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Conflicts and the possibility for coexistence between offshore wind power and national defence

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Sweden has set a goal to produce 100% renewable electricity in 2040. In order to accomplish this, a transition towards renewable energy (RE) is necessary. However, the development of RE needs to coexist with other interests of the nation, as RE typically occupies large areas of land or off shore water. This has resulted in conflicts, for instance, between offshore wind power development and national defence, and this conflict is the aim of this thesis. The conflict is analysed using the theory of Common Pool Resource. A qualitative study done by semi-structured interviews has been performed to analyse the conflict of interest and the possibility for wind power and national defence to coexist. The conclusion is that essential pillars in the theory, such as dialogue, sharing of knowledge and information needs to improve in the case of Sweden. Common understanding and more integration between climate, renewable energy, and national defence are also necessary. Moreover, the interviewees mention that the appropriation direction in 2020 aimed at the national defence is a good starting point to create an environment that promotes coexistence between these interests.

Keywords: *Common pool resource, wind power, national defence, coexist*

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Definitions:

CPR - common pool resource

RE - renewable energy

TWh = 10^6 MW

Translate of Swedish authorities and organisations:

Energimyndigheten - Swedish energy agency

Försvarsdepartementet - Ministry of defence

Försvarsmakten - Swedish armed force

Havs- och vattenmyndigheten - Swedish agency for marine and water management

Länsstyrelsen Skåne - County Administrative Board

Naturvårdsverket - Swedish Environmental Protection Agency

Region Skåne - Region Skåne

Regleringsbrev - Appropriation direction

Regeringskansliet - Government offices of Sweden

Skånes vindkrafts akademi - Wind power academy of Skåne

Svensk vindenergi - Swedish Wind Energy Association

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1. Introduction

Historically, before the first industrial revolution, there was a practical conflict around the use of land. Land was limited and coexistence of different applications was not always possible. Often a choice had to be made of whether to grow food, fodder or wood fuel on the land. With the discovery of fossil fuel, this conflict was solved by the ability to produce energy without a large area of land (Kander, Malanima & Warde, 2013). During the 20th century, the conflict of land did not exist to the same extent, but this has recently changed again. When the negative environmental consequences of fossil fuel such as global warming started to appear, the world started to promote a transfer to renewable energy (RE) sources (see, for example, Kyoto Protocol, Paris Agreement, Agenda 2030). Once again, a conflict about land started. The demand for land from energy sectors has increased even if we, thanks to technology, have been able to use and take advantage of resources in a more effective way (Johansson, 2014).

Within countries the existing conflict is often between RE like wind power, and other interests of the nation. A current discussion today in Sweden is the conflict of interest between national defence and the growth of RE, especially wind power (Svensk vindenergi, 2018). The national defence is one of the main barriers to the development of offshore wind power in Sweden because both actors having different interests in the same geographical location (Svensk vindenergi, 2018). Hence, even if the conflict today differs compared to the one in history, the land area is still today a limited resource (Rule, 2014). In the southern part of Sweden, there are many interests in the same land and water areas, making it hard to find areas for large-scale wind power production areas (Stenkvist, 2019). This thesis will, therefore, focus on how to manage limited resources like land, water and airspace as consequence of increased demand for these resources.

Swedish energy policies are built upon three overarching goals; an energy system which is environmentally sustainable, has a security of supply and comes at competitive pricing (Regeringskansliet, n.d). The transition towards RE is seen as a solution to all of these three objectives. The increased focus on producing RE at a national level is partly a consequence of financial and political instability as well as agreements on the international level like the Kyoto protocol (Negro, Alkemade & Hekkert, 2012). The development of wind power has lately become not only a national but also an international interest. The wind is an important energy source, and even before the first industrial revolution wind drove sailboats across the great seas (Rule, 2014). Wind is argued to be one of resources able to meet the energy demand, and the energy generated from a given set of turbines is based upon where these turbines are installed, which is based on resources available for this purpose.

1.1 Research problem

As an increased focus has been on climate change and how to decrease pollution, RE is regarded one of the main components to accomplish this. Agenda 2030 goal seven points out that the share of RE sources should increase, and in Sweden and Region Skåne, the goal is to use 100% RE in 2040 (Energimyndigheten, 2018). There is huge potential for offshore wind power in Skåne (Skånes vindkraftsakademi. n.d). However, the development is slow due to many conflicting interests in the same area. The ocean is an essential subject for many partakers and can contribute to many different benefits for society (Havs- & vattenmyndigheten, 2019). The argument is not only about land, airspace, and wind but also between different views on national defence and use of resources. The increased concerns about risks and the need for national defence are partly argued to be an outcome of increased concern about climate change (Andrews-Speed et al. 2015).

Many studies regarding sustainability and its relationship to energy have focused on technological and financial dimensions, contributing to plenty of knowledge within these fields. This study will instead focus on institutions and conditions for sustainable common pool resources (CPR). Conducting a study regarding the conflict and possible coexistence in the same area in Sweden using the theory of CPR will contribute to a study based on institutional theory as well as hopefully another viewpoint on how to handle conflicts around wind power and other land demanding RE sources.

1.2 Study aim and research questions

This paper aims to analyse the conflict between two public interests and analyse the case of Sweden in the light of the theory of CPR. This is primarily done by identifying conditions that need to improve for successful coexistence in the same area by offshore wind power and national defence.

The empirical study is conducted mainly using interviews with actors with good knowledge in the field. The

primary data is supplemented by a literature review and secondary data to create reliable data and results. The reason for selecting specifically offshore wind power is because it is argued to be a solution to other problems surrounding RE conflicts, for example, the NIMBY (Not in my backyard) approach (Waldo, 2012). Also, offshore is deemed one of the areas where wind power has the highest potential to generate energy (Skånes vindkraftsakademi, n.d). The following research questions are going to be answered:

- Is it possible to solve the conflict of the common resource, or is the only solution that one actor gets a better access/ (exclusive benefit) of the area?

- Which factor needs to be improved to solve the conflict of the common resource to exploit the resource in the best way and unlock its potential?

The empirical analysis is conducted in Sweden, with a focus on southern Sweden. The geographical location of Skåne and its perfect fitting for offshore wind power makes it an exciting region to study (Skånes vindkraftsakademi, n.d). Region Skåne has the goal to be climate neutral by 2030 (Region Skåne, 2019), leading to a situation where the development of RE is necessary. Furthermore, even if Skåne is a small region, Skåne is an area of great military importance as well as a coastal region with potential for offshore wind, which makes it a good case study for exploring conflict and cooperation over land and water use. The study can give a view of what the central conflict is, and what both sides of the conflict mean are the most significant problems to overcome to be able to build out RE.

It is worth pointing out that even if the aim and focus will be on a regional level, the theory points out that a polycentric system is an important aspect (Dietz, Ostrom & Stern, 2003). Therefore all levels will be included to some extent. Also, some of the organisations are working at a national level, making it necessary to take the national aspect into account. Hence, the development of RE at a national level is often a consequence of decision-making on a global level, and an outcome of problems around CPR like climate change (Koster & Anderies, 2013) as well as conflicts at a local level. The conflict has mainly been evident in southern Sweden since there is considerable potential for wind power and large areas restricted by national defence interests in this geographical location (Havs- & vattenmyndigheten, 2019).

There are some limitations worth mention. First, wind power can be subject to both private and public interest. Hence the subject and discussion around this are not included in this paper. Instead, wind power development is assumed to be a subject for the public interest. Partly since wind power contributes to a decreased dependency on non-domestic energy supply as well as a decrease in the CO2 emissions (Bergek, 2010), another limitation is that the case study is conducted in one specific country and not a comparative study.

1.3 Outline of the thesis

The thesis is organised in a conventional manner. The first chapter includes the research problem, aim, and research questions. The background section aims to explain the area of study as well as how the national interest works within Sweden from both wind power and national defence perspective, and how they relate to each other. The Literature review includes a discussion around CPR and how wind and wind power is related to CPR, and contains a presentation of papers regarding the conflict around CPR as well as the relation between national defence and wind power. After that comes the theoretical framework, starting with a description of the CPR concept developed by Elinor Ostrom in 1990, which is the primary concept used for the data analyses later. The chosen qualitative method is presented, followed by a discussion around the qualitative data based on the interview and a data section. Followed is the empirical results, which includes a presentation of the empirical findings as well as empirical analyses, analysing the connection between the theoretical framework and the empirical findings in the case study. The final section is a discussion, followed by a conclusion, limitations, and suggestions for future research.

2. Background

The background starts with a presentation of Sweden followed by an overview of how the process in Sweden looks like, where the national interest from wind power and national defence is going to be the main focus.

2.1 Area of study

The focus of this thesis is Sweden and, more specifically, the southern parts. Sweden is a country that produces a surplus of electricity, where around 50% is produced from RE (Holmström, 2019). However, the production of electricity is mainly in the northern parts of Sweden, while the consumption is in the southern parts of Sweden, creating a situation where the southern parts of Sweden are suffering from lack of energy (Konsumenternas energimarknadsbyrå, 2019).

The installed effect of offshore wind power was at its highest between 2013 and 2016, having an installed effect of 213 MW. The installed effect of offshore wind power has since 2016 been continuously at 203 MW, distributed among 82 wind turbines (Energimyndigheten, n.d), a considerable difference compared to the wind turbines onshore (Energimyndigheten, 2019a)(see appendix I). In Skåne between 1990 and 2010 only a small increase in the share of wind power production, increasing from non-existing to around 1 TWh (see appendix II).

The southern part is well fitted for wind power offshore (Skånes vindkraftsakademi, n.d), and offshore wind power is one of the RE sources with the highest potential (Länsstyrelsen Skåne, 2017) partly because of the right wind conditions (Skånes vindkraftsakademi, n.d). Consequently, wind power can be a part of stabilizing the energy situation (Skånes vindkraftsakademi, n.d) and increase the share of RE. The development of wind power could also contribute to more local production of energy, something that could contribute to a decrease in the vulnerability of energy supply in the long run (Försvarsdepartementet, 2017).

Moreover, the region has the goal to be climate neutral 2030 (Region Skåne, 2019), leading to a situation where the development of its RE sources is necessary. Furthermore, Sweden, as a whole, has the goal in 2040 to have 100% renewable electricity and to accomplish this, wind power is the source with the highest potential. Hence the production needs to increase with 100 TWh during the coming 30-40 years (Naturvårdsverket & Energimyndigheten, 2019). To accomplish this, the need for land and water areas is increasing, since today the areas pointed out in the review version of the marine plans is assumed to be able to produce 20-30 TWh (Naturvårdsverket & Energimyndigheten, 2019), something that stands in conflict with other interests of the nation.

2.2 National interest

National interest, called Riksintressen, is geographical areas in Sweden that are pointed out as areas with specific national interest for a specific subject (Boverket, 2017). At the local level, municipalities are responsible for planning of the land and water area. Areas onshore should be presented as a municipality's "Översiktsplan" (cohesive plan) to make it easy to weigh areas that are incompatible with the national interest (Boverket, 2017). The national marine planning is starting one nm (nautical mile) outside the coast, which is around 1,85 km, and errands outside this area are handled by the Swedish agency for marine and water management at a national level (Boverket, 2017). The area pointed out acts like guidelines for the planning for municipalities and authorities (Energimyndigheten, 2019a).

2.2.1 Wind power

The Swedish Energy Agency has the mission to present areas that have particularly useful wind conditions both on- and offshore. These areas should be of national interest in wind power planning. According to chapter 3, §8 in the environmental code (Miljöbalken 1998:808), these areas should be protected against actions that significantly can harm the potential use of the area for wind power (Energimyndigheten, 2019b). The decision on where to establish wind farms is mainly based on the wind conditions, because the mean wind speed will affect how the production, which affects the production cost for the wind power electricity (Energimyndigheten, 2018).

2.2.2 National defence

The Swedish armed force is the authority that, according to regulation Management of land and water areas (Hushållning med mark- och vattenområden 1998:896), is responsible for present territories that are regarded areas with a specific national interest for the defence (Försvarsmakten, 2019). The overall national defence includes

all authorities included in the Swedish defence, where each of them has different tasks. The areas of specific military interest, include areas like exercise fields or signal voltage systems.

All errands, including large objects, meaning over 20 meters outside cohesive buildings and 45 meters inside cohesive building areas, need to be remitted to the national defence. Also, regarding the coast area, all plans and praise, no matter height, should be remitted to the national defence. This means that wind power turbines offshore need to be remitted to the national defence (Försvarsmakten, 2019).

What differs the total defence national interest from other national interests is that the confidentially makes it not always possible to present areas and reasons for the public. The national defence interest should be prioritised highest in the conflict with other interests, including both national and public interests (Försvarsmakten, 2019).

2.2.3 The conflict between national interests

One of the biggest obstacles for reaching the potential of wind power is the national defence (Svensk vindenergi, 2018). In Sweden, the areas restricted around flight bases are unlike any other country in this field (Svensk vindenergi, n.d).

Both off-and onshore marine plans report the use of water areas that they judge to be the best fit, and the reports shall be guidelines when decisions on permission to different operations. In today's plans for the ocean, some of the areas that Energimyndigheten pointed out as national interests for wind farming have been taken away because of the interest of the national defence (Energimyndigheten, 2018). This is partly because the Swedish national defence has a right to say NO to wind power plants, and that NO can be equated with a veto (Svensk vindenergi, n.d). Forcing out wind farm developers of the most attractive areas offshore, has created increased costs of construction, and markedly limited the sea area appropriate for long-term investment. A solution to this problem could be by using a multifunctional status in some areas (Hac & Szefer, 2018).

The technological development of wind power has mainly been focusing on increasing production through higher thorns or bigger wind turbines to make it possible to catch more wind. This development of the wind turbines has been fast, and just a couple of years ago, wind power was 150 meters high in total. The best turbine in 2018 produced 2MW, and the total height was around 200 meters or more, and this development will probably continue (Energimyndigheten, 2018). Therefore, it is essential to take the fast development into account when applying for permission since the height must be included in the permit application. An example pointed out by The Energy Agency (2018) is that applications made for about five years ago had a maximum height of 150 meters. Leading to a limitation of the height and does not make it possible to use the most cost-efficient on the market, which may contribute to the fact that the wind farm developer will not use the permission. Today in Sweden, each application is handled based on applications from each wind farm developer, and an overall perspective is missing (Naturvårdsverket & Energimyndigheten, 2019).

Moreover, the authorization process in Sweden affects the possibility and the location of wind power (Energimyndigheten, 2018). As some projects may not get permission at all, other permission may include such conditions on how the plant needs to be designed, which can affect the profitability of the plant.

3. Literature review

The literature review starts with a discussion around wind, airspace, and land defined as CPR. After that comes a discussion about conflicts regarding CPR. Lastly, a presentation of the literature around similar conflicts like the one in this study.

3.1 Is wind power an appropriate subject for common pool resource theory?

CPR is a combination of private- and public goods. It can be exclusive, but exclusion from the resources is costly, and one person's use subtracts from what is available for others (Ostrom, Dietz, Dolšak, Stern, Stovich Weber, 2002). Common examples of CPR are forests and underground water basins, which often are managed by a combination of government actions and market mechanisms. Resources sometimes are small enough to be collectively managed by parties interested in the area. However, in other cases, these valuable resources need to be placed under local government agencies altogether (Kenton, 2019).

To understand the CPR, one needs to separate and understand the dependency between the resources system and the flow of units produced by the system. A resource system is a stock of variables that is produced, and the flow is what is used or appropriate from the resource system. The wind is a CPR (Barnes, 2015) since the wind is a movement of air across the surface of the earth as denser cool air moves to fill spaces in low-pressure areas that are occupied by warm air. Wind stores kinetic energy, which may be captured through wind turbines, converting it into electrical or mechanical energy. Wind provides not only a renewable source of energy, but it is also an integrable, fungible, and non-exclusive resource, and for that reason, it can be defined as CPR (Barnes, 2015). Additionally, the area in which the wind turbines are placed is subject to CPR (Rule, 2014).

In history, the airspace was beyond the reach of humankind, contributing to only a few conflicts arising regarding this area (Rule, 2011). However, lately, the focus on conflict of land has moved to other resources beyond land, for example, to airspace, and the requirement of open airspace has increased due to the increased RE. As for this paper, wind turbines are attractive. The installation of wind turbines occupies the surface of the land and extends high into airspace, and as the technology develops, the height of the wind turbines increases. The wind turbines are precluding any other physical occupation of the space as well as create limitations on the range of possible uses of land and airspace. From this, the conclusion drawn is that the conflict rather could be about land (Rule, 2014).

Hence, even if wind itself are not scarce sources, it has lately been given a substantial economic value. Airspace is the most ubiquitous of all-natural resources presented all over the world, and the air is as a global-shared common (Rule, 2011). The actors making use of the energy coming from wind and sunlight are not paying for this. However, it is argued that these asset transfers under such agreements are carefully defined interests in land and the airspace just above its surface, the assets are inherently scarce (Rule, 2014).

In conclusion, wind power use a unit characterises as a CPR, and occupies areas which can be defined as CPR. Therefore the wind power development can be argued to be a subject for CPR theory.

3.2 Common pool resources in earlier literature

If two or more groups have different interests believed to be incompatible, a conflict will occur. Many of the conflicts around RE development have been due to clashes between competing for interest (Rules, 2014). Although many opponents often are optimistic about RE development, the conflict occurs when they believe that another ideal should be prioritised over a particular RE project (Rule, 2014), as RE only is consider as one way to use the existing land and air (Rule, 2014). The development of RE is merely one of several potential ways of using the given area of land and airspace and is, in many cases, not argued to be the most efficient or productive possible users (Rule, 2014).

A large system, as well as the local system in which the theory of Ostrom takes its starting point, can face similar dilemmas and conflicts, but they differ in scale, costs, and nature of which actors act (Villamayor-Tomas, Fleischman, Ibarra, Thiel & Van Laerhoven, 2014). Hence, the authors point that the strong conceptual and theoretical foundations of the CPR theory make a good starting point to explain governance and environmental outcomes at a large scale as well as contributing to theory building. In a large system, the actors are more often represented or affected by political actors who are trying to maximise their interest (Villamayor-Tomas et al.

2014). The authors found in their study based on meta-analysis data that what enhances cooperation and makes it possible to manage a resource without conflict is a combination of components. Including information, environmental monitoring network, nesting, homogeneity of interest, shared understanding, the formation of collective agreements, and trust. The importance of communication was not found as sufficient at a large scale, especially not when the communication and commitment for collective actions build on accommodating a diversity of interests.

Adams, Dyson, Brockington & Vira (2004), consider that the policy debates today often are flawed because of the assumption that actors involved share an understanding of the problem. The difference in knowledge frames the actor's perspective on the CPR, to overcome this and to be able to reach a policy that is productive to solve this, first, the different perspective needs to be defined (Adams et al. 2004; Rule, 2014 p.140). More knowledge and a deeper understanding of the actor's differences over a CPR may not always lead to a win-win situation. However, it smooths the path towards a consensus in situations where their different actors' interests, values, and priorities are incompatible. The information and transparency can be accomplished by providing information through for example reports on different levels, for example, annual reports, and allowing for feedback, which itself can contribute to knowledge and encourage discussions (Hamilton & Kellett, 2013).

CPR is a core social dilemma facing all people. Koster and Anderies (2013) use the theory of institutional analysis and development framework (IADF) by Ostrom (2005) to analyse the energy system. An energy system occurs on many different scales, from the individual level to the national level. The energy system is a polycentric system that is complex, and it creates demand for institutional arrangements that can coordinate between and across units if necessary. Moreover, since the energy system is a complex system including a lot of different actors, multiple failures are expected, since there is a need for many different actors with different backgrounds and views on the situation (Koster & Anderies, 2013, p. 53-60). The polycentric approach developed by Ostrom is a well-used approach looking at the problem with climate change, a CPR problem. A polycentric approach fosters equality, inclusively, information, as well as an open and frequent communication among interests (Sovacool, 2011). Moreover, also accountability, organisational multiplicities, and adaptability, which Ostrom (1990) points out, are of importance to be able to coexist and cooperate over CPR. Ostrom (2010b) presents based on extensive research on common pool problems the main findings. When individuals are well informed about the problem and other actors involved, they together can build settings where trust and reciprocity can emerge, grow, and sustain over time. Furthermore, actions that can be costly and positive are frequently taken without waiting for the involvement of an external authority that imposes rules, monitoring, and assesses penalties.

Conflicts regarding the environment can be a result of unequal and geographical uneven distribution of gains and losses related to economic activities, including uneven access to natural resources (Avila-Calero, 2017). Environmental problems are common problems for multiple ocean uses, and to reduce these conflicts, it is necessary for communication among stakeholders (users) (Chen, Liu & Chaung, 2015). Communication is essential to reduce conflicts, to enhance consensus on reducing environmental conflicts, and allocate resources effectively. Traditionally public policies were communicating using the top-down, one-way approach, which means that the government set the policies and promoted them to the public. However, this approach does not involve the needs and desires of stakeholders. It leads to conflicts occurring in policy program implementations. Therefore an important part is that stakeholders should be involved in the communication process, including policy evaluation, policy formation, policy adoption, implementation, and evaluation (Chen, Liu & Chaung, 2015).

3.3 National defence and wind power development in the world

In the U.S. the interference between wind farms and radar has been an obstacle for the growth of sustainable energy (Brenner, 2008) and the conflict between military radar and wind turbines has significantly hindered the development of wind turbines (Rule, 2014; Auld, McHenry & Whale 2013; Siegel, 2008; Burleson, 2009). In the U.S, the conflict is in many cases argued to be solved by installing relatively inexpensive upgrades to the ageing radar system (Brenner, 2008; Auld, McHenry, & Whale, 2013). This could contribute to a win-win situation, where both the growth of sustainable energy and improvement in infrastructure radar take place (Brenner, 2008). This update on the radar system is something that has been done in the U.K, and studies looking at the cost compared to the benefits has shown that the cost for installing such radar is lower than the potential benefits of a wind power farm. The development and opportunity to replace ageing radar does not only help to be able to build wind turbines but also contribute to the security of U.S. airspace since it is impossible to fly low in these areas (Brenner, 2008). Additionally, to reduce the impact of wind turbines on the radar signal, a technological solution can be done by wind power modification of the blades, by putting a layer on the turbines. Nevertheless, more resources need to be done to know the effect and the consequences on the production (Brenner, 2008). A second solution is to make the configuration of the turbines known at every instance through data collection (Brenner, 2008).

Besides these technological solutions also non-technological solutions are needed to create a balance between

the interest of different actors (Auld, McHenry & Whale, 2014). The main concerns in their study were that the late notification made it challenging to identify potential issues and mitigation options, as well as limited the effort for collaboration. Additionally, the interviews done in the study pointed out communication between the developer and relevant agencies regarding military, aviation, and meteorological needs to occur as early as possible in the process. Also, rules regarding information that needs to be shared and communicated at different stages in the planning process are needed to be improved to be able to expand the range of mitigation technologies. Furthermore, that pivotal to an agreement is to attach stakeholders to develop collaborative projects. Siegel (2008) argues that only by bringing all the issues and conflicts to the table at once, a win-win solution may be possible to reach all the bilateral tension needs to be at the table at the same time. Balancing different interests and issues may not be clear. However, with the lack of one single forum, the different groups will likely propose different and competing solutions for the same land area. Another non-technological suggestion given by the author is instead of the demand for developers of wind turbines to bring a complete project proposal, an umbrella body with help from all affected actors is needed to be developed.

The conflict of interest between wind energy and other interests is a global problem. For example, one of the significant challenges today is climate change, which can be related to an increased demand for RE and can cause massive ecological, political, economic, and social impacts (Andrew-Speed et al. 2015). The defence of territories, as well as the wind energy debate, can be understood as the different worldviews, interests, and values expressing a stance to the expansion of modern wind farms, which in turn are part of broader efforts to promote low-carbon transition (Avila, 2018). Avila (2018) looks at the conflict with wind energy in 20 different case studies. RE can be related to a high-land intensity, a consequence of the power density-dependent upon the available technology and the resource. If the energy flow stays constant or increases during the transition to a low-carbon system, the area required will increase in large sizes. The development of offshore wind power not only offers effective power production but may also be a basis for the development of a military surveillance and control system that covers areas adjoining the territorial waters, and the national border of the country (Hac & Szefer 2018; Siegel, 2008).

The planning used in England has a “criteria-based” approach. It is distinctive compared to the policy used in other countries and the E.U. and appears to favour the development of offshore wind power (Toke, 2011). The criteria-based approach is based on decisions taken on individual proposals rather than beforehand deciding on areas where wind power could or not could develop, based on constraints. This approach can be argued to be more favourable since it does not exclude some areas (Toke, 2011). Moreover, Jago & Taylor (2002), investigates how wind turbines and aviation is established in European countries. The primary need for the air space for the military is mainly due to training or national defence. Jago & Taylor (2002) discusses several countries, including Sweden. They point out that because Sweden is not a part of NATO, the military capability has high priority, and the military conflict with wind power development is pointed out as one of the main conflicts in the future. Compared to the other counties in the study by Jago & Taylor (2002), the military has the right to veto wind farms developers that could harm the national defence, which probably is a consequence of that the nation is not a part of NATO. The paper finds out that Denmark and the Netherlands have a notable laissez-faire attitude towards the development of wind power farms. Hence, some other countries with well-developed wind farms have started to experience some kind of discomfort from the military aviators, due to the subsequent effect on airspace structure.

4. Theory

This section starts with a description of CPR, followed by the original framework developed by Ostrom. This is then expanded with the works of Ostrom and others to fit a large-scale system.

Definition of CPR

The original theory developed by Ostrom was mainly based on empirical studies done on small-scale, isolated, self-organised institutions. The focus was on finding resource systems where tragedies of commons successfully have been avoided, and how to manage CPR with minimal conflicts. A common denominator found was a variety of institutional arrangements common to all successful cases and absent in those that failed (Ostrom, 1990). Since then, many studies have involved multiple stakeholders with different interests, dependence, and threats from external markets and outsiders (Morrow & Hull, 1996). Making it as well as important as attractive to apply this theory is a set of more complex large-scale situations like the development of management of offshore wind farms.

CPR is a resource with specific boundaries, a certain stock of a particular good, in which a flow can be drawn. This source needs to be renewable, as it is possible to replenish the stock (Ostrom et al. 2002). It is a resource that benefits a group of people and provides a diminishing benefit to everyone if each individual pursues the individual's self-interest. CPR can be limited to a specific number of individuals or firms. It can be jointly provided and/or produced by more than one individual. Although the resources unit is not subject to joint use or appropriation, the system is subject to joint use (Ostrom, 1990). The users of the CPR are called appropriators, and those making the resource available are called providers. Those are two sides of the same coin and that solutions to one of the actors need to match the solution to the other side of actors (Ostrom 1990).

A value of a CPR can be reduced through overuse because the supply of the resource is not unlimited, which can result in scarcity (Kenton, 2019). CPR is a combination of private- and public goods, where public goods include commodities or services, and the use of one person does not prevent another person's consumption. It can be exclusive. However, exclusion from the resources is costly (Ostrom et al. 2002). Typical examples for CPR are forests and underground water basins, which often are managed by a combination of government actions and market mechanisms. Resources sometimes are small enough to be collectively managed by actors interested in the area. In other cases, these valuable resources need to be placed under local government agencies altogether (Kenton, 2019). The CPR and the problems with it come from a combination of free access and rivalry.

The outcome of the decisions jointly affects everyone involved, around CPR (Ostrom, 2010a). If the assumption is that every individual only seeks the short-term material benefits, the outcome will not be one that yields the highest returns for all involved, regardless of the contributions. However, that actors do not change their behaviour voluntarily, and external authorities are sometimes required in the situation of reaching a goal in large scale problems like the climate change. This assumption is updated by Ostrom (2010), by complementing the behaviour theory of individuals. The theory assumes that individuals do not have perfect information but can learn as they interact (Ostrom, 2010a). To overcome social dilemmas and create an environment of a high level of cooperation, trust, and reciprocating others' efforts to cooperate with their cooperation are central characteristics. This is something that policy can be used to create and maintain. The policy is an essential as a way to make the actors see the long-term benefit for themselves and others be higher than their short-term costs. This cooperation between governance at all levels is of high importance because empirical studies have shown that large-, medium- and small scale units are all necessary components (Ostrom 2010). The benefit of polycentric arrangement has in studies been seen to work effectively (Ostrom & Cox, 2010).

The original framework

The original framework illustrated by Ostrom in 1990 includes both an internal and external world. In Figure 1, including four internal variables, the assumption is that an individual will weigh the expected costs and earnings against each other, and in every situation, choose the strategy where the earnings are higher than the costs. However, without information and knowledge about variables affecting the expected outcome, these predictions become useless. In the internal world, one of the components and the main component is the discount rate, meaning that one needs to compare the value today with future value. This may be of interest since both the national defence as well as the benefits from wind power in the form of less Co2 emission are consequences and values that will be shown first in the future.

Figure 1

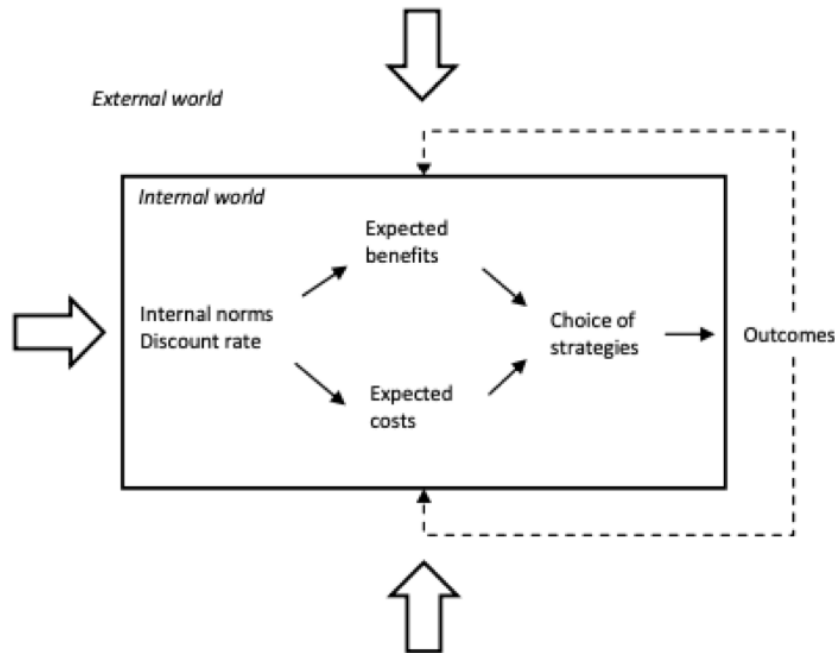


Figure 1: Framework illustrated "The internal world of individual choices" by Ostrom (1990, page 37).

Appropriators need to change their approach from independent actors into a system in which they adopt coordinated strategies to obtain a higher joint benefit or to reduce their joint harm (Ostrom, 1990). Much of the focus regarding how to solve a problem should be put on the users themselves, emphasising the value of local knowledge and experience in the process (Ostrom, 1990; Ostrom, 2007). Some of the groups may suffer from an unnatural incentive system, a result of central authorities and political incitement. A change in the institutional choice situation is dependent on the support of a change of the current status-quo rule. An actor can either decide to support the current or to support a change of the current rule. However, independently of choice, the individuals in the system will stay the same. How an actor acts will depend upon how much knowledge and information the actors have about the cost and benefits change in the status-quo rules compared to the existing situation (Ostrom, 1990).

Communication

A well-discussed subject in Ostrom's (1990) work is the aspect of communication. The internal world seen in Figure 1 is one of the main pillars in the success of CPR, and since the actors are assumed not to be able to affect the external world, the internal world is in focus. One leading explanation for actors' possibility to reach a success is communication and trust: how much others invest in being trustworthy and follow the rules and norms. These core relationships are mutually either reinforcing or weakening and are decided by the actor's knowledge and earlier experience to solve common dilemmas and structural variables (Ostrom, 1990). Management over CPR that not has been successful may be missing some of the components necessary for developing communication and trust for each other.

Power ratio

An asymmetry in the power ratio may also be a problem, according to Ostrom (1990). The powerful actors may take advantage of the existing conditions. In contrast, others suffer from the losses, making the possibility for the less powerful to change the rules of the game hard. This kind of situation and groups may require help from other external actors to overcome the problem. One factor that characterises successful commons is voluntary associations (Ostrom, 1990). These associations create a forum in which the parts could communicate face-to-face and make decisions about joint problems and discuss strategies together, based on all actor's knowledge rather than independently. This type of association also makes it possible to share knowledge, cost, and investment in technological development that one actor itself could not afford or did not have full knowledge around. The lack of such an association is also something that is missing when institutions over CPR are failing (Ostrom, 1990).

Polycentric system and nesting

One of the critical terms in Ostrom's works (1990) is a polycentric system, defined as various governing authorities at different scales (Ostrom, 2010b). This means that the local knowledge should be combined with the controls from the outside to avoid discrimination and to offer help if the local group is not able to solve a problem. How-

ever, the other way around is also meaningful. Moreover, this is connected to the principle nesting, one of the principals particularly crucial for a large scale, meaning that the arrangement of institutions must be involved, redundant, and exist in many layers (Dietz, Ostrom & Stern, 2003). Nesting is also one of the shared similarities in case studies where collective action has been successful (Ostrom, 1990). Ostrom (2010) argues that the need for a polycentric system is increasing as climate change becomes a more significant problem. As the effect of climate change is on a global scale is the outcome of actions taken at smaller scales.

Large scale

Dietz, Ostrom & Stern (2003) are scaling up the theory of CPR by Ostrom in 1990 and applying them to some of the main issues of today. As today many CPR faces unstable conditions from an increased population and climate change, requiring actors to make tough decisions under uncertainty, complexity, and sustainable biophysical constraints. Actors also need to take conflicting human values and interests in aspects (Dietz, Ostrom, & Stern, 2003), this is essential to be able to gain a common understanding, pointed out as important to understand the other users and the system (Ostrom, 2007). To accomplish successful common governance, Dietz, Ostrom & Stern (2003) found some principles of importance. First, support for effective monitoring, as well as available and understandable information at a low cost, is important. The rates of change need to be moderate both regarding the resources, resources-user population, technology, economic and social conditions. Further, frequent communication, partly face-to-face and a dense social network contribute to a situation where people can express. These forums create a possibility to see emotional reactions, a potential forum for trust. Hence the face-to-face communication it is argued to be more relevant at a small-scale level because it is more challenging at a large system. However, the importance of communication is still there (Dietz, Ostrom & Stern, 2003).

The challenge is to evolve the institutional arrangement to create an environment where such conditions could be achieved easier (Dietz, Ostrom, & Stern, 2003). Furthermore, as governance becomes more national and international, many of the tools are often forgotten and ignore the importance of community-based governance and traditional tools that can have a significant impact, including informal communication and sanctions. To be able to succeed and to create adaptive governance in a complex system, providing trustworthy information is one of the main pillars. Besides, this knowledge regarding actors and social values is of importance because every decision has a tradeoff and outcome, creating a major informational challenge for governance. Both providing physical and technological infrastructure is important and can determine to which a CPR can be exploited. Effective communication, as well as institutional infrastructure, to create an infrastructure between local and higher levels of governance through research and social capital that is prepared to adapt and adjust to changes in the society and the situations is of critical importance (Dietz, Ostrom & Stern, 2003). To have adaptive governance creating rules that can be changed and adapted to the pressures at hand, but also being able to deal with conflicts. Conflicts occur as actors and interests bring different perspectives, social values, interests, and differences in power ratio conflicts regarding the environment will occur (Dietz, Ostrom, & Stern, 2003). To deal with these conflicts, the environmental minister, at a national level, is not always able to solve the conflict in a satisfactory way. As the engagement often can be passive, and the integration of participants is minimal, the need for allowing actors in the potential conflict to provide inputs in a structured way is necessary.

To accomplish these conditions at a larger scale Dietz, Ostrom & Stern (2003) point out three principles that are particularly relevant for problems at a large scale with non-local influences and to create adaptive governance. One of them is Analytic deliberation, meaning that dialogue, including different relevant actors, both scientists and resources users that together provide information and create trust, will better handle conflict and rules and allow for changes. Also, a combination of a variety of institutions is essential, combining different kinds of institutions like markets and community self-governance. A mixture of it will employ a variety of decision rules and increase different views on the problem and contribute with information from a variety of areas. The last that seems particularly relevant for large-scale systems is nesting. Nesting means institutions must be involved and nested in many layers (Dietz, Ostrom, & Stern, 2003). Common for all these principles is that information is an essential factor, as well as local conditions, and organisation. The connection to the principals from the original framework created by Ostrom in 1990, seen in Figure 1, leads to the conclusion that the original framework can be applied to larger-scale study objects, in combination with the theory developed later.

Summary

The theory points out important factors to be able to manage a CPR successfully, mainly a polycentric system, power ratio, information, knowledge, dialogue, and trust. These findings from the theory will be used in the empirical study to explain what components exist today regarding how the Swedish armed force and wind power development can coexist in the same geographical location. The main factors mentioned in theory is both independent and integrated. The power ratio could probably affect the way that communication occurs, which then affects both the trust and share of information. The degree of polycentric system and affect how actors at different levels share information and knowledge.

5. Methodology and data

This section aims to explain the methodology approach in order to answer the central question of this thesis. The empirical data is combining secondary data with primary data from interviews. The sections starts with an explanation of the methodology framework chosen, followed by a data section, explaining how the data has been collected and handled.

5.1 Qualitative approach

5.1.1 Secondary data

The first step is to identify relevant papers and articles connecting the theory CPR to the case of Skåne and Sweden. Documents are collected online, where the framework from the theory and the main components, a nested system, communication, information, and knowledge, have acted as guidelines. The findings were later compared with the one from the primary data to create a reliable secondary source and trustworthy and correct information.

5.1.2 Primary data

The primary source to answer the research question is by using the qualitative approach, to gain more in-depth information about the subject. But also because the qualitative method makes it be possible to interview people that are known within the specific subject at different stages in the society. The case study is applied to Sweden and especially Skåne, which has the geographical conditions for development, but the implementation goes slow (Havs- & vattenmyndigheten, 2019)

Interviews were used to collect data and are consider as a core when designing a case study. Moreover, interviews give better insight because the information will be received from persons with good knowledge in the subject, who complement the secondary data and theoretical views (Dalen, 2015). In qualitative studies, semi-structured or unstructured interviews are well-used methods. What differs them is that the unstructured interview is more as a regular conversation, while the semi-structured interview follows a before prepared template but still is relatively open. The interview method chosen is the semi-structured method as semi-structured interviews give the respondent the possibility to elaborate on the questions and create an opening for asking sub-questions (Bryman, 2008). The chosen method contributes to flexibility in the interviews making the answers broad and gives possibilities to ask questions as a response. Moreover, the method makes it possible to set a framework for the interview, based on earlier knowledge related to the subject of the thesis (Bryman, 2008). The structure of the interview follows the main finding in the theory of CPR, complemented with the findings in the literature review. Based on the theory of CPR, the interview question formula is divided into four main sections (See appendix III and IV).

The result from interviews can be presented using different methods. The method chosen to present the interviews is the coherent case description, a well-used method among qualitative studies regarding the organisation and social phenomena (Nylén, 2005). The method chosen creates an excellent ground to be able to analyse the empiric and integrate the data collected with the theory. In the chosen method, it is possible to use quotes from the interviews, which create credibility (Nylén, 2005). To be able to use quotes, the interviews have been recorded and transcript. The use of quotes is also essential to accomplish a detailed analysis (Bryman, 2002).

The interviews were conducted using telephones. Earlier studies have observed that the difference between telephone interviews and face to face is not that huge (Bryman, 2008). One aspect that will be lost using telephone interviews is the possibility to see facial expressions and body language. The interviews were carried out in Swedish during April and May 2020. The interviews were around 30-40 minutes and recorded to enable re-listening and transcription. The interview questions, in both Swedish and English, are attached in Appendix III and IV.

5.1.3 Data collection

The primary data source has been collected through interviews. It was collected through five interviews done with people with good knowledge in their respective fields of offshore wind power in Sweden. Interview persons were selected based on that they can provide information about the main research question of this thesis, called a purposeful sampling strategy (Bryman, 2008). Moreover, people contacted were able to share contact information to other people they knew, called sampling through snowball or chain sampling (Creswell, 2007). The persons

interviewed include people with different knowledge and background within the offshore wind farm field in Sweden to get a broader view. The decision to include persons with different backgrounds is also because the theory of CPR emphasises the importance of different types of organisation and nesting to successfully manage a CPR (Ostrom, 1990; Dietz, Ostrom, Stern, 2003; Ostrom, 2010a). Because of that, interviews were done with wind farm developers, the national defence and also with organisations working with wind power in other ways. The information about the employer of the interviewee person and the type of employer is found in Table 1.

Table 1: Names of the organisations in which persons interviewed are working and type of employer.

Person 1	Svensk vindenergi (Swedish wind energy association)	Trade association
Person 2	Svensk vindkraft (Swedish wind power association)	Trade association
Person 3	Involved in companies and partner of wind power company KustVind	Researcher and Consultant
Person 4	Energimyndigheten (Energy agency)	Authority
Person 5	Försvarsmakten militära avdelning (The military department of the Swedish Armed Force)	Authority

The questions were not sent out before the interviews were done, mainly because of the willingness of the person to be able to talk more openly and freely around the questions and subjects. Hence, a short presentation of the main subjects is sent out before the interview to create trust.

The purposive sampling method was chosen for the semi-structured interviews to establish a coherent correspondence between the research question of this thesis and the sampling (Bryman, 2008). The chosen interview participation was selected based on the fact that they needed to be within the field of wind farm development or national defence. The restriction of only interviewing participants within the field, and so also knowledge restrictions provided a more coherent group. It is, however, essential to include diversity, and therefore different actors involved in different parts of the process and different organisations were chosen to ensure different perspectives become observed. The main segment to interview was to interview at least one person from each interest. However, it was also essential to include both organisations (Person 1, Person 2), authorities (Person 4, Person 5) and individuals running their own company (Person 3) to get a broad view and get more aspects of the situation. It would have been interesting to interview a politician, but due to circumstances and time constraints, this was not done. However, it would have been an interesting aspect to include in the study.

To start with, an email was sent out to some organisation working with wind power in Sweden and other countries to collect data. An email was also sent out to the Swedish Armed Force since they are the main agency working with the national defence in Sweden. Some of them did not respond to the email, and some of them could not participate during the period April to May, hence all persons conducted was positive to the subject of this thesis. Moreover, contacted persons recommended other persons that could be interesting to include in the study both through email and during the interviews and these persons were later contacted. This is called snowball sampling (Creswell, 2007). It would have been interesting to include more interviews, but due to limited time, some restriction was necessary. Eventually, five interviews were conducted in the scope of this thesis. The majority of the interviewed persons has the same interest, and are from the wind farm developer and thus promoting that interest, this could create some bias of the thesis.

The questions asked during the interview is based on the main pillars of the CPR theory and literature. Some keywords found in the literature review, for example, Adams, Dyson, Brockington & Vira (2004), point out that the different perspectives needed to be defined to accomplish a productive policy. These keywords is then formed into codes when analysing the data to sort better the data collected through interviews (Creswell, 2007). The lean codes are the main founded in the theory and literature, and this is during the transcription expanded with codes that will be sub-categories since it is essential to be open to additional codes not to limit the analysis (Creswell, 2007).

5.2 Limitations

In this situation of the interview method and the chosen theory, there is a tradeoff between generalisation and complexity, to be able to analyse the result to other similar cases (Cox, 2019). A limitation of the qualitative method is the possibility of bias. Another limitation could also be the question, which is affected by the interviewer, and there could also be different definitions of words and the context which can affect the credibility of qualitative research.

Another possible limitation is the number of interviews conducted in this study. When deciding on how many to interview, there is a possible tradeoff between generalisation and in-deep data collection which create a limitation. Further, there may be a bias in the interviews since the majority is working and promoting that wind power should have a higher priority. This may, therefore, not give the whole picture since individuals can have different experiences. However, if the persons interviewed discusses the same circumstance, one can assume that this is something that can be representative for the case in some degree. There is also a limitation that no impartial has been interviewed in this study.

6. Empirical result

This part of the paper is starting with a presentation of the main findings from each interviewed. This is followed by the Analyses of empirical findings, presenting the result from the secondary and primary sources connected to the main findings in the theory and literature review. In this section interviews will be presented integrated with inspiration from the coherent case description from Nylén (2005), as similarities and differences to different parts of the sub-categories, together creating an answer to the research question. In this chapter Person 1 will be referred to as P1 and so forth.

6.1 The interviews

Person 1 - Swedish wind energy

The Swedish Wind Energy organisation is working with all parts of wind power development. During the interview, the importance of building wind power in the right locations to accomplish sustainable wind power development was discussed. One of the obstacles to build on the best places is conflicting interest, partly the interest from the national defence. The Swedish Armed Force practical veto right and possibility to say NO without any explanation is mentioned as one reason for the conflict of interests. This is mention to create a situation where the wind power developer does not receive information about possible solutions, partly as a consequence of small resources aimed at this subject at the Swedish Armed Force.

Moreover, Person 1 feels like there is no action taken to improve this situation of today, and discusses that if climate and a transition towards RE not are included in the Swedish Armed Forces mission, they will not operate to include that in the work task. However, the person mentions an appropriation direction, aimed towards The Swedish Armed Force is a huge first step taken to include the climate in Swedish regulations and the Swedish Armed Forces mission.

Furthermore, it is mention that without a collaborate between the interest, it is a risk that the wind power development cannot be in that extend that they want. However, the person assumes that there is a possibility for different interest to coexist, and give examples of other countries that have to success. However, to be able to coexist the more communication is mention as an essential pillar.

Lastly, the person discusses that historically the local intrusion or benefits when seeking permission for wind power are what has been in focus. The focus needs to change to include the global aspect because even if wind power intrudes locally, it also contributes to a global benefit that could have a positive local effect.

Person 2 - Swedish wind power

The second interviewee is working at Swedish Wind Power and operates with many of the questions regarding national interests and coexistence. In the interview, there is a discussion about the veto and proposal of large areas by the Swedish Armed Forces. These factors are argued to affect the dialogue between the interest and actors in a negative way. Hence, there is some indication that the dialogue recently has been improved.

Further, there is a discussion that at a national level, there are too much down-pipes and more communication and collaboration between different interest is essential to be able to coexist. There is also a consideration that the existing down-pipes is a generation issue, and a new generation at these positions could improve communication and collaboration. At a national level, the interviewee mentions there is a need for more dialogue around the climate aspects of wind power to be included in Swedish guidelines and rules. A consensus between the interest, and to integrate them is argued to be an essential step to solve the conflict.

To end with, Person 2 discusses that consensus in terms of that an expansion of the offshore wind power in southern Sweden could reduce the vulnerability and contribute to energy security due to more decentralised energy production.

Person 3 - Partner of wind power company KustVind

Person 3 is involved in a couple of companies and is a partner at the wind power company Kustvind. The person discusses that the conditions in the southern part of Sweden makes it a great place to build wind power offshore. Further, there is a belief that the building of a wind power farm is the best some regions could do for the climate. The building of wind power farms is also argued to have the greatest impact on Sweden's opportunities to influence the global climate right now. Hence, this aspect is often something that is missed in discussions regarding the climate.

The conflict between the interest is from the wind power side mainly is a lack of discussion. The veto right, indicating that in practice the Swedish Armed Forces has the right to say no to an application without explaining is partly creating a weak dialogue. This is mentioned as an obstacle for sharing of knowledge and information. Furthermore, the appropriation direction is mentioned as a good starting point to accomplish dialogue and communication between the actors with interest in the same geographical location.

Besides this, person 3 also discusses that the national defence could experience some uncertainty due to the existing process. Partly since a YES from them is not an automatic result in a wind power farm since there are other obstacles on the way.

Person 4 - Energy Agency

Person 4 works at the Energy Agency, which is an authority working with energy questions in Sweden. Their goal is to accomplish a sustainable wind power expansion. Person 4 mentions that the conflict between the interest of wind power and national defence is larger in Sweden than in other countries, partly because Sweden is not a member of NATO. The need for the Swedish Armed Force to practice within the borders of the nation has led to restrictions on large areas. The conflict is also a consequence of the veto right that the Swedish Armed Force is said to have, leading to a situation where they say NO without giving a further explanation. This results in a weak dialogue, which harms the possibility to coexist, to develop solutions and the sharing of knowledge and information.

Further, Person 4 considers that national defence has the highest priority. In contrast, the development of wind power farms has a lower priority in the planning of water and land areas, argued to be a factor that makes it hard to gain a local understanding of the benefits of wind power.

Furthermore, the appropriation direction saying that the Swedish Armed Force should improve their dialogue is regarded as an essential step to coexist and cooperate between the interest.

Person 5 - The military department of the Swedish Armed Force

Person 5 works with national interest for the military department as a part of the total defence and has the mission to protect Riksinteresse for the military department. The person discusses that there is no Riksinteresse for the climate, and therefore it is hard to understand what each wind power project could contribute to at a national level.

In their view, there is already a well-developed dialogue at early stages between the actors. However, to have a dialogue with each wind project is challenging. As the Swedish Armed Force is an authority, they want to give the same response to all applications, and this is recognised as challenging. As a consequence, the Swedish Armed Force is working more at a national level than with specific projects. Person 5 stated that there is a difference in knowledge between the actors due to different education and backgrounds.

Further, there is a discussion that many applications for a wind power farm that has been accepted are not taken advantage of. As a consequence of the permission given, even if there is no wind power farm built, the Swedish Armed Force needs to find new places to practice, which may contribute to a NO to other applications. Consequently, this becomes an obstacle to building parks in other places, as long as the permission exists. In conclusion, the person indicates the importance of using the areas that have been granted permission.

6.2 Analyses of the empirical findings

The original framework

The appropriator and the actors in the internal world are assumed to be wind farm developers and the national defence. Both have an interest in the geographical location, where land, airspace, and wind is subject to how to manage. The resource unit is not subject to joint use since it can only be occupied by either wind farms or restricted by the national defence. The external world is discussed in terms of policy decisions that the actors, in many cases, can not affect. The possibility to jointly use the system is what this paper aims to study.

The limited resource land is considered by Person 4. Who discusses that since Sweden is not a member of NATO, the Swedish Armed Force needs to practice and exercise within the country's borders, argued to be one of the reasons why Sweden experiences a larger conflict between the interests than other countries (P4). Consequently, wind farm parks are restricted by the national defence affecting the cost for wind farms in terms of not being built on the best places and so unable to bind carbon dioxide through small local intrusions (P1). Furthermore, a built wind farm affects the national defence possibility to perform their tasks in that area (P4).

In Sweden, like in most other countries, the main barriers for wind power is the radar system, but also the low flight areas. Some ideas for a solution have been investigated both by organisations and the national defence. Technological solutions are discussed as a solution to the possibility to coexist since other nations have been able

to coexist by using the same technological infrastructure (P1).

"Men man kan också sam-äga eller sam-använda tex kommunikationskablar, WiFi-kablar. Man har väldigt mycket datahantering på en vindkraftspark, och informationsinfrastruktur är ju viktigt för försvaret så att man kan få lösningar också." (But you can also co-own or co-use, for example, communication cables, WiFi cables. You have a lot of data management on a wind farm, and information infrastructure is important for the defence so that you can get solutions as well) (P1)

To be able to improve the integration of these technologies, a need for more collaboration between different interests, as well as a sharing of knowledge and taking a broader view needs to develop according to the interviews. However, since the national defence can say no, without presenting any solutions or reason to why (Svensk vindenergi, n.d), a knowledge asymmetry occurs. The wind farm developers do not know what to improve or how to improve it.

Communication

The main subject discussed in the empirical study conducted through interviews is the communication and dialogue between the national defence and actors within the wind power field. A dialogue already exists at an early stage, according to Person 5. While in the other interviews, communication, information and knowledge are mentioned as fields that need to improve most for coexistence to be possible within the same geographical area (P1).

"Har vi en bättre dialog så kommer vi kunna verka i samma områden i större utsträckning" ("If we have a better dialogue, we will be able to work in the same areas to a greater extent")(P1)

"Så de är väl därför det vore bra om man kunde få till på nåt sätt den här dialogen med försvaret. Att dom måste vara mer delaktiga i att hitta lösningar för de är ganska svårt för utomstående att göra, vad är det som funkar." ("So they are probably why it would be good if you could get this dialogue with the defence. They have to be more involved in finding solutions as well as they are quite difficult for outsiders to know what works.") (P4)

The communication is also pointed out by a study done in 2010 looking at Sweden by Mels & Aronsson. They argue that communicative planning should be interactive and a presentation of information should occur in different forums, where wishes and comments from different actors and interests should be presented to solve common problems (Mels & Aronsson, 2010). These forums should be constructed to promote dialogue, understanding and an exchange of different views since it is important that all parties feel included and feel like what they say is important (Mels & Aronsson, 2010). Expression and discussion around different views have also been mentioned by Adams et al. (2004) and Rule (2014) as an important factor in gaining more knowledge and a deeper understanding. There exists a lot of organisations and forums in Sweden where developers can meet each other. Some organisations try to push questions relevant to wind power development. Hence, to be able to create a communication forum, trust is an essential factor (Dietz, Ostrom & Stern, 2003).

Trust and uncertainty affect the relation between actors (Ostrom, 1990). Uncertainty is discussed by Person 5, wind power farms that have received permission to build, but for some reason, they do not build. This contributes to a situation where the national defence needs to include the possibility to build in new applications, no matter whether there is a wind power park build or not—leading to other areas being restricted due to, for example, training areas. The restriction done by the national defence is in large areas, which could be a consequence of uncertainty (P4).

"Dom (Försvarmakten) upplever det så osäkert, de var därför dom peka ut dom här stora områdena till land [...] Så som i havsplanerna när man säger det skulle vara möjligt här men liksom inte i vilken omfattning som helst för då funkar det inte längre för vår verksamhet så för deras del skulle det vara bra egentligen om man hade ett nationellt utpekat områden dom visste att här hamnar vindkraften då kanske dom skulle kunna vara lite mindre restriktiva. När dom inte vet då är dom restriktiva för att dom inte ska få en stor skada på deras verksamhet." ("And then again this, another part of the problem is that they (The Swedish Armed Force) feel it so uncertain, they were, therefore, pointing out these large areas to land. [...] In the sea plans when you say it would be an opportunity here but like not to any extent because then it no longer works for our business. So for their part it would be good really if you had pointed out national areas they knew that here there will be wind power parks, maybe they could be a little less restrictive. When they do not know, then they are restrictive so that they do not get a great deal of damage to their business.") (P4).

The weak or none-existing dialogue also creates a situation where information and knowledge are not shared (P4, P3). That there is knowledge asymmetry between the national defence working with wind power and the wind power branch is supported by Person 5; however, there is a fully functional dialogue (P5).

"[...] Från vindkraftens sida så är det nu så att försvaret inte kommunicerar alls i frågan, och nu har man ju till och med fattat nåt beslut att man inte ska kommunicera med enskilda projekt" ("On the wind power side, it is now that the defence does not communicate at all on the issue, and now you have, after all, decided something that you should not communicate with individual projects,") (P3)

"[...] Så de är väl därför det vore bra om man kunde få till på nåt sätt den här dialogen med försvaret att dom måste vara mer delaktiga i att hitta lösningar liksom för de är ganska svårt för utomstående att göra, vad är det som funkar då om man bara säger nej så blir det bara aha. Då är de liksom viktigt att få den hjälpen från försvaret." ("So they are probably why it would be good if you could get this dialogue with the defence in some way that they have to be more involved in finding solutions as well as they are quite difficult for outsiders to do what works then. If you just say no, then it will just be aha, then it is just important to get that help from the defence.") (P4)

The lack of communication is considered as a consequence of small resources working with this subject at The Swedish Armed Force (P1). That there is a weak of communication at an early stage is not supported by Person 5.

"[...] Ska föra dialog i alla så kräver det att dom har avsatt resurser för det och ha ett projekt för det." ("and they are going to have a dialogue with everyone, so it requires that they have allocated resources for it and have a project for it.") (P1)

"[...] Kan delvis vara en resursfråga. De (Försvarsmakten) kan inte sitta och svara på 100 projekt. Men i vissa lägen måste dom ju såklart hålla det som en hemlighet vad gäller vissa objekt i alla fall och det får man ha förståelse för. Lite mer resurser, lite mer fokus hos försvaret på att dom behöver bidra och mer resurser till det." ("Can partly be a resource question they (Swedish Armed Force) cannot sit and answer 100 projects. In some situations, they must, of course, keep its a secret regarding certain objects, and that must be understood. A little more resources, a little more focus on the defence that they need to contribute and more resources for it.") (P1)

"Men de där kanske inte är så lätt, det kräver ju väldiga resurser om försvaret ska sitta med och vara konstruktiva och ha en konstruktiv dialog emellan vindkraftsprojekt. Det kan vara väldigt krävande resursmässigt." ("But those where it may not be so easy it requires huge resources if the defence is to sit with and be constructive and have a constructive dialogue between wind power projects it can be very demanding in terms of resources.") (P4).

There is a discussion that the availability of resources is a reason for weak communication between the actors (P1). It makes it hard to communicate and give a response to each wind power project. To be able to hold resources, rules and guidelines are essential; otherwise, no effort will be provided to the subject (P1). Hence the regulation and the administrative circumstances create some conflict, and lack of trust, from both parts. The national defence can experience uncertainty in the wind planning process (P3).

"Där tycker jag på nåt vis att försvaret har en poäng, den processen som vi har nu de är en väldigt långdragen och väldigt oförutsäg." ("There I think in some way that the defence has a point, the process that we have now they are a very long and very unpredictable (P3).

Power ratio

The power ratio creates communication difficulties since the interest of the national defence is prioritised in the planning of land and water areas. It can be discussed as an asymmetric power ratio since the national defence could take advantage of the status-quo rule. And necessary help from external actors could sometimes be necessary to overcome this power asymmetry (Ostrom, 1990). That the communication is not working optimally is due to the situation where the national defence has a kind of veto to say no without any explanation (P1, P2, P3, P4). Furthermore, this is argued to be one of the main barriers for a coexistent and co-development between wind power and national defence within the same geographical area (P1, P2, P3).

"[...] I miljöbalkens nästan första kapitel så står det att försvarsmaktens intressen ska väga tungt eller tyngts [...] Vi har upplevt i branschen att det har varit väldigt svårt att få till en dialog med försvarsmakten." ("[...]Almost in the first chapter of the Environmental Code, it says that the interests of the defence force must weigh heavily or weighted heaviest. [...] We have experienced in the industry that it has been very difficult to establish a dialogue with the armed forces.") (P2)

The wishes from persons interviewed are more communication and dialogue around the different project, where a NO is complemented by an explanation or suggestion of changes that could make it possible to build on that geographical location (P2). Hence, to have a dialogue and communication with each project is challenging, since all should be given the same response (P5).

"Och vi har försökt att få till en dialog mellan väldigt många delar [...] och då svarar dom ju bara ja eller

nej, dom skulle ju aldrig svara att flytta det 100m dit eller sänk total höjden med x m så funkar det. [...] så den dialogen hade man önskad var mer och bättre [...] jag tycker att det har blivit bättre dom sista åren." ("And we have tried to create a dialogue between a great many parts. [...] and then they answer only yes or no. They would never answer to move it 100m there or lower the total height with x meters it works [...] so the dialogue you wanted to be more and better. [...] I think it has become better in recent years.") (P2)

Mention in the interviews is also that the national defence makes proposals on huge areas. The reason for this is not clear but is discussed as a consequence of uncertainty from the national defence side. Hence, according to the theory, this could also be a consequence of them taking advantage of the existing status-quo rule. Consequently, when the defence makes propose on huge areas, the sustainable wind power development is harmed (P1). It can create a power asymmetry between actors and interests. Which may create a power asymmetry between actors and interests. However, it is understandable as the defence must fulfil its role. But Person 1 wish that they had the resources to look more closely at individual projects so that the best project could be allowed.

"[...] Och eftersom försvaret i praktiken har vetorätt och lägger förslag på väldigt stora områden så eliminerar dom möjligheten att bygga på väldigt många bra ställen" ("The defence has, in fact, veto right and makes proposals in very large areas, they eliminate the opportunity to build on a lot of good places.") (P1).

Polycentric system and nesting

In the case of Sweden, the municipalities have the responsibility for planning the area within its borders, at a more local level (Regeringskansliet, 2015). At a regional level, Sweden has a County Administrative board, a section working with energy and climate question, and they lead the regional development (Länsstyrelsen Skåne, n.d). At a national level, The Swedish Energy Agency is working with wind power development. Off shore, there is also the Swedish Agency for Marine and Water Management, planning the water area at a national level. It indicates that Sweden has a polycentric system, meaning that authorities at different levels are cooperating and working together. Person 5 mentions that the collaboration, as well as communication, works well between the national defence and the County governments in Sweden. The same person discusses the planning process of water areas, including many actors, as something appreciated among interests. One of the critical parts of how to handle a CPR successfully is just a polycentric system, which in the theory seems to well develop in Sweden.

Further, there was some discussion around collaboration and communication with local actors in the interviews. Person 1 says there is pretty much communication with local actors, while Person 4 discusses the local understanding as something hard to gain. Hence, in both municipalities and counties there is an experience that the national interest of wind power does not have a high status (P4). Therefore it is difficult to understand at a local level, why the wind power has an interest in a specific area, and why that should be priorities over another interest that is more concrete and easier to understand (P4).

Hence even if the literature indicated that it is a polycentric system in Sweden, four interviews indicate that that the collaboration between actors and interest is the most critical point that needs to improve (P1, P2, P3 and P4).

Large scale

In 2019 the Swedish Energy Agency, together with the Swedish environmental protection agency, mentioned the coexistence between different interests as the central pillar to the strategic work to promote the development of sustainable wind power (Naturvårdsverket & Energimyndigheten, 2019). This year (2020), The Swedish armed forces got an appropriation direction, a letter the government sends out every year to Swedish authorities saying how they should work during the coming year (Regeringskansliet, 2017). The direction can be deemed as a change in the external world using the framework of CPR. The appropriation direction to the Swedish Armed Forces in 2020 is saying:

"Försvarsmakten ska i sina yttranden i våg- och vindkraftsärenden utveckla förmågan till tidig dialog och samverkan med övriga samhället. Försvarsmakten ska analysera jämförbara länders och grannländers erfarenheter av fungerande samexistens mellan försvarsmakt och kraftigt utbyggd vindkraft inom samma geografiska område. Försvarsmakten ska återkomma med förslag på hur det svenska systemet kan förbättras i det avseendet." ("In its statements in wave and wind power matters, the Armed Forces will develop the ability for early dialogue and collaboration with other communities. The Armed Forces will analyse comparable countries' and neighbouring countries' experiences of functioning coexistence between the Armed Forces and greatly expanded wind power in the same geographical area. The Armed Forces will return with suggestions on how the Swedish system can be improved in this regard.") (Regleringsbrev, 2020)

The direction points out the need for coexistence between wind power and national defence. The appropriation direction also points out the need for communication and early dialogue between the actors; this is something that is one of the main pillars in theory as well, indicating what Sweden is pointing out essential pillars according to the theory. Monitoring and governance are also of importance in the theory of CPR, and this can be done by

creating guidelines and rules for actors to follow. The appropriation direction is also well discussed in the interview performed as a great first step to be able to create a situation where cooperation at an early stage is promoted.

"[...] Förhoppningsvis leder de här regleringsbrevet till att man får någon struktur på hur de där samtalet ska gå till och att det öppnar upp för en dialog. Men innan, så att säga fram till nu så har det stora problemet varit att dom inte är intresserade, man får inte ens reda på vad problemet är." ("Hopefully, these appropriation directions will give you some structure on how they were the conversation should go and that it opens up for dialogue. But before so to speak so far, the big problem has been that they are not interested; you cannot even figure out what the problem is.") (P3)

"[...] Det största framsteget vi sett på länge är just precis det här med regleringsbrevet" ("[...]The biggest progress we have seen in a long time is exactly here with the regulatory letter") (P1)

The appropriation direction is discussed positively and is considered as a way to accomplish dialogue and communication between actors (P3). Furthermore, the governance and government are discussed by Person 2 in terms of that the governance and the system today is missing pointing out the climate benefits with wind power, which can be discussed as missing of a common understanding and target.

"[...] Det hoppas man ju kommer bli tydligare framöver att man väger in klimatnyttan tydligare när man fattar beslut" ("[...] Hope it will be clearer in the future that you weigh the climate benefit more clearly when making decisions") (P2).

Beside the appropriation direction, there is a discussion that more decisions and rules need to be established on the national level regarding the climate. An example given is that the Environmental code needs to include more sustainability and the benefits of wind power. Furthermore, Person 5 discusses that there is no national interest (Riksintressen) for the climate today. As a consequence, there could be a miss of discussion around what individual wind power projects could contribute to on the national level. The lack of including climate in different rules and guidelines is similarly mentioned by Person 2, who discussed that climate benefits not is included when making decisions within other subjects.

"Just det här enskilda projekten skulle bidra till det här, dom civila delarna så finns det ju inga specifika utpekade just riksintressen" ("just these individual projects would contribute to this. The civil parts, so there are no specific designated national interests") (P5)

The collaboration at a national level is further discussed by Person 5.

"[...] Och sen just igen tror jag att man ska trycka på det här att det finns möjlighet till nån nationell samordning jag tror ju att det är där det finns störst möjlighet att föra diskussioner" ("[...] And then again I think you should push this that there is the possibility of some national coordination, I think that is where there is the greatest opportunity to hold discussions") (P5).

However, according to the theory, a polycentric approach with local knowledge is an essential factors to include when managing a CPR, something that often becomes missing when governance become more national, which also seems to be the case in Sweden, supported by the following quote:

"[...] Jobbar mer på nationell nivå än med enskilda bolag" ("[...] Working more at the national level than with individual companies") (P5)

As the willingness is to have more cooperation at a national level, one could miss local knowledge from other actors with other backgrounds and knowledge in other subjects related to more local or regional questions and concerns. Further Person 2, mention that more consensus between different interest is essential. The importance of a common understanding of the problem is mention by Adams et al. (2004) and Ostrom (2007) as well as in earlier studies when looking at large scale systems. As of today, this is something that is missing at a national level in Sweden.

"Om man lyfter blicken lite ytterligare och kollar på nationens intressen så det är för mycket stuprör man skulle vilja att energiministern, försvarsministern och näringsministern satte sig och hade samma mål och jobbade tillsammans mer än man gör, för i dagsläget är det väldigt mycket stuprör man tittar på sina egna delar och lyfter inte blicken och breddar sig utan man tittar mer på sina egna delar." ("If you lift your eyes a little further and look at the interests of the nation, so it is too many downpipes. You would like the Ministry of Energy, the Minister of Defence and the Minister of Industry to sit down and had the same goals and worked together more than they do because at present there are very much downpipes, they look on their parts and does not lift their eyes and widen, but they look more at their parts") (P2)

Further Person 3 discusses the consequences of these large restricted by the national defence having an effect on Sweden's possibility to impact the global climate. Something that is not much discussed in the climate context, indicating that a common understanding and approach between different interests is missing.

"Så det här att försvaret blockerar utbyggnaden av havsbaserad vindkraft runt hela södra Sveriges kuster, det är inte någonting man diskuterar så mycket i klimatsammanhang men det är förmodligen de, det som har störst effekt som har effekt på Sveriges möjligheter att påverka det globala klimatet just nu." ("so that this defence is blocking the expansion of offshore wind power around the whole of southern Sweden's coasts is not something that is discussed much in the climate context, but it is probably that, that ones that have the largest effect, that have an effect on Sweden's opportunities to impact the global climate right now.") (P3)

The importance of consensus between interests (P2) could also be connected to Person 5 who discusses around that Swedish Armed force is not having a specific person or section working with wind power, something that probably needs to change to increase communication and sharing of knowledge between actors.

Summary

In summary, the empirical studies indicate that the appropriation direction is an essential step in the right way. Hence the situation today indicates that there needs to be an improvement in the dialogue to be able to coexist. The limited dialogue can be an outcome by an asymmetric power ratio, where the national defence has the highest priority and that they do not have to explain or justify a NO. Hence, this is not supported by all interviews. Another contributor to a limited dialogue discussed is that the Swedish Armed Force not have enough resources and is therefore not able to discuss each project. This is, however, not supported by the Swedish Armed Force, even if they have the feeling that developers hope for more discussion, they mean that it is not the lack of resources, instead it is the internal process.

The consequences of a weak dialogue have been shown harming the sharing of knowledge and information which in terms harms the possibility to coexist and manage the CPR successfully.

7. Discussion

This section is discussing the empirical findings related to the theoretical framework and earlier literature.

The operation in an uncertain environment, something discussed as a common denominator by Dietz & Ostrom, Stern (2003) for large scale CPR, is also mentioned in the interviews as a barrier for co-development. However, this is also what the other factors in the theory aim to solve. The national defence has put restrictions on large areas, meaning that wind power could not be built there. The discount rate for the national defence is low as these restrictions not is costly for the national defence, hence excluding wind power is costly in terms of harming the possibility to build at the most efficient places and so also the sustainable development of wind power (P1). The restriction of these large areas could, therefore, be a result of a weight of the expected cost compared to expected benefit, discussed in the original framework by Ostrom (1990). To be able to do an correct calculation of future benefits and cost, knowledge and right information is essential. The actors in the internal world need to share there knowledge to be able to have an discussion with the relevant information.

In an early stage a share of relevant information could contribute to decisions taken based on all relevant information. An important step towards cooperation and discussion at an early stage is the new appropriation direction, which is mentioned by all interviewed persons as something necessary and an important step taken at the national level. Hence, there was almost none or only a short discussion from the interviewed persons about the polycentric system. It can be the case that it is hard to have a polycentric interactive system in a country. At a national level, the collaboration was mentioned as a factor that needed to improve, which partly can be accomplished by more integrated discussions and targets. It is necessary to develop a common understanding and more integration between climate, renewable energy, and national defence. This could further contribute with knowledge and information to local actors like municipalities and counties, which could increase their understanding of wind power, something that is discussed as missing today according to (P4).

The empirical study indicates that some critical pillars in the theory of how to manage CPR are lacking. A well-discussed pillar in all interviews is communication, and mainly a weak or a lack of dialogue between the actors. This could partly be an outcome of the power asymmetry between the actors, leading to a situation where the willingness to have a dialogue is harmed. The common denominator is the need to improve the dialogue. The dialogue itself creates consequences on other components like trust, power ratio, and sharing of information.

The definition of dialogue is, however, vague. This could be deciphered from the empirical study since some persons argue that communication is good while others said the opposite. However, the majority said the dialogue needed to be improved, mainly be through the sharing of knowledge, information, and a willingness to develop together and integrated. If these factors could be improved, so would the dialogue. Thus, consequently, many of the other factors that are defined by uncertainty today. The empirical study further indicates that the parts need to cooperate at an early stage, and information about the situation about what could be improved to be able to coexist is desired from the wind power developer, to complement a NO or a YES from the Swedish Armed Force. This could contribute to a sustainable wind power development, something that is discussed in the interviews, to be able to unlock the area's potential and to use the natural resources effectively.

Moreover, the veto that the Swedish armed forces have, meaning they can say NO without explanation, is without doubt the most discussed subject. Applying this to the theory of CPR, it creates a situation where there partly is a power asymmetry, where one can say that the Swedish Armed Forces can say NO without given more information. The veto also creates an asymmetry of information and seems to harm the trust between the parts. The asymmetry of information is also something creating uncertainty from both actors. Hence, even if the veto right may not be possible to change, the information given to complement a NO may be able to increase, or a discussion at a more generalized level may increase the degree of trust between the parts. The empirical study gives some examples of other countries with more residents and a smaller area that has had successful wind power development. There is an example from other countries where the national defence and wind power share technology, but to be able to reach this, there is a demand for a better and more integrated dialogue. But all the interviewed person was positive to coexistence between the interests and mention that it has been successful in other countries.

Finally, to characterise the airspace as a CPR as a way to solve the conflict between national defence and wind power may not solve the complex problem. However, the application of the theory on the problem creates an overview of pillars that need to be improved. The empirical results indicates that the theory can be used for the case of resource use of national defence and wind power since the empirical results mainly discuss the same topics regarding coexistence and this can help as a guide to decision-makers towards the appropriate set of solutions.

Hence, some circumstances may not be easy to change. For example, the regulation in Sweden, giving the

national defence veto contributes to a situation where the national defence has the better right to the land and airspace. However, developing the dialogue between actors both at the local and national levels may decrease the uncertainty and increase the possibility to coexist. To reach this, the government needs to be adaptive and adjust to the new situation with an increased focus on climate and RE, to improve the dialogue. The need to develop integrated solutions and targets, and an understanding of different views is also essential steps taken to increase the possibility for coexistence according to this study.

8. Conclusion

The study is based on the theory of CPR and has the aim to answer the following questions:

- *Is it possible to solve the conflict of the common resource, or is the only solution that one actor gets a better access/ (exclusive benefit) of the area?*
- *Which factor needs to be improved to solve the conflict of the common pool resource to exploit the resource in the best way and unlock its potential?*

The answer to the first question is that it is possible to coexist and solve the conflict over the CPR according to the empirical study. The main barrier found is that different interests stand against each other and that this is not somewhat unique for Sweden, however, some other countries have been able to solve this conflict. The interviewed persons all agreed that the possibility to cooperate and coexist to reach the areas full potential is possible. The appropriation direction is mentioned as an essential pillar to be able to coexist in the same area.

Factors that are considered essential to manage a CPR in its best potential based on the theory are communication, polycentric system, and sharing of knowledge. These factors have also been stressed as essential by the persons interviewed in the empirical study. The main subject discussed as factors that need to improve is communication. Communication is dependent partly on more information and knowledge being shared between actors, as well as a willingness to trust and develop integrated rather than separated. However since much of the information from the Swedish Armed Force is classified as confidential, all information may not be shared, this can however not be an argument for no communication and dialogue between the interest. Moreover, Sweden is on its way to developing a shared understanding of the problem, partly thanks to the appropriation directions. To include the RE on the agenda for the Swedish Armed Forces also indicates an adaptive governance. However, empirical results indicated that RE and climate benefits need to be included in more layers to exploit the resource to its best possibility.

To conclude this paper, it is evident that one of the main pillars that the CPR theory are pointing out are missing in the Swedish case of managing a common-pool resource: communication. The dialogue needs to develop to be able to create trust, remove uncertainty to create a successful manager over the CPR to maximise its full potential. Hence the interviewed persons all agreed that the possibility to cooperate and coexist to reach the areas full potential is possible with dialogue.

9. Limitations and future research

This paper is looking at a specific case, which creates some limitations. Based on the chosen theory, there will also be a tradeoff between generalisation and complexity (Cox, 2019), creating a situation where this paper cannot provide a simple guideline to other similar cases. Future research could focus on the same or similar problems in other regions and nations. Interesting would also be more studies around energy systems and RE based on the theory of CPR to get a better understanding and more empirical data on the subject. For future studies, a comparative study could be done looking at similar conflicts between countries and investigate why some nations may have succeeded better than others in handling the conflict and having different interests coexisting within the same geographical area. Future research could also compare the wind power development with other energy sources being more successful in Sweden, for example, the waterpower in the northern parts of Sweden, using the theory of CPR.

When conducting the study, the complexity of the development of wind power became more apparent. A limitation of this study is the compromise between space and what to include in the study. To look deeper into one specific conflict and context rather than a more overview could be regarded as a limitation, but also a strength. This paper takes its starting point in the national defence being a hindering factor for off shore wind expansion in Sweden. Future research may instead focus on how municipalities function since they are mentioned as another barrier for wind power development. Moreover, studies could investigate how to include climate in, for example, the environmental code, something discussed among the interviewed persons.

Sustainability is missing in much of the Swedish guidelines according to the empirical study. Future studies can look into how sustainability should to be included in research goals and contribute to innovation and global sustainable development. The policy should focus on encouraging dialogue and sharing of knowledge and information between actors.

The appropriation direction in 2020, is still quite new. The organisations and agencies are still just looking at this appropriation direction. Future research could, therefore, be a similar study to this in a couple of years to investigate whether the coexistence has improved.

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Appendix I

Number of Wind Turbines, Installed Capacity and Wind Power Production by Installation Type, Whole Country, 2003-

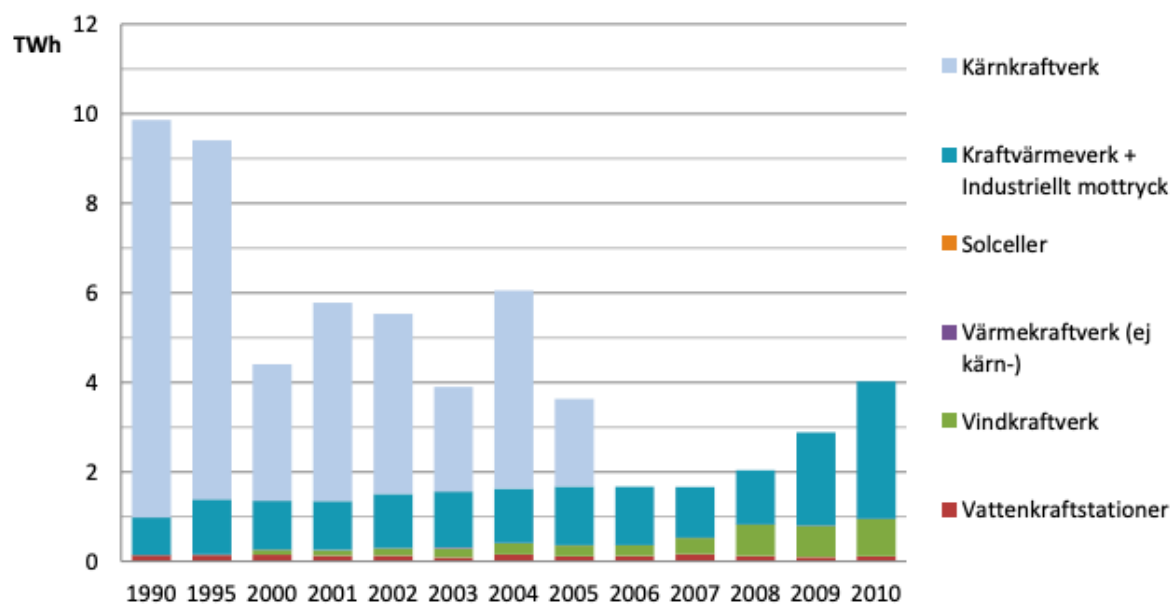
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Off-shore																	
Number of Wind Turbines	14	14	14	14	61	61	71	71	71	71	87	87	87	82	82	82	82
Installed Capacity, MW	21	21	21	21	131	133	163	163	163	163	213	213	213	203	203	203	203
Electricity Production, GWh	..	56	62	55	107	367	382	420	485	457	468	669	714	608	670	550	606
On-shore																	
Number of Wind Turbines	696	750	799	853	948	1,105	1,300	1,587	1,947	2,313	2,551	2,868	3,074	3,248	3,294	3,487	3,894
Installed Capacity, MW	396	454	501	564	692	956	1,312	1,854	2,601	3,443	3,981	4,875	5,606	6,232	6,408	7,097	8,478
Electricity Production, GWh	..	804	873	929	1,319	1,631	2,109	3,067	5,622	6,707	9,374	10,566	15,608	14,871	16,939	16,067	19,240

Statics of Wind turbines in Sweden, both offshore and onshore.

Available online: https://pxexternal.energimyndigheten.se/pxweb/en/Vindkraftsstatistik/-/EN0105_5.px/table/tableViewLayout1/ [Access: 2020-05-19]

Appendix II

Figur 19. Regional elproduktion (TWh) i Skåne fördelat på produktionslag mellan 1990 och 2010.



Källa: Vattenkraft, Värmekraft, Kraftvärme + Industriellt mottryck (SCB KRE), Vindkraft 2000-2007 (Vindstat), Vindkraft 2008-2010 (Energimyndigheten Vindkraftstatistik), Solceller (Länsstyrelsen Skåne)

The appendix shows the Region Skåne's electric production between 1990 and 2010.

Light blue = Nuclear plant

Blue = CHP

Orange = Solar

Purple = Thermal power, excluding Nuclear

Green = Wind power

Red = Water power

Available online: <https://www.lansstyrelsen.se/download/18.840e7ca163033c061f1b63a/1526068621729/Skanes-Energibalans-2010.pdf> [Access: 2020-05-19]

Appendix III

Intervjuformulär svenska

Öppning

Vad är din position hos xxx företaget? Vilka är dina dagliga arbetsuppgifter? Vindkraft i dagliga arbetet?

Berätta lite om den konflikt du upplever mellan vindkraft havsbaserad och försvarsmakten?

Hur arbetar ni med konflikten, eller att sammanföra vindkraft och försvarsmakten??

Vilka åtgärder vidtas för att förbättra situationen mellan vindkraft och försvarsmakten och systemet kring samexistens?

Vad är den största barriären för utveckling av vindkraft enligt dig?

När det gäller vindkraftsutvecklingen, vad skulle du säga är den största barriären för militären i områdena?

Finns det någon lösning på detta?

Berätta om de tekniska hinder och lösningar.

Vilka är de teknisk (radar m.m) hindren? Arbetar du med att hitta lösningar på det här problemet?

Hur skulle modernisering av vindkraftsteknik kunna implementeras / förbättras för att samexistera effektivt? Är detta en lösning?

Varför har framgången för vindkraft på land inte kunnat överföra offshore?

Investerar ni i FoU? Tillsammans / inte tillsammans med utvecklare av vindkraftsparker och försvaret?

Vad är problemet / hinder på fysisk nivå

Vilka är / var de tekniska och administrativa svårigheterna? Hur har dessa tagits upp? Vilka var de från början och vilka kvarstår?

Hur skulle modernisering av vindkraftsteknik kunna implementeras / förbättras för att samexistera effektivt? Är detta en lösning?

Vad tror du är det mest effektiva sättet att göra en förändring?

Berätta om hur kommunikationen fungerar mellan aktörer som är intresserade av samma område.

På vilka andra områden kommunicerar ni med varandra; teknik, FoU?

Arbetar du med att hitta lösningar på det här problemet?

Hur är kommunikationen? Hur ofta, i vilket sammanhang?

På vilka andra områden är din kommunikation andra? Hur känner du / din organisation hur kommunikationen fungerar?

Kommunikation samarbete / förhållande på och mellan olika nivåer, lokal, regional, nationell?

Berätta om kunskapen om processen? Finns det en symmetri eller asymmetri?

Delar ni kunskap med varandra, känner du att alla får tillgång till samtlig information?

Hur är kunskapen från din sida om processen, har båda/alla aktörer samma typ av kunskap om processen,tekniken och så vidare?

Hur är kunskapen om de lokala förhållandena från din sida, hur mycket kommunikation har du med lokala aktörer osv?

Nyligen blev ordet samexistera av stort fokus i det nya regleringsbrevet, vad är dina tankar om samexistens?

Vad betyder ordet "samexistens" för dig?

Är det möjligt att samexistera mellan det nationella försvaret och vindkraften i samma område?

Känner du att konflikten kan övervinnas? - På vilket sätt?

Finns det en delning i hur vindkraft uppfattas, att problemet eller lösningen på problem sig inte är definierat likadant mellan aktörer?

Slutligen

Är det något du känner att jag missade som du vill ta upp?

Tack för att du ställde upp!

Appendix IV

Interview guide English

Opening

What is your position with the xxx company?

What are your daily tasks?

Wind power in daily work?

Tell about the conflict you experience between offshore wind power and the defence force?

How do you work with conflicts or meet wind power and the defence force?

What actions are taken to improve the situation between wind power and the defence force and the coexistence system?

In your opinion, what is the biggest barrier to developing wind power?

What would you say is the biggest barrier for the military in the areas connected to wind power development?

Is there any solution to this?

Tell about the technical obstacles and solutions.

What are the technical (radar, etc.) obstacles?

Do you work to find solutions to this problem?

How could modernisation of wind power technology be implemented/improved to coexist? How? Is this a solution?

Why has the success of onshore wind power not been able to transfer offshore?

Do you invest in R&D? Together / not together with the development of wind farms and the defence?

What is the problem/obstacle on physical levels?

What are/were the technical and administrative difficulties? How were these recorded? Who were they from the beginning, and which ones remain?

How could modernisation of wind power technology be implemented/improved to coexist? How? Is this a solution?

What do you think is the most effective way to do and change?

Tell about how communication works between actors who are interested in the same area.

In what other areas do you communicate with each other; technology, R&D?

Do you work to find solutions to this problem?

How is communication?

How often, in what context?

In what other areas is your communication with each other?

How do you / your organisation know how communication works?

Communication collaboration/relationship at and between different levels, local, regional, national?

Tell about the knowledge of the process? Is there asymmetry or asymmetry?

Do you share knowledge, do you feel that everyone has access to all the information?

How is your knowledge of processes, do both/all actors have the same type of experience about methods, techniques, and so on?

How is knowledge of the local conditions, how much communication do you have with local actors, etc.?

Recently, the word coexistence received great attention in the new appropriation direction from the government, what are your thoughts on coexistence?

What does the word "coexistence" mean to you?

Is it available to coexist between the national defence and the wind power in the same area?

Do you feel that the conflict can be overcome? - How?

Is there a division in how wind power is perceived, that the problem or solution to the problem itself is not defined equally between actors?

Lastly

Is there something you feel I missed that you want to raise?

Thanks for your time and participation!