The cooperative wind of change?

A research on the effect of cooperative ownership and vicinity of existing wind turbines on the development of wind projects in the Netherlands.

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Colophon

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Preface

Hereby, I present you the master thesis “The cooperative wind of change?”. With this thesis the master ‘Environment and Society Studies’ at the Radboud University comes to an end. With this research I have gained insight in the influence of cooperative ownership and familiarity on the development of wind projects in the Netherlands. I have been interested in renewable energy for some time. I got familiar with a cooperative wind project that was being developed in my municipality, the wind park Nijmegen-Betuwe. This got me interested in this cooperative ownership of wind projects. Therefore, this research topic immediately spoke to me.

In February I started my internship at consultancy firm Bosch & van Rijn. During my internship I learned a lot about the development of wind projects and I gained a lot of knowledge and information for my thesis. I would like to thank my internship supervisor Geert Bosch for guiding me through wind energy sector. I would also like to thank my colleagues for helping me with my research.

I especially would like to thank my thesis supervisor Dr. ir. Henk-Jan Kooij for always being available for help. His feedback and encouraging words helped me to deliver a thesis that I am very proud of.

Futhermore, I would like to thank Huub Ploegmakers and my research colleague Wieke Veenhuizen for creating the dataset together with me and for their help with figuring out how to analyse the data in SPSS. Finally, I would like to thanks my parents, my sister and my boyfriend for their unconditional support.

I hope you enjoy reading this thesis!

Jaclijn Matijssen

Abstract

In order to reduce climate change, goals have been set to create a more sustainable and carbon neutral society. This requires a more sustainable energy system, which is based on renewable energy sources. In the Netherlands the transition towards renewable energy has gained increased attention in national policies, such as the Energy Agreement, the Climate Agreement and the Climate Act. The energy transition will also compromise the establishment of more onshore wind parks. This can have strong spatial and environmental impacts. Thus, it is no wonder that wind parks in the Netherlands have faced strong local resistance. In new policies, participation and local ownership of wind projects becomes increasingly important. However, only little research has been executed on the effect of local ownership on the development of wind projects. Furthermore, this research focusses on the effect of familiarity with wind turbines on the development of wind turbines. This research will gain insight in these effects by doing desk research and analysing a database on wind projects in the Netherlands.

Keywords: *Local ownership; cooperative ownership; wind energy; wind cooperatives; familiarity.*

Executive summary

In 2020, the cabinet of the Netherlands wants to reach an installed capacity of 6000 MW (megawatt) onshore wind power. This goal is part of the transition from a fossil-based energy system to an energy system that is based on renewable energy sources. By the end of 2018, wind power reached an installed capacity of 4292, of which 3335 MW was based onshore. Thus, to achieve an installed capacity of 6000 MW onshore wind power many new wind turbines will have to be developed. However, in the Netherlands, wind parks have faced strong local resistance. Social support for and acceptance of renewable energy were central to the design of the Climate Agreement. To reach this, an aspiration for 50 per cent local ownership (by citizens and local businesses) of the production of onshore renewable energy sources by 2023 was included in this agreement. From academic literature it becomes clear that public participation and local ownership promote the acceptance of wind projects by citizens. Nonetheless, it is not guaranteed that participation and local ownership lead to a high acceptance rate. In addition to participation and local ownership, familiarity with wind turbines has gained attention in the media and scientific research. However, these concepts have not been researched on a large scale. Therefore, the central question of this research is:

To what extent do cooperative ownership and vicinity of existing wind turbines influence the process of development of, and being granted a permit for, onshore wind projects in the Netherlands?

Based on a literature review a conceptual model was created and six hypotheses (see table 2) were drawn up. In order to test these hypotheses, a dataset containing data on wind projects in the Netherlands was made. The Cox's regression was used to examine the relationship between the chance of a wind project being granted a permit or being developed and predictor variables or covariates.

The results of the analysis show that cooperative wind projects have a higher chance of being granted a permit than non-cooperative wind projects. Additionally, cooperative wind projects have a higher chance of being granted a permit first, compared to non-cooperative wind projects. Wind project in vicinity of existing wind turbines have a higher chance of being granted a permit than wind projects without existing wind turbines in the vicinity. As the radius for vicinity becomes larger, the effect of each additional wind turbine within that radius becomes smaller.

However, cooperative wind projects do not have a significantly higher chance of being developed than non-cooperative wind projects. Wind projects in the vicinity of existing wind turbines do have a significantly higher chance of being developed if the radius for vicinity is 10 or 15 kilometres.

Hence, cooperative wind projects do have a higher chance of being granted a permit, but do not have a significantly higher chance of being developed. Once wind projects have received a permit there is also no difference in chance of being developed for cooperative and non-cooperative wind projects. This was expected because the lead time between being granted a permit and being developed is largely determined by how fast a project is financed and built. Accordingly, the advantage for cooperative wind projects is during the phase from initiative until the permit is being granted. In this phase, the effect of vicinity of existing wind turbines is also the largest.

Table of Contents

List of figures

List of tables

1. Introduction

1.1. Onshore wind energy in the Netherlands

In the Netherlands, wind power reached an installed capacity of 4292 MW (megawatt) by the end of 2018, of which 3335 MW was based onshore (CBS StatLine, 2019). In 2020, the cabinet of the Netherlands wants to reach an installed capacity of 6000 MW onshore wind power (Ministerie van Infrastructuur en Milieu, 2014). This goal is part of the energy transition, which is the process in which the fossil-based energy system gradually transforms into an energy system that is based on renewable energy sources (Negro, Alkemade & Hekkert, 2012). In 2013, the Energy Agreement was established in the Netherlands to stimulate the energy transition. In this document, agreements were made on stimulating energy savings and generating renewable energy. The goals set in the Energy Agreement were, amongst others, to generate 14 per cent of the energy used from renewable sources in 2020 and 16 per cent in 2023 (SER, 2013). However, in 2017, the percentage of renewable energy in the Netherlands was only 6.6 per cent, of which 25 per cent was wind energy (CBS, 2018).

Thus, the Dutch government has set ambitious goals to bring about a transition from a fossil-based energy system to an energy system that is based on renewable energy sources. Next to the goals that were laid down in the Energy Agreement, carbon emission reduction goals were laid down in the design of the Climate Agreement and the Climate Act (SER, 2018). In order to accomplish these goals, a lot of measures have to be taken and the energy system has to change. One of these measures is the aforementioned increase of installed capacity of onshore wind energy. In 2017, there were approximately 2270 wind turbines in the Netherlands, of which 1981 were based onshore (CBS, 2018). To achieve an installed capacity of 6000 MW onshore wind energy many new wind turbines will have to be developed (Bakema & Scholtens, 2015). This has a strong spatial and environmental impact. (A. de Vries & P. Schmeitz, personal communication, November 30, 2018). However, in March 2019 it became clear that two provinces will not reach their goals for the installed capacity of wind energy by 2020 and presumably neither will four other provinces. According to the provinces, this is mainly because of a lack of social support, legal procedures and obstacles that only the state can remove (Dirks & Van den Berg, 2019).

In the Netherlands, wind parks have faced strong local resistance (Oteman, Wiering & Helderman, 2014). A central part of the design of the Climate Agreement is social support for and acceptance of renewable energy. According to the design of the Climate Agreement, in order to generate more social support and acceptance, it is important to have transparency of decision-making and a fair distribution of the benefits and the burdens. This fair distribution of the benefits and the burdens is not just financial, but also spatial and social. In the case of onshore renewable energy, giving citizens and businesses a chance to think along about the location of projects and sharing in the revenues, can lead to a fair distribution. Public participation is an important buzzword in this context and it has gained increased attention in the creation of wind projects. The concept of public participation refers to the involvement of citizens in decision-making processes (Langer, Decker & Menrad, 2017). However, public participation could also refer to financially involving citizens into wind energy projects, which can create more local ownership (Langer, Decker, Roosen & Menrad, 2018). An aspiration for 50 per cent local ownership (by citizens and local businesses) of the production of onshore renewable energy sources by 2023 was included in the design of the Climate Agreement (SER, 2018). From academic literature it becomes clear that public participation and local ownership promote the acceptance of wind projects by citizens (Langer et al., 2017; McFadyen, 2010; Walker, 2008). Nonetheless, it is not guaranteed that participation leads to a high acceptance rate and local controversies remain to exist (Langer et al., 2017; Jolivet & Heiskanen, 2010).

Furthermore, in 2015 a reporter of local Dutch newspaper 'de Gelderlander' interviewed residents living close to wind parks in the villages Duiven and Kesteren. From these interviews it became clear that, even though a lot of inhabitants were against the development of the wind parks at the time the plans were announced, after the wind turbines were built the inhabitants were not against the wind parks any more (Pols, 2015). Studies from Wolsink (2007a; 2007b) show a similar development of attitudes towards wind energy (see paragraph 2.1.4.). However, it is not clear whether vicinity of existing wind turbines would have a similar positive effect on the acceptance of wind projects.

1.2. Research objective and questions

In the previous paragraph (1.1.) it becomes clear what the research problem is. Namely, the share of onshore wind turbines has to be increased in the Netherlands and a large share of these wind turbines has to be developed with a form of local ownership. However, the effect of public participation and local ownership, such as cooperative ownership, on the development of onshore wind project in the Netherlands remains unclear. From this research problem a research objective can be drawn. Besides cooperative ownership, this research is concerned with the effect of familiarity with wind energy through vicinity of existing wind turbines. This will be discussed in more detail in paragraph 2.1.4. This research is not only concerned with the time from initiative to development, but also with the time from initiative to permit. This is because legal procedures, which are mentioned as a large obstacle by the provinces for reaching their wind energy goals, take place in the period before the permit is definite. The research objective that is central to this research is formulated as follows:

The research objective is to gain insight in the effects of cooperative ownership and vicinity of existing wind turbines on the process of development of, and being granted a permit for, onshore wind projects in the Netherlands.

From this research objective the central research question follows:

To what extent do cooperative ownership and vicinity of existing wind turbines influence the process of development of, and being granted a permit for, onshore wind projects in the Netherlands?

In order to answer this central research question, the following list of sub-questions has been made:

1. To what extent does cooperative ownership influence being granted a permit for onshore wind projects in the Netherlands?
2. To what extent does vicinity of existing wind turbines influence being granted a permit for onshore wind projects in the Netherlands?
3. To what extent does cooperative ownership influence the development of onshore wind projects in the Netherlands?
4. To what extent does vicinity of existing wind turbines influence the development of onshore wind projects in the Netherlands?

The concepts cooperative ownership and familiarity will be explained in more detail in the chapter 2.

1.3. Scientific relevance

As follows from paragraph 1.1. the concepts public participation and cooperative ownership in the context of wind projects have gained increased attention in academic literature. This body of literature is mainly concerned with the influence of participation on local acceptance. From the literature on public participation the general conclusion that public participation promotes the acceptance of wind projects by local citizens can be drawn. Since participation is a very broad term and it comes in many forms, Langer, Decker and Menrad (2017) have done more in-depth research on which form of participation citizens prefer. Jolivet and Heiskanen (2010) have included unique characteristics of the site of wind turbines in their case study on participation processes in wind projects. However, to what extent cooperative ownership, which can be seen as a form of public participation, affects the development of onshore wind projects has only gained little attention in the academic field. Therefore, this research can contribute to scientific knowledge on cooperative ownership and its effect on the development of onshore wind projects.

The concept of familiarity with special developments and wind projects has also gained attention in academic literature. Most notably are the studies by Wolsink (2007a; 2007b) on the development of attitudes towards wind power when people are confronted with a plan for a wind project in their area. Van der Horst (2007) has also studied the attitude towards developments of people living close to these existing developments. In this research, the effect of existing wind turbines on the development of wind projects and being granted a permit for wind projects was studied more specifically and on a large scale. This research can contribute to scientific knowledge on the effect of familiarity through vicinity of existing wind turbines on the development of onshore wind project.

1.3.1 Methodological relevance

Furthermore, the Cox's regression was used as statistical analysis in this research. The Cox's regression is often used in medical research, but also in studies of wind turbines being scrapped in Denmark (Mauritzen, 2012) and the risk of failures of wind turbines in Germany (Ozturk, Fthenakis & Faulstich, 2018). Therefore, the use of a Cox's regression to study wind turbines is not new. However, in this research the focus is on social and policy aspects of wind turbines, instead of technical aspects of wind turbines. This research can prove the usefulness of the Cox's regression in social and policy studies towards wind turbines. The Cox's regression will be explained in more detail in paragraph 3.3.2.

1.4. Societal relevance

In addition to the scientific relevance of this research it also has societal relevance. From paragraph 1.1. it becomes clear that renewable energy, amongst which wind energy, will become an increasingly important energy source in the Netherlands, in order to create a sustainable energy system and achieve greenhouse gas (GHG) emissions reduction goals. The ultimate goal of this is to reduce climate change and limit global warming. However, as was discussed in paragraph 1.1. a lot of progress still has to be made in order to reach the goals for renewable energy production. Provinces that do not reach their goals for the installed capacity of wind energy by 2020 have to compensate their deficit with double the amount of renewable energy as a penalty between 2021 and 2023 (Dirks & Van den Berg, 2019). Hence, many more wind projects will have to be developed in the Netherlands in the coming years. It is laid down in the Climate Agreement that social support and acceptance of renewable energy is important. The Climate Agreement mainly focuses on public participation and local ownership to generate social support and acceptance of renewable energy. In the design of the Climate Agreement an aspiration was included for 50 per cent local ownership (by citizens and local businesses) of the production of onshore renewable energy sources by 2023 (SER, 2018). A 2016 report from the Ministry of Infrastructure and Environment about the upcoming Environment and Planning Act mentions that participation leads to a higher quality and more social support and/or acceleration of large-scale planning projects. This conclusion is based on pilots that were executed (Ministerie van Infrastructuur en Milieu, 2016). Nevertheless, there is no clear scientific evidence that shows that participation leads to better outcomes for large-scale planning projects, such as onshore wind projects. This research can gain insight in the effect of cooperative ownership on the development of onshore wind projects in the Netherlands. The results from this study can be used to assess the effectiveness of cooperative ownership in order to achieve a rapid increase in the installed capacity of onshore wind energy in the Netherlands. This research will also focus on the effect of vicinity of existing wind turbines on the development of onshore wind projects in the Netherlands. This research can provide valuable information for local governments and developers of wind projects to speed up the development of wind projects. This, in turn, can contribute to the transition towards renewable energy and help to achieve the goals set for GHG emission reductions. Ultimately contributing to a more sustainable and carbon neutral society.

1.5. Outline

The following chapter, chapter 2, will provide insight in the theoretical framework that is relevant for this research. Subsequently, chapter 3 will provide a description of the research methodology that was employed in this research. Chapter 4 is the context of this research, in which the large trends in society and policy concerning onshore wind projects and public participation will be described. In chapter 5 the results of the analysis will be presented. Finally, in chapter 6 the conclusions of this research will be drawn and the researched will be critically discussed. Additionally, recommendations will be made for policy makers and further research.

2. Theory

This chapter consists of a critical review of the existing academic literature and provides more insight in the policy context of this research. The relevant theoretical frameworks will be discussed and the theoretical concepts will be operationalised, from which the conceptual model follows.

2.1. Literature review

2.1.1. NIMBY

It was mentioned in paragraph 1.1. that wind parks in the Netherlands have faced strong local resistance. Resistance to wind energy is not bound to the Netherlands, in for example Sweden (Anshelm & Simon, 2016) and France (Enevoldsen & Sovacool, 2016) resistance to wind parks is also visible. Local resistance is often explained using the NIMBY phenomenon. NIMBY stands for ‘not in my backyard’ and it refers to the situation in which people are in favour of a certain facility, but are opposed to this facility in their own area. This phenomenon has been analysed in infrastructure facilities, such as roads, waste facilities and power plants, as well as social facilities, such as mental health care and housing projects. In the context of wind power, surveys have shown overall public support for wind power, but concrete projects have faced resistance, which has been explained using the NIMBY syndrome. The NIMBY phenomenon can be seen as a game-situation. More specifically it can be seen as a multi-person prisoner’s dilemma, in which the aim of local residents is to maximise their own individual utility. Large-scale wind power is a public good to be provided and people are in favour of this. However, people try to block the development of wind turbines in their area in order to minimise the personally perceived impact of this. If this happens at all sites, wind power will not be employed and societal goals will not be reached (Wolsink, 2000). The NIMBY explanation assumes people oppose wind turbines for selfish reasons (Wolsink, 2007a). Despite being used by many planners, authorities and scholars (Wolsink, 2007a), the NIMBY idea has been criticised for being “too simplistic a concept to explain the multi-faceted reasons for oppositional behaviour” (Warren & McFadyen, 2010).

2.1.2. Opposition

Opposition can both refer to a negative attitude or actual behaviour, such as acts of resistance against new developments (Krohn & Damborg, 1999). As mentioned in the previous paragraph, several reasons for opposition to wind projects can be distinguished. Wolsink (2007b) names two main factors causing opposition to particular wind projects: perceived exclusion from decision-making during public participation and most importantly the visual impact on the landscape. The visual impact on the landscape is mainly concerned with the compatibility of the infrastructure with the landscape and how the impact of wind turbines on the values of the landscape is evaluated (Wolsink 2007b).

Other environmental factors that cause annoyance at the project level are noise pollution and light and shadow flicker. The noise that is caused by wind turbines is quieter than that of traffic or industry. Nevertheless, this noise is experienced as more annoying, due to its swishing character (Van Kamp, Dusseldorp, Van den Berg, Hagens & Slob, 2014). According to Wolsink (2007a) noise annoyance is more strongly related to visual impact attitudes than to sound pressure. Surveys have also shown that people report more annoyance when they can see a wind turbine and less annoyance when they benefit from the wind turbine(s) (financially) (Van Kamp & Van den Berg, 2018). Light and shadow flicker or shadow flickering occurs when the rotating blades of the wind turbine periodically cast shadows on for example houses, causing a flickering effect. This can be prevented by shutting the wind turbine(s) down when shadow flickering occurs, for example with the help of a light sensor (Saidur, Rahim, Islam & Solangi, 2011).

Next to visual impact, noise pollution and shadow flickering, homeowners often worry about a decrease in their house value. Dröes and Koster (2016) have found that after the construction of a wind turbine the "house prices within a 2 km radius are on average 1.4% lower than prices in comparable neighbourhoods that have no nearby wind turbines." Furthermore, the impact on nature and especially (endangered) birds can become an important factor causing opposition at the project level. At the level of the general implementation of wind power the visual impact on landscape is also a dominant factor explaining opposition. The environmental benefits of wind power, such as it being a clean way to generate power, influences the general attitude as well, but far less than the visual impact.

As mentioned in the previous paragraph (2.1.1.) the NIMBY phenomenon is used to explain opposition to spatial developments. Wolsink (2007a) identifies four forms of opposition, only one of which fits the definition of the NIMBY syndrome:

- A positive general attitude combined with the intention to oppose the construction in one's own area (NIMBY-motivated opposition).
- Opposition because the technology is rejected (not-in-any-backyard).
- "A positive attitude [towards wind farms], which turns into a negative attitude as a result of the discussion surrounding the proposed construction of a wind farm." (Wolsink, 2007a, p. 1201).
- Resistance because the construction plans themselves are faulty, without a rejection of the technology itself.

This illustrates that besides NIMBY-motivated opposition, there can be other reasons for opposition to spatial developments such as wind parks. Thus, not all oppositional behaviour can be explained using the NIMBY concept. Multiple other factors influence the public attitudes to wind parks (Warren & McFadyen, 2010). Besides the previously mentioned factors, factors influencing the public attitudes are "local perceptions of economic impacts, the national political environment, social influences and institutional factors such as the perceived inclusiveness and fairness of the planning and development process" (Warren & McFadyen, 2010).

2.1.3. Social acceptance

Wüstenhagen, Wolsink and Bürer (2007) have researched social acceptance of renewable energy innovation. Social acceptance has been identified as a barrier in reaching renewable energy targets. They distinguish between three types of social acceptance, namely socio-political acceptance, community acceptance and market acceptance. These three types of social acceptance are illustrated in figure 1.

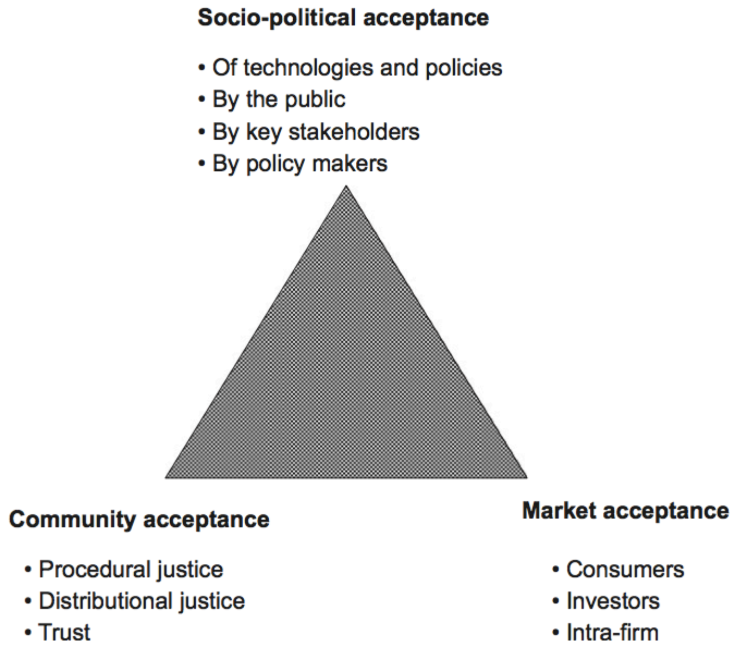

Figure 1. The triangle of social acceptance of renewable energy innovation. From "Social acceptance of renewable energy innovation: An introduction to the concept" by R. Wüstenhagen, M. Wolsink & M.J. Bürer, 2007, *Energy policy, 35,* p. 2684.

Socio-political acceptance is the broadest form of social acceptance and it refers to the public acceptance of renewable energy technologies and policies. Overall the public acceptance of renewable energy technologies and policies is high. Community acceptance refers to the acceptance of siting decisions and renewable energy projects by local stakeholders, such as residents and local authorities. The difference between general acceptance and resistance to specific projects is where the term NIMBYism comes up. This explanation has been labelled as an oversimplification of people's motives. Some authors have even found evidence for the opposite effect: "that the opposition decreases, rather than increases with the degree of being directly affected a by specific wind power project." (Wüstenhagen et al., 2007, p. 2685). Furthermore, community acceptance has a time dimension. Wolsink (2007b) has shown wind power attitudes follow a U-shaped development pattern (see figure 2 on page 12), going from high acceptance (when people are not confronted with a wind project in their area), to lower acceptance (during the siting phase) and to higher acceptance a reasonable time after the wind project has been constructed. This concept will be explained in more detail in paragraph 2.1.4. Finally, market acceptance is distinguished, which refers to the market adoption of an innovation. Since this type of acceptance is more concerned with smaller-scale renewables instead of wind energy, this type of social acceptance is not taken into account in this research (Wüstenhagen et al., 2007).

Local acceptance of wind projects is considered to be important in order to achieve goals on sustainability and GHG emission reductions, because local resistance can slow down or even block the development of wind projects (Wüstenhagen et al., 2007). When looking at community acceptance, factors such as distributional justice and procedural justice are important. Distributional justice is about how the costs and benefits of a wind project are shared. Procedural justice refers to the existence of a fair decision-making process, in which all relevant stakeholder have an opportunity to participate. Furthermore, trust in the information and intentions of actors outside the community was found to be of importance (Wüstenhagen et al., 2007). Other research has shown that important factors contributing to acceptance of wind projects are the sound level at the place of residence, the distance of the turbines to the place of residence and participation opportunities (Langer et al., 2017).

2.1.4. Familiarity

In paragraph 2.1.3. the U-shaped development pattern of wind power attitudes was mentioned. This U-shaped development pattern illustrates the evolution of wind power attitudes over time. Figure 2 below shows what this U-shaped development pattern looks like. On the vertical axis the group average in standard units (z-scores) is represented, where 0 represents a positive average attitude. This illustrates that attitudes towards wind power are very positive when people are not confronted with a plan for a wind project in their area. When a project plan is announced in their area their attitude becomes more critical and acceptance is lower. Reasonable time after the project has been constructed their attitudes become positive again and acceptance is higher. Differences are visible between solitary turbines and wind farms (Wolsink, 2007a; Wolsink, 2007b).

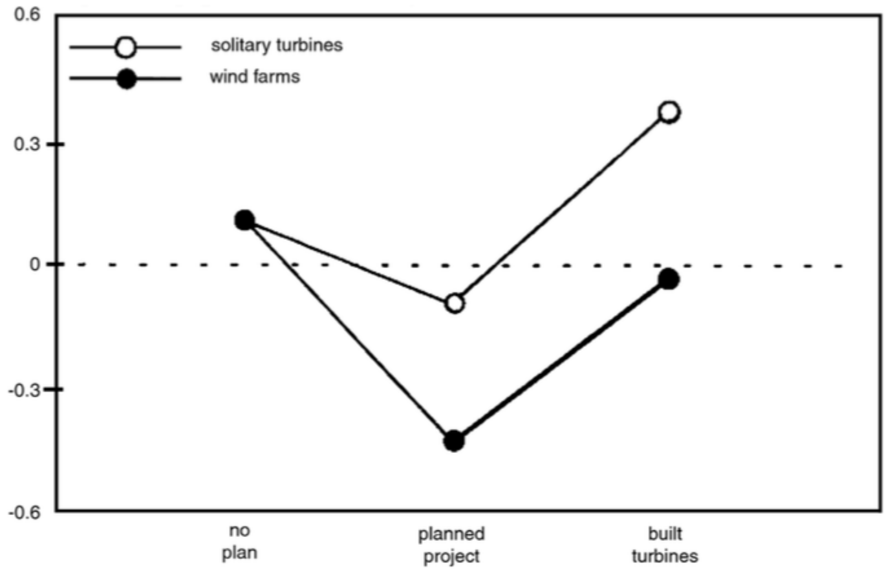

Figure 2. The development of wind power attitudes. From "Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'." by M. Wolsink, 2007a, *Renewable and sustainable energy reviews, 11*, p. 1198.

Van der Horst (2007) states that people living close to *proposed* developments are least likely to be supportive, because they are directly affected by it. Whilst people living close to *existing* developments are most likely to be supportive, because their personal experience has made them more familiar with the technology. Accordingly, people living in the vicinity of an existing wind turbine are expected to be supportive of this development, due to familiarity with wind energy. However, Devine-Wright (2009) argues that it is unlikely that familiarity solely derives from direct experience. Instead he argues mediated experience, through exposure to mass media sources or interpersonal communication, also influence familiarity.

2.1.5. Public participation

As was mentioned in chapter 1 public participation has gained increased attention in the creation of wind projects and a substantial share of academic literature has been published on public participation and the acceptance of wind projects. As participation plays an important role in the creation of wind projects and influences local acceptance, it is important for this research to gain more insight in this concept.

Participation is a vague concept and is very dependent on the exact method and process of its implementation (Jolivet & Heiskanen, 2010). It can be defined as the "involvement of citizens in decision-making with the purpose of influencing the choices being made" (Langer et al., 2017, p. 64). In 1969 Arnstein identified eight different forms of citizen participation, all leading to different outcomes. The eight forms are: manipulation, therapy, informing, consultation, placation, partnership, delegated power and citizen control (see figure 3). Arnstein's (1969) typology of citizen participation was arranged in a ladder pattern corresponding to the extent of citizens' power in determining the end product, as is illustrated below in figure 3.

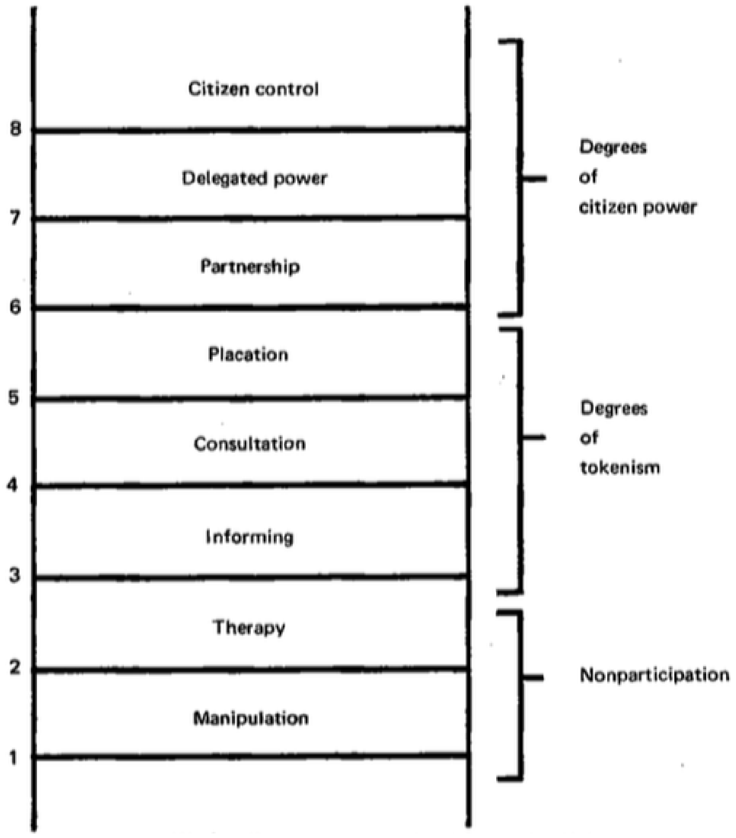

Figure 3. The Ladder of Citizen Participation. From "A ladder of citizens participation" by S.R. Arnstein, 1969, *Journal of the American Institute of planners, 35*, p. 217.

‘Manipulation’ and ‘therapy’ are described as non-participation, because their objective is not truly to enable people to participate, but to “enable power holders to “educate” or “cure” the participants.” (Arnstein, 1969, p. 217). ‘Informing’, ‘consultation’ and ‘placation’ are labelled as having degrees of tokenism. This is because citizens will hear and be heard, but they do not have the power to ensure that the power holders are taking their views into account. The remaining forms of citizen participation are labelled as having degrees of citizen power, meaning citizens have an increasing degree of influence on decision-making. Partnerships can enable citizens to negotiate with the traditional power holders. With ‘delegated power’ and ‘citizen control’, citizens obtain the majority or even full decision-making power. In her typology Arnstein equates participation with power (Arnstein, 1969).

Based on Arnstein’s typology, Wilcox (1994) identifies five levels of participation:

- Information;
- consultation;
- deciding together;
- acting together;
- supporting independent community interest.

‘Information’ means merely telling people what is planned. In ‘consultation’, citizens are offered options and they have the opportunity to give feedback, without introducing new ideas. When ‘deciding together’, new ideas are encouraged and citizens have opportunities for joint decision-making. When ‘acting together’, the different interests also form a partnership to implement decisions together. Finally, when ‘supporting independent community interests’, “local groups or organisations are offered funds, advice or other support to develop their own agendas within guidelines” (Wilcox, 1994).

Since Arnstein's (1969) *Ladder of Citizens Participation* was published, authorities have adopted new and improved participation methods. In the field of wind power, participation is important for local acceptance. However, participation methods are heterogeneous and local resistance is still being observed (Jolivet & Heiskanen, 2010). Langer et al. (2017) have analysed the relationship between different modes of public participation in the context of acceptance of wind projects. Based on Arnstein (1969) and Wilcox (1994), they identified the following six forms of participation:

- No participation;
- alibi participation;
- information;
- consultation;
- cooperation;
- financial participation.

The higher the level, the more control citizens have over the activities. The first level is 'no participation', which means that individuals have not participated in wind energy projects. 'Alibi participation' means citizens want to get involved in wind energy projects, but their opinion is suppressed. 'Information' is a passive form of participation. 'Consultation' is an active form of participation, in which individuals can express their opinion and are being heard. 'Cooperation' is also an active form of participation, in which citizens co-decide on wind energy plans. The highest level is 'financial participation', in which citizens participate in a wind project through a financial investment.

'Consultation' and 'cooperation' are connected to procedural justice, because people have the opportunity to actively participate during the planning and implementation of wind energy projects. This leads to perceived fairness of decision-making. 'Financial participation' is connected to distributive justice, because people can make a profit from their financial investments, which can lead to a more even distribution of costs and benefits of a wind project (Wüstenhagen et al., 2007; Langer et al., 2017). Procedural and distributive justice are important factors determining acceptance (Langer et al. 2018). Walter (2014) distinguishes between two forms of justice connected to financial participation, namely equality and equity. Equality refers to all persons involved getting an equal share of the outcome, which is the case for communal funds. Equity refers to the outcomes being proportional to the inputs, which is the case for financial shares. The study of Walter (2014) shows that communal funds result in high acceptance than financial participation.

The research of Langer et al. (2017) shows that participation in the form of ‘information’, ‘cooperation’, ‘consultation’ and ‘financial participation’ have a positive effect on acceptance. ‘Alibi participation’ and ‘no participation’ have a negative effect on acceptance. ‘Information’ was the preferred form of participation (Langer et al., 2018). ‘Cooperation’ and ‘consultation’ were preferred over ‘financial participation’ (Langer et al. 2017). Nonetheless, other studies have shown that ‘financial participation’ is more important for the deployment of wind energy projects (Toke, Breukers & Wolsink, 2008; Aitken, 2010). However, there are also some constraints to ‘financial participation’. Community benefits can for example create the impression that developers of a wind project are trying to ‘buy consent’, which can lead to hostile reactions rather than more acceptance. Community benefits can also seem like an acknowledgement that the wind project has an impact that requires compensation, which can reduce trust (Aitken, 2010; Fast & Mabee, 2015). Furthermore, lack of knowledge of investments or lack of trust towards wind energy developers can constrain ‘financial participation’. Nevertheless, not only the type of participation is important, but also issues as who is involved, in what stage of the process and how often (Langer et al., 2017).

2.1.6. Community ownership

Wüstenhagen et al. (2007) identified a link between community acceptance and ownership. However, not much research has been done on this link. Warren and McFadyen (2010) have researched the influence of community ownership on attitudes to wind parks by comparing public attitudes towards a community-owned wind park with attitudes towards a developer-owned wind park in Scotland. The community-owned wind park scored more positive. Other studies have also shown evidence that community-owned projects have higher local acceptance and fewer problems with obtaining planning permission (Walker, 2008). Community ownership can be seen as a form of participation. ‘Supporting independent community interests’ from Wilcox’ (1994) typology and ‘financial participation’ from the categorisation of Langer et al. (2017) both refer to community ownership.

In the Netherlands, community ownership and citizen participation of wind projects can be generally divided in three different models. The first is a cooperative model, in which a local energy cooperative is the owner of a wind project. Citizens can participate financially via the cooperative. The second is a shares model, in which citizens can buy shares in the wind project directly. Citizens are shareholders and co-owners of the wind project. Cooperatives can facilitate this type of participation, but there is no cooperative ownership. Finally, there is the financial participation model. In this case, citizens do participate in a wind project financially, but without getting ownership. This type of participation can also be facilitated by cooperatives. These different models can be combined (HIERopgewekt, 2017). Other forms of financial participation are a local fund and a scheme for local residents. These forms of financial participation also do not encompass ownership (NWEA, 2016). The cooperative and shares models fit in the 'independent community interests' level from Wilcox' (1994) typology and the 'citizens control' level from Arnstein's (1969) typology. A combined model in which both citizens and the developer of the project have ownership fits in the 'delegated power' or 'partnership' level of Arnstein's (1969) typology. The financial participation model, local funds and schemes for local residents are forms of 'nonparticipation', because they do not increase the power of citizens.

Local energy cooperatives or wind cooperatives are community initiatives for renewable energy. In 2018, there were 484 cooperatives for renewable energy in the Netherlands (HIERopgewekt, 2018). These cooperatives form a heterogeneous group and most of them are still in an early phase of the project (Oteman, Kooij & Wiering, 2017). The initiators of these cooperatives have experience with and local knowledge about what works in the community. Therefore, they have the advantage that they can come up with solutions that comply with the local situation and the interests and values of the community (Seyfang & Smith, 2007). Local cooperatives also have more opportunities to experiment with new practises and norms on a local level and can use an alternative approach more easily (Middlemiss & Parrish, 2010).

Nevertheless, local energy cooperatives also face several challenges. The cooperatives rely on people with limited power, limited resources, limited time and limited ability to influence others. Thus, the success of a cooperative is dependent on both the capacities of the initiators and members and on the nature of the community in which it is active. The initiators of local energy cooperatives are usually active in their free time. These individuals have to invest their time in the start-up and persistence of the cooperative. Challenges they face include hostile reactions from local citizens, burnouts and reassurance of funding. Furthermore, the influence of these cooperatives is often limited and they have difficulties with scaling up (Middlemiss & Parrish, 2010; Seyfang & Smith, 2007). Even though projects initiated by wind cooperatives are expected to have higher local acceptance and fewer problems with obtaining planning permission, they also face challenges that can hinder the development of wind projects. Rogers, Simmons, Convery and Weatherall (2008) suggest that “community renewable energy projects are likely to gain public acceptance but are unlikely to become widespread without greater institutional support.”

2.2. Operationalisation

The theoretical frameworks and concepts that were discussed in the previous section (2.1.) are used to create the conceptual framework as illustrated in figure 4. The concepts that are used in the conceptual framework are operationalised in table 2. Finally, six hypotheses were drawn up based on the theoretical framework and the conceptual model.

2.2.1 Conceptual model

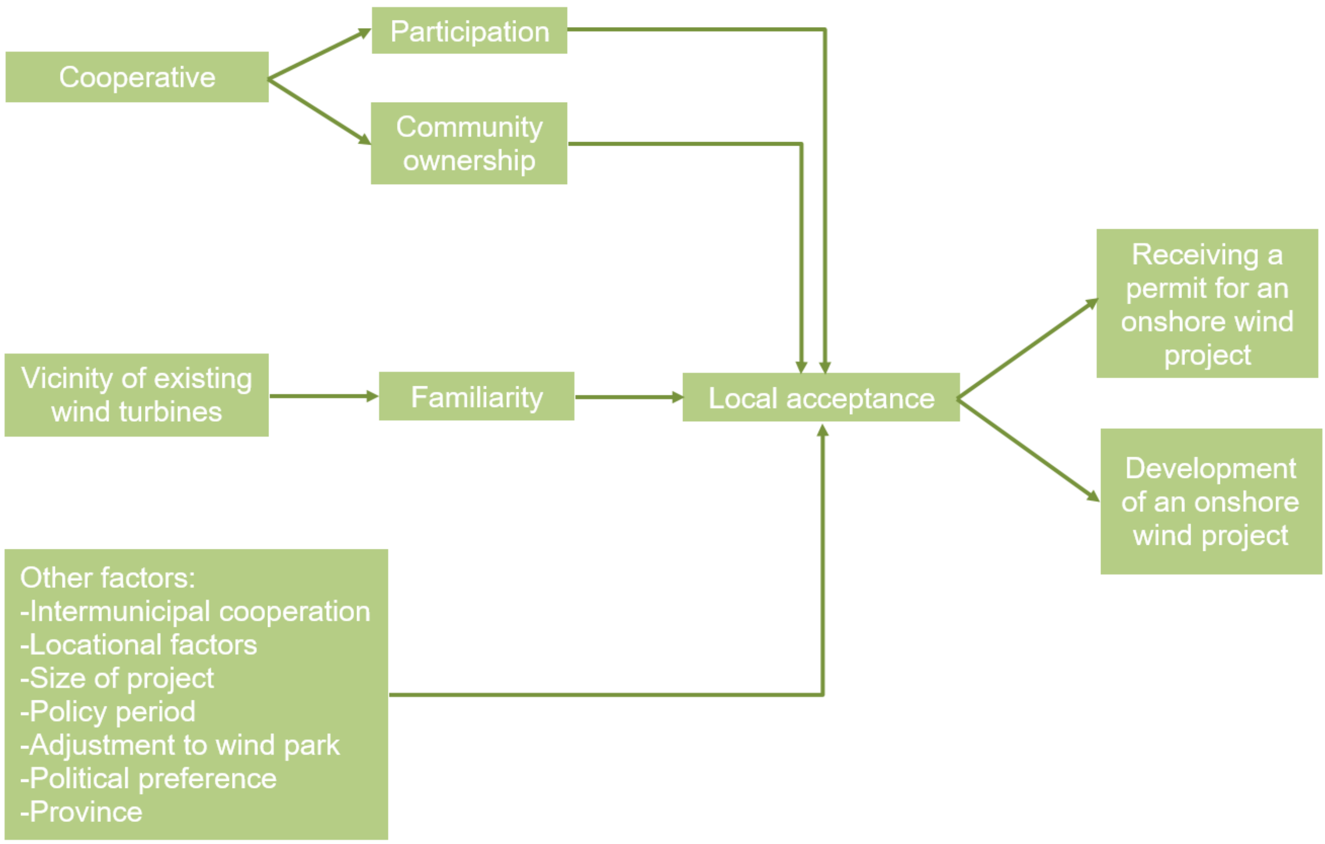

Figure 4. Conceptual framework.

This conceptual framework illustrates that the development of onshore wind projects and receiving a permit for onshore wind projects is affected by multiple factors through local acceptance. The development of onshore wind projects is measured by the chance of development of the project. Receiving a permit for an onshore wind project is measured by the chance of being granted a permit. In this research, the type of effect (positive or negative) and the extent of the effect of cooperative ownership and vicinity of other wind turbines on the development of and receiving a permit for wind projects will be researched. Other factors are also expected to influence the development of and receiving a permit for wind project. These are intermunicipality, locational factors, the size of the wind project, the policy period, whether it is an adjustment to a wind park, the political preference in the municipality and the province in which the project is located. The concepts that are used in the conceptual framework are shown in the operationalisation scheme below (table 1).

2.2.2. Operationalisation scheme

Concept	Dimension	Indicator
Participation	Cooperative	Financial participation through cooperative
Community ownership	Cooperative	Financial participation through cooperative
Familiarity	Vicinity of existing wind turbines	Amount of wind turbines within 2km/5km/10km/15km
Intermunicipal cooperation	Intermunicipal plan	Wind project located in two or more municipalities
Locational factors	Proximity to houses	0-10 or more than 10 houses within 500 metres
	Proximity to railway	Project is located within 100 metres of a railway
	Proximity to business park	Project is located within 100 metres of a business park
	Nature area	Project is located within a Natura2000 area
	Proximity to large road	Project is located within 100 metres of a national or provincial road
Size of project	Maximum capacity	The maximum capacity (in MW) of the wind project
Policy period	BLOW period	The project was initiated in the BLOW period (2002-2008)
Adjustment to wind park	Scale up	Project is a scale up of an existing wind park
	Expansion	Project is an expansion of an existing wind park
Political preference	Division of votes on the municipal level	Majority of votes for political parties in favour of wind energy
		Majority of votes for political parties against wind energy
Province	Province	Province in which the wind project is located

Table 1. Operationalisation scheme.

The concepts 'participation' and 'community ownership' both consist of the dimension 'cooperative'. This is because through a cooperative, community ownership can be established. Furthermore, participation in the form of 'financial participation' from the categorisation of Langer et al. (2017) or 'supporting independent community interests' from Wilcox' (1994) typology can be created through a cooperative. Even though other forms of participation exist, these are not within the scope of this research. Community ownership can also be established without the interference of a cooperative, but this is also not within the scope of this research. Therefore, the indicator for both dimensions is 'financial participation through cooperative'.

The concept 'familiarity' refers to familiarity with wind turbines. 'Vicinity of existing wind turbines' was the only dimension of familiarity that was studied in this research. The indicator of this dimension is 'amount of wind turbines within 2km/5km/10km/15km'. The motivation behind these distances will be discussed in more detail in paragraph 3.3.1. The other concepts that were added to the conceptual model as 'other factors' are also explained in more detail in paragraph 3.3.1.

2.2.3. Hypotheses

Six hypotheses are formed based on the conceptual model, these hypotheses are summarized in table 2. H_1 assumes that wind projects in which a cooperative is involved have a higher chance of being granted a permit, than wind projects without the involvement of a cooperative. H_2 presumes that wind projects in vicinity of already existing wind turbines have a higher chance of being granted a permit, than wind projects that are not in vicinity of existing wind turbines. This is expected because as was explained in paragraph 2.1.4., people living close to existing wind turbines are most likely to be supportive, because their personal experience makes them more familiar with the technology. H_3 supposes that cooperative wind projects have a higher chance of being developed than non-cooperative wind projects. Being developed refers to the moment when the last wind turbine of the wind project is placed. H_4 assumes wind projects in vicinity of already existing wind turbines to have a higher chance of being developed than wind projects that are not in vicinity of existing wind turbines. H_5 presumes that cooperative wind projects with a permit have an equal chance of being developed as non-cooperative wind projects with a permit. H_6 assumes that wind projects with a permit within vicinity of already existing wind turbines have an equal chance of being developed as wind projects with a permit that are not in vicinity of existing wind turbines. Thus, H_5 and H_6 assume there is no difference in lead time from permit to development, because this lead time is largely determined by how fast a project is financed and built. Cooperatives and professional developers both hire companies to build the wind turbines, so no difference is expected in this. It can also be expected that vicinity of existing wind turbines does affect the period from permit to development.

Lead time initiative to permit
1. Cooperative wind projects have a higher chance of being granted a permit than non-cooperative wind projects.
2. Wind projects in vicinity of already existing wind turbines have a higher chance of being granted a permit than wind projects that are not in vicinity of existing wind turbines.
Lead time initiative to development
3. Cooperative wind projects have a higher chance of being developed, than non-cooperative wind projects.
4. Wind projects in vicinity of already existing wind turbines have a higher chance of being developed than wind projects that are not in vicinity of existing wind turbines.
Lead time permit to development
5. Cooperative wind projects with a permit have an equal chance of being developed as non-cooperative wind projects with a permit.
6. Wind projects with a permit in vicinity of already existing wind turbines have an equal chance of being developed as wind projects with a permit that are not in vicinity of existing wind turbines.

Table 2. Summary of hypotheses.

3. Methodology

In this chapter, the research methodology is described. First, the philosophy underlying this research will be discussed. This will be followed by the research strategy, research methods and data collection and analysis. Finally, the validity and reliability of this research will be discussed.

3.1. Research philosophy

In order to determine the research strategy that was employed in this research, the philosophical assumptions underlying this research have to be discussed. These assumptions have shaped the way the research was conducted. These assumptions are based on philosophical arguments on the nature of reality (ontology) and what we can know about this reality (epistemology). Thus, the research philosophy defines what the researcher considers to be reality, how the researcher can identify what is real and how the researcher positions her- or himself within the research (Farthing, 2016; Guba & Lincoln, 1994). Guba and Licoln (1994) distinguish between four research paradigms: positivism, post-positivism, critical theory and constructivism. The paradigm that will be employed should serve to answer the central research question, which is:

To what extent do cooperative ownership and vicinity of existing wind turbines influence the process of development of, and being granted a permit for, onshore wind projects in the Netherlands?

Accordingly, this research gives insight in a common effect of cooperative ownership and vicinity of existing wind turbines on the development of, and being granted a permit for, onshore wind projects. Since a common effect is studied, this research follows the positivist paradigm. Studying common effects namely corresponds to the positivist point of view that a common objective reality exists across individuals (Newman & Benz, 1998). According to positivists an apprehendable reality exists and knowledge of the “way things are” can take the form of cause-effect laws. This knowledge is time and context free and can therefore be generalised. The researcher is assumed to be objective and the researcher and the researched “object” do not influence each other. Thus, the researcher is independent of the data and the research is undertaken in a value-free way. Positivist researchers usually use existing theories to develop hypotheses, as was done in this research. These hypotheses are tested and either confirmed or refuted (in whole or partly). Positivist researchers usually employ deductive and quantitative research (Saunders, Lewis & Thornhill, 2009; Guba & Lincoln, 1994). Positivism has faced considerable critique because of its strong reliance on realism and the fact that it has no place for human interpretation and ideas that are not observable (Guba & Lincoln, 1994).

3.2. Research strategy

In this paragraph, the research strategy will be discussed. This research strategy was built on the choice for a positivist research philosophy, as mentioned in the previous paragraph. Verschuren and Doorewaard (2010) present five different research strategies: survey, experiment, case study, grounded theory and desk research.

This research can be typified as an explanatory research, because it tries to establish a causal relation between variables, namely participation by local residents and the development of onshore wind projects. Many different research strategies can be used for explanatory research. However, the choice for a deductive approach does influence the choice of the research strategy (Saunders et al., 2009). This research is focussed on gaining knowledge that can be generalised, therefore a quantitative research approach fits best. Quantitative research is aimed at identifying opinions, behaviour and underlying reasons of phenomena. Whereas qualitative research is concerned with social constructs and different meanings that have been assigned to them (Verschuren & Doorewaard, 2010). Besides, positivist researchers primarily employ a quantitative research approach, so this is in line with the research philosophy.

Desk research was chosen as the most suitable research strategy. When conducting desk research the researcher does not gather empirical data her- or himself. Instead the researcher uses material produced by others. There are multiple categories of existing material that can be used for desk research: literature, secondary data and official statistical material. Literature, such as books and articles, contain knowledge products of scientists. Literature has been used in the theoretical framework of this research (chapter 2). Secondary data refers to empirical data that has been collected for previous research (by either other researchers or yourself). This can for example be records of interviews or databases. In this research, secondary data from databases regarding onshore wind projects in the Netherlands was used for the analysis. Official statistical material is data that has been gathered periodically or continuously for a broader public. Some of the databases on onshore wind projects in the Netherlands used in this research fall under this category. Parallel to this distinction between knowledge sources and data sources, there are two main variants of desk research: literature survey and secondary research. In a literature survey the researcher uses knowledge produced by scientists. This variant is usually used to map out the latest theories on a certain subject. In secondary research, empirical data produced by others is used. The researcher rearranges existing data and then analyses and interprets this. In this research, secondary research was used as research strategy, by using databases regarding onshore wind projects in the Netherlands (Verschuren & Doorewaard, 2010). The new database that was created by combining different databases is called multiple-source secondary data. This research strategy was chosen because the researcher was not able to empirically collect data on all wind projects in the Netherlands within the timeframe of this research. Besides, sufficient secondary data was available to provide a main dataset from which the main research question could be answered (Saunders et al., 2009).

3.3. Research method

From the previous paragraph it becomes evident that no new empirical data was collected in this research. Instead, existing empirical data was collected, rearranged, analysed and interpreted. In the following paragraph this data collection method will be discussed in more detail. After that, the manner in which the collected data was analysed will be discussed.

3.3.1. Data collection

When a researcher uses existing empirical data, this data must be reliable scientific data. In this research, a database consisting of data from reports and databases of several (governmental) institutions was used. Additional and recent data regarding onshore wind projects in the Netherlands was added to this database. The data in the database originates from the consultancy firm Bosch & van Rijn (2008 & 2011), 'BLOW lists' (2002-2008), Monitor Wind op Land from RVO (Netherlands Enterprise Agency) (2015-2017) and Lokale Energie Monitor from HIERopgewekt (2015-2018).

Locational factors were also added to the database by using software programme ArcGIS. The locations of existing wind parks were added from the database WindStats, created by Bosch & van Rijn. The version of WindStats that was used, was last updated on the 29th of March 2019, wind parks built after this date are therefore not included in the database. The plans for wind projects have been added to ArcGIS based on maps of the projects that were included on websites of projects, in Environmental Impact Assessments (EIA) and in other reports. Figure 5 shows a screenshot of the plans for wind parks (polygons) and existing wind turbines (small circles).

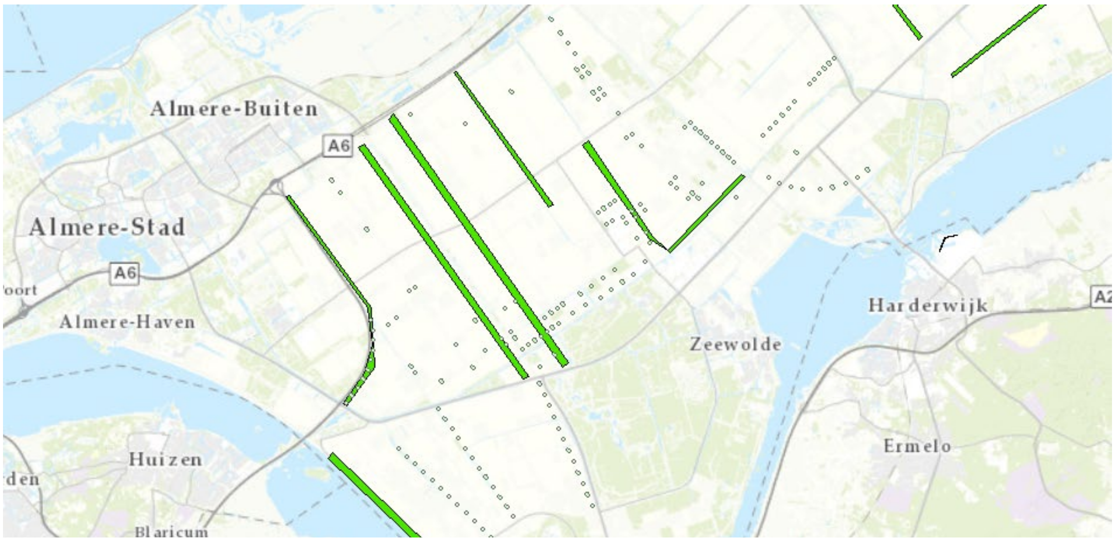

Figure 5. Screenshot of existing wind turbines and plans for wind parks in ArcGIS.

Furthermore, houses were added based on the BAG (Basisregistratie Adressen en Gebouwen), in which all addresses and buildings in the Netherlands are included. The version of the BAG that was used was last updated in April 2019. Large roads (national and provincial roads) were added based on the NWB (Nationaal Wegenbestand), in which all roads in the Netherlands are included. This version was last updated on the 13th of October 2018. Railways were also included based on the NWB, this version was last updated on the 31st of March 2014. Business parks were included based on Ibis data, this was last updated on the 12th of June 2014. The factor nature area was added as locational factor using the Natura2000 areas. It was unclear on which date this data was last updated. Data of Natuurnetwerk Nederland areas (NNN) could not be added successfully to ArcGIS. The openness of the landscape was also included as a locational factor. This was done based on data from a study published by the CLO (Compendium voor de leefomgeving). The topographical data used in this study is from 2017. This data shows the surface of visible landscape in hectares with a maximum of 1500 hectare (CLO, 2018).

For the spatial analysis, buffers were created around the wind parks in ArcGIS. For the spatial analysis with large roads and railways the buffer distance that was used was 100 meters. This is because the minimum distance between large roads and wind turbines has to be half of the rotor diameter measured from the edge of the road (with a minimum distance of 30 meters). The minimum distance between railways and wind turbines is half of the rotor diameter plus 7.85 meter measured from the centre of the railway (with a minimum distance of 30 meters). Therefore, wind turbines within 100 meters of a large road or railway are close to a major road or railway (RVO, 2014; RVO, 2016). For business parks a buffer distance of 100 meters was used as well. For houses a buffer distance of 500 meters was used. The minimum distance between houses and wind turbines differs per location and per type of wind turbine. This is mainly due to legal standards for noise nuisance and shadow flicker on ‘sensitive objects’ such as houses, this will be elaborated on in paragraph 4.2. The minimum distance between a wind turbine and houses is the hub height plus half of the rotor diameter or in case it is larger the maximum ‘throw distance’ with nominal rotations (RVO, 2016). Because this distance can differ so much I discussed this with experts at Bosch & van Rijn and the distance of 500 metres was chosen as distance within which houses are close by a wind park. Figure 6 shows a screenshot of the buffers of 500 metres around wind turbines and plans for wind parks (yellow) and the houses that intersect with these buffers (red dots).

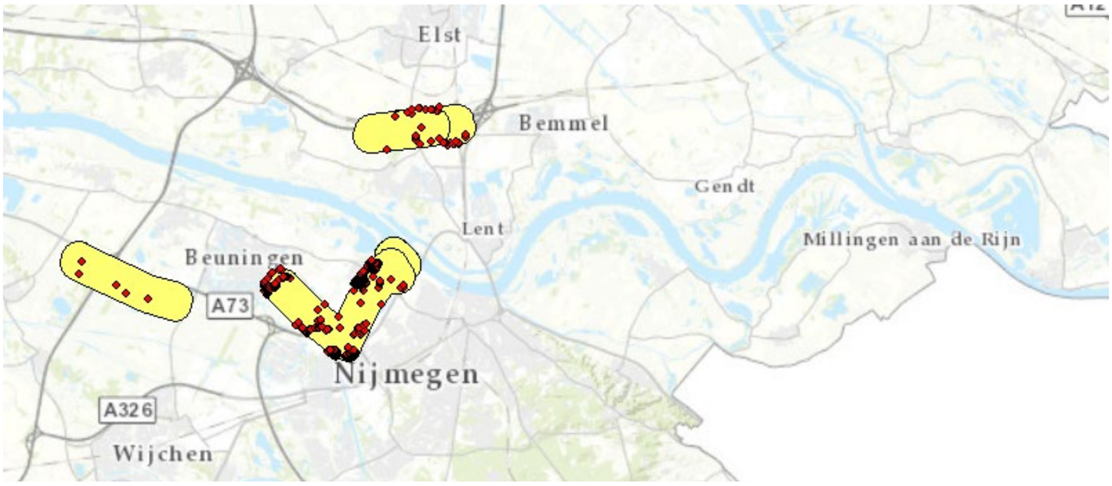

Figure 6. Screenshot of the intersection of houses and the 500 metres buffers around wind turbines and plans for wind parks in ArcGIS.

The vicinity of existing wind turbines was measured with four different distances: 2, 5, 10 and 15 kilometres. These four radiuses were chosen because of the visibility of wind turbines. When wind turbines are visible for residents, they can gain familiarity with them. In 2012 a study was executed in the Netherlands on the visibility of wind turbines and their influence on the appreciation of the landscape. Visibility of wind turbines is determined by their height, the presence of trees and buildings in their surrounding and by the distance to the wind turbine. Within 1.5 kilometres from a wind turbine the appreciation of the landscape was one third lower than without a wind turbine and within 2.5 kilometres it was a quarter lower. Wind turbines in the Netherlands can be visible from 35 kilometres if the sight is very good. With average weather conditions wind turbines with a height of 100 metres are visible from 10 kilometres. However, at this distance they comprise only a small part of the view (CLO, 2014). The first radius of 2 kilometres was chosen, because within this radius wind turbines are very visible. Residents within this radius can also be familiar with possible nuisance of wind turbines, such as noise and light and shadow flicker. Within the radius of 5 kilometres wind turbines can be expected to be less visible. Within the radius of 10 kilometres wind turbines with a height of 100 metres are still visible with average weather conditions, although they compromise only a small part of the view. However, new wind turbines can have a height of 200 metres or more, therefore the radius of 15 kilometres was also added. Besides measuring familiarity through visibility, residents within these radiuses could have gained familiarity with wind turbines due to previous spatial and permit procedures.

A political factor was also added to the database. First a categorisation was made of political parties in favour of or against wind energy. To create this categorisation the so called ‘windkieswijzer’ was used to classify the political parties. The ‘windkieswijzer’ was developed by Urgenda for the 2019 Dutch provincial elections and shows the point of view of the political parties per province on wind energy (Urgenda, 2019). This categorisation was applied to the outcomes of the national elections per municipality. After that, wind projects located in a municipality in which political parties in favour of wind energy got the majority of the votes were given the number 1. Wind projects located in municipalities in which the political parties in favour of wind energy did not get the majority of the votes were given the number 0. The assumption that people have the same voting behaviour on the local level as on the national level was made. Besides, the assumption that political parties have the same point of view on wind energy on local and national level was made.

Since multiple data sources were used and merged in the database, a complete picture of all the existing wind parks and plans wind project that existed or exist in the Netherlands from 2002 to March 2019 is created. By using and combining existing data it was possible to use such a large amount of data within the timeframe of this research (Saunders et al., 2009; Verschuren & Doorewaard, 2010).

A disadvantage of this approach is that the data that was used was originally gathered for other purposes. This means the researcher cannot determine what data was and what data was not collected. Consequently, the existing data that was available might not be appropriate to answer the research question or address the research objective. Thus, the researcher had to use the existing data as efficient as possible. For some wind projects the data in the database was not complete. To overcome this problem the researcher had to gather additional information by searching for news articles, policy documents, reports and other databases on wind projects. This means that the data that was analysed in this research, is not exclusively empirical data produced by others. By adding this new data to the database the issue of being limited by the availability of data was solved. Furthermore, the terms that were used in the different databases, such as the project name, did not always correspond with each other and over time. These project names and terms had to be aligned with each other (Saunders et al., 2009; Verschuren & Doorewaard, 2010).

3.3.2. Data analysis

The quantitative data in the compiled database was analysed using statistics. The statistical software programme SPSS was used to analyse the data. The Cox proportional hazards model was applied to execute a survival analysis. Survival analysis is often used for medical research, such as research on how long patients with a certain treatment for their disease live, hence the name survival analysis. However, survival analysis can also be used for broader application to analyse how long it takes before a certain event occurs (Buis, 2006). The Cox's regression was for example also used to analyse the risk of wind turbines being scrapped in Denmark (Mauritzen, 2012) or the risk of failures of a wind turbine in Germany (Ozturk, Fthenakis & Faulstich, 2018). Hence, the use of a Cox's regression to study wind turbines is not new, however in this research the focus is more on social and policy aspects of wind projects.

In this research, the Cox's regression was used to examine and model the survival time of wind projects in three ways. Namely, the time it takes for a wind project to be granted a permit from the moment the plan was initiated, the time it takes to be developed from the moment the plan was initiated and the time it takes to be developed from the moment the project received a permit. Additionally, the Cox's regression was used to examine the relationship between the chance of occurrence of a certain event (being granted a permit or being developed) and predictor variables or covariates. The Cox regression was chosen, because unlike the Kaplan Meier analysis, it can study multiple predictor variables at once (Fox & Weisberg, 2011).

The main assumption of the Cox's regression is the proportional hazards assumption. This means that the hazard ratio between two groups remains constant over time. This assumption can be tested by producing Kaplan Meier survival plots. Kaplan Meier survival plots show the cumulative proportion of, in this case, wind projects "surviving" at the end of the interval. 'Surviving' means a certain event has not occurred. In this research, the events studied are being granted a permit and being developed. The proportional hazard assumption is met when the lines of the two groups in the Kaplan Meier survival plot are approximately parallel and do not cross each other. If this is not the case, the hazard ratio between cooperative and non-cooperative wind projects does not remain constant over time and differences between the two groups can be time dependent.

The Cox's regression is a semi-parametric analysis. Meaning that it can deal with many predictor variables, unlike a non-parametric analysis such as the Kaplan Meier analysis. Without assuming the chance of occurrence of an event changes over time, as a parametric analysis would assume. Since no assumptions are made about time dependence, results cannot be influenced by such assumption. However, a disadvantage of this is that hypotheses about time dependence cannot be tested and if assumptions about time dependence are correct, a parametric analysis would provide more precise results. A semi-parametric analysis only makes an assumption about the way that the predictor variables influence the chance of occurrence of an event and can deal with many predictor variables (Buis, 2006).

3.4. Validity and reliability of the research

3.4.1. Validity

Validity refers to the extent to which the researcher measures the phenomena he or she intends to measure. A distinction can be made between internal validity and external validity. Internal validity refers to instruments of measurement being accurate and pointing out as good as possible what they are determined to point out. The internal validity of this research is determined by whether the findings actually represent the reality of what was measured. Since it is impossible to know this, researchers often look for other relevant evidence. The variables included in this research are based on previous research, to ensure internal validity (P. Beckers, personal communication, December 5, 2018; Saunders et al., 2009).

External validity refers to the ability to generalise the results of the research. In this research, all planned and developed onshore wind projects in the Netherlands are included. Therefore, the generalizability of this research on a national level is high. However, the results cannot be generalised for other countries. Additional research will be necessary in other countries (P. Beckers, personal communication, December 5, 2018; Saunders et al., 2009).

When evaluating potential secondary data sources, Saunders et al. (2009) suggest a range of validity and reliability criteria. The first is measurement validity. Measurement validity is concerned with whether the secondary data provides the researcher with the information necessary to answer the research question and meet the objectives. If the measures that are being used do not match the measures that researcher needs, the answers will be invalid. There is no problem with measurement validity in this research, because the data used in this research is suitable to answer the research question and meet the objective. Another criteria is that of coverage, which refers both to unwanted data being excluded and ensuring sufficient data remains in the database. For this research a new database was created based on multiple databases. In the new database, unwanted data was excluded and necessary variables were added (Saunders et al., 2009).

3.4.2. Reliability

Reliability refers to the extent to which the same results could be reproduced under a similar methodology (Verschuren & Doorewaard, 2010). A research is reliable when the data collection techniques or analysis procedures will yield consistent findings on other occasions. When using secondary data the data sources have to be assessed on their reliability. The databases used in this research are from reliable organisations and because multiple sources were used, these can be compared on precision (Saunders et al., 2009).

The sources that were used for the database are clearly mentioned in this chapter (chapter 3) and are mostly publicly accessible. The data used in this research is very objective, because it concerns secondary data from government and expert sources. Therefore, the repeatability of this research is high, namely if the research is repeated using the same method the variation in measurements is low. Because the data that was used is secondary data that is largely publicly accessible the reproducibility of this research is also high. Reproducibility refers to the variation in measurements under different conditions, such as a different method (Bartlett & Frost, 2008).

4. Context

In this chapter, recent trends in society and policy concerning onshore wind projects and public participation will be described. First, the discourse of renewable energy policy in the Netherlands will be discussed. Subsequently, the Dutch regulation that is concerned with wind turbines will be described. Finally, the discourse of cooperatives for renewable energy in the Netherlands will be discussed.

4.1. Discourse of renewable energy policy

As was mentioned in the introduction, the Energy Agreement was established in the Netherlands in 2013. More than 40 organisations worked on the establishment of this agreement. Divergent interests are represented in this agreement, since a broad range of organisations, such as employer and employee organisations, nature and environmental organisations, social organisations and financial institutions, have signed it. The main goals of the Energy Agreement are to generate 14 per cent of the energy used in the Netherlands from renewable sources in 2020 and 16 per cent in 2023 (SER, 2013). In order to achieve this, the cabinet of the Netherlands presented a planning for onshore wind energy called “Structuurvisie windenergie op land” in 2014. The goal of this document is to reach an installed capacity of 6000 MW onshore wind energy. In this document, specific areas were also appointed for the development of wind parks (Ministerie van Infrastructuur en Milieu, 2014).

In addition to the Energy Agreement, a design of the Climate Agreement was presented to the cabinet of the Netherlands on the 21st of December 2018. The national Climate Agreement is the Dutch contribution to the Paris Agreement. In 2015, 192 countries signed the Paris Agreement, to reduce climate change and limit global warming to well below 2 degrees Celsius. The creation of the design of Climate Agreement was similar to that of the Energy Agreement and the Dutch government also included a broad range of organisations (Klimaatakkoord, n.d.). In the document, agreements were laid down to reduce carbon emissions with 49 per cent in 2030 (compared to 1990 levels). In order to reach this aim, fossil energy sources have to be replaced with renewable energy sources both onshore and offshore. As was mentioned in the introduction (paragraph 1.1.) an aspiration for 50 per cent local ownership (by citizens and local businesses) of the production of onshore renewable energy by 2030 was included in the design of the Climate Agreement. This is only an aspiration and there is room for deviation, nevertheless it is likely that local ownership will become more important in the future (SER, 2018).

Next to the Climate Agreement, the House of Representatives (In Dutch: Tweede Kamer) of the Netherlands has agreed to the Climate Act. The Climate Act is meant to secure long-term goals and the realisation of the Climate Agreement and the Energy Agreement. The Climate Act sets the goals of a 95 per cent GHG emissions reduction and 100 per cent CO_2-neutral production of electricity in 2050. Furthermore, the Climate Act states that every 5 years a Climate Plan, with measures to reach the goals, must be made (SER, 2018; A. de Vries & P. Schmeitz, personal communication, November 30, 2018). To provide spatial plans, it was included in the Climate Agreement that municipalities, provinces and water boards have to work together in regions to make Regional Energy Strategies (RES). The Netherlands has been divided into 30 regions. In the RES a region can formulate its own measures to contribute to the national agreements (Nationaal Programma RES, n.d.; SER, 2018).

To stimulate the production of renewable energy several subsidy schemes have been in place in the Netherlands. In 2011, the SDE+ (Incentive Renewable Energy) subsidy was introduced for companies and organisations that are going to produce renewable energy, such as onshore wind energy (RVO, n.d.-a; Ministerie van Infrastructuur en Milieu, 2014).

4.2. Regulation wind turbines

The development of a wind park in the Netherlands requires permits. Before the application of permits can be submitted, an Environmental Impact Assessment (EIA) has to be executed in most cases. The EIA is a procedure that has to be carried out before a spatial decision of substantial size can be taken. In an EIA, the environmental impact of the wind turbines is assessed. Both in the EIA procedure and the permit procedure, there is scope for expressing opposition by legal means (RVO, n.d.-b). Due to the researches that have to be executed, the public participation procedures and possible lawsuits, the lead times for wind projects can be 8 up to even 13 years (Elzenga & Schwencke, 2015). Legal procedures were also mentioned as one of the main reasons why provinces will not reach their goals for the installed capacity of wind energy by 2020. Often, local residents and nature organisations express opposition by legal means for plans for wind projects. In most cases the Council of State rejects these appeals, nonetheless they can lead to significant delays (Dirks & Van den Berg, 2019).

In Dutch legislation, standards are included for noise and shadow flicker from wind turbines. Sensitive objects, such as houses, have an annual average noise emission limit of 47 dB and a night limit of 41 dB on the façade of the sensitive object (Bakema & Scholtens, 2015; InfoMil, n.d.). Shadow flicker standards prescribe turbines cannot cause shadow flicker on sensitive objects for more than 17 days a year, lasting 20 minutes each day (Bakema & Scholtens, 2015). These standards are put in place to minimize the nuisance of wind turbines on local residents.

4.3. Discourse of cooperatives for renewable energy

As was mentioned in paragraph 2.1.6. there were 484 cooperatives for renewable energy in the Netherlands in 2018 (HIERopgewekt, 2018). These cooperatives are a form of citizen cooperatives that are concerned with energy savings and supplying or producing renewable energy on a local scale (Oteman, et al., 2017). The legal form cooperation was chosen because (other than in a foundation or association) the members can jointly try to reach common goals, they have a say in the cooperation, they are co-owners and the profit can be distributed among the members (Elzenga & Schwencke, 2015).

Cooperatives for renewable energy are not new in the Netherlands. In the 1980s and 1990s a small number of wind cooperatives was developed. After 2000, new initiatives for renewable energy started to emerge and after 2009 the movement ‘boomed’. Figure 7 (see next page) illustrates the establishment of initiatives for renewable energy in the Netherlands per year. In this figure, the ‘boom’ between 2009 and 2014 can be seen very clearly. The Dutch initiatives form a heterogeneous group with various scales, activities and degrees professionalism (Oteman et al., 2017).

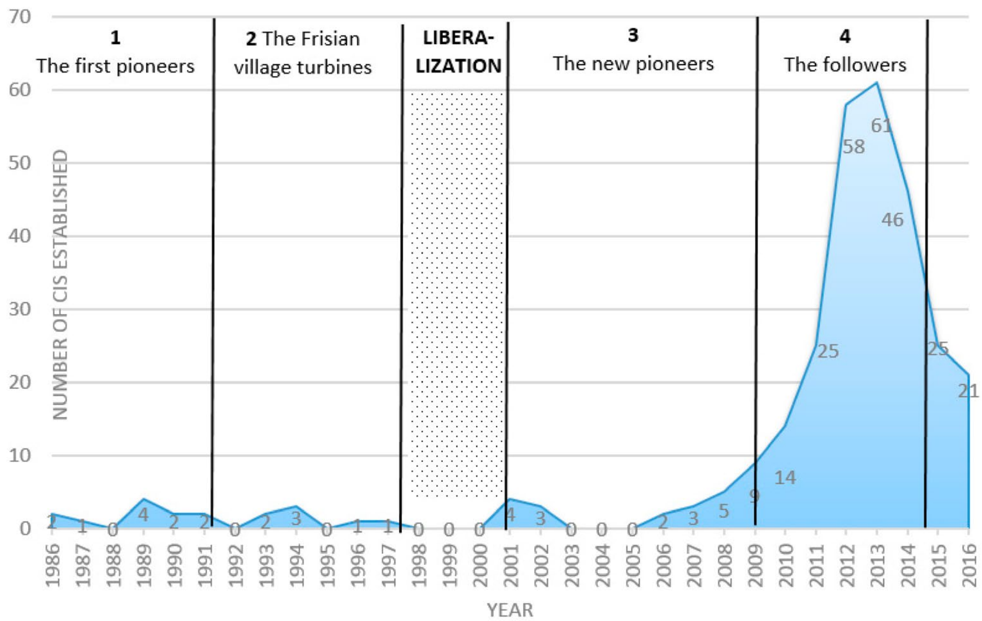

Figure 7. The establishment of initiatives for renewable energy in the Netherlands per year. From "Pioneering renewable energy in an economic energy policy system: The history and development of Dutch grassroots initiatives." by M. Oteman, H.J. Kooij & M. Wiering, 2017, *Sustainability, 9*, p. 6.

Developing wind projects is complex and requires a lot of expertise, time and money. New cooperatives usually lack experience and money, therefore they often seek collaboration with experienced and wealthy project developers, wind cooperatives or energy companies. Investors can also profit from such collaboration, because it can help them facilitate participation. In 2016, the branch association for wind energy drafted a code of conduct for onshore wind energy. This code of conduct was concerned with acceptance and participation. Following the code of conduct developers of wind projects should set up a participation plan. In this plan, developers have to set out who are the stakeholders in the different phases of the project and how these stakeholders will be involved in the project (NWEA, 2016). Following the forthcoming new legislation called the Environment and Planning Act (Omgevingswet) a participation plan will be mandatory in the future. Additionally, it can help investors to achieve the aspiration of the Climate Agreement for 50 per cent local ownership of the production of onshore renewable energy by 2030 (Elzenga & Schwencke, 2015).

5. Results

In this chapter, the data analysis and the results of the data analysis will be presented. First, the descriptive statistics will be presented. This will give an insight in the dataset that was used and the variables that will later be used in the data analysis. Subsequently, the outcomes of the data analysis will be presented and discussed.

5.1. Descriptive statistics

5.1.1. Sample size

Data was collected for 557 cases in total. However, of 174 cases locational data could not be collected, because the locations of these wind project could not be found. These cases with missing location data were mainly plans for wind projects (165 cases). For wind projects that have been built, the exact location was known. However, the locational data of a few wind projects that have been built could not be linked to the dataset. Most errors in the linking process (such as misspellings) could be detected and fixed, but 9 wind projects that have been built could not be linked to the locational data. SPSS automatically does not include the 174 cases with missing values in the analyses, leaving 383 cases available for the analyses.

Cases	Amount
Total collected cases	557
Cases with missing values	174
Total valid cases	383

Table 1. Sample overview.

In only 47 (12.3%) of the cases, a cooperative is involved. Thus, the majority of wind projects are not cooperatively owned. Out of the 383 wind projects, 210 (54.8%) have been granted a permit. 152 of these wind projects have already been developed. 173 (45.8%) of all wind projects in the dataset do not have a permit (yet).

On average it takes 5.7 years for a wind project from the dataset to be developed after the project was initiated. For cooperative wind projects, the average time it takes for a wind project to be developed after it was initiated is 3.7 years and for non-cooperative wind projects this is 6 years. The year in which the last wind turbine was placed was chosen as the year in which the wind project was developed. The average time it takes for a wind project to get a permit is 4.7 years. For cooperative wind projects this is only 2.9 years and for non-cooperative projects it is 4.9 years. The average time it takes for wind projects with a permit to be developed is 1 year.

5.1.2. Wind turbines in vicinity

The vicinity of existing wind turbines was measured with four different distances with the variables 'Turbines within 2 km of project', 'Turbines within 5 km of project' 'Turbines within 10 km of project' and 'Turbines within 15 km of project'. These four radiuses were chosen because of the visibility of wind turbines. When wind turbines are visible for residents, they can gain familiarity with them. The first radius of 2 kilometres was chosen, because within this radius wind turbines are very visible (see paragraph 3.3.1.). Residents within this radius can also be familiar with possible nuisance of wind turbines, such as noise and light and shadow flicker. Within the radius of 5 kilometres, wind turbines can be expected to be less visible. Within the radius of 10 kilometres wind turbines with a height of 100 metres are still visible with average weather conditions, although they compromise only a small part of the view. However, new wind turbines can have a height of 200 metres or more, therefore the radius of 15 kilometres was also added. Besides measuring familiarity through visibility, residents within these radiuses could have gained familiarity with wind turbines due to experience with previous spatial and permit procedures. The average amount of existing wind turbines at the moment a wind project was initiated is illustrated in the table below (table 4). The averages have been rounded to one decimal place.

Wind turbines within:	Mean
2km	7
5km	15
10km	27
15km	43.6

Table 2. Average amount of wind turbines in vicinity of wind projects.

5.1.3. Geographical distribution

The independent variables that are added to the models in the data analysis are 'Cooperative' and 'Turbines within … km of project' (2km, 5km, 10km or 15km). The provinces are included as control variables in the analyses, because for example different policies of provinces might lead to differences amongst the provinces. The first map below (figure 8) illustrates how the wind projects in this dataset are distributed geographically over the provinces. Provinces such as Utrecht, Limburg, Drenthe and Overijssel have relatively few wind projects. In Flevoland and Friesland there are also relatively few wind projects, even though these provinces are known for having many wind turbines. In Friesland this can be explained because there are a lot of solitary wind turbines, which were excluded from the database. Figure 9 illustrates how the MWs of wind projects in this dataset are distributed geographically over the provinces. The MWs in a province are determined by the amount of wind turbines and the MWs per wind turbine, as larger wind turbines usually have a larger capacity. Figure 9 shows that the even though there are only 22 wind projects in Flevoland, this province has the most MWs (1873 MW). This is because the province of Flevoland has made plans for only a few large wind parks. This explains why there are only a few wind projects in Flevoland, despite having many wind turbines.

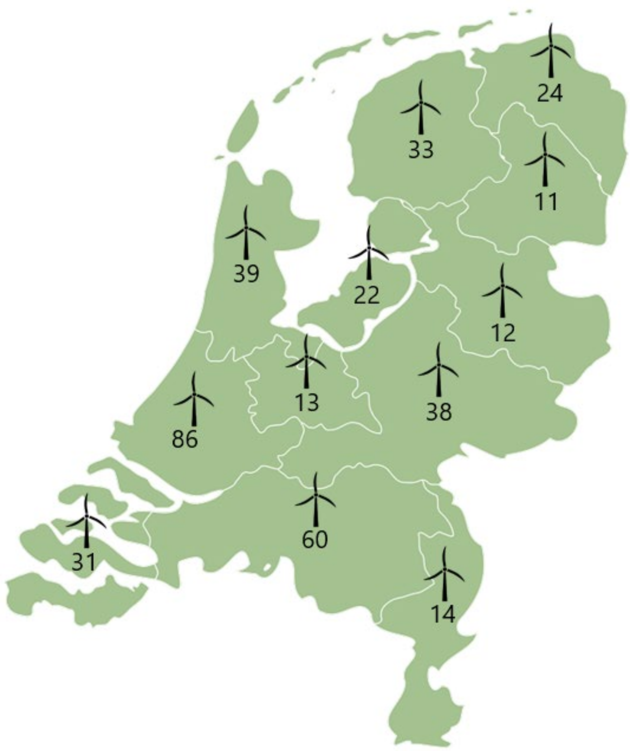

Figure 8. Geographical distribution of wind projects over provinces.

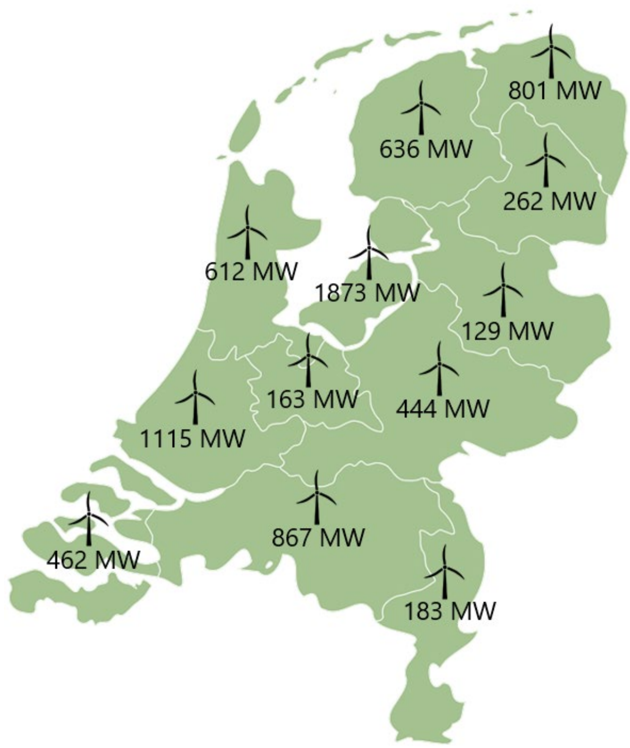

Figure 9. Geographical distribution of megawatts wind power over provinces.

	Percentage MWs of total	
	Dataset[1]	*MWOL 2017*[2]
Drenthe	3,5%	4,3%
Flevoland	24,8%	25,1%
Friesland	8,4%	8,1%
Gelderland	5,9%	3,8%
Groningen	10,6%	14,7%
Limburg	2,4%	1,5%
Noord Brabant	11,5%	7,9%
Noord Holland	8,1%	10,4%
Overijssel	1,7%	1,3%
Utrecht	2,2%	1,0%
Zeeland	6,1%	8,3%
Zuid Holland	14,8%	13,6%

Table 3. Percentages megawatts per province of dataset and Monitor Wind op Land 2017 (RVO, 2018).

Table 5 shows a comparison of the percentage of MWs of the total dataset and the Monitor Wind op Land 2017 per province. This table shows that the percentages per province in the dataset and the Monitor Wind op Land 2017 are very similar to each other. Therefore, the cases in the dataset are a good reflection of the geographical distribution of existing wind parks and plans for wind parks in the Netherlands.

5.1.4. Locational factors

Five locational factors were included in the analyses as control variables. These variables control for locational factors that might influence whether is wind project is being granted a permit or being developed. The first variable is '0-10 houses'. This variable refers to whether there are 0 to 10 houses or more within 500 metres of the wind project**Error! Reference source not found.**. This variable was added because when there are many houses within 500 metres of a wind project, this means there are many residents living close by the wind project. Local residents can oppose to the wind project via legal means and thereby inhibit the wind project from receiving a permit and being developed. The division between 0 to 10 houses and more than 10 houses within 500 metres was chosen because 0 to 10 houses within 500 metres are not expected to cause much opposition. When there are more than 10 houses within 500 metres the opposition is expected to increase, as residents take on collective action more easily. Nevertheless, this division is always partly arbitrary.

[1] These percentages refer to the amount of wind power capacity in MW that was included in the dataset. This are wind projects from initiatives to developed wind projects in the period 2002-2019, excluding the invalid cases mentioned in paragraph 5.1.1.

[2] These percentages refer to the amount of wind power capacity in the Netherlands in MW that has already been developed, is currently being developed, is in the procedure for a permit, is in the spatial procedure and is in a preliminary stage according to the Monitor Wind op Land 2017 (RVO, 2018).

On average there are 70 (mean=69.98) houses within 500 metres of a wind project. There are 227 (59.3%) wind projects with less than 10 houses within 500 metres. The maximum number of houses within 500 metres of a wind project is 4924. This is 'Windpark Wieringermeer, deel NUON - opschaling'. The plan area of this wind project is very large, therefore it is likely that the amount of houses within 500 metres of the turbines of this wind project will be lower in reality.

Other locational factors that were added to the model are the control variables 'Within 100m of the railway', 'Within 100m of a business park', 'Within a nature area' and 'Large road'. 'Large road' refers to wind projects within 100 metres from either a national or provincial road. These variables were added because locations nearby a railway, large road or business park are often designated as suitable locations for wind projects. Nature areas on the other hand are not designated as suitable locations for wind projects and can even conflict with legislation. The nature areas that were added to this analysis are Natura2000 areas. Out of 383 wind projects, 55 (14.4%) are in a nature area. 166 wind projects (43.3%) are within 100 metres from a large road. 73 (13.1%) of the wind projects are within 100 metres from a railway. Furthermore 142 (37.1%) wind projects are within 100 metres from a business park.

5.1.5. Political factor

The variable 'Political – Majority positive' was also added as a control variable. It refers to whether the majority of inhabitants of the municipality in which the plan is located vote for political parties in favour of wind energy in national elections. Only 23 (6%) of the wind projects are located in municipalities in which a majority of the inhabitants vote for political parties in favour of wind turbines. In paragraph 3.3.1. it was explained how the categorisation of political parties was made.

5.1.6. Other variables

Other control variables that were used in the analyses were 'Maximum capacity', 'BLOW period (2002-2008)', 'Intermunicipal plan' and 'Adjustment to wind park'. The variable 'Maximum capacity' refers to the maximum capacity in MW a wind project will have. This variable illustrates the size of a wind park in MW. The maximum capacity of wind projects in the dataset varies from 0.6 to 329 MW with a mean of 19.7 MW.

The variable ‘BLOW period (2002-2008)’ refers to a period in which the BLOW (Bestuursovereenkomst Landelijke Ontwikkeling Windenergie) policy was in place. This was a national agreement that was aimed at increasing the wind capacity in the Netherlands to 1500 megawatt in 2010 (BLOW, 2001). The BLOW was a top-down policy approach, while in recent years policy has become more bottom-up. 159 (41.5%) of the wind projects in the dataset were initiated in the BLOW period.

The variable ‘Intermunicipal plan’ refers to wind projects that are located in at least two municipalities. Only 12 (3.1%) of the 383 wind projects are intermunicipal plans.

25 of all cases are expansions of existing wind parks and 41 cases are a scale up of a wind park (meaning the old turbines are removed and replaced for larger turbines). All expansions and scale ups are grouped together as ‘Adjustment to wind park’. There are 65 adjustments to wind parks, because one of the wind projects concerns both an expansion and upscaling.

5.3. Data analysis

5.2.1. Kaplan Meier survival plots

In this paragraph, the outcomes of the data analysis will be presented and discussed. The Cox’s regression was executed to answer the main question. The main assumption of the Cox’s regression is the proportional hazards assumption. This means that the hazard ratio between two groups remains constant over time. This assumption was tested for the two groups: ‘cooperative wind projects’ and ‘non-cooperative wind projects’, by producing Kaplan Meier survival plots. The proportional hazard assumption is met when the lines of the two groups in the Kaplan Meier survival plot are approximately parallel and do not cross each other. If these conditions are not met the hazard ratio between cooperative and non-cooperative wind projects does not remain constant over time and differences between the two groups can be time dependent.

The Kaplan Meier survival plots show the cumulative proportion of wind projects "surviving" at the end of the interval. The interval is the lead time period that was chosen. In figure 10 (below) this was the lead time from initiative to permit. In this graph, surviving means the wind project has not been granted a permit. Thus, every year the wind project "survives", it has been delayed another year. Figure 10 illustrates that wind projects in which cooperatives are involved are granted a permit faster than wind projects without cooperatives. The proportion of cooperative wind projects "surviving" namely decreases faster than the proportion of non-cooperative wind projects. The lines of the plot are not completely parallel and the lines do cross each other. Since the lines only cross once in the beginning of the lead time and the group 'cooperative' only has a slightly higher cumulative survival rate in the beginning, this does not indicate a difference in how the groups score in different stages of the lead time. However, it can still be argued that the proportional hazard assumption is not met for the lead time from initiative to permit due to the lines not being approximately parallel.

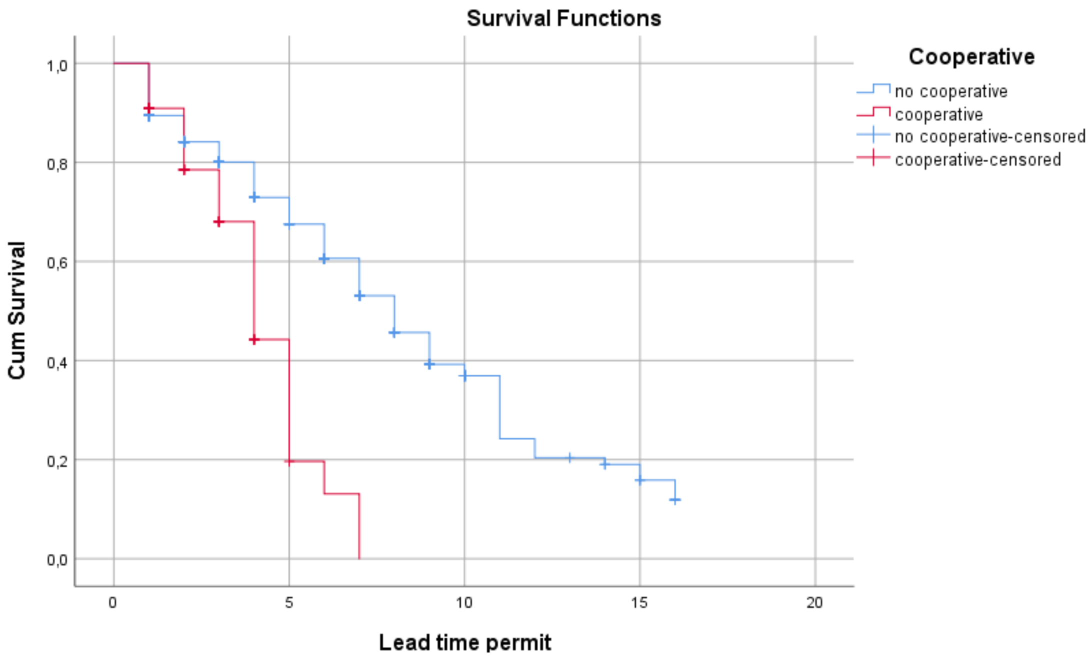

Figure 10. Kaplan Meier survival plot of the lead time from initiative to permit of cooperative and non-cooperative wind projects.

Figure 11 shows the Kaplan Meier survival plot of the lead time from initiative to development. This graph also illustrates that cooperative wind projects are developed faster. The proportion of cooperative wind projects "surviving" namely decreases faster than the proportion of non-cooperative wind projects. The lines do not cross each other, but it could be argued the lines are not approximately parallel. Therefore, it can also be argued the proportional hazard assumption is not fully met for the lead time from initiative to development.

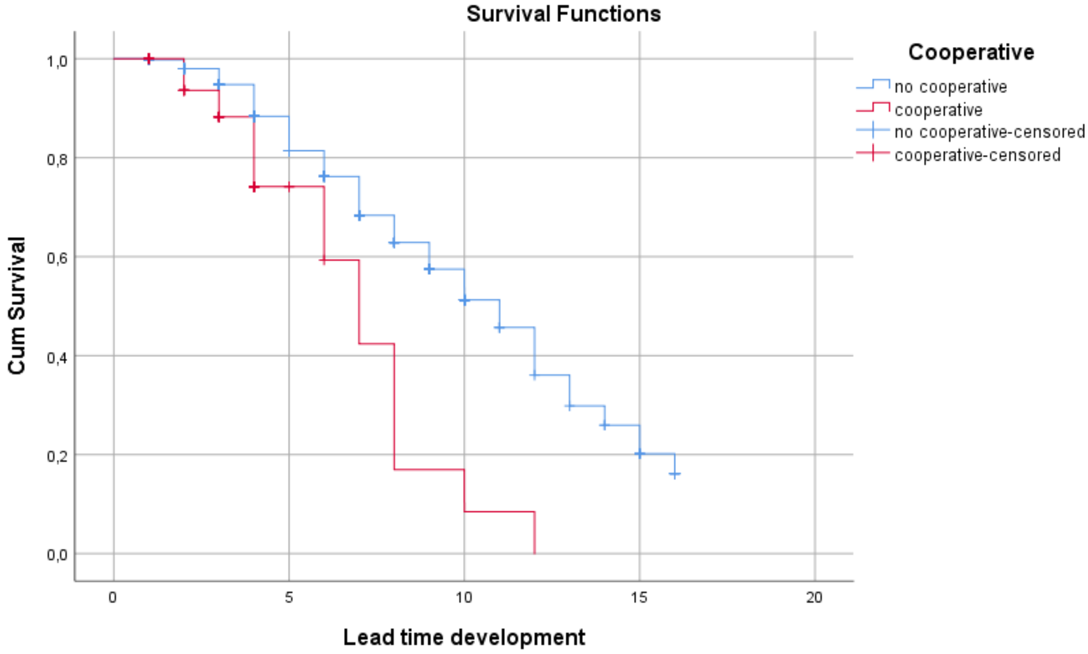

Figure 11. Kaplan Meier survival plot of the lead time from initiative to development of cooperative and non-cooperative wind projects.

Figure 12 shows the Kaplan Meier survival plot of lead time from permit to development. This graph also illustrates that from the moment a wind project was granted a permit it takes slightly longer for non-cooperative wind projects to be developed. The lines of the plot also do not cross each other and are approximately parallel. This means it can be assumed that the proportional hazards assumption is met.

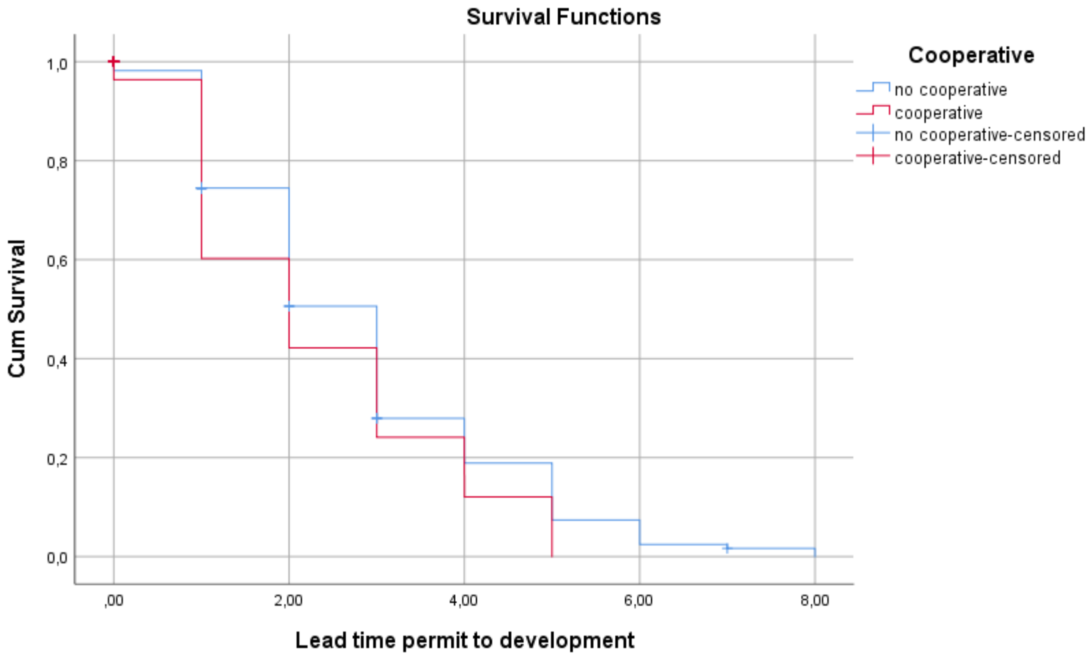

Figure 12. Kaplan Meier survival plot of the lead time from permit to development of cooperative and non-cooperative wind projects.

It can be argued that for the lead time from initiative to permit and the lead time from initiative to development the proportional hazards assumption is not met, because the lines are not parallel. However, the condition for the proportional hazards assumption is that lines should be approximately parallel. What approximately parallel means can be up for interpretation. Therefore, in this research, the Cox regression will be executed, but it should be noted that the proportional hazard assumption for the lead time from initiative to permit and the lead time from initiative to development can said to be violated.

5.2.2. Lead time from initiative to permit

The first hypothesis (**H_1**) and the second hypothesis (**H_2**) were tested in the first four models. In each model a different radius for the variable 'Turbines within … km of project' was used, as was mentioned in paragraph 5.1.2. **H_1** was that cooperative wind projects have a higher chance of being granted a permit, than non-cooperative wind projects. **H_2** was that wind projects in vicinity of already existing wind turbines have a higher chance of being granted a permit, than wind projects without existing wind turbines in the vicinity. These hypotheses were tested by executing a Cox's regression of the lead time to permit. The Cox's regression of the lead time to permit was executed four times with the four different radiuses for wind turbines in the vicinity of a project. This can give insight in the effect of different distances to existing wind turbines on the lead time from initiative to permit. It can show whether the effect decreases or increases as the radius becomes larger, and how much it decreases or increases.

In **Error! Reference source not found.** the model fitting of all four models is shown. The model fitting is tested with the likelihood ratio test. This tests the improvement of the model fit of adding predictor variables to the model, compared to a null model with no predictor variables. The likelihood ratio test of model 1 relative to a null (intercept only) model suggests the model is a significant [$x^2(23)=85.999$, $p<.001$] improvement in fit relative to the null model. Model 2 [$x^2(23)=87.353$, $p<.001$], model 3 [$x^2(23)=90.087$, $p<.001$] and model 4 [$x^2(23)=89.454$, $p<.001$] are also a significant improvement in fit relative to the null model. This infers that adding the predictor variables in all four of these models makes the models statistically significant and at least one of the predictor variables is statistically significant.

Model fitting information	*Relative to null model*
Model 1 (wind turbines within 2 km)	
-2 Log Likelihood	2045.357
Chi-square (df)	85.999 (23)***
Model 2 (wind turbines within 5 km)	
-2 Log Likelihood	2044.004
Chi-square (df)	87.353 (23)***
Model 3 (wind turbines within 10 km)	
-2 Log Likelihood	2041.270
Chi-square (df)	90.087 (23)***
Model 4 (wind turbines within 15 km)	
-2 Log Likelihood	2041.902
Chi-square (df)	89.454 (23)***

** p ≤ .05, ** p ≤ .01, *** p < .001.*

Table 4. Model fitting of Cox's regression analysis of lead time to permit.

5.2.2.1. Cooperative wind projects

The results of the Cox's regression analysis of lead time to permit are depicted in the table below (table 7). The Exp (B) shows the hazard ratio. In this model, hazard refers to a wind project being granted a permit. The hazard ratio is a ratio and therefore the odds and not the probability (Mills, 2011). The hazard ratio for 'Cooperative' in model 1 indicates that wind projects in which a cooperative is involved have a 64.1% higher chance of being granted a permit than wind projects without cooperative involved. The p-value shows this chance is significant on a 0.05 level. In models 2, 3 and 4 the variable cooperative is also significant on a 0.05 level. The hazard ratio for the variable cooperative increases for each model in which the distance for turbines in vicinity of the project was larger. In model 2 the chance of being granted a permit for a cooperative wind project is 70.9% higher than non-cooperative wind projects, in model 3 this chance is 81.4% higher and in model 4 81.7% higher. Thus, the first hypothesis (**H_1**) can be confirmed, cooperative wind projects have a higher chance of being granted a permit. The hazard ratio (HR) can be used to calculate the 'probability of being first' (P) with the formula $\mathrm{P} = \frac{HR}{1+HR}$. In these models, this refers to the probability of being granted a permit first. In model 1 the chance a cooperative wind project is granted a permit first is 62.1%, in model 2 this chance is 63.1% and in model 3 and 4 this chance is 64.5%. These chances are opposed to a 50-50 chance when there would be no differences between cooperative and non-cooperative wind projects. This means cooperative wind projects have a higher chance of being granted a permit first.

	Model 1 (2 km)	*Model 2 (5 km)*	*Model 3 (10 km)*	*Model 4 (15 km)*
Predictor	*Exp (B)*	*Exp (B)*	*Exp (B)*	*Exp (B)*
Cooperative	1.641*	1.709*	1.814*	1.817*
Turbines within vicinity of project	1.014**	1.010**	1.009**	1.007**
Intermunicipal project	1.112	1.139	1.167	1.140
Locational factors				
0-10 houses	1.665**	1.684**	1.723**	1.745**
Within 100m of the railway	1.129	1.115	1.096	1.091
Within 100m of a business park	0.960	0.952	1.016	1.075
Within a nature area	0.950	0.952	0.932	0.908
Large road	0.922	0.939	0.965	0.975
Maximum capacity	0.986**	0.987**	0.988**	0.989**
BLOW period (2002-2008)	0.680*	0.717	0.778	0.787
Adjustment to wind park	0.653	0.664	0.627*	0.633*
Political – Majority positive	1.432	1.406	1.356	1.392
Provinces (fixed effect)	Yes	Yes	Yes	Yes

** P ≤ .05, ** P ≤ .01.*

Table 5. Results of Cox's regression analysis of lead time to permit.

5.2.2.2. Vicinity of wind turbines

The hazard ratio for 'Turbines within 2 km of project' indicates that for each additional wind turbine within 2 kilometres, the project has a 1.4% higher chance of being granted a permit. For each additional turbine within 5 kilometres of the project this chance is 1% higher. For each additional turbine within 10 kilometres of the project the chance is 0.9% higher. Each additional turbine within 15 kilometres increases the chance of a project being granted a permit with 0.7%. These chances are significant on a 0.01 level. Each additional wind turbine within 2 kilometres increases the chance of receiving a permit more than each additional wind turbine within a larger radius. Hence, $\mathbf{H_2}$ can also be confirmed. However, it must be noted that the chance only increases slightly (1.4% to 0.7%) for each additional wind turbine in the vicinity. Furthermore, the effect of an additional wind turbine within close proximity (such as 2 kilometres) is slightly higher than an additional wind turbine within a larger radius.

5.2.2.3. Locational factors

The locational variable '0-10 houses' refers to whether there are 0 to 10 houses within 500 metres of a wind project or more than 10. This variable is significant at the 0.01 level in all models. Wind projects with 0 to 10 houses within 500 metres have a higher chance of being granted a permit than wind projects with more than 10 houses within 500 metres. In model 1 the chance of being granted a permit is 66.5% higher for wind projects with 0 to 10 houses within 500 metres, in model 2 this chance is 68.4% higher, in model 3 72.3% and in model 4 even 74.5%. Hence, this locational factor has a significant (at the 0.01 level) and large effect.

The locational variables 'Within 100m of the railways', 'Within 100m of a business park', 'Within a nature area' and 'Large road' are not significant in any of the models. This means these locational factors do not have a significant effect on whether a wind project is being granted a permit.

5.2.2.4. Other control variables

The variable 'Intermunicipal project' was added to the model to control for the effect of a wind project being located in more than one municipality. The variable is not significant in any of the models and therefore does not have a significant effect on being granted a permit.

The hazard ratio for ‘Maximum capacity’ indicates that for each additional megawatt capacity a wind project has a lower chance of being granted a permit. In model 1 the chance of being granted decreases 1.4% for each additional megawatt capacity, in model 2 this is 1.3%, in model 3 this is 1.2% and in model 4 this is 1.1%. These chances are significant at the 0.01 level in all four models. Even though this chance is significant the chance of being granted a permit only decreases slightly of each additional megawatt in all four models.

The variable ‘BLOW period (2002-2008)’ corrects for the time period in which the wind projects were initiated, based on policy periods. The hazard ratio for ‘BLOW period (2002-2008)’ is only significant at the 0.05 level for model 1. In model 1 the hazard ratio indicates that wind projects that were initiated in the BLOW period have a 32% lower chance of being granted a permit than wind projects that were initiated after the BLOW period. In models 2, 3 and 4 the hazard ratio is not significant, meaning that in these models the chance being granted a permit is not significantly lower for wind projects initiated between 2002 and 2008.

The variable ‘Adjustment to wind park’ indicates whether the wind project is an expansion or upscaling of an existing wind park. In models 1 and 2 the hazard ratio is not significant, this means that in these models, adjustments projects have a significant lower chance of being granted a permit. In models 3 and 4 the hazard ratio is significant at the 0.05 level. In these models, wind project that are an adjustment to an existing wind park have a lower chance of being granted a permit than wind projects that are not an adjustment. In model 3 this chance is 37.3% lower, and in model 4 36.7% lower. It would be expected that the chance of being granted a permit for projects that are adjustments to wind parks would be higher, as local residents are already familiar with wind turbines. It is unclear why in models 3 and 4 this chance is lower.

All provinces where also added to the models as control variables, to adjust for differences between provinces. The variables for the provinces were measured relative to the province of Noord Holland. The hazard ratios for the provinces can be found in appendix 1. These hazard ratios are indicative of the chance that a wind project in a certain province is being granted a permit, relative to a wind project in Noord Holland.

5.2.3. Lead time from initiative to development

The third hypothesis (**H_3**) and the fourth hypothesis (**H_4**) were tested in models 5, 6, 7 and 8. **H_3** was that cooperative wind projects have a higher chance of being developed, than non-cooperative wind projects. **H_4** was that wind projects in vicinity of already existing wind turbines have a higher chance of being developed than wind projects that are not in vicinity of existing wind turbines. These hypotheses were tested by executing a Cox's regression of the lead time to development. Like the previous Cox's regressions this was also executed four times with different radiuses for wind turbines in the vicinity of a project. In table 8 the model fitting of all four models is shown. The likelihood ratio test of model 5 relative to a null (intercept only) model suggest the model is a significant [$x^2(23)=88.074$, $p<.001$] improvement in fit relative to the null. Model 6 [$x^2(23)=88.202$, $p<.001$], model 7 [$x^2(23)=90.287$, $p<.001$] and model 8 [$x^2(23)=91.245$, $p<.001$] are also a significant improvement in fit relative to the null. Thus, this infers that adding the predictor variables in all four of these models makes the models statistically significant and that at least one of the predictor variables is statistically significant.

Model fitting information	*Relative to null model*
Model 5 (wind turbines within 2 km)	
-2 Log Likelihood	1377.867
Chi-square (df)	88.074 (23)***
Model 6 (wind turbines within 5 km)	
-2 Log Likelihood	1377.740
Chi-square (df)	88.202 (23)***
Model 7 (wind turbines within 10 km)	
-2 Log Likelihood	1375.654
Chi-square (df)	90.287 (23)***
Model 8 (wind turbines within 15 km)	
-2 Log Likelihood	1374.696
Chi-square (df)	91.245 (23)***

** p ≤ .05, ** p ≤ .01, *** p < .001.*

Table 6. Model fitting of Cox's regression analysis of lead time to development.

5.2.3.1. Cooperative wind projects

The results of the Cox's regression analysis of lead time from initiative to development are depicted in the table below (table 9). Although the hazard ratio for 'Cooperative' indicates that the chance to be developed is higher for cooperative wind projects than non-cooperative wind projects in all models (45.6% in model 5, 48.8% in model 6, 49.6% in model 7 and 45.9% in model 8), this is not significant. **H_3** cannot be confirmed, because cooperative wind projects do not have a significantly higher chance of being developed than non-cooperative wind projects. This means that even though cooperative wind projects have a significantly higher chance of receiving a permit than non-cooperative wind projects, they are not developed significantly faster.

	Model 5 (2 km)	*Model 6 (5 km)*	*Model 7 (10 km)*	*Model 8 (15 km)*
Predictor	*Exp (B)*	*Exp (B)*	*Exp (B)*	*Exp (B)*
Cooperative	1.456	1.488	1.496	1.459
Turbines within vicinity of project	1.015	1.009	1.008*	1.006*
Intermunicipal project	0.973	0.996	1.006	0.994
Locational factors				
0-10 houses	1.525*	1.523*	1.547*	1.575*
Within 100m of the railway	0.790	0.769	0.774	0.765
Within 100m of a business park	0.963	0.959	1.000	1.036
Within a nature area	0.808	0.811	0.814	0.798
Large road	0.833	0.843	0.860	0.874
Maximum capacity	0.974**	0.975**	0.975**	0.975**
BLOW period (2002-2008)	0.644*	0.664	0.708	0.729
Adjustment to wind park	0.633	0.640	0.603	0.607
Political – Majority positive	2.901**	2.727*	2.714*	2.850*
Provinces (fixed effect)	Yes	Yes	Yes	Yes

** $P \leq .05$, ** $P \leq .01$.*

Table 7. Results of Cox's regression analysis of lead time to development.

5.2.3.2. Vicinity of wind turbines

The hazard ratio for 'Turbines within 2 km of project' indicates that for each additional wind turbine within 2 kilometres the project has a 1.5% higher chance of developed, however this chance is not significant. For each additional turbine within 5 kilometres of the project the hazard ratio is also not significant. For each additional turbine within 10 kilometres of the project this chance is 0.8% higher. This chance is significant at the 0.05 level. Each additional turbine within 15 kilometres increases the chance of a project being developed with 0.6%. This chance is also significant on the 0.05 level. Each additional wind turbine within 10 kilometres increases the chance of being developed slightly more than each additional wind turbine within 15 kilometres. **H_4** can be confirmed for the distances 10 kilometres and 15 kilometres. However, it must be noted that the chance only increases slightly (0.8% to 0.6%) for each additional wind turbine in the vicinity. The vicinity of existing wind turbines does not have a significant effect on the development of wind projects in models 5 and 6.

5.2.3.3. Locational factors

The variable ‘0-10 houses’ is significant at the 0.05 level in all models. Wind projects with 0 to 10 houses within 500 metres have a higher chance of being developed than wind projects with more than 10 houses within 500 metres. In model 5 the chance of being developed is 52.5% higher for wind projects with 0 to 10 houses within 500 metres, in model 6 this chance is 52.3% higher, in model 7 54.7% and in model 8 even 57.5%. This locational factor has a significant and large effect on the development of wind projects.

The other locational variables ‘Within 100m of the railways’, ‘Within 100m of a business park’, ‘Within a nature area’ and ‘Large road’ are not significant in any of the models. This means these locational factors do not have a significant effect on whether a wind project is being developed.

5.2.3.4. Other control variables

The variable ‘Intermunicipal project’ is not significant in any of the models and therefore does not have a significant effect on the development of wind projects.

The hazard ratio for ‘Maximum capacity’ indicates that for each additional megawatt capacity, a wind project has a lower chance of being developed. In model 5 the chance of being developed decreases 2.6% for each additional megawatt capacity. In models 6, 7 and 8 the chance of being developed decreases 2.5% for each additional megawatt capacity. These chances are all significant at 0.01 level in all four models.

The hazard ratio for the variable ‘BLOW period (2002-2008) is only significant at the 0.05 level in model 5. The hazard ratio in model 5 indicates that wind projects that were initiated in the BLOW period have a 35.6% lower chance of being developed than wind project initiated after the BLOW period. The hazard rations in models 6, 7 and 8 are not significant, this means that in these models the chance being granted a permit is not significantly lower for wind projects initiated in the BLOW period.

The hazard ratio for the variable 'Adjustment to wind park' is not significant in these four models. This means that in these models, projects that are adjustments to wind parks do have a significant lower chance of being developed.

All provinces where also added to these models as control variables, to adjust for differences between provinces. In these models the variables for the provinces were also measured relative to the province of Noord Holland. The hazard ratios for the provinces can be found in appendix 2.

5.2.4. Lead time from permit to development

The fifth hypothesis (**H_5**) and the sixth hypothesis (**H_6**) were tested in models 9, 10, 11 and 12. **H_5** was that cooperative wind projects with a permit have an equal chance of being developed as non-cooperative wind projects with a permit. **H_6** is that wind projects with a permit that are in vicinity of already existing wind turbines have an equal chance of being developed as wind projects with a permit that are not in vicinity of existing wind turbines. These hypotheses were tested by executing a Cox's regression of the lead time from permit to development. Like the previous Cox's regressions this was also executed four times with different radiuses for wind turbines in the vicinity of a project. In table 10 the model fitting of all four models is shown. The likelihood ratio test of model 9 relative to a null (intercept only) model suggest the model is not a significant [$x^2(23)=22.907$, $p>.05$] improvement in fit relative to the null. Model 10 [$x^2(23)=29.131$, $p>.05$], model 11 [$x^2(23)=22.933$, $p>.05$] and model 12 [$x^2(23)=23.225$, $p>.001$] are also not a significant improvement in fit relative to the null. This means that adding these variables to the null model does not significantly reduce the log likelihood.

Model fitting information	*Relative to null model*
Model 9 (wind turbines within 2 km)	
-2 Log Likelihood	1293.184
Chi-square (df)	22.907 (23)
Model 10 (wind turbines within 5 km)	
-2 Log Likelihood	1293.186
Chi-square (df)	22.904 (23)
Model 11 (wind turbines within 10 km)	
-2 Log Likelihood	1293.158
Chi-square (df)	22.933 (23)
Model 12 (wind turbines within 15 km)	
-2 Log Likelihood	1292.865
Chi-square (df)	23.225 (23)

** p ≤ .05, ** p ≤ .01, *** p < .001.*

Table 8. Model fitting of Cox's regression analysis of lead time from permit to development.

In the table below (**Error! Reference source not found.**) the results of the Cox's regression analysis of lead time from permit to development are depicted. Even though the models are not a significant improvement in fit relative to the null model, individual coefficients can still be significantly different. Adding these variables to the model does not improve the model fit, but can still show how these factors can influence the development of wind projects with a permit. The variable cooperative is not significant, therefore **H_5** can be confirmed, there is no significant difference in the chance of being developed for cooperative and non-cooperative wind projects with a permit. **H_6** can also be confirmed, there is no significant difference in the chance of being developed for wind projects with a permit within the vicinity of already existing wind turbines and ones that are not in vicinity of existing wind turbines. This can be explained by the fact that this period of time is largely determined by building the project. Cooperatives and professional developers both depend on (often the same) companies to build the wind turbines. It was expected that vicinity of existing wind turbines also does not affect this period. The only variable that is significant in these models is 'BLOW period (2002-2008). In all models the hazard ratio is significant at the 0.05 level. This hazard ratio indicates that the chance of a wind project with a permit initiated in the BLOW period to be developed, is significantly lower than wind projects with a permit initiated after the BLOW period. However, since the model as a whole is not a significant improvement in fit compared to a null model, this variable cannot be interpreted as such.

	Model 9 (2 km)	*Model 10 (5 km)*	*Model 11 (10 km)*	*Model 12 (15 km)*
Predictor	*Exp (B)*	*Exp (B)*	*Exp (B)*	*Exp (B)*
Cooperative	0.923	0.923	0.922	0.915
Turbines within vicinity of project	1.001	1.000	1.001	1.001
Intermunicipal project	0.789	0.785	0.794	0.800
Locational factors				
0-10 houses	1.072	1.071	1.072	1.077
Within 100m of the railway	0.764	0.774	0.762	0.747
Within 100m of a business park	1.031	1.038	1.028	1.027
Within a nature area	0.854	0.859	0.855	0.853
Large road	0.772	0.770	0.774	0.783
Maximum capacity	0.993	0.993	0.993	0.993
BLOW period (2002-2008)	0.583*	0.579*	0.588*	0.607*
Adjustment to wind park	0.763	0.772	0.755	0.743
Political – Majority positive	1.654	1.663	1.646	1.647
Provinces (fixed effect)	Yes	Yes	Yes	Yes

$* P \leq .05$, $** P \leq .01$.

Table 9. Results of Cox's regression analysis of lead time from permit to development.

5.2.5. What do these models illustrate?

H_1, H_2, H_5 and **H_6** are confirmed. **H_3** cannot be confirmed and **H_4** only partly. This means that cooperative wind projects do have a significantly higher chance of *being granted a permit* than non-cooperative wind projects. Nonetheless, cooperative wind projects do not have a significantly higher chance of *being developed* than non-cooperative wind projects. When wind projects have already been granted a permit there is no significant difference in chance of being developed between cooperative wind projects and non-cooperative wind projects. Wind projects in vicinity of already existing wind turbines have a significantly higher chance of *being granted a permit* than wind projects that are not in vicinity of existing wind turbines. This chance is also significantly higher for the *development* of a wind project for the radiuses 10 kilometres and 15 kilometres. As the radius becomes larger the effect of each additional wind turbine within that radius becomes smaller. There is no difference in chance of *being developed* for wind projects that already have a permit due to vicinity of existing wind turbines.

6. Conclusion, discussion and recommendations

In this chapter, the conclusions of this research will be presented. This will be followed by a discussion of these conclusions and the theoretical framework and methodology used to come to these conclusions. Finally, recommendations will be made for policy makers and further research.

6.1. Conclusion

The objective of this research was to gain insight in the effects of cooperative ownership and vicinity of existing wind turbines on the development of, and being granted a permit for, onshore wind projects in the Netherlands. The central research question that followed from this was:

To what extent do cooperative ownership and vicinity of existing wind turbines influence the process of development of, and being granted a permit for, onshore wind projects in the Netherlands?

First, existing academic literature was reviewed and relevant theoretical frameworks and relevant theoretical concepts were discussed. The concepts of 'community ownership' and 'familiarity' were operationalised. A conceptual model was made by adding factors influencing the development of, and receiving a permit for wind projects, such as locational and political factors (see figure 4). The six hypotheses shown in the table below (table 12) were drawn up based on the literature review.

Lead time initiative to permit
1. Cooperative wind projects have a higher chance of being granted a permit than non-cooperative wind projects.
2. Wind projects in vicinity of already existing wind turbines have a higher chance of being granted a permit than wind projects that are not in vicinity of existing wind turbines.
Lead time initiative to development
3. Cooperative wind projects have a higher chance of being developed, than non-cooperative wind projects.
4. Wind projects in vicinity of already existing wind turbines have a higher chance of being developed than wind projects that are not in vicinity of existing wind turbines.
Lead time permit to development
5. Cooperative wind projects with a permit have an equal chance of being developed as non-cooperative wind projects with a permit.
6. Wind projects with a permit in vicinity of already existing wind turbines have an equal chance of being developed as wind projects with a permit that are not in vicinity of existing wind turbines.

Table 10. Summary of hypotheses.

In order to test these hypotheses, a dataset containing data on wind projects in the Netherlands was made. This dataset was compromised of data from reports and databases of (governmental) institutions. Locational and political data was also added to the dataset. The data was analysed using the statistical software programme SPSS. The Cox proportional hazards model was applied to execute a survival analysis. This Cox's regression was used because this is a semi-parametric analysis, meaning that it can deal with many predictor variables, without assuming the chance of occurrence of an event changes over time. The Cox's regression was used to examine the relationship between the chance of a wind project being granted a permit or being developed and predictor variables or covariates.

The independent variables that were added to the models in the data analysis are 'Cooperative' and 'Turbines within 2, 5, 10 or 15km km of project'. Other predictor variables were added as control variables. These are the locational factors '0-10 houses', 'Within 100m of the railway', 'Within 100m of a business park', 'Within a nature area' and 'Large road'. Other control variables were 'Intermunicipal project', 'Maximum capacity', 'Adjustment to wind park', 'BLOW period (2002-2008)' and 'Political – Majority positive'. The provinces were also added as control variables. These control variables were added to the models to correct for effects that are not caused by the independent variables themselves.

The first four models test $\mathbf{H_1}$ and $\mathbf{H_2}$. $\mathbf{H_1}$ can be confirmed, cooperative wind projects have a higher chance of being granted a permit than non-cooperative wind projects. Additionally, cooperative wind projects have a higher chance of being granted a permit first, compared to non-cooperative wind projects. $\mathbf{H_2}$ can also be confirmed, wind project in vicinity of existing wind turbines have a higher chance of being granted a permit than wind projects without existing wind turbines in the vicinity. As the radius for vicinity becomes larger, the effect of each additional wind turbine within that radius becomes smaller.

Models 5 to 8 test $\mathbf{H_3}$ and $\mathbf{H_4}$. $\mathbf{H_3}$ cannot be confirmed, cooperative wind projects do not have a significantly higher chance of being developed than non-cooperative wind projects. $\mathbf{H_4}$ can be confirmed partially, in model 7 (vicinity radius of 10km) and model 8 (vicinity radius of 15km) wind projects in the vicinity of existing wind turbines have a significantly higher chance of being developed. In models 5 and 6 this chance is not significant.

The last four models test **H_5** and **H_6**. **H_5** and **H_6** can both be confirmed, because the last four models are not a significant improvement in fit compared to a null model. This means the predictor variables that are added to the models do not make them significantly different from a model without predictor variables. Thus, the variables 'Cooperative' and 'Turbines within 2, 5, 10 or 15km km of project', as well as the control variables, do not illustrate significant differences.

Cooperative wind projects do have a higher chance of being granted a permit, but do not have a significantly higher chance of being developed. Once wind projects have received a permit there is also no difference in chance of being developed for cooperative and non-cooperative wind projects. This was expected because the lead time between being granted a permit and being developed is largely determined by how fast a project is financed and built. Accordingly, the advantage for cooperative wind projects is during the phase from initiative until the permit is being granted. In this phase, the effect of vicinity of existing wind turbines is also the largest.

6.2. Discussion

This research has attempted to gain insight in the effect of cooperative ownership and vicinity of existing wind turbines on the development of and being granted a permit for wind projects in the Netherlands. This effect has not been studied before on this scale. Therefore, this research has gained new insights in the effects of cooperative ownership and vicinity of exiting wind turbines.

Wüstenhagen et al. (2007), Warren and McFadyen (2010) and (Walker, 2008) have studied the relationship between community ownership and acceptance of and attitudes towards wind parks. These studies have shown that local inhabitants have a more positive attitude towards community-owned wind park. Furthermore, these studies have shown that community-owned projects have higher local acceptance and fewer problems with obtaining planning permission. In addition to these studies, this research has demonstrated that community ownership in the form of cooperative ownership can increase the chance of being granted a permit for a wind project. Although a causal relation between ownership and local acceptance cannot be proven with this research, the conclusions of this research are in line with the studies of Wüstenhagen et al. (2007), Warren and McFadyen (2010) and Walker (2008). Likewise, this conclusion supports the statement by Walker that community-owned projects have fewer problems with obtaining planning permission.

Van der Horst's (2007) study has shown that people living close to proposed developments are least likely to be supportive, because they are directly affected by it. Whilst people living close to existing developments are most likely to be supportive, because their personal experience makes them more familiar with the technology. This research cannot prove a causal relation between living in the vicinity of existing wind turbines and the attitude of local residents. Nevertheless, this research has shown that wind projects in vicinity of existing wind turbines have a higher chance of being granted a permit and partially have a higher chance of being developed. This conclusion is in line with study of Van der Horst.

Wolsink (2007a; 2007b) has studied the development of wind power attitudes. Wolsink has illustrated this development with a U-shaped development pattern going from high acceptance when people are not confronted with a wind project in their area, to lower acceptance during the siting phase and to higher acceptance a reasonable time after the wind project has been constructed. Wolsink's study has also illustrated there are more types of opposition than only the NIMBY syndrome. This research has not studied opposition and local acceptance, but rather the chance for a wind project of being granted a permit and being developed. Even though this is different, it can assumed that opposition and local acceptance can influence the chance for a wind project of being granted a permit and being developed. Therefore, the conclusions of this research are in line with the study of Wolsink. This research can be seen as an addition to the studies that were mentioned, because it is an extension of these studies.

However, this research also has several limitations. Due to limited time and access to resources certain sources could not be added to the database. For example the 'Monitor Wind op Land 2018' could not be added because this document was published after the analyses in ArcGIS were finished. Moreover, maps of appreciation of the landscape and NNN (Natuur Netwerk Nederland) areas could not be added to ArcGIS. These sources could have made the database more complete and increase the measurement validity of the research.

Some wind projects could also not be added to the analyses, because they were missing locational factors. Of 174 wind projects locational data could not be added to the database, because the locations of these wind projects could not be found or because the locational data could not be linked to the database due to errors in the linking process. The wind projects of which the location could not be found are mainly older plans for wind projects that could not be found online. This decreases the coverage of this research, which refers to unwanted data being excluded from the database while ensuring sufficient data remains in the database. By adding locational factors to the database cases were namely excluded from entering the database. Besides that, the cases that were left out were mainly older plans, so these values are not missing completely at random.

Furthermore, not all factors that can influence the development of and being granted a permit for wind project could be added to the analysis. Based on the literature study the most important factors were added. In the analyses the concept of familiarity with wind turbines was for example only measured with the indicator vicinity to existing wind turbines. However, as was mentioned in paragraph 2.1.4., Devine-Wright (2009) argues that it is unlikely that familiarity solely derives from direct experience. He argues mediated experience, through exposure to mass media sources or interpersonal communication, also influence familiarity. Unfortunately, these factors could not be studied within the scope of this research.

Additionally, for proximity of houses the division 0 to 10 houses and more than 10 houses within 500 metres was chosen. This division was chosen because 0 to 10 houses within 500 metres are not expected to cause much opposition. When there are more than 10 houses within 500 metres the opposition is expected to increase, as residents take on collective action more easily. Nevertheless, this division is also partly arbitrary. In this division, wind projects with 11 houses within 500 metres are divided in the same category as wind projects with for example 200 houses within 500 metres. If there are 11 houses within 500 metres this might not cause a lot more local resistance, but 200 houses within 500 metres could cause a lot more local resistance. Since this problem will arise with any division this division was chosen as most appropriate.

Another limitation of this research is the use of the Cox's regression to analyse the data. Even though the Cox's regression is an appropriate regression analysis to answer the main question, it is not completely suitable for this dataset as the lines in the Kaplan Meier survival plots are not approximately parallel. A parametric analysis would overcome this problem, but this was beyond the scope of this research.

Since the data that was used in this research mainly concerns secondary data from government and expert sources, the influence of the researcher on the results was limited. The researcher did influence which variables were included in the models and how the analyses were interpreted. These choices were based on knowledge from existing literature, thereby variation in measurement if the research would be reproduced is minimised.

6.3. Recommendations

6.3.1. Practise recommendations

This research gives insight in the effect of cooperative ownership on the development of wind projects. One of the conclusions of this research is that cooperative wind projects have a significantly higher chance of being granted a permit than non-cooperative wind projects. Additionally, cooperative wind projects have a higher chance of being granted a permit first, compared to non-cooperative wind projects. Thus, in the phase from initiative to being granted a permit cooperative has an advantage over non-cooperative wind projects. As was stated in paragraph 1.1. an aspiration for 50 per cent local ownership (by citizens and local businesses) of the production of onshore renewable energy sources by 2023 was included in the design of the Climate Agreement. This research would support this aspiration, because wind projects with local ownership via cooperatives are proven to have a higher chance of receiving a permit. Criticism for this could be that there are too few cooperatives to arrange 50 per cent local ownership or that cooperatives are not professional enough to arrange this. Although this criticism might be valid, policy makers could actively stimulate cooperatives and help them to become more professional. By overcoming these difficulties, the advantage of cooperatives could be put to use and the development of wind projects could be sped up. This, in turn, can contribute to the transition towards renewable energy and help to achieve the goals set for GHG emission reductions. Ultimately contributing to a more sustainable and carbon neutral society.

Another conclusion that was drawn from this research is that wind projects in vicinity of existing wind turbines have a higher chance of being granted a permit. Policy makers and developers of wind projects could apply this knowledge when appointing locations for wind projects.

6.3.2. Scientific recommendations

Recommendations can also be made for further research. If there would have been more time and resources available for this research, the sources that were not added to the dataset could be added. This are the ‘Monitor Wind op Land 2018’ and ArcGIS data on appreciation of the landscape and NNN (Natuur Netwerk Nederland). These sources can make the database more complete. The cases with missing locational factors could be reviewed again, in case missing locations can be added this would enlarge the amount of cases that can be used for the analysis.

For further research a parametric analysis could be executed, since this is a more appropriate analysis for this dataset than the Cox's regression. Nonetheless, this research has demonstrated the broad applicability of the Cox's regression.

The dataset that was used in this research could also be used for a comparison with different countries, a similar dataset from a different countries is necessary. This could give insight in the effect of cooperative ownership and vicinity of existing wind turbines in other countries.

Finally, the concept of familiarity with wind energy in relation to acceptance of wind projects could also be researched more in depth. In this research, the concept of familiarity was solely studied based on vicinity of existing wind turbines, while for example exposure to mass media could also influence familiarity with wind energy. A media analysis could be executed to study the effect of coverage of wind energy in mass media in relation to acceptance or development of wind projects.

6.3.3. Recommendations for conceptual model

In paragraph 2.2.1., a conceptual model was created based on the theoretical frameworks and concepts that were discussed in the literature review (paragraph 2.1.). Based on the results of this research we can review this conceptual model. The cooperative ownership and vicinity of existing wind turbines both influence the chance of being granted a permit. The chance of development of a project is not significantly influenced by cooperative ownership and only partly by vicinity of existing wind turbines. Thus, this relation would have to be changed in the conceptual model. Furthermore, the variable 'intermunicipal project' and all the locational factors did not have a significant effect on the chance of being granted a permit for, or the development of wind projects. Therefore, the concepts 'intermunicipal cooperation' and 'locational factors' can be removed from conceptual model.

References

Aitken, M. (2010). Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature. *Energy Policy*, *38*(4), 1834-1841.

Anshelm, J., & Simon, H. (2016). Power production and environmental opinions–Environmentally motivated resistance to wind power in Sweden. *Renewable and sustainable energy reviews*, *57*, 1545-1555.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners*, *35*(4), 216-224.

Bakema, G. & Scholtens, B. (2015). *Alles over windenergie. De feiten op een rij.* Enschede: Geen blad voor de mond BV.

Bartlett, J. W., & Frost, C. (2008). Reliability, repeatability and reproducibility: analysis of measurement errors in continuous variables. *Ultrasound in Obstetrics and Gynecology*, *31*(4), 466-475.

Buis, M. L. (2006). An introduction to survival analysis. *Department of Social Research Methodology Vrije Universiteit Amsterdam.* Retrieved on 08-10-2019, from http://www.maartenbuis.nl/wp/survival.pdf

BLOW (2001). *Bestuursovereenkomst Landelijke Ontwikkeling Windenergie (BLOW).* Retrieved on 25-09-2019, from https://bestanden.noord-holland.nl/internet/programmabegroting2010/BLOW.pdf

CBS (2018). *Hernieuwbare energie in Nederland 2017*. Retrieved on 14-02-2019, from https://www.cbs.nl/nl-nl/publicatie/2018/40/hernieuwbare-energie-in-nederland-2017

CBS StatLine (2019*). Windenergie; elektriciteitsproductie, capaciteit en windaanbod per maand.* Retrieved on 03-05-2019, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/70802ned/table?ts=1556888037812

CLO (2014, July 9). *Zichtbaarheid en invloed op landschapswaardering van windturbines, 2012*. Retrieved on 30-09-2019, from https://www.clo.nl/indicatoren/nl1408-zichtbaarheid-windturbines

CLO (2018, April 24). *Openheid landschap*. Retrieved on 09-05-2019, from https://www.clo.nl/indicatoren/nl1022-openheid-landschap

Devine‐Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place‐protective action. *Journal of community & applied social psychology*, *19*(6), 426-441.

Dirks, B. & Van den Berg, J. (2019, March 11). Provincies slagen er niet in voldoende windmolens te bouwen. *De Volkskrant*. Retrieved on 11-03-2019, from https://www.volkskrant.nl/nieuws-achtergrond/provincies-slagen-er-niet-in-voldoende-windmolens-te-bouwen~bdca913f/?utm_source=link&utm_medium=app&utm_campaign=shared%20content&utm_content=free

Dröes, M. I., & Koster, H. R. (2016). Renewable energy and negative externalities: The effect of wind turbines on house prices. *Journal of Urban Economics*, *96*, 121-141.

Elzenga, H., & Schwencke, A. M. (2015). Lokale energiecoöperaties: nieuwe spelers in de energie. *Bestuurskunde*, *24*(2), 17-26.

Enevoldsen, P., & Sovacool, B. K. (2016). Examining the social acceptance of wind energy: Practical guidelines for onshore wind project development in France. *Renewable and Sustainable Energy Reviews*, *53*, 178-184.

Farthing, S. (2016). *Research Design in Urban Planning. A Student's Guide.* London: Sage Publications.

Fast, S., & Mabee, W. (2015). Place-making and trust-building: The influence of policy on host community responses to wind farms. *Energy Policy*, *81*, 27-37.

Fox, J. & Weisberg, S. (2011). Cox Proportional-Hazards Regression for Survival Data in R. *An Appendix to An R Companion to Applied Regression* (2nd edition).

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, *2*(163-194), 105.

HIERopgewekt (2017). *Lokale Energie Monitor 2017*. Retrieved on 14-02-2019, from https://www.hieropgewekt.nl/uploads/inline/Lokale_Energie_Monitor_2017_2.pdf

HIERopgewekt (2018). *Lokale Energie Monitor 2018*. Retrieved on 14-02-2019, from https://www.hieropgewekt.nl/uploads/inline/2018%20PDF%20Lokale%20Energie%20Monitor%20DEF02_0.pdf

InfoMil (n.d.). *Geluid in 't kort - Windturbines*. Retrieved on 04-03-2019, from https://www.infomil.nl/onderwerpen/integrale/activiteitenbesluit/activiteiten/installaties/windturbine/geluidsvoorschriften/

Jolivet, E., & Heiskanen, E. (2010). Blowing against the wind—An exploratory application of actor network theory to the analysis of local controversies and participation processes in wind energy. *Energy Policy*, *38*(11), 6746-6754.

Klimaatakkoord (n.d.). *Over het klimaatakkoord*. Retrieved on 04-03-2019, from https://www.klimaatakkoord.nl/klimaatakkoord

Krohn, S., & Damborg, S. (1999). On public attitudes towards wind power. *Renewable energy*, *16*(1-4), 954-960.

Langer, K., Decker, T., & Menrad, K. (2017). Public participation in wind energy projects located in Germany: Which form of participation is the key to acceptance?. *Renewable Energy*, *112*, 63-73.

Langer, K., Decker, T., Roosen, J., & Menrad, K. (2018). Factors influencing citizens' acceptance and non-acceptance of wind energy in Germany. *Journal of Cleaner Production*, *175*, 133-144.

Mauritzen, J. (2014). Scrapping a wind turbine: Policy changes, scrapping incentives and why wind turbines in good locations get scrapped first. *The Energy Journal*, 157-181.

Middlemiss, L. & Parrish, B. D. (2010). Building capacity for low-carbon communities: The role of grassroots initiatives. *Energy Policy,* 38(12), 7559-7566.

Mills, M. (2011). *Introducing survival and event history analysis*. London: Sage.

Ministerie van Infrastructuur en Milieu (2014). *Structuurvisie Windenergie op land*. Retrieved on 18-02-2019, from https://www.rijksoverheid.nl/documenten/rapporten/2014/03/31/bijlage-1-structuurvisie-windenergie-op-land

Ministerie van Infrastructuur en Milieu (2016). *Pionieren met de Omgevingswet – Houd het eenvoudig, maak het beter.* Retrieved on 21-03-2019, from https://www.rijksoverheid.nl/documenten/rapporten/2016/12/15/pionieren-met-de-omgevingswet

Nationaal Programma RES (n.d.). *Regio's op de kaart*. Retried on 30-04-2019, from https://www.regionale-energiestrategie.nl/kaart+doorklik/default.aspx

Negro, S. O., Alkemade, F. & Hekkert, M. P. (2012). Why does renewable energy diffuse so slowly? A review of innovation system problems. *Renewable and Sustainable Energy Reviews, 16*(6), 3836-3846.

Newman, I., & Benz, C. R. (1998). *Qualitative-quantitative research methodology: Exploring the interactive continuum*. SIU Press.

NWEA (2016). Gedragcode Acceptatie & Participatie Windenergie op Land. Retrieved on 14-02-2019, from http://www.nwea.nl/images/PDFs/20161215-Gedragscode-Acceptatie--Participatie-Windenergie-op-Land.pdf

Pols, M. (2015, February 4). Verzet tegen windmolens in 'n jaar weg. *De Gelderlander*, p. 22.

Oteman, M., Wiering, M. & Helderman, J. (2014). The institutional space of community initiatives for renewable energy: a comparative case study of the Netherlands, Germany and Denmark. *Energy, Sustainability and Society, 4*(11), 1-17.

Oteman, M., Kooij, H. J., & Wiering, M. (2017). Pioneering renewable energy in an economic energy policy system: The history and development of Dutch grassroots initiatives. *Sustainability*, *9*(4), 550.

Ozturk, S., Fthenakis, V., & Faulstich, S. (2018). Assessing the Factors Impacting on the Reliability of Wind Turbines via Survival Analysis—A Case Study. *Energies*, *11*(11), 3034.

Rogers, J. C., Simmons, E. A., Convery, I., & Weatherall, A. (2008). Public perceptions of opportunities for community-based renewable energy projects. *Energy policy*, *36*(11), 4217-4226.

RVO (n.d.-a). *Stimulering Duurzame Energieproductie*. Retrieved on 04-03-2019, from https://www.rvo.nl/subsidies-regelingen/stimulering-duurzame-energieproductie

RVO (n.d.-b). Fase windproject - MER en vergunningen. Retrieved on 04-03-2019, from https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/duurzame-energie-opwekken/windenergie-op-land/fases-windprojecten/mer-en-vergunningen

RVO (2014). *Handboek Risicozonering Windturbines*. Retrieved on 28-06-2019, from https://www.rvo.nl/sites/default/files/2014/09/Handboek%20Risicozonering%20Windturbines%20versie%20september%202014.pdf

RVO (2016). *Veiligheid en windturbines*. Retrieved on 28-06-2019, from https://www.rvo.nl/sites/default/files/2019/03/Veiligheid%20en%20windturbines.pdf

RVO (2018). *Monitor Wind op Land 2017*. Retrieved on 30-09-2019, from file:///C:/Users/s4222466/Downloads/monitor-wind-op-land-2017%20(1).pdf

Saidur, R., Rahim, N. A., Islam, M. R., & Solangi, K. H. (2011). Environmental impact of wind energy. *Renewable and sustainable energy reviews*, *15*(5), 2423-2430.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th edition). Pearson education.

SER (2013). *Energieakkoord voor duurzame groei*. . Retrieved on 13-02-2019, from https://www.ser.nl/-/media/ser/downloads/overige-publicaties/2013/energieakkoord-duurzame-groei.pdf

SER (2018). *Ontwerp van het Klimaatakkoord*. Retrieved on 13-02-2019, from https://www.klimaatakkoord.nl/documenten/publicaties/2018/12/21/ontwerp-klimaatakkoord

Seyfang, G. & Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental Politics,* 16(4), 584-603.

Toke, D., Breukers, S., & Wolsink, M. (2008). Wind power deployment outcomes: how can we account for the differences?. *Renewable and sustainable energy reviews*, *12*(4), 1129-1147.

Urgenda (2019). *Windkieswijzer*. Retrieved on 25-06-2019, from https://onzemolen.nl/windkieswijzer/

Van der Horst, D. (2007). NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. *Energy policy*, *35*(5), 2705-2714.

Van Kamp, I., & Van den Berg, F. (2018). Health effects related to wind turbine sound, including low-frequency sound and infrasound. *Acoustics Australia*, *46*(1), 31-57.

Van Kamp, I., Dusseldorp, A., Van den Berg, G. P., Hagens, W. I., & Slob, M. J. A. (2014). *Windturbines: invloed op de beleving en gezondheid van omwonenden: GGD Informatieblad medische milieukunde Update 2013.* Retrieved on 13-02-2019, from https://rivm.openrepository.com/bitstream/handle/10029/261646/200000001.pdf?sequence=3&isAllowed=y

Verschuren, P. & Doorewaard, H. (2010). *Designing a Research Project* (2nd edition). The Hague: Eleven International Publishing.

Walker, G. (2008). What are the barriers and incentives for community-owned means of energy production and use? *Energy Policy,* 36(12), 4401-4405.

Walter, G. (2014). Determining the local acceptance of wind energy projects in Switzerland: the importance of general attitudes and project characteristics. *Energy Research & Social Science*, *4*, 78-88.

Warren, C. R., & McFadyen, M. (2010). Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. *Land use policy*, *27*(2), 204-213.

Wilcox, D. (1994). Community participation and empowerment: Putting theory into practice. *RRA Notes*, *21*, 78-82.

Wolsink, M. (2000). Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support. *Renewable energy*, *21*(1), 49-64.

Wolsink, M. (2007a). Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'. *Renewable and sustainable energy reviews*, *11*(6), 1188-1207.

Wolsink, M. (2007b). Planning of renewables schemes: Deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. *Energy policy*, *35*(5), 2692-2704.

Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy policy*, *35*(5), 2683-2691.

Appendices

Appendix 1. Cox regression - lead time from initiative to permit

Appendix 1.1. – Turbines within 2km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
2045,357	90,805	23	,000	85,999	23	,000	85,999	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	,495	,235	4,452	1	,035	1,641
Turbines within 2km of project	,014	,004	12,114	1	,001	1,014
Intermunicipal project	,106	,354	,090	1	,764	1,112
0-10 houses within 500m	,510	,171	8,855	1	,003	1,665
Within 100m of the railway	,121	,201	,362	1	,547	1,129
Within 100m of a business park	-,041	,169	,060	1	,807	,960
Within a nature area	-,051	,226	,050	1	,823	,950
Large road	-,081	,154	,277	1	,599	,922
Maximum capacity	-,014	,003	16,044	1	,000	,986
BLOW period (2002-2008)	-,385	,174	4,910	1	,027	,680
Adjustment to wind park	-,427	,220	3,759	1	,053	,653
Political - Majority positive	,359	,339	1,122	1	,289	1,432
Province of Drenthe	-,709	,500	2,010	1	,156	,492
Province of Flevoland	,086	,382	,051	1	,822	1,090
Province of Friesland	-,043	,316	,018	1	,893	,958
Province of Gelderland	-,826	,344	5,761	1	,016	,438
Province of Groningen	,348	,337	1,066	1	,302	1,416
Province of Limburg	-1,338	,624	4,599	1	,032	,262
Province of Noord Brabant	-,744	,284	6,843	1	,009	,475
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,177	,411	,187	1	,666	,837
Province of Utrecht	-,644	,495	1,689	1	,194	,525
Province of Zeeland	,097	,295	,109	1	,742	1,102
Province of Zuid Holland	-,545	,264	4,260	1	,039	,580

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 1.2. – Turbines within 5km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			*Change From Previous Step*			*Change From Previous Block*		
-2 Log Likelihood	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*
2044,004	93,272	23	,000	87,353	23	,000	87,353	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
Cooperative	,536	,235	5,214	1	,022	1,709
Turbines within 5km of project	,010	,003	13,392	1	,000	1,010
Intermunicipal project	,130	,355	,134	1	,714	1,139
0-10 houses within 500m	,521	,172	9,194	1	,002	1,684
Within 100m of the railway	,109	,202	,289	1	,591	1,115
Within 100m of a business park	-,049	,169	,086	1	,770	,952
Within a nature area	-,050	,227	,048	1	,827	,952
Large road	-,063	,154	,168	1	,682	,939
Maximum capacity	-,013	,003	15,646	1	,000	,987
BLOW period (2002-2008)	-,333	,177	3,532	1	,060	,717
Adjustment to wind park	-,410	,218	3,534	1	,060	,664
Political - Majority positive	,341	,341	,998	1	,318	1,406
Province of Drenthe	-,649	,501	1,678	1	,195	,523
Province of Flevoland	-,079	,396	,040	1	,841	,924
Province of Friesland	-,024	,316	,006	1	,941	,977
Province of Gelderland	-,769	,346	4,954	1	,026	,463
Province of Groningen	,376	,338	1,235	1	,266	1,456
Province of Limburg	-1,296	,625	4,299	1	,038	,274
Province of Noord Brabant	-,714	,285	6,275	1	,012	,490
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,111	,412	,072	1	,788	,895
Province of Utrecht	-,576	,496	1,344	1	,246	,562
Province of Zeeland	,033	,298	,012	1	,912	1,034
Province of Zuid Holland	-,519	,265	3,835	1	,050	,595

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 1.3. – Turbines within 10km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			*Change From Previous Step*			*Change From Previous Block*		
-2 Log Likelihood	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*
2041,270	98,626	23	,000	90,087	23	,000	90,087	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
Cooperative	,596	,236	6,388	1	,011	1,814
Turbines within 10km of project	,009	,002	15,159	1	,000	1,009
Intermunicipal project	,154	,354	,190	1	,663	1,167
0-10 houses within 500m	,544	,172	9,991	1	,002	1,723
Within 100m of the railway	,092	,203	,204	1	,651	1,096
Within 100m of a business park	,016	,165	,010	1	,922	1,016
Within a nature area	-,070	,227	,096	1	,756	,932
Large road	-,036	,154	,054	1	,816	,965
Maximum capacity	-,012	,003	15,812	1	,000	,988
BLOW period (2002-2008)	-,251	,184	1,864	1	,172	,778
Adjustment to wind park	-,466	,220	4,477	1	,034	,627
Political - Majority positive	,305	,342	,794	1	,373	1,356
Province of Drenthe	-,462	,508	,828	1	,363	,630
Province of Flevoland	-,375	,423	,785	1	,376	,688
Province of Friesland	,026	,316	,007	1	,936	1,026
Province of Gelderland	-,627	,352	3,179	1	,075	,534
Province of Groningen	,537	,341	2,482	1	,115	1,712
Province of Limburg	-1,145	,631	3,299	1	,069	,318
Province of Noord Brabant	-,562	,293	3,679	1	,055	,570
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	,090	,422	,046	1	,830	1,095
Province of Utrecht	-,400	,503	,632	1	,427	,671
Province of Zeeland	,162	,299	,293	1	,589	1,175
Province of Zuid Holland	-,406	,271	2,249	1	,134	,666

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 1.4. – Turbines within 15km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			*Change From Previous Step*			*Change From Previous Block*		
-2 Log Likelihood	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*
2041,902	97,363	23	,000	89,454	23	,000	89,454	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
Cooperative	,597	,236	6,384	1	,012	1,817
Turbines within 15km of project	,007	,002	14,187	1	,000	1,007
Intermunicipal project	,131	,355	,136	1	,712	1,140
0-10 houses within 500m	,557	,173	10,405	1	,001	1,745
Within 100m of the railway	,087	,204	,181	1	,670	1,091
Within 100m of a business park	,072	,164	,195	1	,659	1,075
Within a nature area	-,096	,226	,181	1	,671	,908
Large road	-,025	,154	,026	1	,872	,975
Maximum capacity	-,012	,003	15,050	1	,000	,989
BLOW period (2002-2008)	-,239	,186	1,660	1	,198	,787
Adjustment to wind park	-,457	,220	4,305	1	,038	,633
Political - Majority positive	,331	,343	,934	1	,334	1,392
Province of Drenthe	-,345	,517	,445	1	,505	,708
Province of Flevoland	-,275	,404	,463	1	,496	,760
Province of Friesland	,061	,319	,037	1	,847	1,063
Province of Gelderland	-,559	,357	2,460	1	,117	,572
Province of Groningen	,670	,349	3,695	1	,055	1,954
Province of Limburg	-1,026	,637	2,592	1	,107	,359
Province of Noord Brabant	-,456	,305	2,234	1	,135	,634
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	,207	,432	,231	1	,631	1,230
Province of Utrecht	-,295	,511	,332	1	,564	,745
Province of Zeeland	,302	,305	,980	1	,322	1,353
Province of Zuid Holland	-,339	,278	1,489	1	,222	,713

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 2. Cox regression - lead time from initiative to development

Appendix 2.1. – Turbines within 2km

Omnibus Tests of Model Coefficients[a]

-2 Log Likelihood	Overall (score) Chi-square	df	Sig.	Change From Previous Step Chi-square	df	Sig.	Change From Previous Block Chi-square	df	Sig.
1377,867	84,396	23	,000	88,074	23	,000	88,074	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	,376	,299	1,574	1	,210	1,456
Turbines within 2km of project	,015	,008	3,466	1	,063	1,015
Intermunicipal project	-,027	,400	,005	1	,946	,973
0-10 houses within 500m	,422	,207	4,141	1	,042	1,525
Within 100m of the railway	-,235	,262	,810	1	,368	,790
Within 100m of a business park	-,038	,197	,037	1	,847	,963
Within a nature area	-,213	,290	,541	1	,462	,808
Large road	-,183	,186	,960	1	,327	,833
Maximum capacity	-,026	,006	21,704	1	,000	,974
BLOW period (2002-2008)	-,440	,212	4,317	1	,038	,644
Adjustment to wind park	-,457	,278	2,695	1	,101	,633
Political - Majority positive	1,065	,414	6,624	1	,010	2,901
Province of Drenthe	-,901	,761	1,400	1	,237	,406
Province of Flevoland	,355	,447	,630	1	,428	1,426
Province of Friesland	,078	,359	,047	1	,829	1,081
Province of Gelderland	-1,029	,442	5,412	1	,020	,357
Province of Groningen	,188	,460	,168	1	,682	1,207
Province of Limburg	-,837	,756	1,224	1	,269	,433
Province of Noord Brabant	-,524	,331	2,507	1	,113	,592
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,548	,561	,955	1	,328	,578
Province of Utrecht	-,379	,513	,545	1	,460	,685
Province of Zeeland	,450	,342	1,727	1	,189	1,568
Province of Zuid Holland	-,457	,311	2,165	1	,141	,633

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 2.2. – Turbines within 5km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1377,740	85,637	23	,000	88,202	23	,000	88,202	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	,398	,300	1,759	1	,185	1,488
Turbines within 5km of project	,009	,005	3,300	1	,069	1,009
Intermunicipal project	-,004	,400	,000	1	,992	,996
0-10 houses within 500m	,421	,208	4,115	1	,043	1,523
Within 100m of the railway	-,263	,267	,968	1	,325	,769
Within 100m of a business park	-,042	,198	,046	1	,831	,959
Within a nature area	-,210	,291	,520	1	,471	,811
Large road	-,171	,187	,839	1	,360	,843
Maximum capacity	-,025	,006	20,296	1	,000	,975
BLOW period (2002-2008)	-,409	,217	3,561	1	,059	,664
Adjustment to wind park	-,447	,276	2,612	1	,106	,640
Political - Majority positive	1,003	,419	5,737	1	,017	2,727
Province of Drenthe	-,864	,763	1,281	1	,258	,422
Province of Flevoland	,228	,472	,233	1	,629	1,256
Province of Friesland	,084	,358	,055	1	,814	1,088
Province of Gelderland	-,980	,446	4,825	1	,028	,375
Province of Groningen	,216	,462	,219	1	,640	1,241
Province of Limburg	-,807	,758	1,133	1	,287	,446
Province of Noord Brabant	-,516	,332	2,418	1	,120	,597
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,505	,564	,801	1	,371	,604
Province of Utrecht	-,340	,515	,437	1	,509	,711
Province of Zeeland	,404	,344	1,378	1	,240	1,498
Province of Zuid Holland	-,446	,312	2,039	1	,153	,640

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 2.3. – Turbines within 10km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*	*Chi-square*	*df*	*Sig.*
1375,654	91,425	23	,000	90,287	23	,000	90,287	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	*SE*	*Wald*	*df*	*Sig.*	*Exp(B)*
Cooperative	,403	,300	1,801	1	,180	1,496
Turbines within 10km of project	,008	,003	5,244	1	,022	1,008
Intermunicipal project	,006	,400	,000	1	,988	1,006
0-10 houses within 500m	,436	,207	4,444	1	,035	1,547
Within 100m of the railway	-,256	,263	,945	1	,331	,774
Within 100m of a business park	,000	,197	,000	1	,999	1,000
Within a nature area	-,206	,291	,499	1	,480	,814
Large road	-,151	,187	,645	1	,422	,860
Maximum capacity	-,025	,006	19,355	1	,000	,975
BLOW period (2002-2008)	-,346	,222	2,422	1	,120	,708
Adjustment to wind park	-,506	,281	3,250	1	,071	,603
Political - Majority positive	,999	,423	5,561	1	,018	2,714
Province of Drenthe	-,738	,768	,922	1	,337	,478
Province of Flevoland	-,038	,510	,006	1	,940	,962
Province of Friesland	,089	,357	,062	1	,803	1,093
Province of Gelderland	-,883	,452	3,808	1	,051	,414
Province of Groningen	,309	,466	,439	1	,508	1,362
Province of Limburg	-,702	,764	,846	1	,358	,495
Province of Noord Brabant	-,418	,340	1,512	1	,219	,659
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,382	,572	,446	1	,504	,683
Province of Utrecht	-,234	,522	,201	1	,654	,791
Province of Zeeland	,494	,346	2,034	1	,154	1,638
Province of Zuid Holland	-,369	,318	1,345	1	,246	,691

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 2.4. – Turbines within 15km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1374,696	93,201	23	,000	91,245	23	,000	91,245	23	,000

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	,378	,300	1,583	1	,208	1,459
Turbines within 15km of project	,006	,002	6,186	1	,013	1,006
Intermunicipal project	-,006	,400	,000	1	,987	,994
0-10 houses within 500m	,454	,208	4,770	1	,029	1,575
Within 100m of the railway	-,268	,264	1,031	1	,310	,765
Within 100m of a business park	,036	,197	,033	1	,856	1,036
Within a nature area	-,226	,291	,604	1	,437	,798
Large road	-,134	,188	,509	1	,476	,874
Maximum capacity	-,025	,006	19,311	1	,000	,975
BLOW period (2002-2008)	-,317	,224	2,005	1	,157	,729
Adjustment to wind park	-,499	,279	3,208	1	,073	,607
Political - Majority positive	1,047	,423	6,134	1	,013	2,850
Province of Drenthe	-,624	,776	,646	1	,422	,536
Province of Flevoland	-,013	,490	,001	1	,979	,987
Province of Friesland	,092	,359	,066	1	,798	1,096
Province of Gelderland	-,813	,458	3,145	1	,076	,444
Province of Groningen	,407	,471	,749	1	,387	1,503
Province of Limburg	-,597	,771	,600	1	,439	,550
Province of Noord Brabant	-,327	,352	,863	1	,353	,721
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,297	,577	,265	1	,607	,743
Province of Utrecht	-,142	,530	,072	1	,788	,867
Province of Zeeland	,617	,356	3,013	1	,083	1,854
Province of Zuid Holland	-,312	,326	,916	1	,339	,732

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 3. Cox regression - lead time from permit till development

Appendix 3.1. – Turbines within 2km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1293,184	23,978	23	,405	22,907	23	,466	22,907	23	,466

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	-,080	,302	,071	1	,790	,923
Turbines within 2km of project	,001	,009	,007	1	,933	1,001
Intermunicipal project	-,238	,403	,347	1	,556	,789
0-10 houses within 500m	,070	,212	,108	1	,743	1,072
Within 100m of the railway	-,269	,267	1,017	1	,313	,764
Within 100m of a business park	,031	,197	,024	1	,876	1,031
Within a nature area	-,158	,281	,316	1	,574	,854
Large road	-,259	,185	1,949	1	,163	,772
Maximum capacity	-,007	,005	1,648	1	,199	,993
BLOW period (2002-2008)	-,540	,213	6,420	1	,011	,583
Adjustment to wind park	-,271	,298	,825	1	,364	,763
Political - Majority positive	,503	,410	1,504	1	,220	1,654
Province of Drenthe	,541	,789	,471	1	,493	1,718
Province of Flevoland	,421	,479	,772	1	,379	1,523
Province of Friesland	-,193	,368	,275	1	,600	,824
Province of Gelderland	-,054	,439	,015	1	,903	,948
Province of Groningen	-,128	,457	,079	1	,779	,880
Province of Limburg	1,195	,772	2,395	1	,122	3,303
Province of Noord Brabant	,152	,338	,203	1	,652	1,164
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,267	,564	,223	1	,636	,766
Province of Utrecht	-,298	,562	,281	1	,596	,742
Province of Zeeland	,505	,348	2,102	1	,147	1,657
Province of Zuid Holland	,082	,308	,072	1	,789	1,086

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 3.2. – Turbines within 5km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1293,186	23,930	23	,408	22,904	23	,466	22,904	23	,466

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	-,080	,302	,071	1	,790	,923
Turbines within 5km of project	,000	,005	,005	1	,945	1,000
Intermunicipal project	-,242	,405	,357	1	,550	,785
0-10 houses within 500m	,069	,212	,105	1	,746	1,071
Within 100m of the railway	-,256	,267	,918	1	,338	,774
Within 100m of a business park	,037	,199	,035	1	,852	1,038
Within a nature area	-,153	,281	,295	1	,587	,859
Large road	-,261	,186	1,967	1	,161	,770
Maximum capacity	-,007	,005	1,645	1	,200	,993
BLOW period (2002-2008)	-,546	,216	6,418	1	,011	,579
Adjustment to wind park	-,259	,294	,775	1	,379	,772
Political - Majority positive	,508	,412	1,523	1	,217	1,663
Province of Drenthe	,525	,789	,443	1	,506	1,691
Province of Flevoland	,444	,505	,772	1	,380	1,558
Province of Friesland	-,193	,368	,275	1	,600	,824
Province of Gelderland	-,063	,442	,020	1	,886	,939
Province of Groningen	-,118	,452	,068	1	,794	,888
Province of Limburg	1,188	,773	2,361	1	,124	3,279
Province of Noord Brabant	,148	,338	,193	1	,660	1,160
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,277	,567	,240	1	,624	,758
Province of Utrecht	-,300	,562	,285	1	,594	,741
Province of Zeeland	,508	,350	2,110	1	,146	1,663
Province of Zuid Holland	,077	,307	,063	1	,801	1,080

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 3.3. – Turbines within 10km

Omnibus Tests of Model Coefficients[a]

-2 Log Likelihood	Overall (score) Chi-square	df	Sig.	Change From Previous Step Chi-square	df	Sig.	Change From Previous Block Chi-square	df	Sig.
1293,158	24,007	23	,403	22,933	23	,465	22,933	23	,465

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	-,081	,302	,072	1	,789	,922
Turbines within 10km of project	,001	,004	,033	1	,855	1,001
Intermunicipal project	-,231	,405	,325	1	,568	,794
0-10 houses within 500m	,069	,212	,107	1	,743	1,072
Within 100m of the railway	-,271	,258	1,107	1	,293	,762
Within 100m of a business park	,028	,196	,021	1	,886	1,028
Within a nature area	-,157	,279	,316	1	,574	,855
Large road	-,256	,186	1,895	1	,169	,774
Maximum capacity	-,007	,005	1,654	1	,198	,993
BLOW period (2002-2008)	-,531	,220	5,833	1	,016	,588
Adjustment to wind park	-,281	,302	,869	1	,351	,755
Political - Majority positive	,498	,412	1,461	1	,227	1,646
Province of Drenthe	,550	,788	,487	1	,485	1,733
Province of Flevoland	,379	,546	,482	1	,488	1,460
Province of Friesland	-,192	,367	,274	1	,600	,825
Province of Gelderland	-,041	,445	,009	1	,926	,959
Province of Groningen	-,123	,451	,075	1	,784	,884
Province of Limburg	1,206	,775	2,421	1	,120	3,342
Province of Noord Brabant	,159	,340	,218	1	,641	1,172
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,253	,570	,198	1	,657	,776
Province of Utrecht	-,289	,564	,263	1	,608	,749
Province of Zeeland	,504	,348	2,091	1	,148	1,655
Province of Zuid Holland	,086	,308	,078	1	,781	1,089

a. Degree of freedom reduced because of constant or linearly dependent covariates
b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;

Appendix 3.4. – Turbines within 15km

Omnibus Tests of Model Coefficients[a]

	Overall (score)			Change From Previous Step			Change From Previous Block		
-2 Log Likelihood	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1292,865	24,400	23	,382	23,225	23	,448	23,225	23	,448

a. Beginning Block Number 1. Method = Enter

Variables in the Equation[b]

	B	SE	Wald	df	Sig.	Exp(B)
Cooperative	-,089	,301	,088	1	,767	,915
Turbines within 15km of project	,001	,003	,329	1	,566	1,001
Intermunicipal project	-,224	,404	,307	1	,579	,800
0-10 houses within 500m	,074	,212	,122	1	,727	1,077
Within 100m of the railway	-,292	,259	1,270	1	,260	,747
Within 100m of a business park	,027	,194	,020	1	,889	1,027
Within a nature area	-,159	,279	,324	1	,569	,853
Large road	-,245	,186	1,719	1	,190	,783
Maximum capacity	-,007	,005	1,685	1	,194	,993
BLOW period (2002-2008)	-,500	,223	5,021	1	,025	,607
Adjustment to wind park	-,297	,292	1,040	1	,308	,743
Political - Majority positive	,499	,414	1,453	1	,228	1,647
Province of Drenthe	,598	,791	,573	1	,449	1,819
Province of Flevoland	,269	,545	,244	1	,622	1,309
Province of Friesland	-,204	,367	,309	1	,578	,815
Province of Gelderland	,009	,452	,000	1	,984	1,009
Province of Groningen	-,110	,453	,059	1	,808	,895
Province of Limburg	1,264	,782	2,614	1	,106	3,538
Province of Noord Brabant	,197	,347	,323	1	,570	1,218
Province of Noord Holland			.	0[a]	.	
Province of Overijssel	-,208	,571	,132	1	,716	,812
Province of Utrecht	-,249	,569	,192	1	,661	,779
Province of Zeeland	,526	,350	2,254	1	,133	1,692
Province of Zuid Holland	,112	,311	,129	1	,719	1,118

a. Degree of freedom reduced because of constant or linearly dependent covariates

b. Constant or Linearly Dependent Covariates Province of Noord Holland = 0 ;