

THE ROLE OF MUNICIPAL PLANNING IN THE PERMIT DECISIONS ON LARGE
ONSHORE WIND POWER PROJECTS IN SWEDEN

Dissertation in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE WITH A MAJOR IN WIND POWER
PROJECT MANAGEMENT



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ABSTRACT

Sweden wants to produce 100% of its electricity from renewable energy sources by 2040 and achieve net zero greenhouse gas emissions by 2045. While wind power is key to this transition, the permit process for large onshore wind power projects is one of the major challenges the country is currently facing, specifically the provision on municipal approval in the Environmental Code, the so-called municipal veto.

To facilitate the expansion of wind projects in Sweden, the double testing of wind power applications was abolished in 2009, and the municipal veto was introduced to preserve the municipalities' planning influence. However, the municipal veto contributed to a less predictable and legally secure permit process and became the main reason behind the rejections of wind power applications. Today, in 2021, the Swedish Government assigned a special investigator to examine and propose possible changes to the municipal veto provision.

Though the municipalities believe that the veto is essential for their self-government and planning monopoly, the Swedish Energy Agency and the Swedish Environmental Protection Agency argue that the municipal authority should be exercised through the municipal general planning documents. Therefore, this thesis aims to verify the authorities' argument by examining the relationship between the municipalities' planning conditions for wind power and the permit decisions.

The study is performed in collaboration with Westander Klimat och Energi and is based on 206 large onshore wind power applications between 2014 and 2020. The main research methods consist of a document analysis and of statistical analyses, namely simple percentages, and the chi-square test of independence, along with Cramer's V calculation.

The projects are categorized mainly based on the municipal planning conditions, and the permit decisions are analyzed accordingly. Essentially, it is shown that, even if not legally binding, the municipal general spatial planning documents constitute a valuable tool for the planning of onshore wind power projects in Sweden.

Furthermore, the municipal planning conditions and permit decisions are not independent, however, their strength of association is weak. Nonetheless, the statistics indicate that in areas designated as suitable, more cases are likely to receive an approval than expected, and in areas not designated as suitable, the applications are more likely to be revoked than one would expect.

In conclusion, it is important to invest resources into the strategic wind power planning at the local level. Also, the municipal plans must be kept updated to consistently reflect the municipalities' intentions towards the use of their land and water areas.

Keywords:

Sweden, wind power, onshore, planning and permitting, municipal approval, local governance.

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CHAPTER 1 INTRODUCTION

Sweden wants to produce 100% of its electricity from renewable energy sources by 2040 and become a fully decarbonized economy by 2045 (Ministry of the Environment and Energy, 2019). According to the Swedish Wind Energy Association (SWEA, *Svensk Vindenergi*), wind power is key to achieve the country's energy policy goals (*Svensk Vindenergi*, 2020). However, it is argued by the organization, the Swedish Energy Agency (*Energimyndigheten*), and the Swedish Environmental Protection Agency (*Naturvårdsverket*) that the country's permit process for large onshore wind power facilities constitutes one of the major challenges to this transition, the main issue being the provision on municipal approval, also referred to as municipal veto (*Svensk Vindenergi*, 2020; *Energimyndigheten* and *Naturvårdsverket*, 2021).

On October 14, 2020, the Ministry of the Environment (*Miljödepartementet*) in the Swedish Government commissioned a special investigator to examine possible changes to the provision on the municipal veto (Dir. 2020:108, 2020). This regulation is covered in the Swedish Environmental Code (*Miljöbalken*, *MB*) under Chapter 16, Section 4 (16:4 MB), whereby:

‘Permission for a facility for wind power may only be granted if the municipality where the facility is intended to be built has approved it.

The first paragraph does not apply if the government has allowed the activity according to Chapter 17 of the Environmental Code’

(Prop. 2008/09:146, 2009, p. 13, Author's translation)

Clause 16:4 MB came into force on August 1, 2009, as part of a change in the legislation, which aimed to remove the so-called double testing of land-based wind power projects that are subject to testing in accordance with the Environmental Code. The purpose was then to accelerate the expansion of wind power in the country, in line with the national renewable energy targets. The change in regulations meant to simplify the permit process while maintaining the legality of the trial, ensuring careful review, and preserving the municipalities' influence over their land and water use (Prop. 2008/09:146, 2009).

However, after its introduction into the Environmental Code, the regulation was criticized by several actors for resulting in longer permit processing times, along with issues of legitimacy and impartiality (*Svensk Vindenergi*, 2020). Moreover, according to the Swedish Energy Agency and the Swedish Environmental Protection Agency, the municipal approval did not only have a substantial impact on the permitting procedure but was also the main reason

for the rejection of wind project applications over the last few years (Energimyndigheten and Naturvårdsverket, 2021).

Among the possible solutions to these problems and shortcomings, the Swedish Energy Agency and the Swedish Environmental Protection Agency recommended in their 2017 report to the Government to completely repeal the provision on municipal approval (Energimyndigheten and Naturvårdsverket, 2017). While the authorities contended that the removal of the provision would facilitate the permit process and increase its legal security, the municipalities were negative to the measure, as they perceived it to constrain their self-government (Ståhl, 2019). The 2017 proposal did not lead to any change in the legislation to this day (2021) (Energimyndigheten, 2021).

Traditionally, the high level of local autonomy is ingrained in the Swedish planning system. The municipalities have a monopoly over the use of their land and water areas, which is an important aspect of their self-government and the democratic principle in Sweden. The municipal planning monopoly and self-government are thus fundamental parts of Sweden's administration and are protected by the constitution (Khan, 2003; Ståhl, 2019).

With regards to the use of land and water areas for wind power establishments, the Swedish Wind Energy Association (SWEA, 2019), consistent with the Swedish Energy Agency and the Swedish Environmental Protection Agency (2017), argues that the municipalities' influence is still significant, even if the veto is abolished. In fact, the SWEA and the authorities explain that, aside from the municipal approval, the municipalities in Sweden play important roles in the planning and permit procedure of land-based wind projects, namely by being an important stakeholder in the consultation process and through their own general spatial planning documents (Geijer and Lundmark, 2017).

The Government's stance on the municipal general spatial planning documents, i.e., the comprehensive plan (*översiktsplan*) or other equivalent document (e.g., wind power policy or thematic addition), is that they should form a solid guidance for the development of wind power projects and a strong basis for the decision-making in the permit examination, even though they are not legally binding. Accordingly, each municipality should designate areas that are deemed suitable or unsuitable for such establishments. The municipality should also report the national interests according to Chapters 3 and 4 of the Environmental Code and be in line with them. Among these interests, the wind national interest areas that are identified by the Swedish Energy Agency should be included in the relevant municipal planning document. Under the supervision of the County Administrative Board (*Länsstyrelse*), the municipality should

demonstrate how its general spatial planning complies with the national interest in wind (Prop. 2008/09:146, 2009).

When considering the support provided by the municipal general spatial planning for the wind permit decisions, the National Board of Housing, Building and Planning (Boverket, 2012) states that the views differ among the actors, namely the municipalities, the Environmental Assessment Delegations (*Miljöprövningsdelegation, MPD*), and the wind power industry. Particularly, the municipalities' opinion is that the plans are a good basis for the approval or rejection of wind power projects, thus giving more value to the plans than the MPDs.

Against this background, and in view of the importance of the municipality's role in the planning and permitting of large onshore wind power projects in Sweden, this essay seeks to address the following research question:

What is the relationship between the municipalities' planning conditions for wind power and the permit decisions in Sweden?

In the context of this report, it is worthwhile to clarify that the terminology "municipal planning conditions" is used to refer to the area designation in the municipal general spatial planning documents, such as comprehensive plan, wind power policy, thematic addition, or similar. By way of explanation, "municipal planning condition" relates here to whether the proposed area for the establishment is designated as suitable or unsuitable for wind power by the municipality.

As such, this thesis aims to examine the viewpoint of the Swedish Energy Agency and the Swedish Environmental Protection Agency, by which the municipalities' general spatial planning tools for large onshore wind power projects in Sweden play a decisive role when it comes to the permit decisions. In other words, the hypothesis to be validated is that the municipal planning conditions and the permit decisions on wind power matters are not independent. Furthermore, parallels are drawn between the municipal area designations and the national interest designations for wind power in the course of this study.

Accordingly, this report unfolds as follows: [Chapter 2](#) gives a historical review of the permit process for onshore wind power, namely before and after 2009; [Chapter 3](#) explains the methodology adopted to answer the research question; [Chapter 4](#) lays out and analyzes the results; [Chapter 5](#) discusses the findings; and [Chapter 6](#) provides conclusions to the report and suggests further research opportunities.

CHAPTER 2 HISTORICAL REVIEW

This section of the report gives a historical review of the planning and permitting procedure for large land-based wind power projects in Sweden. The starting point is the legal framework that was applicable to these establishments until 2009. This is followed by the background for the change in the regulations along with the ensuing modifications to the permitting procedure and laws, and then by today's planning and legislative process.

After explaining the development of the planning and permitting procedure, account is given to the guidance document on municipal approval by the Swedish Energy Agency in 2015, some of the problems with the present laws (2021), and the Government's assignment to the Swedish Energy Agency and the Swedish Environmental Protection Agency in 2017. Finally, the section concludes with the current Government's mission to the special investigator, along with the latest national strategy for sustainable wind power development by the Swedish Energy Agency and the Swedish Environmental Protection Agency.

2.1 Planning and Permitting for Large Onshore Wind Projects Before 2009

Prior to 2009, large onshore wind power projects in Sweden were subjected to the regulations of both the Planning and Building Act (*Plan- och bygglagen, PBL*) and the Environmental Code. The regulation under the PBL is predominantly related to the planning of the land and water use in view of the existing conflicting interests, and it is handled at the local level by the relevant municipality(-ies) where the facility is to be built. The review under the Environmental Code addresses the possible health effects of the wind turbines, together with their impacts on the environment. The environmental application is dealt with either at the regional level, that is by the County Administrative Board or Environmental Court, or at the national level, depending on the project size (Khan, 2003).

In accordance with the PBL, the municipalities are granted a so-called monopoly when it comes to the planning of land-use. The planning of land-use is primarily reported in the municipality's comprehensive plan, a non-legally binding document, which should reflect the various national interests. The main purpose of the municipal comprehensive plan is to lay out the municipality's vision and strategy for the long-term development of its land and water areas, thus constituting a guiding tool to private developers and public actors (Khan, 2003).

Wind power applications, similar to all building projects, were subjected to a building permit and, in some cases, a detailed plan under the PBL. The detailed plan is legally binding, and it is the municipality that decides on whether such document is required for the specific project at hand (Khan, 2003). The requirement for a detailed plan mainly targeted those projects that had a significant environmental impact, or that were to be established on lands with high demand for development. Here it is important to note that it is possible to appeal both the building permit and the detailed plan to the County Administrative Board and to the Land and Environmental Court (*Mark- och miljödomstolen, MMD*), respectively. The possibility for the appeal adds to the complexity and duration of the process (Ståhl, 2019).

2.2 Change in Regulations of August 1, 2009

On June 20, 2007, a special investigator was appointed by the Ministry of Economic Affairs (*Näringsdepartementet*) in the Swedish Government to assess and propose changes to the organization and regulations of certain matters that are dealt with under the Environmental Code and the PBL (1987:10, PBL), (Dir. 2007:94, 2007). The special investigator's task was further supplemented by December the same year to examine the possible need for constitutional amendments related to renewable energy issues, including wind power. The main purpose of the investigation in wind power was to facilitate the expansion of wind power projects in Sweden by simplifying the planning conditions and streamlining the permitting process (Dir. 2007:184, 2007).

The first reason behind the initiative was to achieve the national renewable energy and wind development targets set by the Swedish Parliament (*Riksdag*). The second was to be in line with the back then upcoming Renewability Directive of 2009, which was adopted by the European Parliament on December 17, 2008. According to this directive, Sweden was to provide 49% renewable energy by 2020 (2009/28/EC, 2009; Prop. 2008/09:146, 2009; Ståhl, 2019). The fast expansion of wind power in Sweden thus became of utmost importance.

The inquiry's assignment resulted in a report on October 2008 (SOU 2008: 86), followed by a government bill in March 2009 (Prop. 2008/09:146). The constitutional changes aimed at enabling the expansion of wind power within a legally secure, environmentally conscious planning and permitting procedure.

It was considered that the double-trial of land-based wind power projects under both the Environmental Code and the PBL was unnecessary and should therefore be removed, since these laws dealt with many of the same issues. Therefore, large wind power plants were to be

tried and permitted on the sole bases of the Environmental Code. However, abolishing the review process under the PBL meant a restriction on the municipal self-government and planning monopoly (Prop. 2008/09:146, 2009).

This proposal was met with concerns and objections, as its consequences were deemed unacceptable by numerous consultative bodies, namely the County Councils and the municipalities. These participants believed that the Environmental Code cannot replace the PBL in the evaluation regarding land-use and designed facilities. The only way to accept the inquiry's suggestion was for the municipalities to be granted such a strong ability to influence the permit process, that the review authorities under the Environmental Code would not be able to issue a permit against the municipalities' wishes (Prop. 2008/09:146, 2009).

As a response, the Government proposed that a new provision on municipal approval be added to the Environmental Code (16:4 MB) whereby a permit may only be granted by the licensing authority if the municipality where the establishment is to be built has endorsed the application. In other words, the municipality's consent is a material condition for the approval of a wind project application. Nonetheless, the Government reserved the right to override the municipality's decision and test the wind power project according to Chapter 17 of the Environmental Code in case the establishment was considered a matter of extreme national importance. As a result, building permits were not required any longer for wind projects, and detailed plans were only needed in exceptional cases when the development demand for the land where the project is to be built is high. The constitutional amendments were applicable from August 1, 2009 (Prop. 2008/09:146, 2009; Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019).

2.3 Current Planning and Permitting Procedure for Large Onshore Wind Projects

This section presents an overview of the planning and permitting procedure for large onshore wind power projects in Sweden today (2021). The Environmental Assessment Ordinance (*Miljöprövningsförfordningen*) in Chapter 21, Sections 13 and 14, classifies a wind farm as a large facility if it consists of 2 or more turbines higher than 150 m, or 7 or more turbines higher than 120 m, including the rotor blades. Such projects necessitate a permit under the laws of the Environmental Code, along with the municipality's approval (NordVind, 2011; Vindlov, 2020).

During the project's planning phase, reference should be taken from the municipality's comprehensive plan, which is issued under the Planning and Building Act (2010:900, PBL).

Although this document is not legally binding, it gives an image of the municipality's intentions towards the long-term development of its land and water areas (Boverket, 2020). The municipality's comprehensive plan should constitute the basis for the decision by the municipality and as such give good planning grounds to the wind power developers (Boverket, 2012).

Wind power, next to nuclear power and other similar installations, is classified as a hazardous activity according to the Environmental Code, Chapter 9, and the permit application is essentially examined against the rules in Chapter 2, Section 6 (2:6 MB). The trial is done by the relevant Environmental Assessment Delegation, which is one of 12 County Administrative Boards. The permit application must include a comprehensive Environmental Impact Assessment (EIA) as per Chapter 6 of the Environmental Code. As for the municipal approval, it is generally requested by the MPD prior to public consultations, at the latest when the permit application and the EIA are finalized. The municipality's approval is required for new and change applications (Nilbecker, 2014; Ståhl, 2019; Darpö, 2020b).

It is possible to appeal the MPD's decision to the Land and Environmental Court (*Mark- och miljödomstolen, MMD*), one among 5 in Sweden. Further on, it may be possible to appeal the MMD's decision to the Land and Environmental Court of Appeal (*Mark - och miljööverdomstolen, MÖD*) (Darpö, 2020b).

2.4 Guidance Document on Municipal Approval

The provision on the municipal approval came rather late in the legislation procedure in 2009. The description of the regulation provided in the preparatory work was brief and did not include guidelines for its use, thus resulting in ambiguities in its interpretation and application (Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019). As such, the Swedish Energy Agency produced a guide in 2015 to clarify some of the uncertainties associated with the provision. The guide is mainly addressed to the municipalities, review bodies, and the wind industry, and although not legally-binding, it aims to streamline the planning and permitting procedure. As such, the guide provides recommendations for the use of the municipal approval provision and explains the roles of the different actors involved in the process (Energimyndigheten, 2015).

In essence, the guidance document explains that the municipality has several distinct functions in the permit process: to influence the location of the project through the comprehensive plan, address the environmental and health issues by taking part of the early

consultations, and take a position on whether the project may be established, through the municipal approval. On the other hand, the MPD and MMD are responsible for the testing of the application according to the Environmental Code. Finally, the project developer is responsible to carry out consultations with the various stakeholders and to deliver a full application with a detailed EIA report (Energimyndigheten, 2015).

Several recommendations are given by the Swedish Energy Agency with regards to the decision-making and only some of these are pointed out herein. First, the authority states that the municipality's opinion towards the establishment should be clarified as early as the consultation phase, especially in the case of a negative stance. Second, if the municipality's decision is made, it can be communicated to the review authority from early on. Third, it is recommended that the municipality makes a decision within 2 to 3 months after receiving the request from the review authority. Finally, the authority believes that the municipality's decision should: be based on the suitability of the land-use, address the entire project (i.e., not be partial approval or partial rejection), not be conditional, and be substantiated with justifications (Energimyndigheten, 2015; Ståhl, 2019).

2.5 Problems with the Current Legislation

The 2009 change in regulations aimed to boost the deployment of wind projects in Sweden by simplifying the permit process and reducing its duration (Svensk Vindenergi, 2020). Furthermore, the introduction of the municipal veto provision in the Environmental Code meant to preserve the municipality's control over its land and water areas (Prop. 2008/09:146, 2009).

However, the evaluation done by the Swedish Environmental Protection Agency in 2017 showed that the intentions of the change in regulations do not seem to have been met, and that the perception of the permit process's efficiency differs among actors. While the municipalities are generally satisfied with the amendment to the Environmental Code, the experiences of the review bodies, the wind power industry, and the Swedish Wind Energy Association (Svensk Vindenergi, 2020) are quite the opposite. These actors believe that the process became more complicated and suffers from many problems and shortcomings. On the other hand, it appears that the actors mostly agree that the guidance document on municipal approval had little contribution to the improvement of the process, as it is open to interpretation (Geiger and Lundmark, 2017).

To begin with, the new regulations do not appear to have practically abolished the double trial of wind power installations. Even though the municipality is no longer a formal review entity, it is still carrying out its evaluation of the projects much the same way. As a result, the permit processing time seems to have slightly increased with the introduction of the Environmental Code amendments (Geiger and Lundmark, 2017; Svensk Vindenergi, 2020).

Furthermore, the wind industry is of the opinion that the process is legally uncertain and lacks transparency and objectivity. The reasons are that the municipality's criteria for decision are unclear, the decision can be affected by political considerations, it can be neither predicted nor appealed on the merits, and it is not necessarily justified. The wind industry is also exposed to financial risks because the municipality's decision comes late and is non-binding, which means it can change during the process (Nilbeker, 2014; Geiger and Lundmark, 2017; Ståhl, 2019; Darpö, 2020b).

Aside from the problems associated with the decision-making process, another significant issue is that the municipal veto is the primary reason for the rejection of onshore wind farm applications and wind turbines in Sweden. Darpö's recent statistical report (2020b) dealing with 192 onshore wind project applications, including change permits, shows that between 2014 and 2018, 11% of the wind turbines (i.e., 427 turbines) were rejected due to the municipal veto, which is considered a high number. Another statistical evaluation was undertaken by Westander Klimat och Energi (2020) for the period from 2014 to mid-2020, which includes 244 onshore applications. During this period, 1,100¹ onshore wind turbines were rejected due to the municipal veto (24%). Other important findings of the study are that firstly, acquiring a permit has not become more difficult, with 43% approvals during 2017-2019 versus 38% in 2014-2016. Secondly, the total numbers of onshore and offshore applications and wind turbines have decreased respectively by 59% and 70% in 2017-2019 in comparison to 2014-2016.

2.6 The 2017 Proposal by the Swedish Energy Agency and the Swedish Environmental Protection Agency

In 2016, the Swedish Energy Agency and the Swedish Environmental Protection Agency were assigned by the Ministry of the Environment to assess the development of the planning and permit process for wind power projects following the introduction of the provision on

¹ In the current report comma separators are used in numbers for groups of thousands, and period separators for decimals.

municipal approval in 2009. The authorities were to analyze the effect that the guidance document on municipal approval had on the process. It was also requested to evaluate the requirement for and produce measures and amendments to the laws, specifically regarding the municipal veto, in order to simplify the permitting procedure (Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019).

On June 19, 2017, the Swedish Energy Agency and the Swedish Environmental Protection Agency released their report in response to the Government's assignment. Firstly, with regards to the effect that the guidance document on municipal approval had on the process, the conclusion was the same as that reported by the evaluation unit of the Swedish Environmental Protection Agency. It was believed that the guidance leaves room for interpretation and as such did not have the desired outcome (Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019).

Secondly, the Swedish Energy Agency and the Swedish Environmental Protection Agency studied 10 alternative measures to the municipal veto, and primarily recommended that the provision be completely removed. The authorities believe that abolishing the municipal veto would ensure the sustainable development of wind power as intended, as it eliminates most of the issues associated to it, simplifies the permit process, and makes it more legally reliable. Also, the authorities consider that the process would be rendered more democratic, since the municipal approval cannot be appealed on the merits, while the permit examination allows those who are affected by the development to express their opinions and concerns, as well as to appeal the permit decision in substance. Furthermore, on the one hand, it is thought that the review under the Environmental Code alone is sufficient, and on the other hand, the municipality's influence, although reduced, can still be practiced through consultations and general spatial planning documents. This proposal, as in 2009 prior to the addition of the municipal approval provision, was met with objections from the municipalities (Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019).

The second recommended alternative consists of an early municipal approval, which replaces the provision on municipal veto in 16:4 MB. In this alternative measure, the municipality's decision comes earlier in the process in the form of a precondition for the permit examination and is legally binding. Additionally, the municipality's review is to exclusively address the suitability of the area where the project is to be built, in consideration of the proposed maximum number of wind turbines. Consequently, the municipality's consent is not required for change applications if the area and number of turbines are not modified. As a

result, the permit process is facilitated, and its legal security increased, with a reduced impact on the municipality's influence (Energimyndigheten and Naturvårdsverket, 2017; Ståhl, 2019).

2.7 The Current Government Assignment to the Special Investigator

The previous subsections lay down the background for the committee directive entitled 'Increased predictability in environmental testing of wind power' (Dir. 2020:108, 2020, p.1, Author's translation), which was issued by the Ministry of the Environment on October 14, 2020. In this directive, a special investigator is commissioned to first investigate the conditions to abolish the provision on municipal veto; second, suggest methods for repealing the provision while ensuring the municipal influence is maintained; and third, evaluate other suggestions for increasing the legality and predictability of the environmental permit process in case the provision on municipal veto is kept.

According to the committee directive (Dir. 2020:108, 2020), the special investigator is to take consideration of the alternative proposals to the abolishment of the municipal veto, as provided in the 2017 report by the Swedish Energy Agency and the Swedish Environmental Protection Agency. The investigator shall also refer to the different alternatives that were submitted in the consultation responses to the authorities' report. Furthermore, the task should be conducted in close consultation with several important stakeholders, such as the Swedish Energy Agency, the Swedish Environmental Protection Agency, the municipalities, the County Administrative Boards, the Land and Environmental Courts, the wind industry, and others. The assignment is to be completed by June 30, 2021.

2.8 National Strategy for Sustainable Wind Power Development

In January 2021, a national strategy for sustainable wind power development was produced by the Swedish Energy Agency and the Swedish Environmental Protection Agency in collaboration with many stakeholders, mainly the County Administrative Boards. One of the departure points for the strategy is the national renewable energy targets. These result in a minimum need of 100 Terawatt-hours (TWh) of wind power by the 2040s according to the Swedish Energy Agency, of which 80 TWh are assumed to be produced onshore and 20 TWh offshore. To ensure adequate planning conditions, analyses and planning documents are required at the national, regional, and local levels (Energimyndigheten and Naturvårdsverket, 2021).

An important area of focus within the strategy is related to the permit process for large onshore wind power projects and specifically consists of a legal analysis of a proposed change to the municipal approval provisions in the Environmental Code. The proposed change consists essentially of an early approval and supersedes the authorities' recommendation of eliminating the municipal veto provision, as given in their report of 2017. Moreover, the authorities suggest that the Government conveys their proposal to the special investigator, for their use in the review of the provision on municipal approval.

The proposal for early approval was part of the earlier report to the Government and is further adjusted and developed in the current national strategy, with the aim of enhancing the predictability of the permit process. In this proposal, the early municipal approval is essentially differentiated from the permit process in that it is treated as a precondition for the examination of a permit application by the relevant authority. In other words, the municipality must recommend a site for wind power establishment in order for an application to be considered and a permit to be issued. As such, the municipality's approval is mandatory for a complete permit application, and once the application is announced by the review authority, the municipality's approval becomes binding.

Through the early municipal approval, the Swedish Energy Agency and the Swedish Environmental Protection Agency believe that the influence of the municipality over the use of its land and water areas is maintained, although decreased relative to today. The municipality's decision should be based on its general spatial planning documents, taking into consideration the suitability of the area for wind power establishment. Consequently, and to prevent the double testing of the projects, the only information considered necessary for the decision-making is the site limit, maximum turbine number, and maximum turbine height. The municipality's decision should then cover the entire project and cannot be partial nor conditional. In the case of design changes that are within the initial project conditions, the municipality's approval is not needed for the review authority to consider and process the change permit application.

Comments were received on the authorities' proposal during consultations, specifically when it comes to the data requirement for the municipal assessment and approval. On the one hand, the municipalities' desire is to influence not only the location of the wind power project, but also its design, and for this, more comprehensive information is deemed necessary for their evaluation of the establishment. On the other hand, the wind industry, albeit generally supportive of the proposal, is of the opinion that the municipality's decision should only consider and apply to the location of the project, not the turbine height.

The overall anticipated outcome of the new provision is that more initiated applications lead to a permission, and inadequate projects from a location perspective stop at an early stage. The impacts on the municipalities, review authorities, and developers are also assessed and included in the national strategy, and some examples are mentioned herein. The provision's main advantages are that it clearly defines the role of each of the actors in the permit process and entails a reduction of the processing time, resources, and costs. On the other hand, as the early dialogue between the municipality and the developer becomes more crucial in this process, resource allocation is needed at an earlier stage. Also, the municipalities' assessment may be considered more challenging as the decision basis is limited, and for the developers, they may face a larger number of rejections, since the municipalities can no longer issue a conditional approval.

From a constitutional perspective, the early approval consists of abolishing the provision of Chapter 16, Section 4 in the Environmental Code and replacing it by new provisions in Chapters 19 and 22. Similar to what applies today on the municipal veto provision, the municipality's decision can only be appealed through a legality review. As for the new regulations, they must clearly state the information requirements for the municipality's decision-making, i.e., area limit, maximum number of turbines, and maximum height of turbines. Furthermore, the processing times for the municipal approval should be also regulated and limited to 6 and 4 months for new and upgrade applications, respectively. As for the validity period of the municipality's approval, it should be specified as 3 years before the announcement of the decision on the permit application. If the permit is rejected or has expired, the municipality's approval becomes obsolete.

CHAPTER 3 METHODOLOGY

The first part of this chapter briefly defines the theoretical research methods employed in the study, while the second gives a detailed description of the data sources and the step-by-step data-handling and analysis procedures. Figure 1 summarizes the methodological framework.

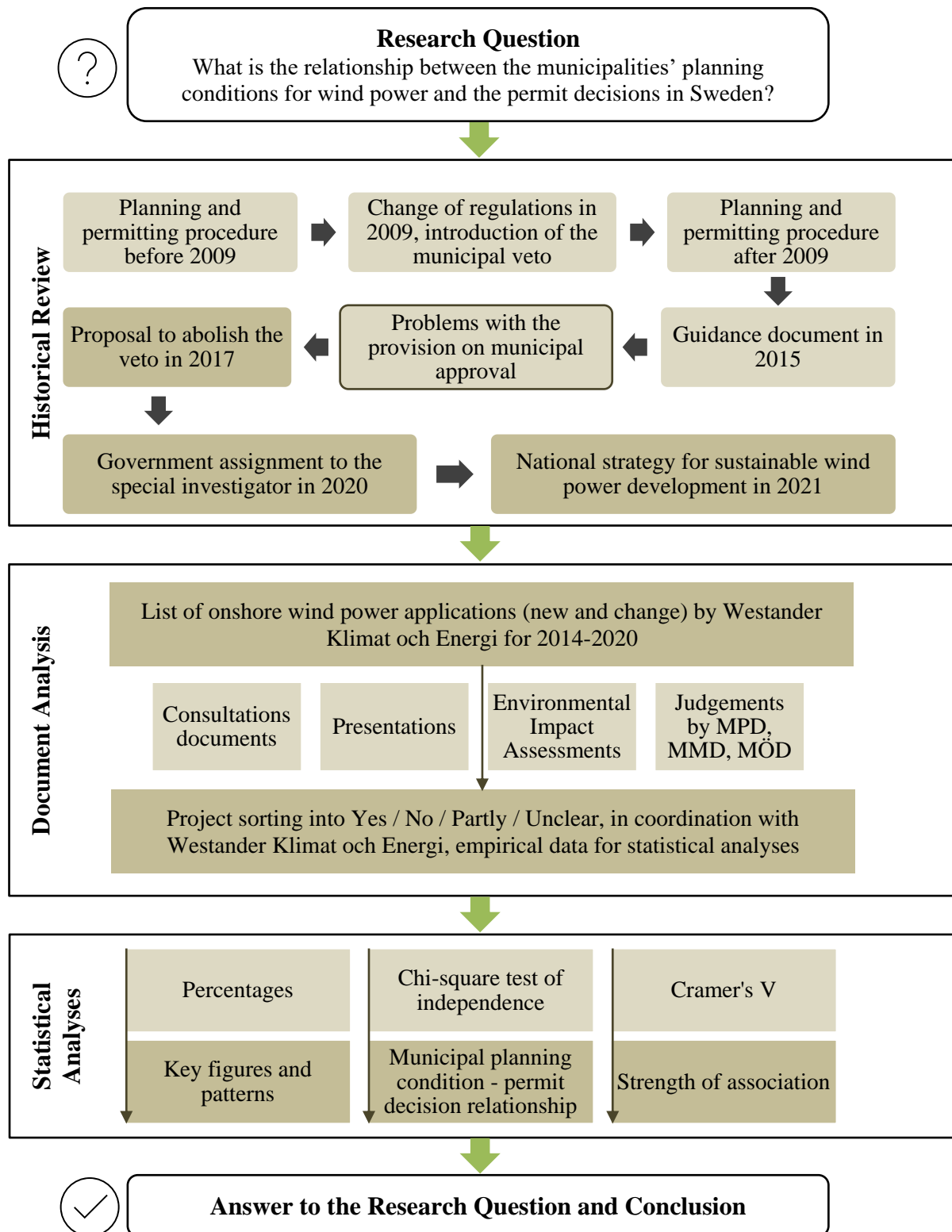


Figure 1 - Methodological framework diagram

3.1 Research Methods

The research work is conducted using the mixed-methods technique, which is a combination of both qualitative and quantitative research approaches (Bowen, 2009). In this thesis, a qualitative document analysis is first carried out, followed by a quantitative method, consisting of statistical analyses of the results.

Essentially, the document analysis systematically reviews and evaluates documents as a basis for finding and interpreting the data needed to answer the relevant research question, in a combined process of content and thematic analyses. The content analysis consists of a first reading process, where data related to the research question is identified, while the thematic analysis entails careful further reading of the data, which is coded and categorized in relation to the central research question (Bowen, 2009). The resulting empirical information thus constitutes the discrete data to be utilized in the statistical analyses.

The statistical analyses adopted in this study consist of both descriptive and inferential statistics. The descriptive statistics are used in the form of percentages, while the inferential statistics use the chi-square (χ^2) test of independence, with the calculation of Cramer's V.

The chi-square test of independence is suitable when the research question or hypothesis addresses the "relationship", "association", or "independence" between two categorical variables. The result is to determine whether there is an association between the variables, or if they are independent. Cramer's V on the other hand, is a way to assess and describe the strength of the dependence between the variables (Korb, 2013; Rana et al., 2015; Kent State University, 2021; Clark et al., n.d.).

3.2 Data Sources and Methodological Framework

Westander Klimat och Energi compiled a detailed list of onshore and offshore wind power applications in Sweden for the years 2014 to 2020. The considered applications are those for which a decision was made by the MPD or MMD after January 1, 2014, for onshore and offshore cases respectively, as well as those projects for which a final decision is not yet made. The compilation includes new and change applications and is mainly based on surveys to the MPDs, MMDs, MÖD, and the Swedish municipalities, along with other similar lists by Olle Hedberg, Jan Darpö, Fröberg and Lundholm, and the Swedish Energy Agency.

For the purpose of this study, consideration is given only to the decided onshore wind power applications between 2014 and 2020. The data related to offshore wind power

applications is disregarded, as it is out of scope and not included in this thesis. The data is recorded in Excel, and the information associated to each project is listed below.

- Project location:
County; municipality
- Project information:
Project name; developer name
- Key dates:
Application year; application date; decision date by MPD
- Application type:
New / change application
- Number of turbines:
Original application; reduced number; final application
- Results from the MPD:
Name of the reviewing MPD; decision reference number; decision date; number of approved turbines; number of rejected turbines
- Final result:
Permission / Rejection / Revoked / Partly
- Results for the number of wind turbines:
Approved; rejected; withdrawn due to the municipal veto; withdrawn due to the army; reduced with respect to the original application; total number of rejected turbines; total number of rejected turbines due to the municipal veto; withdrawn due to other reasons
- Year for the final decision
- National interest designation:
The designation of the proposed area on a national level, mostly according to the Swedish Energy Agency's map tool Vindbrukskollen. The designation of the area can be Yes / No / Partly. "Yes" means that the project is fully within a national interest area for wind power, "No" means that the project is completely outside a national interest area for wind power, and "Partly" refers to a project partly within a national interest area for wind power.

The first step is to examine the planning conditions for the wind power projects with regards to the municipality(-ies) where the projects are to be built. That is to say, using the final wind power applications, the objective is to first determine whether a project is located in a suitable area for wind power establishment according to the municipality's comprehensive plan or wind power plan.

For the purpose of categorizing the applications with respect to the type of the area designation by the municipality, a document analysis is performed. The bases for the assessment consist of consultations documents, presentations, and environmental impact assessments issued by the developers, as well as decisions by the MMD or MÖD in the cases of appealed applications. Additionally, reference is made to decisions from the MPDs in certain instances. The document analysis allows then to codify and group the wind power applications into four different categories: "Yes", "No", "Partly", and "Unclear", according to the criteria set in Table 1.

The survey is carried out jointly with the team at Westander Klimat och Energi. The list of project applications is first investigated by the Author and by the team at Westander independently, resulting in two separate lists where the projects are put under their respective categories. Then, both findings are put together, compared, coordinated, and validated, resulting in one final list in Excel, where the following entries are added:

- Designation in the comprehensive plan or wind power plan:
Yes / No / Partly / Unclear
- Source or link to the reference document:
Mainly consisting of consultations documents, presentations, environmental impact assessments, and judgement decisions by MPD, MMD, or MÖD
- Exact quotes from the source:
Quotes which constitute the basis for the choice of category
- Comments:
For further clarification, if needed

Table 1 - Classification criteria of wind power applications with respect to the municipal planning conditions

Classification	Description	Criteria
Yes	The wind farm is <i>fully located within</i> an area designated as suitable for wind power establishment according to the municipality's comprehensive plan or wind power plan.	<p>Sentences highlighted in the documents, such as:</p> <ul style="list-style-type: none"> - "The area has been designated as suitable for the establishment of wind power in the municipality's wind power plan" - "The area is part of the municipal interest area for wind power" - "The area is a priority area in the master plan" - "A-area for wind power" - "The area is designated as Area type 1 for wind farms in the comprehensive plan" - "Designated in the municipality's wind power plan as the primary area" - "Potentially appropriate" - "Good conditions for wind power" - Etc.
No	The wind farm is <i>fully outside</i> areas designated as suitable for wind power establishment according to the municipality's comprehensive plan or wind power plan.	<p>Sentences highlighted in the documents, such as:</p> <ul style="list-style-type: none"> - "The municipality did not report any areas for wind power development" - "The municipality chose not to include the area in the adoption document for the wind farm plan" - "The project is not designated as a suitable area in the plan" - "In the thematic supplement for wind power, the area of activity is not designated for large-scale wind power" - "A large-scale wind power establishment is contrary to the comprehensive plan" - Etc.
Partly	The wind farm is <i>partly located within</i> an area designated as	Sentences highlighted in the documents, such as:

Classification	Description	Criteria
	suitable for wind power establishment according to the municipality's comprehensive plan or wind power plan.	<ul style="list-style-type: none"> - "The wind farm plan points out parts of the area as an A-area" - "Most of the area has been designated by the municipality as a suitable area for wind farms" - "The project area largely corresponds to an area that the municipality in its thematic supplement for wind power in the comprehensive plan pointed out as suitable for wind power establishment" - "Four of seven wind turbines are within the area designated by the municipality as suitable for wind farms, while the others are just outside" - Etc.
Unclear	It is <i>unclear whether the wind farm is fully within, partially within, or completely outside</i> areas designated as suitable for wind power establishment according to the municipality's comprehensive plan or wind power plan.	<p>According to the documents, when reference is made to:</p> <ul style="list-style-type: none"> - Proposals for a new/revised comprehensive plan or wind power plan - Conditions exceeding those specified in the comprehensive plan, such as maximum number of turbines and maximum turbine height <p>Sentences highlighted in the documents, such as:</p> <ul style="list-style-type: none"> - "Possible investigation areas for wind power" - "Wind power is not dealt with in the comprehensive plan" - "An area that is not designated as suitable for large-scale wind power establishment, but which may be possible and investigated in each individual case" - "Neither priority areas for wind power nor areas to be exempted

Classification	Description	Criteria
		<p>from wind power, but areas where wind power can be tested”</p> <ul style="list-style-type: none"> - “The area is outside the areas where the municipality does not want the establishment of wind power” - “The area is not designated as an unsuitable area for wind power in the municipal comprehensive plan” - “The establishment is not in conflict with the current comprehensive plan” - “Class 2 area - areas possible for wind power” - “The wind turbines are within the comprehensive plan's B areas” - Etc.

The empirical data gathered from the classification of the wind power applications into their corresponding categories are used in the statistical analyses. Two categorical variables are considered: the municipal planning condition with sub-categories “Yes”, “No”, “Partly”, and “Unclear”, and the permit decision divided into “Permission”, “Rejection”, “Revoked”, and “Partly”.

Here it is important to define the permit classification. The permits consisting of “Permission” and “Rejection” address the projects in their entirety, according to the wind farm design in the final application. The sub-category “Partly” is related to the projects that received a partial approval, that is for which the number of wind turbines was reduced with respect to the final application. As for the “Revoked” group, it includes the applications that were withdrawn by the developer, who chooses to opt out of the process for example due to the low electricity prices or high financial risks associated to the project, or who believes that it will not be possible to obtain a permit due to the municipal veto or other reasons, such as the army.

Both descriptive and inferential statistical methods are used to analyze the data. On the one hand, percentages are employed to give the overall picture and key information on the projects. Some examples of key information include the proportion of permitted, rejected, revoked, and partly approved applications; the proportion of permitted and rejected turbines; the percentage of rejected or revoked applications due to the municipal veto; etc. The percentage method is also used to illustrate several important patterns, such as how the municipality’s area designation types compare to the national interest designation for the proposed locations; the ratio of approved, rejected, revoked, or partially approved applications for each municipal designation category (i.e., Yes, No, Partly, or Unclear); etc. The results are plotted in pie and bar diagrams using Excel for more clarity and better understanding.

On the other hand, and to answer the research question, the chi-square test of independence is performed to evaluate the dependence between the municipal planning condition and the permit decision, which constitute the categorical variables of interest to this thesis. In other words, the chi-square test of independence aims to answer the question “are the municipal planning conditions and the permit decisions independent?”, and therefore to test the hypothesis, which states: “the variables are independent”. In order to apply the chi-square test of independence, the data must satisfy the following assumptions (Kent State University, 2021; Clark et al., n.d.):

- The data is discrete and comprises of counts or frequencies
- The counts are independent, and the total counts should be equal to the sample size

- The sample should be sufficiently large
- The majority of the expected counts (80% according to the sources) should be greater than 5, and no expected count should be less than 1

The test uses 4 by 4 contingency tables, and the step-by-step procedure is briefly described, following the example given by Kent State University (2021).

Table 2 - Contingency table layout

		Permit decision				
		Permission	Rejection	Revoked	Partly	Total
Municipal planning condition	Yes	O ₁₁ , E ₁₁ , R ₁₁	O ₁₂ , E ₁₂ , R ₁₂	O ₁₃ , E ₁₃ , R ₁₃	O ₁₄ , E ₁₄ , R ₁₄	Row 1
	No	O ₂₁ , E ₂₁ , R ₂₁	O ₂₂ , E ₂₂ , R ₂₂	O ₂₃ , E ₂₃ , R ₂₃	O ₂₄ , E ₂₄ , R ₂₄	Row 2
	Partly	O ₃₁ , E ₃₁ , R ₃₁	O ₃₂ , E ₃₂ , R ₃₂	O ₃₃ , E ₃₃ , R ₃₃	O ₃₄ , E ₃₄ , R ₃₄	Row 3
	Unclear	O ₄₁ , E ₄₁ , R ₄₁	O ₄₂ , E ₄₂ , R ₄₂	O ₄₃ , E ₄₃ , R ₄₃	O ₄₄ , E ₄₄ , R ₄₄	Row 4
	Total	Column 1	Column 2	Column 3	Column 4	Grand total

Where:

- O_{ij} denotes observation or actual count at row “i”, column “j”

- E_{ij} denotes expected count at row “i”, column “j”

$$E_{ij} = (\text{Sum row})_i \times (\text{Sum column})_j / (\text{Grand Total}) \quad \text{Eq. 1}$$

- R_{ij} denotes residual count at row “i”, column “j”

$$R_{ij} = (O_{ij} - E_{ij}) \quad \text{Eq. 2}$$

The chi-square parameter is calculated as follows:

$$\chi^2 = \sum_i \sum_j (R_{ij}^2 / E_{ij}) \quad \text{Eq. 3}$$

The obtained value of χ^2 is compared to the critical value corresponding to the selected significance level alpha, here set at 0.01 or 1%, i.e., for a confidence level of 99%, and the relevant degree of freedom d.f., given by:

$$d.f. = (\text{Number of rows} - 1) \times (\text{Number of columns} - 1) \quad \text{Eq. 4}$$

If χ^2 is greater than the critical value, then the variables are not independent.

Another way to validate the result, is to calculate the p-value of the test, which is done using CHITEST function in Excel, and to compare it to the significance level alpha. If the p-value is less than alpha, then the variables are not independent.

The last step is to determine the strength of the association of the variables, which is done using Cramer's V given by:

$$V = \sqrt{\chi^2 / (n \times (k - 1))} \quad \text{Eq. 5}$$

Where:

- n denotes the sample size
- k denotes the number of rows or columns, whichever is less

Cramer's V can vary between 0 and 1, indicating little to strong association between the variables, respectively. For values between 0 and 0.3 the association is classified as weak, between 0.3 and 0.6 it is moderate, and between 0.6 and 1 it is strong (Clark et al., n.d.).

CHAPTER 4 RESULTS AND ANALYSIS

The analysis of the project applications at hand yields several important results. Firstly, the overall picture is illustrated through general information and key figures around the projects. Secondly, the municipal planning conditions and national interest designations are statistically evaluated against different parameters, such as the permit and the veto decisions, and parallels are drawn between the area designation for wind power on the local and the national levels. Finally, the relationship type and strength between the municipal planning condition and the permit decision are assessed through the chi-square test of independence and Cramer's V.

4.1 General Information and Key Figures

The wind power applications considered in this study cover a wide range of municipalities and counties within Sweden, along with different combinations of the same. In total, wind power applications span over 116 Swedish municipalities in 19 counties, as listed in Table 3.

The number of decided onshore wind power applications between the years 2014 and 2020 is 206, with a total of 4,338 turbines. The projects are divided into 182 new applications with 3,899 turbines, and 24 change applications with 439 turbines.

Of the 206 decided applications, 121 (59%) were fully or partially permitted, while 85 (41%) were either rejected or revoked. Breaking down these numbers, it is found that 78 (38%) applications received a full permission, 43 (21%) were partially permitted, 67 (32%) were rejected in their entirety, and 18 (9%) were revoked. The detailed division of the permit decisions is illustrated in the pie chart of Figure 2.

Table 3 - List of Swedish counties and municipalities in the study

County	Municipality
Dalarna	Avesta, Falun, Hedemora, Ludvika, Malung-Sälen, Säter, Smedjebacken
Gävleborg	Bollnäs, Hofors, Ljusdal, Nordanstig, Ockelbo, Söderhamn
Gotland	Gotland
Halland	Falkenberg, Halmstad, Hylte, Varberg
Jämtland	Berg, Bräcke, Härjedalen, Krokom, Ragunda, Strömsund
Jönköping	Aneby, Eksjö, Gislaved, Gnosjö, Habo, Jönköping, Mullsjö, Nässjö, Sävsjö, Vaggeryd, Värnamo, Vetlanda
Kalmar	Borgholm, Hultsfred, Kalmar, Mönsterås, Västervik, Vimmerby
Kronoberg	Alvesta, Ljungby, Uppvidinge, Växjö
Norrbottn	Arjeplog, Arvidsjaur, Gällivare, Kalix, Pajala, Piteå
Örebro	Askersund, Degerfors, Hallsberg, Laxå
Östergötland	Kinda, Motala, Söderköping, Valdemarsvik, Ydre
Skåne	Hässleholm, Helsingborg
Södermanland	Eskilstuna, Flen, Gnesta
Stockholm	Norrtälje
Värmland	Årjäng, Arvika, Filipstad, Kristinehamn, Säffle, Sunne, Torsby
Västerbotten	Åsele, Bjurholm, Lycksele, Nordmaling, Norsjö, Robertsfors, Skellefteå, Sorsele, Storuman, Umeå, Vilhelmina
Västernorrland	Ånge, Härnösand, Kramfors, Örnsköldsvik, Sollefteå, Sundsvall, Timrå
Västmanland	Norberg, Sala
Västra Götaland	Alingsås, Bengtsfors, Bollebygd, Borås, Dals-Ed, Falköping, Färjlanda, Karlsborg, Lerum, Lilla Edet, Mellerud, Skara, Stenungsund, Strömstad, Tanum, Tibro, Tidaholm, Töreboda, Tranemo, Uddevalla, Ulricehamn, Vårgårda

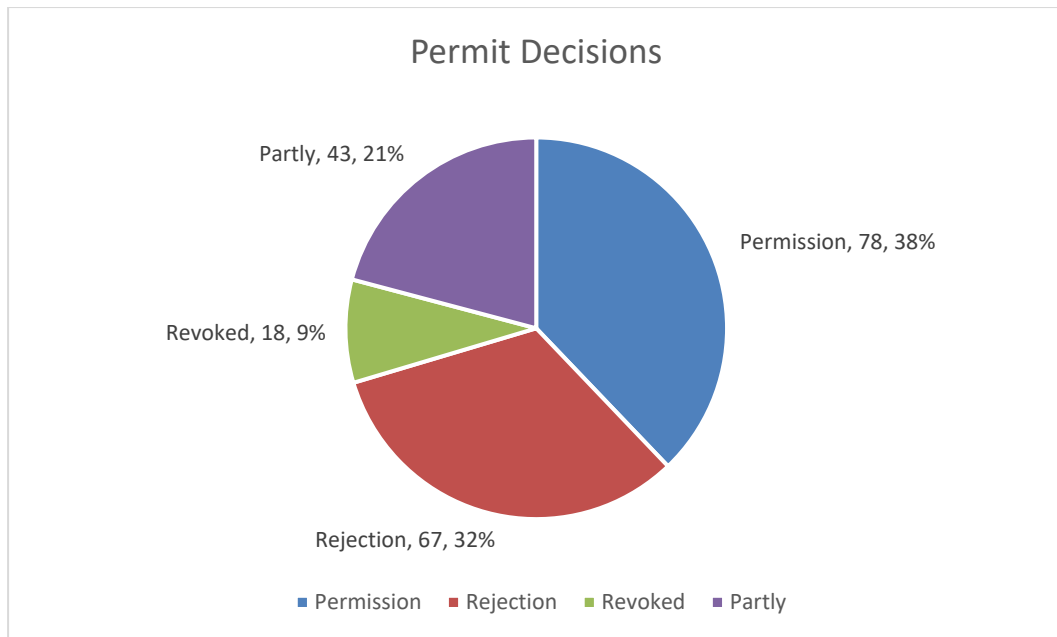


Figure 2 - Distribution of the permit decisions

Of 128 reduced, rejected, and revoked applications, 55 are due to the municipal veto. In just over 56% of the cases where applications were completely rejected or revoked, the reason was the municipal veto.

When it comes to the wind turbines, 2,096 (48%) were permitted and 2,242 (52%) did not receive a permit. Due to the veto, 1,022 turbines were rejected or revoked, which constitute 24% of the 4,338-total. Looking at the new and change applications respectively, 845 turbines out of 3,899 (22%) and 177 turbines out of 439 (40%) were rejected or revoked as a result to the veto.

4.2 Municipal Planning Conditions vs National Interest Designations

In this section, the projects are mapped with respect to the municipal planning condition and the national interest designation regarding wind power establishment. Further to the document analysis, the decided onshore wind power applications are classified under 4 categories (i.e., “Yes”, “No”, “Partly”, and “Unclear”) with regards to the planning condition at the municipality(-ies) where the projects are intended to be built. The outcomes of the classification are shown in Table 4, and the same is reflected in the pie chart of Figure 3.

The results show that the majority of the projects (64%) are located, with almost equal proportions, in areas either designated as suitable for wind power projects (34%) or in unclear municipal planning conditions (30%). The rest of the projects are found in areas partly or not designated as suitable for wind projects at 24% and 12%, respectively.

Table 4 - Distribution of the projects with respect to the area designation in the municipal general spatial planning documents

Classification	Count	Percentage
Yes	70	34%
No	25	12%
Partly	49	24%
Unclear	62	30%

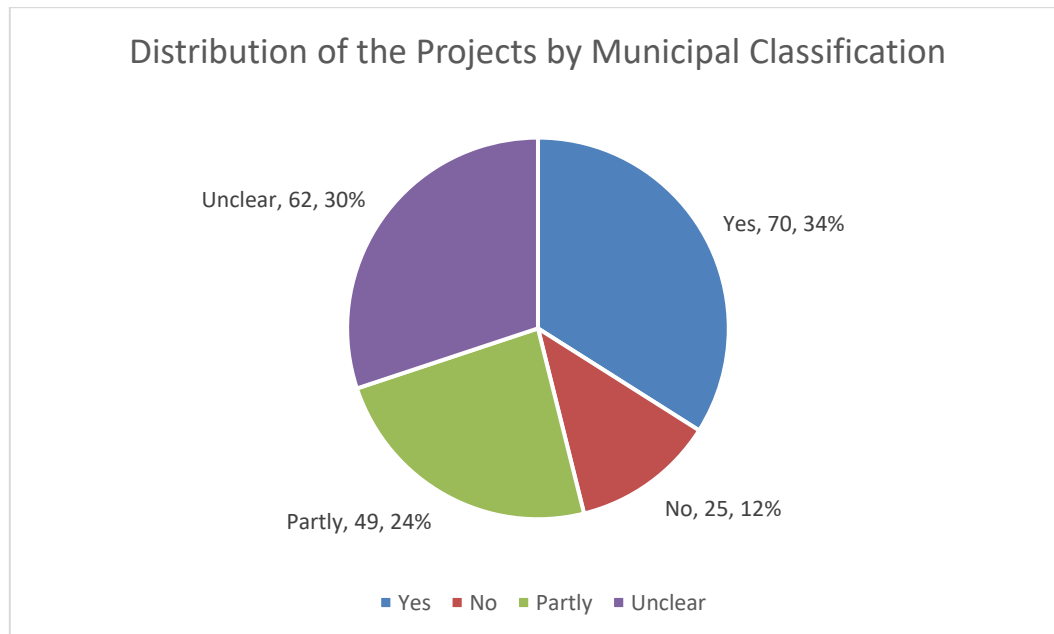


Figure 3 - Pie chart for the distribution of the projects with respect to the area designation in the municipal general spatial planning documents

Under the national interest designation, an area can be classified as “Yes”, “No”, or “Partly”, as summarized in Table 5 and illustrated in Figure 4. The results show that the majority of the projects (63%) are intended to be built in locations not designated as national interest areas for wind power projects. The second highest classification goes to locations partly designated (30%), while only 7% of the projects are found in locations fully designated as national interest areas.

Table 5 - Project classification with respect to the national interest designation

Classification	Count	Percentage
Yes	14	7%
No	130	63%
Partly	62	30%

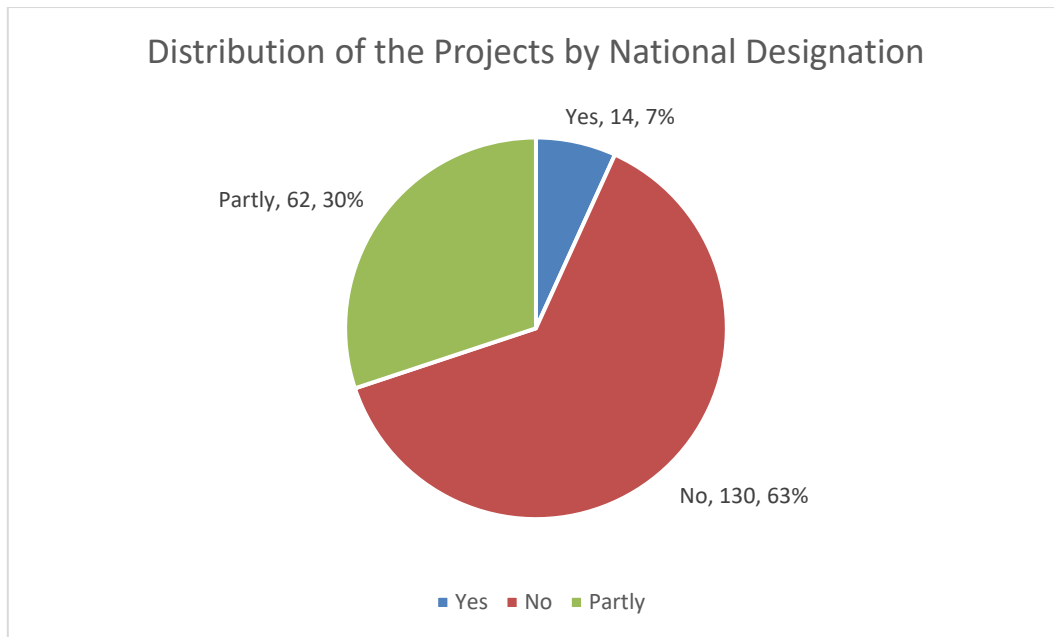


Figure 4 - Pie chart for the project classification with respect to the national interest designation

The results of the survey regarding the municipal planning condition and national interest designation are displayed in Table 6 and plotted in Figure 5. Figure 5 shows that, among the nationally designated interest areas for wind power, 50% are also designated as suitable by the municipality, 0% designated as unsuitable, 21% partially designated as suitable, and 29% have unclear conditions. As for the projects located in areas not designated as national interest for wind, the proportion of Yes, No, Partly, and Unclear designations is 32%, 13%, 18%, and 37% respectively. Lastly, where the projects are in partially designated areas from a national wind interest perspective, the municipal planning conditions for wind power are distributed as follows: 34% Yes, 13% No, 37% Partly, and 16% Unclear.

Table 6 - Project classification with respect to the municipal planning condition and the national interest designation

		National interest designation		
		Yes	No	Partly
Municipal planning condition	Yes	7	42	21
	No	0	17	8
	Partly	3	23	23
	Unclear	4	48	10

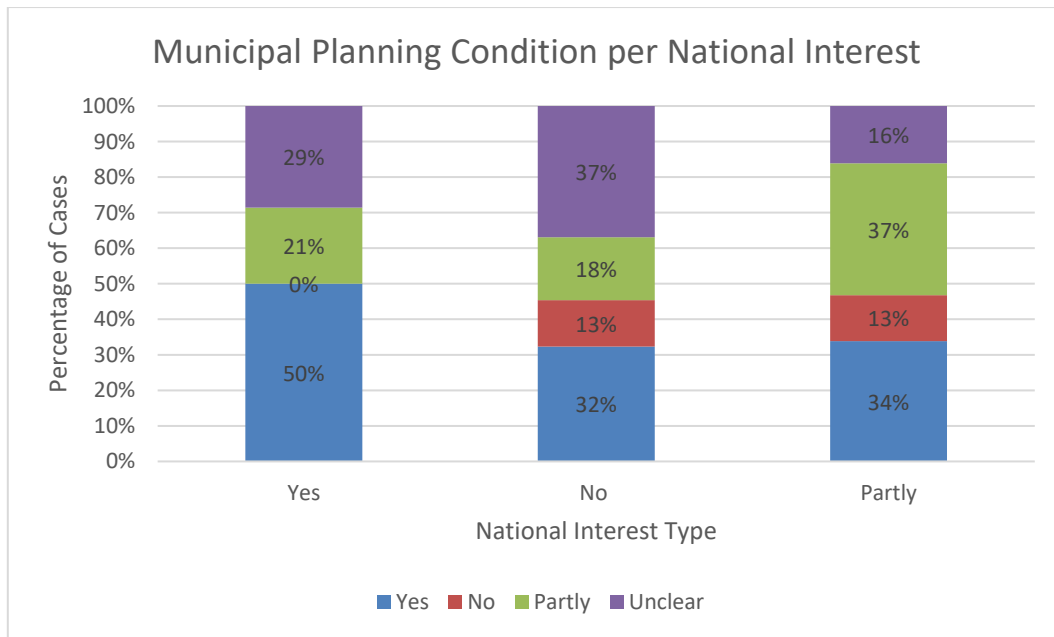


Figure 5 - Bar diagram showing the distribution of the municipal planning condition per national interest type

4.3 Municipal Planning Conditions vs Permit Decisions

The projects are categorized with respect to two variables: the municipal planning condition and the permit decision, as shown in Table 7. These results are illustrated using bar diagrams in two different ways: the first way is the breakdown of the permit decisions for each municipal planning condition type (Figure 6), and vice-versa in the second way, where the projects are analyzed in terms of municipal planning condition for each permit decision type (Figure 7).

Table 7 - Project classification with respect to the municipal planning condition and permit decision

		Permit decision			
		Permission	Rejection	Revoked	Partly
Municipal planning condition	Yes	34	23	5	8
	No	8	9	5	3
	Partly	15	12	1	21
	Unclear	21	23	7	11

Firstly, it can be seen from Figure 6 that, for projects located in areas designated as suitable for wind power establishment by the municipality, 49% were permitted in their entirety, 33% were completely rejected, 7% were revoked, and 11% were partially permitted. Moving on to those projects in areas not designated as suitable for wind power, the proportion of permitted, rejected, revoked, and partly permitted applications is 32%, 36%, 20%, and 12%

respectively. As for partly designated areas, 31% of the applications were permitted, 24% rejected, 2% revoked, and 43% partially permitted. Lastly, where the projects were to be built in unclear conditions with regards to municipal planning for wind power, the results are distributed as follows: 34% permission, 37% rejection, 11% revoked, and 18% partial permission.

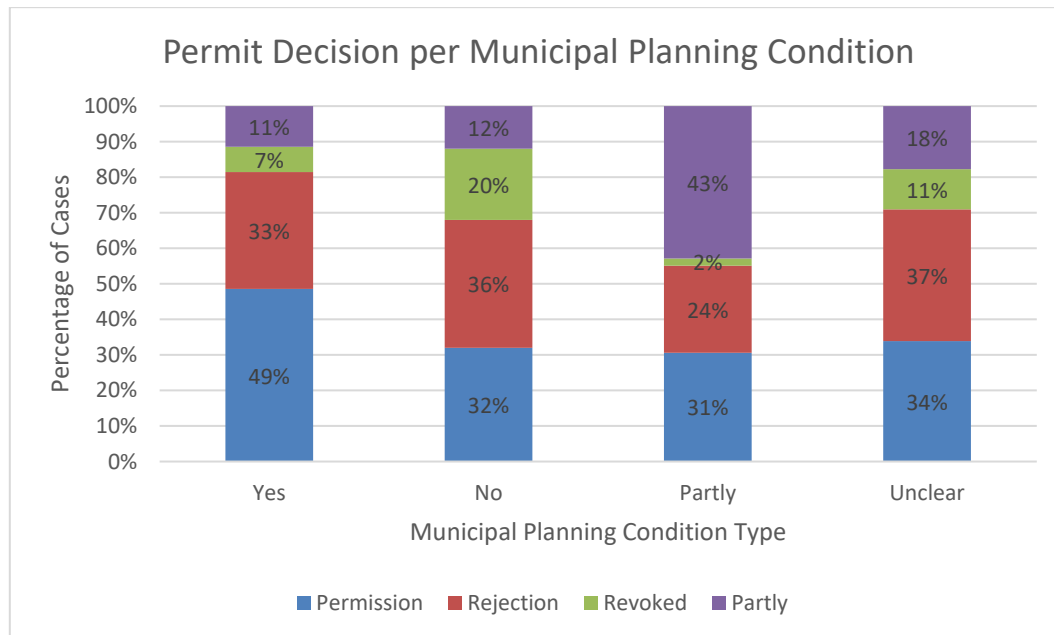


Figure 6 - Bar diagram showing the distribution of the permit decision per municipal planning condition type

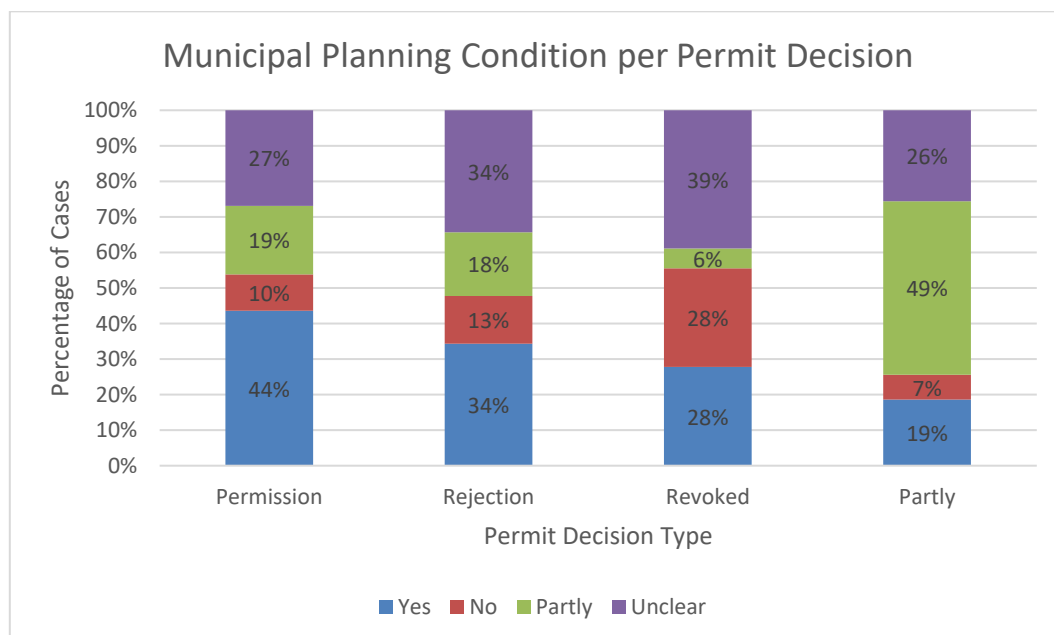


Figure 7 - Bar diagram showing the distribution of the municipal planning condition per permit decision type

Secondly, it can be seen from Figure 7 that, among the permitted applications, 44% of the projects were in suitable areas, 10% in unsuitable areas, 19% in partially designated areas, and 27% in unclear conditions. As for the rejected applications, the proportion of Yes, No, Partly, and Unclear designations is 34%, 13%, 18%, and 34%, respectively. Looking at the revoked cases, 28% of them were suitable, 28% unsuitable, 6% partly suitable, and 39% unclear. Lastly, where the projects were partially permitted, the municipal planning conditions for wind power are distributed as follows: 19% Yes, 7% No, 49% Partly, and 26% Unclear.

4.4 National Interest Designations vs Permit Decisions

In this section, the projects are classified with respect to the national interest designation and the permit decision, as shown in Table 8. Accordingly, the diagram in Figure 8 shows the breakdown of the permit decisions for each national interest designation type and vice-versa in the diagram of Figure 9, which shows the distribution of the national interests across each permit decision category.

Table 8 - Project classification with respect to the national interest designation and permit decision

		Permit decision			
		Permission	Rejection	Revoked	Partly
National interest designation	Yes	4	8	0	2
	No	54	39	13	24
	Partly	20	20	5	17

Firstly, Figure 8 shows that, for projects located in areas designated as national interest for wind power establishment, 29% were permitted in their entirety, 57% were completely rejected, none were revoked, and 14% were partially permitted. As for those projects in areas not designated as national interest for wind power, the proportion of permitted, rejected, revoked, and partly permitted applications is 42%, 30%, 10%, and 18% respectively. Finally, where the projects were to be built in partly designated areas as national interest for wind power, the results are distributed as follows: 32% permission, 32% rejection, 8% revoked, and 27% partial permission.

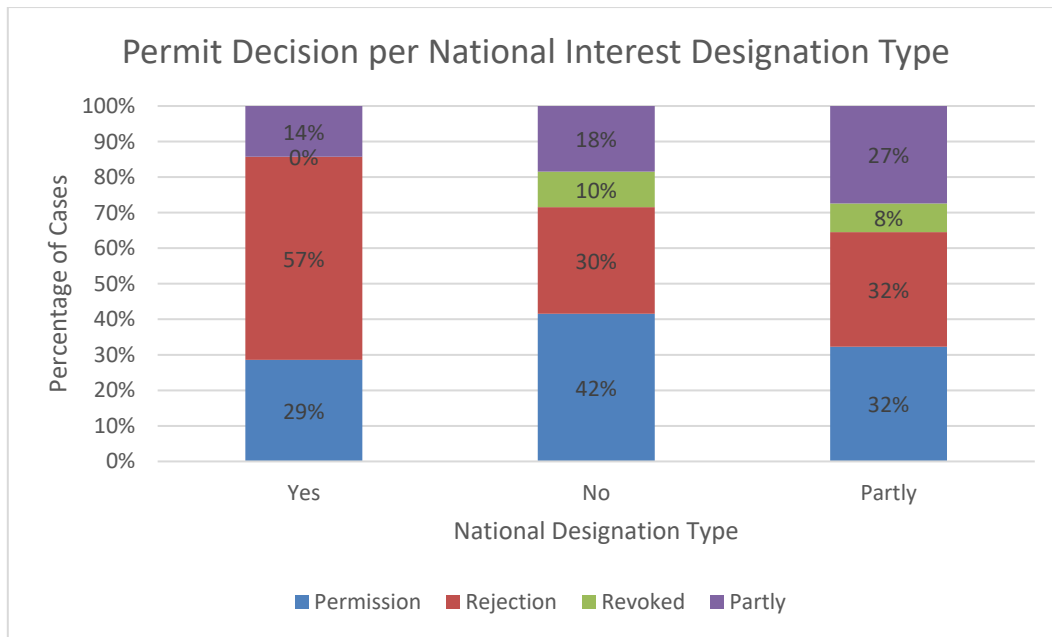


Figure 8 - Bar diagram showing the distribution of the permit decision per national interest designation type

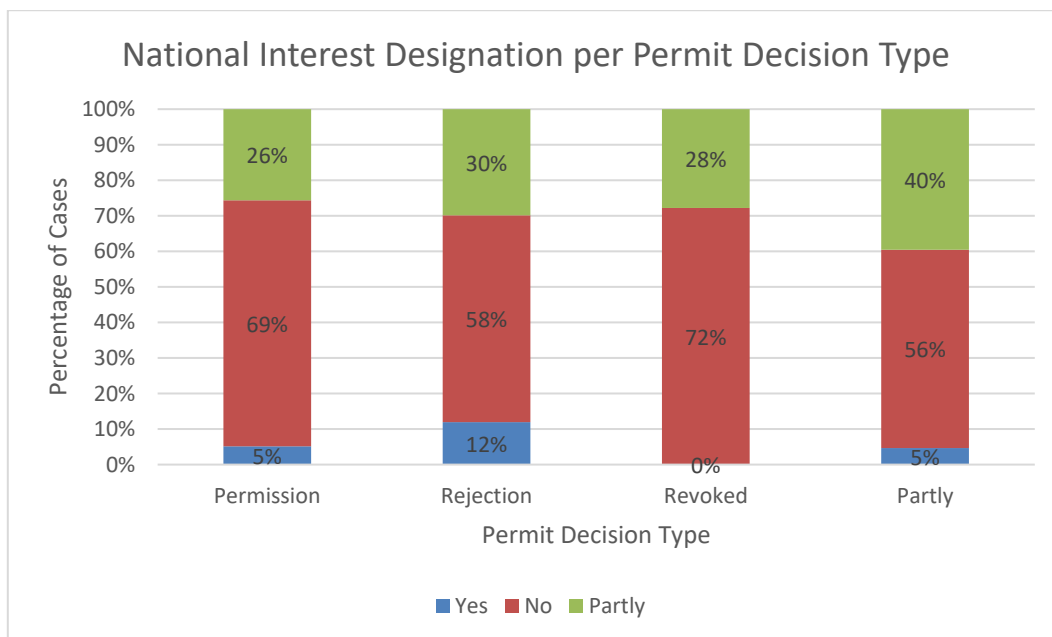


Figure 9 - Bar diagram showing the distribution of the per national interest designation per permit decision type

Secondly, Figure 9 shows that, among the applications which received a full permit, 5% of the projects were in designated areas, 69% in non-designated areas, and 26% in partly designated areas. As for the rejections, the proportion of national interest designations in terms of Yes, No, and Partly is 12%, 58%, and 30%, respectively. In consideration to the revoked cases, none of them were located in designated areas from a national interest perspective, 72% were in non-designated areas, and 28% in partly designated areas. Finally, where the projects

received a partial permission, the national interest designations for wind power are divided as follows: 5% Yes, 56% No, and 40% Partly.

4.5 Municipal Planning Conditions vs Veto Permit Decisions

In consideration to the applications that were rejected, revoked, or partially permitted, the distribution of the reasons among “Veto” and “Others” is shown in the bar diagram of Figure 10. It is seen that the municipal veto was the reason behind rejected, revoked, and partially permitted applications in 54%, 67%, and 16% of the cases, respectively.

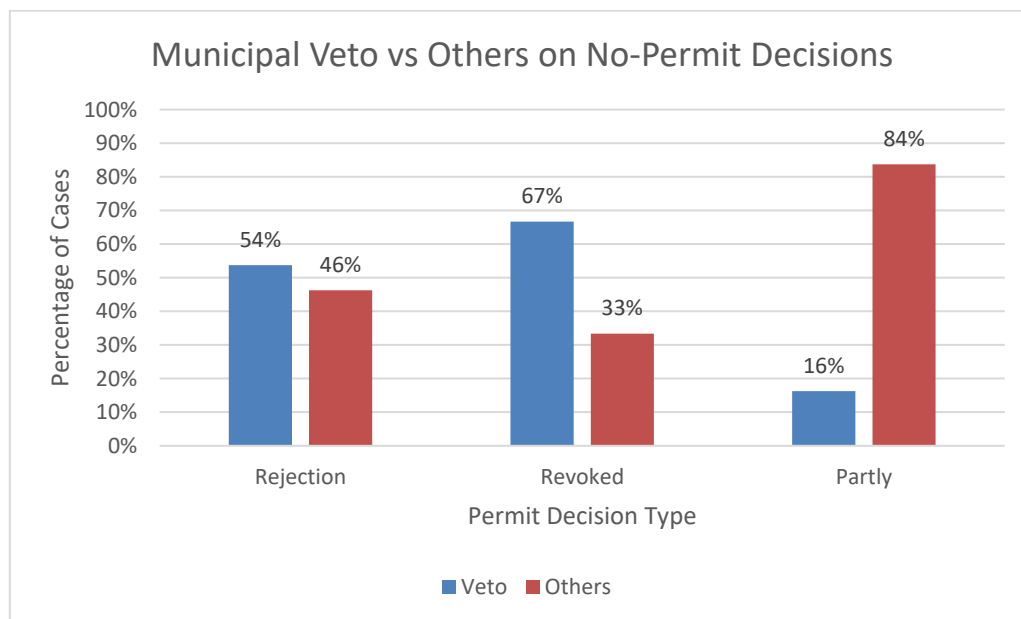


Figure 10 - Reasons for no-permit decisions, Veto vs Others

Focusing on the no-permit decisions due to the veto, the distribution of the projects considering the municipal planning conditions is summarized in Table 9, and the same is illustrated in Figure 11. Table 9 shows that the veto resulted in full or partial rejections in 43 out of 55 cases (78%), and in revoked applications in 12 cases out of 55 (22%). Moreover, it can be seen from Figure 11 that, among the rejected applications, 36% of the projects were in suitable areas, 11% in unsuitable areas, 17% partly outside of designated areas, and 36% in unclear conditions. As for the revoked applications, the proportion of Yes, No, Partly, and Unclear designations is 33%, 25%, 8%, and 33% respectively. Lastly, where the projects were partially permitted, the municipal planning conditions for wind power are as follows: 0% Yes, 14% No, 43% Partly, and 43% Unclear.

Table 9 - Project classification with respect to the municipal planning condition and the no-permit decision due to the municipal veto

		Veto decision type			
		Rejection	Revoked	Partly	Total
Municipal planning condition	Yes	13	4	0	17 (31%)
	No	4	3	1	8 (15%)
	Partly	6	1	3	10 (18%)
	Unclear	13	4	3	20 (36%)
	Total	36 (65%)	12 (22%)	7 (13%)	55

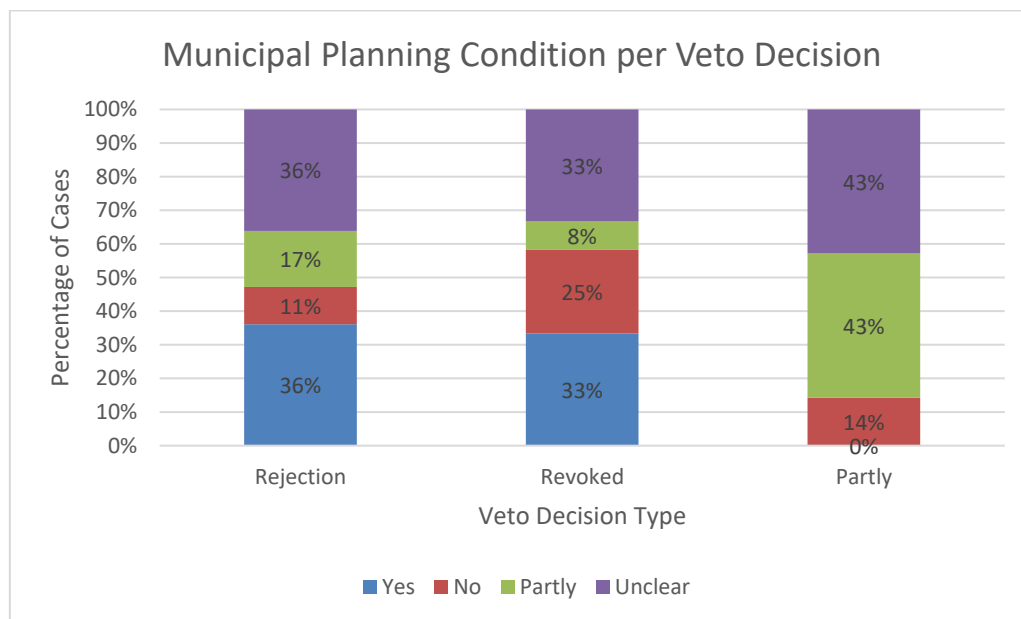


Figure 11 - Bar diagram showing the distribution of the municipal planning condition per no-permit decision type due to the municipal veto

4.6 National Interest Designation vs Veto Permit Decisions

In this section, the no-permit decisions due to the veto are considered with respect to the distribution of the projects in terms of national interest designation for wind power, as summarized in Table 10 and illustrated in Figure 12. Figure 12 shows that among the rejections, 11% of the projects were in designated areas, 50% in non-designated areas, and 39% in partially designated areas. As for the revoked applications, the proportion of designations in terms of Yes, No, and Partly is 0%, 75%, and 25%, respectively. Finally, where the projects were partially permitted, the national interest designations for wind power are as follows: 0% Yes, 57% No, and 43% Partly.

Table 10 - Project classification with respect to the national interest designation and the no-permit decision due to the municipal veto

		Veto decision type		
		Rejection	Revoked	Partly
National interest designation	Yes	4	0	0
	No	18	9	4
	Partly	14	3	3

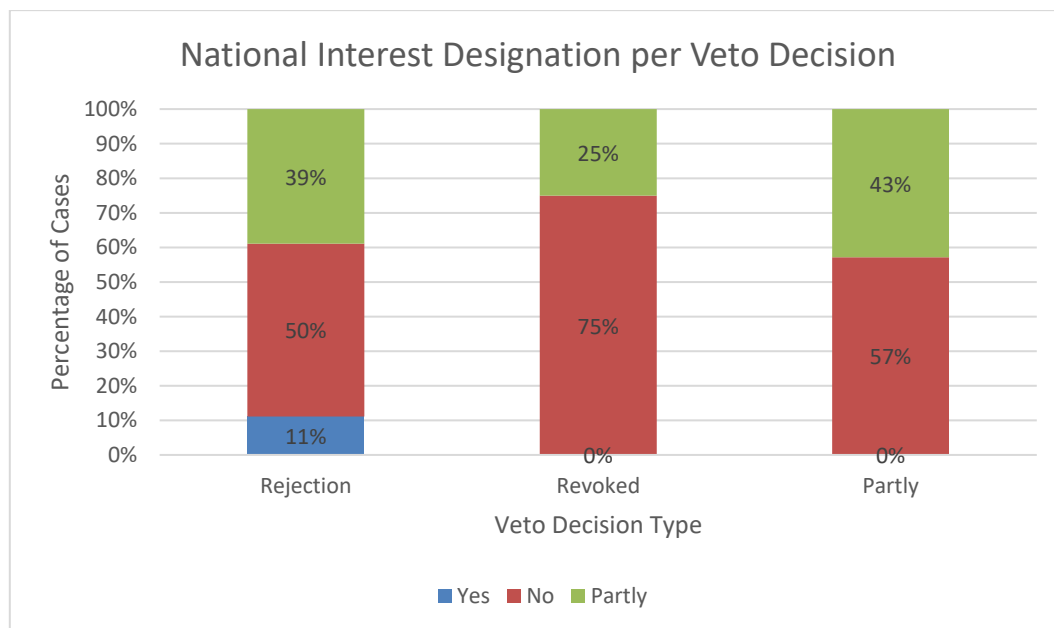


Figure 12 - Bar diagram showing the distribution of the national interest designation per no-permit decision type due to the municipal veto

4.7 Relationship between Municipal Planning Conditions and Permit Decisions

To answer the research question, the chi-square test of independence is applied to determine whether there is a relationship between the municipal planning condition and permit decision variables, and Cramer's V is calculated to evaluate the strength of their association. The parameters of this statistical analysis are listed below, and the procedure is given in the subsequent tables.

- Variables: municipal planning condition (Yes / No / Partly / Unclear) and permit decision (Permission / Rejection / Revoked / Partly)
- Contingency tables: 4 rows by 4 columns
- Degree of freedom: 9
- Sample size: 206 projects
- Confidence and significance levels: 99% confidence and 1% significance levels

Table 11 - Observations

		Permit decision				
		Permission	Rejection	Revoked	Partly	Total
Municipal planning condition	Yes	34	23	5	8	70
	No	8	9	5	3	25
	Partly	15	12	1	21	49
	Unclear	21	23	7	11	62
	Total	78	67	18	43	206

Table 12 - Expected values

		Permit decision			
		Permission	Rejection	Revoked	Partly
Municipal planning condition	Yes	26.505	22.767	6.117	14.612
	No	9.466	8.131	2.184	5.218
	Partly	18.553	15.937	4.282	10.228
	Unclear	23.476	20.165	5.417	12.942

Here it can be seen that the data satisfies the underlying assumptions of the chi-square test of independence as it is discrete and comprises of counts, the counts are independent, and the total count is equal to the sample size. Additionally, the sample is large, the number of expected counts above 5 is 14 out of 16 cells (87.5%), and no expected count is less than 1.

Table 13 - Residual values

		Permit decision			
		Permission	Rejection	Revoked	Partly
Municipal planning condition	Yes	7.495	0.233	-1.117	-6.612
	No	-1.466	0.869	2.816	-2.218
	Partly	-3.553	-3.937	-3.282	10.772
	Unclear	-2.476	2.835	1.583	-1.942

Table 14 - Residual squared values

		Permit decision			
		Permission	Rejection	Revoked	Partly
Municipal planning condition	Yes	56.177	0.054	1.247	43.714
	No	2.149	0.755	7.927	4.922
	Partly	12.627	15.499	10.769	116.033
	Unclear	6.129	8.037	2.504	3.770

Table 15 - Ratio of residual squared values to expected values

		Permit decision			
		Permission	Rejection	Revoked	Partly
Municipal planning condition	Yes	2.120	0.002	0.204	2.992
	No	0.227	0.093	3.629	0.943
	Partly	0.681	0.973	2.515	11.344
	Unclear	0.261	0.399	0.462	0.291

The calculations give a χ^2 value of 27.14, which exceeds the critical value of 21.67 for a degree of freedom equal to 9 and a significance level of 0.01. Also, the p-value of the test is equal to 0.00133, which is less than the significance level of 0.01. Therefore, the municipal planning condition and the permit decision are not independent.

On the other hand, the calculation of Cramer's V gives a value of 0.21. This value belongs to the lowest interval of 0 and 0.3, which means that the association between the variables is classified as weak.

Furthermore, the following observations can be drawn for each category of the municipal planning condition:

- Yes:

The applications in this category are more likely to be permitted than expected, while they are less likely to obtain a partial permission than expected.

- No:

Here, the applications are more likely to be revoked, and less likely to be partly permitted than expected.

- Partly:

In this case, the applications are significantly more likely to be partially permitted than expected, and less likely to be revoked than one would expect.

- Unclear:

In this category, the differences between expected and observed values are not significant in general, and it is the contribution of the above listed counts that is the most considerable in the calculation of χ^2 . Nonetheless, and for the sake of completeness, it can be seen that the proportion of rejected and revoked applications is equally more than expected, while that of permitted and partially permitted applications is equally less than expected.

CHAPTER 5 DISCUSSION OF THE FINDINGS

The local level governance in Sweden is undoubtedly a fundamental aspect of the Swedish administration. In practice, municipalities have the full authority to plan the use of their land and water areas. When it comes to wind power however, it seems that these establishments are distinguished from other, similar activities.

On the one hand, by applying the provision on municipal approval, wind power projects hold a special place in the Environmental Code. On the other hand, completely abolishing the municipality's legal right to approve or reject a wind power project puts these facilities in a special place in the PBL (Ståhl, 2019). In the present day (2021), the Swedish Government is striving to set the right conditions for achieving the national renewable energy targets. Among the measures undertaken by the Swedish Government for this purpose is the current assignment to the special investigator, aiming to reconcile the interests of the municipal influence and those of wind power expansion in the country.

It is long argued by the Swedish Energy Agency and the Swedish Environmental Protection Agency that the municipal authority with regards to wind power planning should be exercised through the municipality's general spatial planning instruments. Although not legally binding, the authorities state that the municipal comprehensive plans are duly taken into consideration by the licensing authorities and the courts when deciding on wind power matters (Energimyndigheten and Naturvårdsverket, 2017; Energimyndigheten and Naturvårdsverket, 2021). This thesis aims to test the authorities' claim by analyzing 206 large onshore wind power applications between 2014 and 2020.

The analysis of more than 200 applications for the establishment of large, in-land wind power projects in the last 7 years reveals many important features and patterns. In general, wind power applications were spread across 116 out of 290 (40%) Swedish municipalities in 19 out of 21 (90%) counties, albeit not evenly. If wind power expansion is to be accelerated, it is crucial that all municipalities in Sweden contribute jointly to this mission.

The proportion of fully or partially permitted applications during the study period exceeds that of rejected or revoked cases, with 59% against 41%, respectively. This has a positive implication, that most applications result in a permit. Zooming in on the reasons for rejections, the main cause is found to be the municipal veto with 56%, with only 16% of the cases being partially approved due to the veto. However, it is noticed that the fully and partially rejected cases due to the veto significantly exceed the revoked cases, at 78% and 22%, respectively.

Several important observations can be raised. Firstly, it is worthwhile to investigate, understand, and suggest solutions for the reasons behind the municipality's rejection of wind power proposals (i.e., public opposition, landscape change, etc.), which could be a potential research opportunity. In case public opposition is discovered to be the main reason behind the municipality's rejection, then effort should be made into finding and implementing measures that increase local acceptance. Secondly, the latest proposal by the Swedish Energy Agency and the Swedish Environmental Protection Agency (2021) to have the municipality approve or reject a project in its entirety, rather than partially, does not deviate substantially from what practically applies today and is deemed appropriate. Thirdly, it is less resource- and time-consuming to the developers and licensing authorities that the application process is stopped from early on in case the municipality does not support the project (Energimyndigheten and Naturvårdsverket, 2017). In other words, it is better that an application be revoked than rejected. For this, the Swedish Energy Agency in its guidance document recommends that a negative stance by the municipality be communicated as early as during the consultation phase (Energimyndigheten, 2015). However, what was being applied during the last 7 years goes against the authority's recommendation since the rejections due to the veto significantly outweigh the proportion of revoked applications.

In this study, the wind power projects are scrutinized in terms of their locations when it comes to the municipal planning condition and the national interest designation for wind power, revealing opposing trends with regards to these two variables. While 58% of the projects are located in fully (34%) or partly (24%) designated areas from the municipality's viewpoint, and only 12% fall outside such areas, the opposite is depicted from a national perspective. In fact, 63% of the projects are planned outside areas designated as suitable for wind on a national level, against as little as 7% that are sited within designated locations. These findings suggest that, in practice, the municipal planning conditions play a more important and decisive role in the selection of proper sites for wind power projects than the national interest areas. That is to say, the municipal general spatial planning documents are a valuable tool when it comes to planning wind farms onshore Sweden.

The understanding of the municipal planning conditions should bring more certainty to the developers concerning the municipality's position vis-à-vis wind power projects. In other words, if a project is proposed within an area designated as suitable for wind power by the municipality, the developer would be reassured of the municipality's positive position towards the development in the area, in principle. Although in 70% of the cases it was clear to the developer whether the proposed project is located in suitable, unsuitable, or partially suitable

areas for wind power establishment, consultations were still carried-out with the municipality from early on. Also, in the 30% of the cases where the planning conditions were unclear, the developers undertook early dialogues with the municipality to understand its position. In all cases, the municipalities are a key stakeholder and consultative body in the planning process for wind power projects.

The municipal planning conditions are further compared to the national interest designations for wind power. It is seen that for those projects that are within suitable areas on a national level, 71% are also fully or partially designated by the municipalities, while none is designated as unsuitable. Even though these numbers look statistically promising, they relate to only 14 applications out of 206 (7%). Similarly, among 62 applications (30%) relating to partial national interest areas, 44 (71%) are fully or partially designated by the municipalities, against 8 (13%) that are not designated. Conversely, looking at the majority of the applications (63%), out of the 130 projects proposed in areas not designated for wind power on a national level, 65 (50%) are fully or partly designated as suitable by the municipalities and only 17 (13%) are designated as unsuitable. As such, the results show that the municipal planning conditions do not seem to be in good agreement with each of the national interest designation categories. Therefore, close coordination should be carried out between the County Administrative Boards and the municipalities, making sure that the municipal general spatial planning documents take account of the national interests in wind power as much as possible.

Aside from the municipality's role in the initial planning process, it is important to evaluate the influence of its general spatial planning documents on the permit decisions. At first sight, it may be assumed that the municipal planning conditions and the permit decisions are not fully compatible, i.e., clear municipal planning conditions do not render the permit decision predictable to the developers. This stems from the fact that for example, only 49% of the applications where the project was located in suitable wind power areas resulted in a permit, while 40% were completely rejected or revoked (with 24% due to the veto). In unsuitable areas, 56% of the cases were not permitted or revoked (with 50% due to the veto), whereas 44% were partially or fully permitted. Similarly, looking specifically at the no-permit decisions due to the veto (56%), 53% of the rejections and 41% of the revoked applications were related to projects located in suitable and partially suitable areas for wind.

The permit and veto decisions are also examined in light of the national interest designations. Here, the statistics show that 43% of the applications where the project was located in designated wind power areas resulted in a full or partial permit, while 57% were completely rejected. In areas not designated, 60% of the applications were fully or partially

approved, against 40% rejected or revoked. Statistically speaking, there is a higher chance to get a permit outside national interest areas than inside. However, since only 7% of the projects (14) were proposed in national interest areas for wind, the results are not considered to be fully representative of the permit decision trend within this category. When it comes to the municipalities, their veto power was used mostly in locations that are not designated as national interest areas.

To get more insights on the relationship between the municipal planning condition and the permit decision, the χ^2 test of independence is performed and Cramer's V calculated, showing indeed that these variables are not independent, but their association is weak in strength. However, the results are more consistent than initially assumed. In fact, the statistics show that for fully and partially designated areas, more cases are likely to receive a full or partial approval than expected. Also, in areas designated as unsuitable, the applications are more likely to be revoked than one would expect.

From the inferential statistical analysis, it can be said that although the municipal planning conditions have a weak association to the permit decisions, the municipal general spatial planning documents do play a decisive role in wind power testing, even if they are not legally binding. Accordingly, the municipalities' influence on the planning of wind power is effective in practice, both during the initial planning phase and in the permit decision-making, as stated by the Swedish Energy Agency and the Swedish Environmental Protection Agency (2017; 2021).

Since the municipal plans constitute a strong tool for wind power establishment, it is crucial that further resources are invested into the strategic planning for wind power within the municipalities' boundaries (Energimyndigheten and Naturvårdsverket, 2017). Furthermore, it is important to keep the municipal plans recent and updated as believed by MÖD (Ståhl, 2019), to consistently reflect the municipality's vision for the development of its lands and water areas. As such, another potential field for further research is to survey the status of wind power plans in the Swedish municipalities, thus examining whether such plans exist in the first instance and mapping the year of their development in the second instance.

CHAPTER 6 CONCLUSIONS

For a long time now, the Swedish Government was working towards setting the right conditions to accelerate the expansion of wind power in the country, as it is believed that wind is key for the achievement of the national, long-term renewable energy goals. In the end of the year 2020,

the Swedish Government assigned a special investigator to look into the current regulations regarding the municipal approval provision in the Environmental Code and suggest changes or alternatives to reconcile the interests in the municipal planning monopoly and those of wind power expansion.

This research work aims primarily to investigate the relationship between the municipal planning conditions and the permit decisions on large onshore wind power applications, as well as to assess their strength of association. However, this thesis has several limitations. Firstly, there are no uniform criteria when it comes to the design of the master plans by the municipalities in Sweden. As a result, the classification of the projects with respect to the municipal planning conditions is not fully standardized. Secondly, the classification of the projects relies for the most part on the description of the proposed area by the developers in their consultations and EIA documents, as well as on terminologies in the decisions on cases by the MMDs and MÖD. In those situations where the wording is not conclusive, the projects are put under the Unclear category. Finally, many cases relate to municipal general spatial planning documents that are being drafted or revised. These projects are also added to the Unclear category, as it is not possible to study each case in detail, to consider the date for the adoption of the new planning document, and that of the veto decision.

Despite the limitations, the research work verifies and validates many claims by important actors in onshore wind power matters and gives valuable insights into the existing planning and permitting framework for large onshore wind power projects in Sweden. The statistics confirm that the wind power applications are proposed in less than half of the Swedish municipalities and in an uneven fashion, which goes against the target of expanding wind power across the country. On the other hand, while the majority of the applications resulted in a permit, the veto is still the principal reason for the rejections. Interestingly though, the proportion of partial rejections due to the veto is not significant, which means that having the municipalities approve or reject a project in its entirety is deemed appropriate. Furthermore, the proportion of rejected cases due to the veto substantially outweighs those that are revoked, leading to higher cost and time implications to the developers and licensing authorities, thus further highlighting the importance of an early municipal approval.

The municipal general spatial planning documents are found to be a valuable tool for the planning of wind power. However, the municipal planning conditions do not seem to be consistent with the national interest designations. For this, close collaboration is needed between the County Administrative Boards and the municipalities to make sure that the municipalities incorporate the national interest areas in their planning documents as far as

possible. From a planning perspective, the municipalities are indeed a key stakeholder and consultative body.

Regarding the permitting process, it is shown that the municipal planning conditions and the permit decisions are not independent, and their association strength is weak. Despite this fact, the municipal general spatial planning documents do play a decisive role in the testing of wind power. As such, in addition to being a key stakeholder and consultative body during the initial project phases, the municipalities can and do, through their spatial planning, effectively influence the decisions on wind power matters. As a result, it is crucial to invest resources into the municipal strategic planning for wind power, and to keep the general spatial planning documents up to date and relevant, reflecting the municipalities' vision for the long-term development of their land and water areas.

The planning and permitting framework for onshore wind power in Sweden is a vast and interesting topic, and many new research venues and opportunities within this field are identified throughout the course of this study. These are briefly listed as follows:

- What are the main reasons behind the municipalities' rejection of wind power proposals and what are the possible solutions to the municipalities' concerns?
- How many Swedish municipalities account for wind power in their planning documents and how old or recent are these plans?
- How can the wind power planning at the local level be performed in a standardized manner in Sweden?

How the current regulations affected the expansion of onshore wind power in Sweden certainly became clearer over the years, and numerous research and statistical studies and reports address this issue. The outcome of the ongoing special investigator's work and what will become of these regulations will soon unravel, and the future of wind power in Sweden remains to be seen.

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