their position as environmental organisations can deter businesses from collaboration with them as they feel that the organisations might not see things from their perspectives and only focus on the environmental part of the problem and less on the economic side. This clash between perspectives can ultimately become visible in the sense-making process and influence how possible strategies toward a circular phosphorus economy are viewed. Further hindrances of collaboration that were brought up are low motivation or lack of incentives to contact and exchange knowledge. Finally, as already mentioned, language barriers between stakeholders were also mentioned as possible obstacles. The findings suggest that according to the interviewees the reason why collaboration regarding phosphorus flows in the Baltic Sea region can be difficult to be implemented is that at different levels of the industry various challenges can be observed. For example, during the interview with the member from HELCOM it became apparent that not all actors experience the same

challenges. During this interview no obvious hindrances for collaboration were mentioned by the participant and the general assessment of the current level of cooperation was viewed very positively. This could possibly be traced back by to underlying power relations as HELCOM is an established organisation in the region with a number of partners in politics, interest associations and environmental organisations. They have already created a network of partners to work with whereas other actors with less network building capacity might face more difficulties when engaging with the topic of circular phosphorus flows. Other participants mentioned more hindrances they experienced and also highlighted that actors outside of the existing networks such as small-scale farmers have a harder time to form long-term collaborations and connect with each other caused by opposing goals and language barriers for example.

Throughout the interviews, there was no mention of difficulties specifically regarding the different definitions of the concept of circular economy. None of the interviewees connected the current challenges to differing understandings of the concept of circular economy itself. This could be related to the similar understanding of circular economy displayed by the participants. However, the challenges presented in the interviews suggest that different views towards necessary strategies and therefore what circular economy means to them, other stakeholders and the possibility to communicate with each other exacerbates successful implementation of a circular economy.

# 7. Critical reflection

As the discussion of the results has shown the theoretical and methodological choices made in thesis had a great influence on the findings and showed strengths as well as limitations. Therefore, this next chapter will reflect on the theoretical as well methodological framework and present these limitations. It will also contain a critical examination of one's own role as a researcher and interviewer as well as make suggestions for future research.
The aim of this thesis was to investigate how stakeholders involved within the phosphorus industry in the Baltic Sea region define the concept of circular economy and view collaboration as well as if the understanding of circular economy influences cooperation between actors. Therefore, the project was situated within the broader context of sustainable development with relation to nutrient development and circular economy as it focuses on how communication about sustainable economic strategies could influence cooperation between stakeholders. The investigation of stakeholder perspectives and how they perceive and engage with circular economy places this study furthermore within the field of policy analysis and stakeholder engagement, which is crucial for understanding how cooperation influences a successful implementation of sustainable resource management practices.

To reach the aim of the study some key steps needed to be taken. Following the literature review and frame development, including the theoretical and methodical framework, the stakeholders that were to be interviewed needed to be identified and contacted. The data was then collected through the interviews and analysed using data coding and frame analysis to work the perspectives presented by the interviewees. After completing the analysis, I synthesized the findings which highlighted the stakeholders understanding of circular economy, their view on the need of collaboration and how the definition of circular economy could impact cooperation between stakeholders. Lastly the research process required final refinements of the analysis as well as drawing a conclusion and preparing recommendations for future research. This set up inadvertently causes limitations of the study.
The chosen formulation of the research question and therefore the limitation of the research goal made it possible to reduce the scope of the study to such an extent

that it was appropriate for the given time frame in which the study was conducted. On the other hand, this meant that the group of interviewees was very limited and therefore not diverse. This decision was made to uphold the possibility of comparing the findings generated in the individual interviews and drawing conclusions from them. The study therefore did not include any representatives of the business community and therefore cannot make any statements about their understanding of the circular economy and perspectives on the necessary cooperation and its obstacles. The choice of research design also favoured this limitation of the study, as the qualitative approach favoured the selection of fewer case studies for in-depth analysis, which made it impossible to create a diverse sample of the group. It can be critically questioned whether a greater variance with respect to the interviewees led to a higher reliability of the results.

Furthermore, a critical consideration can be made regarding the choice of the theoretical background as limiting factor of the thesis. The chosen theoretical framework, frame analysis, was found to be appropriate because it offers the opportunity to examine, name and categorize different perspectives on a topic, thereby making them comparable. It also offers the opportunity to investigate not only the frames itself but also the process of framing. This allowed insights into how the perspectives of the participants were formed and their views were influenced. Nevertheless, it is also necessary to consider whether another method such as discourse analysis might have been appropriate. Discourse analysis "usually refers to a research approach in which language material, such as talk or written texts, and sometimes other material altogether, is examined as evidence of phenomena beyond the individual person" (Taylor, 2013, p. 2). This method could have provided an in-depth understanding how the language and by extension how communication about something shapes social realities, identities and power structures. Furthermore, due to flexibility regarding the medium which can be analysed as well as possibility to examine underlying assumptions and biases this method could have been beneficial for the present study to uncover the perceptions regarding circular economy and collaboration. However, disadvantages of discourse analysis include a high complexity which can be time-consuming as well as the production of interpretation that are highly influenced by the researcher (Taylor, 2013). Especially, the high complexity and the possibility results that are highly influenced by the researchers' assumptions lead to the decision of a different theoretical concept. Frame analysis proved to be time-effective for this type of research and allowed to analyse and systematize the perspective communicated the interviewees and the process be them. Discourse analysis does not place much focus on the process of how phenomena developed except for how language shapes them. Therefore, the frame analysis was shown to be the more fitting choice for the present study as gave insights into the framing process. However, future studies

could test the influence of language on the perspectives of the stakeholders while applying discourse analysis and approach the research topic from a different angle.
Another important aspect that needs to be critically examined is the choice of the research method. In the case of the present paper, the chosen method was to conduct qualitative guided interviews. The advantages of this method have already been explained in detail in Chapter 3. While they allowed for detailed answers from the participants and a flexible question guide for the interviewer, limitations due to language constraints, time constraints as well as pressure due to the online face-to-face setting impacted the interviews as well as the results. One interview was conducted in a written format which allowed for an answering of the questions at a suitable time for the participant as well as the possibility for a longer thought process before answering and the opportunity to look up unknown words. However, the answers were less detailed and did not allow from an immediate enquiry from the interviewer and were therefore less insightful for the research. The interviews proved to be an appropriate tool for collecting empirical data to be analysed.
A final aspect that can still be considered a limiting or impacting factor in this research is the influence of the researcher in the interviews and in carrying out the analysis of the collected material. In frame analysis, the researcher is responsible for extracting the important information from the text, naming it and categorizing it as frames which can lead to an over-emphasis of certain aspects whereas others are neglected. One is also influenced by one's own experiences and social and cultural background, which can also lead to distortions of the presented results. This was tried to be avoided by creating the question guided with open questions, allowing the interviewees to steer the interviews with as little influence as possible by the interviewer. Furthermore, multiple rounds of analysing and coding the empirical data were conducted to ensure that all details helpful the answer the research questions can be worked out and analysed.
In summary, therefore, it can generally be stated that the study results can be distorted by various influences during the conduct of the study, which must be taken into account when revisiting the study contents.

# 8. Conclusion

The conclude this thesis and sum up the findings this last chapter will provide a short conclusion of the results. The research questions of this study were: “How is the concept of a circular phosphorus economy within the Baltic Sea region understood and made sense of by members and partner organizations of the Baltic Marine Environment Protection Commission?” and “How do these stakeholders frame collaboration regarding the establishment of a circular phosphorus economy and possible difficulties that might hinder a successful implementation?”. The analysis and the discussion of the results showed that the interviewees basing their understanding on their experiences and reciprocate the commonly used definitions of circular economy focusing on recycling and a smart use of existing resources as the defining practices. Even though no clear indicator for the influence of the understanding of circular economy on a collaboration between stakeholders could be found, it became clear that different perspectives on necessity and realisability of strategies working towards circular economy impact the willingness to cooperate. Lack of trust, motivation and language barriers were named as the main hindrances for collaboration.

The present study approached the topic of the circular economy within the phosphorus industry in the Baltic Sea region from a social science or communication science perspective, which has received little attention in previous research, and which leaves much room for further studies. Due to the nature of this study certain limitations arose and prevented from extending the research. Future examinations could therefore further analyse how stakeholders from different economical fields view circular economy and if their perceptions differ from those who been interviewed for this paper to gain a more holistic perspective on the topic. Furthermore, it could be insightful to study how stakeholders involved in the phosphorus industry outside of the Baltic Sea region view the issues. Lastly, a different theoretical perspective such as a discourse analysis could provide a deeper and more complex view on the topic as well as focus on how language impacts how the concept of a circular phosphorus economy is understood by stakeholders.

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Furthermore, I want to extend much thanks to my family and friends who supported me during this challenging time, encouraged me to and helped me to see the light at the end of the tunnel.

# Appendix 1

*Consent form (English)*

**Consent form**

My name is Tabea Mönnig, and I am currently in my second year of studying environmental communication at SLU, the Swedish Agricultural university, in Uppsala. I would like to conduct this interview as part of my research project for my master thesis. This research project focuses on how the concept of circular economy is understood by stakeholders related to the phosphorus industry in the Baltic Sea region. It is aimed at examining if different perspectives of this concept and its implementation exist. In a second step the focus lies on understanding how stakeholders view the need of collaboration in order to implement approaches that favour a circular phosphorus economy and possible difficulties that could arise as well as might hinder a successful implementation.

You will be asked for your knowledge and impressions on these topics in an interview of approximately 30 to 40 minutes. Participation is voluntary and you do not have to answer any question you do not want to answer. If you want, the final version of the study can be sent to you.

The undersigned agrees to the following:

- Access to this material is restricted to only serve the purpose of the research
- The interview will be audio-recorded to make sure all information is remembered accurately; the audio will solely be used by the interviewer/author of the thesis report
- I can withdraw from participation at any moment;
- I will remain anonymous;
- Considering quoting, I prefer that…
    - ◯ My name will not be used in the thesis report

◯ My job title will not be used in the thesis report

◯ The name of the organisation I work for will not be mentioned in the thesis report

- Considering a word of thank you, I would like that…
  - ◯ My name is mentioned (**not** connected to any specific opinion/utterance)
  - ◯ My name is not mentioned

Place, date Name and signature

…… ……

# Appendix 2

***Interview guide***

## 1. Introduction

Hello, thank you very much for participating in this study. It will take you approximately 30 - 40 minutes. To start off, I would like to shortly introduce myself again. My name is Tabea Mönnig, and I am currently in my second year of studying environmental communication at SLU, the Swedish Agricultural university, in Uppsala. I would like to conduct this interview as part of my research project for my master thesis.

This research project focuses on how the concept of circular economy is understood by stakeholders related to the phosphorus industry in the Baltic Sea region. It is aimed at examining if different perspectives of this concept and its implementation exist. In a second step I would like to understand how stakeholders view the need of collaboration in order to implement approaches that favour a circular phosphorus economy and possible difficulties that could arise as well as might hinder a successful implementation.

It is important that there are no right and wrong answers. We do not want to test you. This short interview is about your personal assessment of and your opinions regarding the topic.

Your statements will be completely anonymized. This means that from the interview and the information I will make use of in my thesis no conclusions can be drawn about you personally. For the evaluation and the possibility to revisit your answers, I would like to record the interview. This record will be solely used by me and will not be accessed by others.

Do you agree to this?

Do you have any questions before we start?

*Have the written consent form signed, clarify any questions/concerns if necessary.*

Thank you. I will start recording now.

## 2. Warm Up (incl. Ice breaker questions and questions to lead to the topic)

Could you please introduce yourself?

What is your connection to the Baltic Sea?

How is your work related to the phosphorus industry in the Baltic Sea region? Do you have any projects currently that focus on the issue of eutrophication (over-fertilization of the Baltic Sea)? Or maybe on fertilizer production or agriculture?

Have you ever come across the term "circular economy" in your daily life or as part of your work?

## 3. Main part

### *a) Understanding and making sense of circular economy*

How do you define the term of circular economy for yourself? What do you connect with this term?

Which criteria must an industry follow to be called "circular" in your opinion?

> *→if interviewee struggles with the terminology, maybe provide a short definition*

So, based on your understanding of "circular economy", what needs to be done to achieve a circular phosphorus economy in in the Baltic Sea region?

Which part of the phosphorus economy needs to be changed to create more circular economic processes?

> *→e.g transport to reduce leakage of phosphorus? The production processes (e.g. to make use of byproducts or find a way to release them in to nature without harm)? Recovery and Reuse of nutrients (e.g. in wastewater)?*

How would you evaluate the current situation within the industry? Have there been efforts made to achieve circularity? What hinders the implementation of suitable approaches?

***b) Understanding of collaboration?***

From your perspective, which role plays collaboration for establishing a circular phosphorus economy?

Have you heard of or been part of attempts to establish collaboration between stakeholders and join forces?

If yes:

*How did this collaboration look like? Was this only short-term or long-term oriented collaboration? How many stakeholders were involved? Was it international or locally limited?*

*Did you experience difficulties regarding implementing strategies to achieve a circular phosphorus economy?*

If no:

*In your opinion, what is needed to establish collaboration between stakeholders?*

*What might hinder collaboration between different actors?*

*What difficulties do you expect to arise when it comes to implementing strategies to achieve a circular economy?*

## 4. Final part/conclusion

What do you think is needed on a political level to support the establishment of a circular phosphorus economy?

What do you hope for the future of the phosphorus economy (regarding the implementation circular economy)?

Thank you again for participating in this study. Do you have any last comments or something you want to add?

Do you have any last questions? (maybe regarding this interview, my research etc. …)

Then I'll end the recording.

# Appendix 3

Interview questions

Hello, thank you very much for participating in this study. My name is Tabea Mönnig, and I am currently in my second year of studying environmental communication at SLU, the Swedish Agricultural university, in Uppsala. I would like to conduct this interview as part of my research project for my master thesis.

This research project focuses on how the concept of circular economy is understood by stakeholders related to the phosphorus industry in the Baltic Sea region. It is aimed at examining if different perspectives of this concept and its implementation exist. In a second step I would like to understand how stakeholders view the need of collaboration in order to implement approaches that favour circular phosphorus flows and a more sustainable phosphorus industry as well as possible difficulties that could arise as well as might hinder a successful
This short interview is about your personal assessment of and your opinions regarding the topic. Your statements will be completely anonymized. This means that from the interview and the information I will make use of in my thesis no conclusions can be drawn about you personally. For the evaluation and the possibility to revisit your answers, I would like to record the interview. This record will be solely used by me and will not be accessed by others.
Again, thank you very much for your participation.

1) Warm Up

Could you please introduce yourself? What is your role or work field in your organisation?

How is your work related to the phosphorus industry in the Baltic Sea region?

2) Main part

How do you define the term of circular economy for yourself? What do you connect with this term?

Based on your understanding of “circular economy”, what needs to be done to achieve a circular phosphorus economy in in the Baltic Sea region? What does your organisation do already and what more does it need to do to achieve circular phosphorus flows?

How would you evaluate the current situation within the industry? Have there been efforts made to achieve circularity? What hinders the implementation of suitable approaches?

From your perspective, which role plays collaboration between different stakeholders for establishing a circular phosphorus economy?
What organisations/companies are your organisation collaborating with? Have you heard of other attempts to establish collaboration between stakeholders and join forces?

In your opinion, what is needed to establish collaboration between stakeholders?

What might hinder collaboration between different actors? What challenges could arise?

3) Final part

What do you think is needed on a political level to support the establishment of a circular phosphorus economy?

Thank you again for participating in this study. Do you have any last comments or something you want to add?

# 9. Popular Science Summary

Phosphorus is an essential nutrient needed in agriculture to grow food. However, it is a finite resource. The Baltic Sea region is therefore facing a dual challenge: preventing phosphorus runoff to pollute the sea while ensuring a sustainable use of the resource to secure food stability. One concept suggested to be a solution is circular economy – a system where phosphorus is reused instead of wasted. In recent years scientists and stakeholders have explored this concept and possible strategies revealing both great opportunities as well as challenges.

**What is circular economy?**

The idea of circular economy is based on reusing, recycling and repurposing resources to minimize waste, reduce the impact on the environment and establish a sustainable use of nutrients. This includes winning back phosphorus from sources such as wastewater, food waste or animal manure and reintegrating it into production systems. These strategies would allow the Baltic Sea region to reduce the need for imported phosphorus and limit the over-fertilization of its waterways.

**Stakeholder perspectives**

To build a circular phosphorus economy not just technical challenges need to be overcome – it also requires a shared understanding of the concept and collaboration between stakeholders. This study aimed to understand how stakeholders working in environmental organisations define the concept of circular economy and applied frame analysis to do so. Interviews showed that participants shared the commonly used definitions which focus on recycling and sustainable management of resources.

**Collaboration is key**

The study also looked at how collaboration was perceived by the stakeholders and if the understanding of circular economy can have an impact on collaboration between different actors. The findings suggest that collaboration is a key element for achieving a circular phosphorus economy. However, different priorities among stakeholders can create tension when those interests clash and result in lack of trust and motivation to implement sustainable practices.

**Why it matters**

The mismanagement of phosphorus not only threatens the environment but also jeopardises food security. A circular economy for phosphorus offers an opportunity to tackle both problems, but only if stakeholders can work together. The Baltic Sea region is already a hotspot for innovation in this area, with initiatives ranging from the recovery of phosphorus from wastewater to awareness campaigns for better use of fertilisers.

**The road ahead**

The transition to a circular economy for phosphorus is not a one-size-fits-all solution. Success will require customized approaches that take local circumstances into account, as well as solid cooperation between stakeholders and continuous innovation. The base line for this is a shared understanding of what circular economy means and what it entails. If efforts continue, the Baltic Sea region could become a model for sustainable phosphorus management worldwide.

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