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THE ACCEPTANCE OF ONSHORE WIND ENERGY IN FLANDERS

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Preamble

This thesis was written in unusual times, during the outbreak of a pandemic caused by the Covid-19 virus. In this preamble I would like to thank some people who were so kind to help me when I needed them. The preamble contains also how Covid-19 influenced this thesis.

First of all I would like to thank my supervisor Prof. Elsy Verhofstadt and co-supervisor Astrid Buchmayr. They helped me with all my questions as quick as possible. Every e-mail or video call was always a big leap forward for me.

Furthermore I want to thank all the participants who took the time and filled in my questionnaire. Without the ten minutes every participant spend to complete it, the study could not be conducted.

The city Eeklo deserves also to be mentioned here. They provided me very quick with detailed information I needed to complete the study.

To conclude this acknowledgments, I would like to thank my family and girlfriend to keep supporting me through this not always easy process.

Covid-19

This thesis was written during the outbreak of the Covid-19 virus. The outbreak had almost no impact on the completion of the thesis. The setup of the study and research questions could stay the same.

However after the announcement of the precautions taken by the government regarding social distancing, physical data collection, through questionnaires on paper, was no longer possible. There needed to be a shift from physical data collection to online data collection. This was much harder to assemble data from people with specific characteristics to reach enough participants in each of the four groups. However through the use of Facebook (via its groups of specific regions) and directed mailing, enough participants for each group was recruited. Furthermore a minor obstacle Covid-19 caused was that there were no physical meetings possible with my promotor. Therefore practical struggles with for example statistical analyses were solved via e-mail. Sometimes this was complex and took much more time than a physical meeting would have.

This preamble was drawn up after consultation between the student and the supervisor and is approved by both.

Ghent, June 2020

The promotors,

The tutor,

The author,

Abstract

Study aims: In the literature is described that there is a discrepancy between a global support of wind energy and a low implementation rate of local wind project mostly due to opposition of local communities. Renewable energy, including onshore wind, will become more and more important in the battle against climate change and global warming. This means that it is important for project developers and municipalities to understand where this local opposition comes from and how they can reduce it. This study had three aims. The first aim was to examine the general attitude of the population of the region (Maldegem-Eeklo-Kaprijke) where the participants were recruited. This region is a pioneer in term of wind energy, with a wind plan and vision since 1999. The second aim was to test the Not In My Backyard hypotheses that some studies describe as the only explaining factor for local opposition. This was done by differentiating whether or not there is a wind turbine in line of sight of the residence. The third aim was to test if there was a difference in attitude toward wind turbines whether or not people were member of an energy cooperative.

Methodology: Data collection was conducted in the form of a questionnaire. 227 of the 245 participants were retained as 18 participants were excluded based on the distance to the predefined region. To make the two comparisons, the same sample (n=227) was once divided in a Backyard (n=120) and Distance (n=107) groups, and once in a cooperative member (n=98) and a non-cooperative member (n=129) group. Each section of the questionnaire was analysed in SPSS with the optimal statistical test for the obtained data (Chi-Square Test for ordinal data and Mann-Whitney U Test for not normally distributed scale data

Results: Considering the undivided sample, there is on average a moderate to positive attitude towards wind turbines, as there is hardly any variable that is evaluated negatively by the participants. The only variables which were evaluated relatively negative were related to the beauty of wind turbines and their impact on landscape aesthetics. Furthermore there were almost no significant differences found between the Backyard and Distance group. The only significant difference occurred for impact on local economy. When the C member and non-C member groups are considered several significant differences were found, with C members displaying always a more positive evaluation. These differences were observed across all investigated areas.

Conclusion: First of all, the general results are in line with the literature that indicates a global support of wind energy. However to make a comparison possible, there needed to be a similar count of cooperative and non-cooperative members. This resulted in an overrepresentation of

cooperative members in the sample when compared with the population of the predefined region. The general positive results of the whole sample could be influenced by that overrepresentation. Second, the results support the claims of the opponents of the NIMBY hypotheses. The attitude towards wind turbines is barely influenced whether or not there is a wind turbine in line of sight of the residence as there were almost no significant differences found. Third, the results show that for some topics cooperative members evaluate wind turbines more positive than non-cooperative members. This could be explain through knowledge difference and a different level of commitment towards global warming. Also cooperatives redistribute the benefits and the burdens of wind turbines so that these are matched, this could be another explanation for the more positive evaluation.

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List of abbreviations

(non)-C members	(non)-cooperative members
CVBA	*Coöperatieve vennootschap met beperkte aansprakelijkheid*
EM	Electricity mix
EU	European Union
LCOE	Levelised cost of electricity
NECPs	National energy & climate plans
NIMBY	Not In My Backyard
PCS	Pearson Chi-Square

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PART I

Literature Study

1 Introduction

In times in which global warming and decarbonisation are well-known subjects, renewable energy becomes more and more important. Within the renewable energy sources, wind energy is identified as the most effective way for meeting short and medium renewable energy targets (Cowell et al., 2011). The European Union (EU) have set targets for 2030, which are binding for each member state. To meet these targets wind energy will be an important energy source across the EU. In Belgium and Flanders the wind turbine count is rising and project developers compete for a limited number of suitable locations. Although, the general attitude of Europeans towards wind energy is mainly positive, project developers encounter increasing opposition from communities against local wind projects (Wolsink, 2007). Several factors are in play within local communities that cause this opposition such as the physical appearance of the wind turbine that disturb the landscape, noise and shadow flicker that can cause annoyance, the lack of involvement in the decision-making process and the unequal distribution of the benefits and burdens. (Cowell et al., 2011; Kamp & Berg, 2018; Pepermans & Loots, 2013; Voicescu et al., 2016)

In the second chapter of the literature study, onshore wind energy will be discussed. Here the history, trends, (inter)national data and targets, and the challenges regarding onshore wind energy is examined in the literature. This is followed by the global concepts concerning acceptance and opposition in chapter 3. Those concepts will also be applied to onshore wind in that chapter. Thereafter there will be a closer look at how to handle opposition towards local wind projects by project developers in chapter 4. Finally the research questions of this thesis will be outlined in chapter 5. There will be three research questions handling: the general attitude towards wind turbines of the specific research region (Maldegem-Eeklo-Kaprijke), potential differences in attitude due to whether or not a wind turbine is visible from the residence/garden and potential differences due to whether or not people are member of a renewable energy cooperative.

2 Onshore wind energy

2.1 Evolution of wind energy

2.1.1 History

The usage of wind as an energy source is centuries old. In the recent past the development of new techniques and machinery was a fast changing process. However, wind energy has come a long way. The first knowledge about usage of wind energy is around 5000 BC, when wind was used to drive boats through the Nile. Ancient Persians (500 BC) used wind to pump water and to grind grain. Later, 200 BC, the Persians made use of the predecessor of the windmills as we know them, this with a vertical axis. The horizontal-axis windmill would be introduced and widely used much later, 1300–1875, in the Netherlands and the Mediterranean. These windmills were utilised exclusively for pumping water and grinding grain. The first wind turbine that produced electricity was installed in Cleveland, Ohio, in 1888. In the 1970s, through the involvement of the USA government there was a boost in research and development of wind turbines. The main reason for this was the oil crisis in 1973. Between 1973 and 1986 the wind turbine market in the USA evolved from domestic and agricultural (1-25 kW) to interconnected utility-scale wind farm applications (50-600 kW). In northern Europe, in the same period, there was a slower development of wind farm installation. After 1990 most market activity shifted to Europe. Since 1975 Denmark had a pioneering role in this shift. Led by Denmark, the wind capacity of the EU overtook that of the US in 1995. In the present wind energy meets on average 15% of the EU’s power demand. (Gupta, 2016; Kaldellis & Za, 2011; Wind Europe, n.d.)

2.1.2 Technology

Over the last two decades wind power was the renewable energy source which saw the largest deployment. This was due to vast research and innovation in the sector. A short overview of the most important changes in technology in the last two decades will follow.

First the rotor diameter of horizontal axis turbines will be examined. In **figure 1** the trend to longer blades in all parts of the world is observable. This trend was possible due to the improved materials technology. The enhancement of materials is the most important type of improvement for the wind energy sector. Globally the rotor diameter of wind turbines grew steadily from an average of 67.4 meters in 2005 to average 95.9 meters in 2014. In different regions of the world different averages can be found due to the different wind quality across these regions. (González & Lacal Arantegui, 2016)

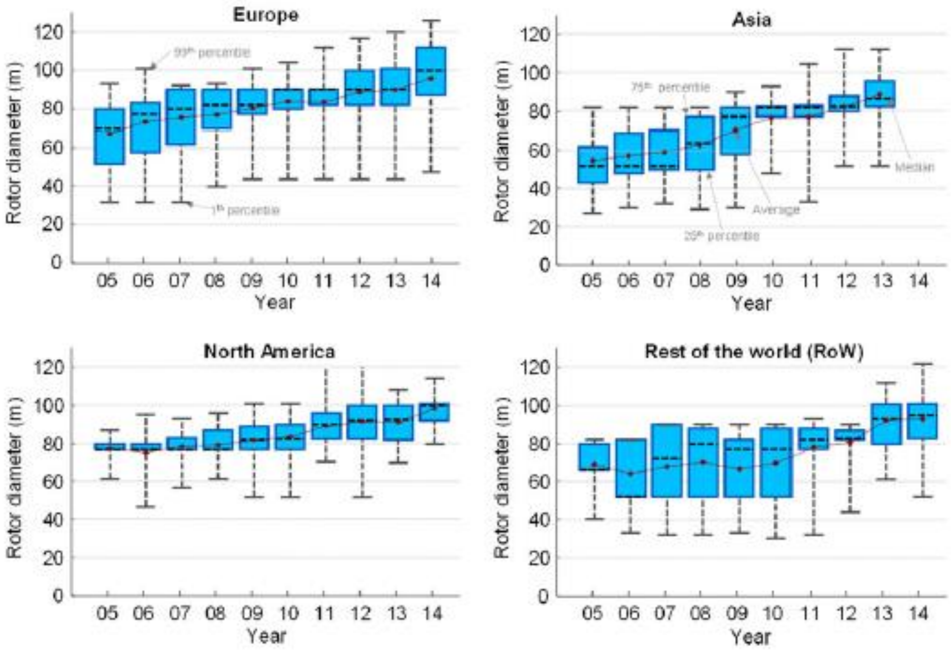

__Figure 1:__ Box plot representation of the rotor diameter of onshore wind turbines from 2005 till 2014 (González & Lacal Arantegui, 2016)

Figure 2 shows an increase in hub height over the investigated years (2005-2012). This trend has two reasons. The first is the larger rotor diameters over the years. With a larger rotor diameter a larger hub height is required, otherwise the blades will hit the ground or other elements such as trees. The second reason is that wind speed increases with increasing height. But with increasing hub height there is an increasing cost for mast and foundation. Therefore the hub height should be a balance between reaching optimal wind speed and cost. (González & Lacal Arantegui, 2016)

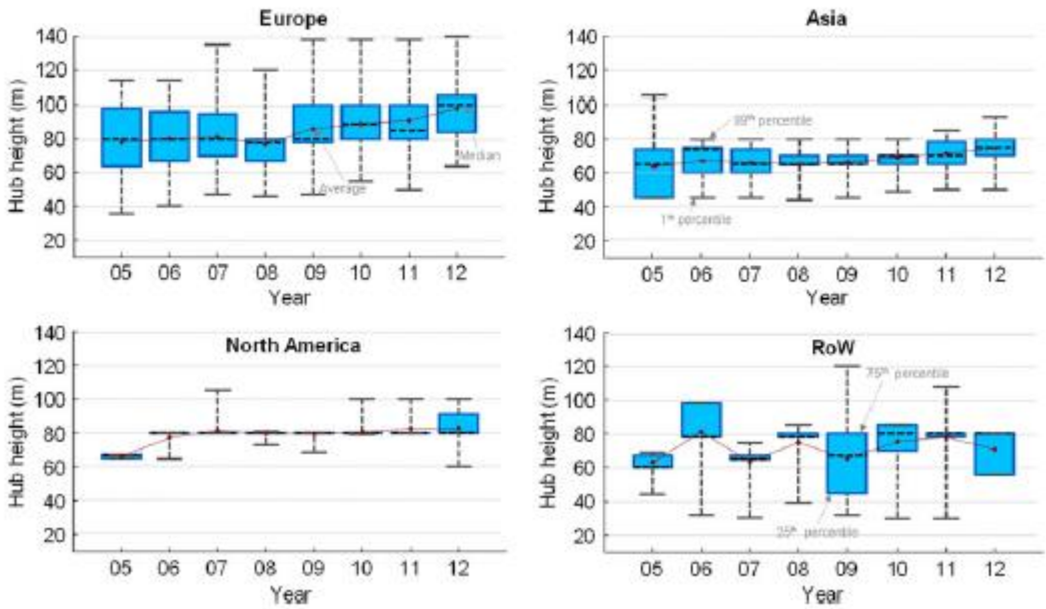

__Figure 2:__ Box plot representation of the hub height of onshore wind turbines from 2005 till 2012 (González & Lacal Arantegui, 2016)

The increase in rotor diameter and hub height is expected to continue in the following years (Taddei, 2015)**.** Due to of these trends the efficiency and rated power of a wind turbine has vastly improved. The downsides of the trends are increasing cost and unpleasant side effects for the population such as noise pollution, shadow flicker and landscape disruption (González & Lacal Arantegui, 2016). These challenges will be discussed in a following chapter.

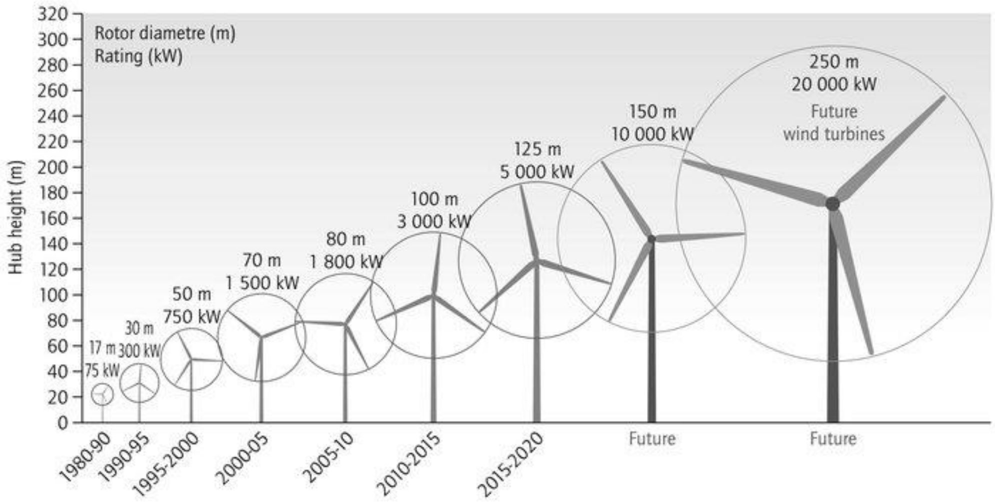

Figure 3: *Evolution of rotor diameter and hub height since 1980* (Taddei, 2015)

The future of wind energy is not only a matter of technological improvement, but also one of social acceptance and support. To cope with both the technical and the social challenges, that come with increasing hub height and rotor diameter, some innovative ideas were developed. Gupta (2016) displayed an innovative idea in the form of a kite inspired turbine as seen in **Figure 4**. This concept is based on the notion that the wind speed increases with increasing height. The cost of traditional wind turbines increases drastically as they become taller, due to the need for a stronger mast and foundation. With the kite inspired design higher wind speeds can be reached, while the costs can be reduced. There is less material needed and the traditionally used steel can be replaced by a less expensive alternative.

Figure 4: *Kite inspired wind turbine* (Gupta, 2016)

A second innovation are bladeless wind turbines or vortex generators. **Figure 5** shows an example of such a turbine. This machine generates electricity through oscillating movements due to the wind. Although it generates much less electricity than a standard wind turbine, there are some advantages. These bladeless wind turbines can be placed much closer to each other resulting in more machines can be placed in a given area and the noise and shadow is much more limited than standard turbines. (Jesús & Villarreal, 2018)

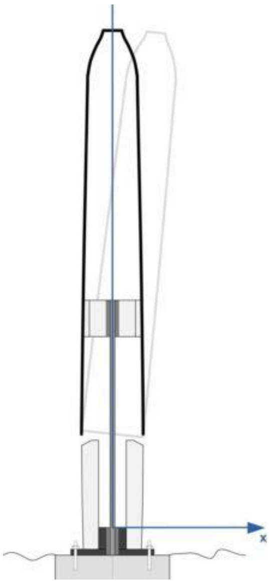

Figure 5: *Bladeless wind turbine* (Jesús & Villarreal, 2018)

To conclude wind turbines have been developed throughout the years, with increasing rotor diameter and hub height as result. These developments have benefits as described, but intensify the challenges, technological and social, that come with wind turbines as well. These challenges will be analysed in chapter 2.3.

2.2 Data and targets regarding wind energy

This chapter will discuss the available data on wind energy and the targets for the future set by Europe, Flanders and the city Eeklo which will be the focus area of this study.

2.2.1 Europe

The organisation Wind Europe has over 400 members, active in the wind industry in over 35 countries. They report up-to-date figures regarding wind energy production in Europe on their website, https://windeurope.org. Wind Europe states on its website that onshore wind is the cheapest form of energy production in Europe today. This statement is supported in the New Energy Outlook 2018 of Bloomberg New Energy Finance. **Figure 6** displays the levelised cost of electricity (LCOE) of the major energy technologies in Europe). This data shows that the LCOE of onshore wind in Europe ranges from $58 (€50) to $76 (€65) per MWh, the lowest of all technologies. Yet the total contribution of wind energy, onshore and offshore, in the European electricity mix lies between 11 and 15%. (Bloomberg, 2018; Wind Europe, n.d.)

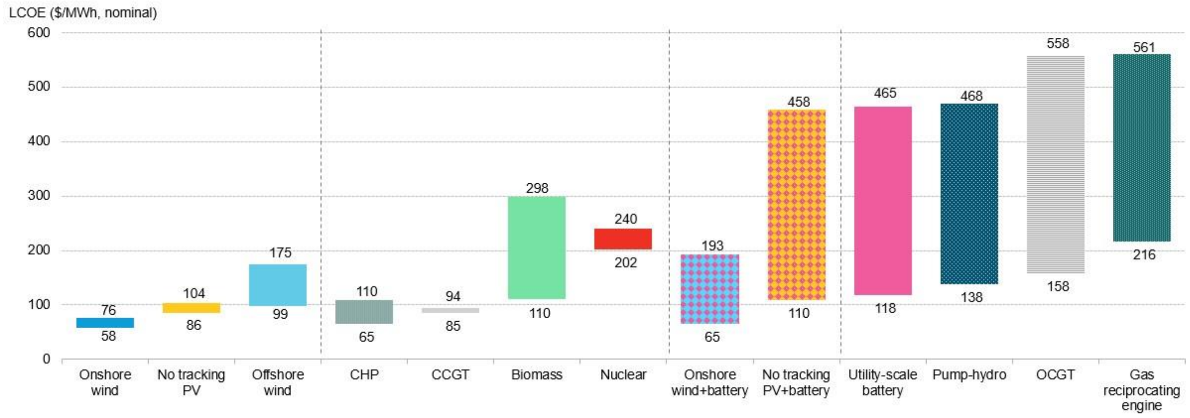

Figure 6: *The LCOE of the major power generation technologies in Europe in 2018 (Bloomberg, 2018)*

Figure 7 gives an overview of the contribution of wind energy in the country's electricity mix for the European countries in 2018. This chart shows that onshore wind turbines makes about 80% of the wind energy production. Furthermore a large difference between countries is observed. In the four leading countries Denmark, Ireland, Portugal and Germany the electricity demand covered by wind is more than 20%. In the 18 countries at the bottom, including Belgium, the percentage is less than 10.

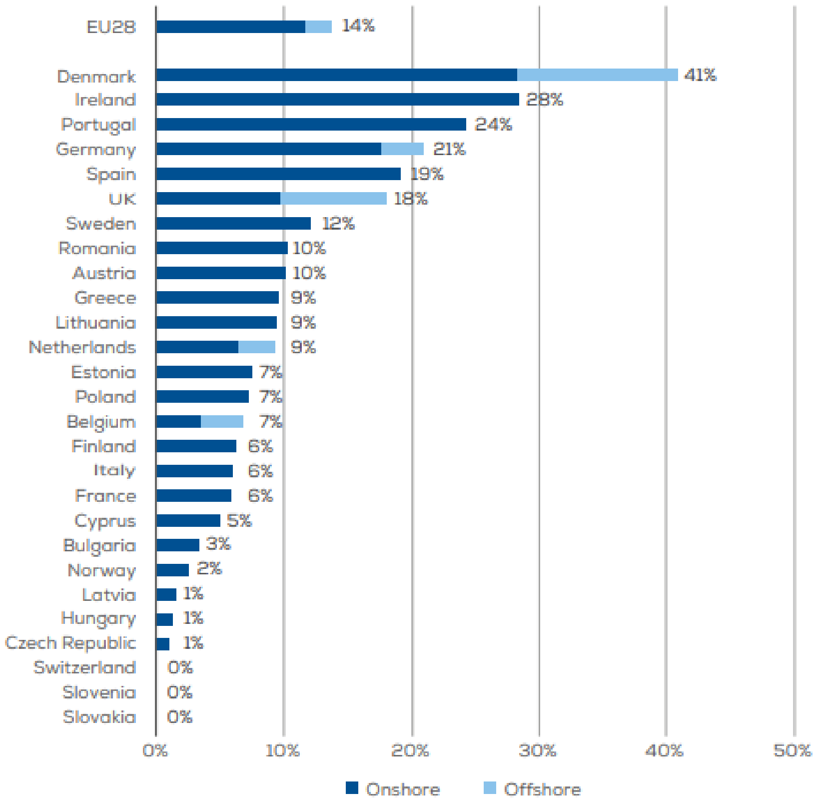

Figure 7: *Percentage of the average annual electricity demand covered by wind* (Komusanac et al., 2019)

In 2009 the European Commission adopted the renewable energy directive (2009/28/EC), an overall policy for the production and promotion of energy from renewable sources in the EU. This policy stated that by 2020 at least 20% of the total energy production in the EU needs to be from renewable sources. In December 2018 the renewable energy directive was revised (2018/2001/EC) and entered into force as part of the ‘clean energy for all Europeans’ package. This package aims to make the EU less dependent from import of electricity and keep the European Union a global leader in renewable energy. This also would ensure to meet the emissions reduction commitments from the Paris Agreement. The new directive brought some updates. The first was a new binding renewable energy target of 32% for the EU for 2030, which could be upwardly revised in 2023. Secondly, all EU countries are obliged to draft a 10-year National Energy & Climate Plans (NECPs) for 2021-2030. This will outline how they will meet the new 2030 targets for renewable energy and for energy efficiency. (European commission, 2020)

2.2.2 Flanders

In Belgium the responsibilities for energy and climate policies are divided over the federal state and the Flemish, Brussels and Walloon region. The result is that Belgium has 4 ministers of climate. For this chapter the Flemish figures and prospects will be reported because onshore wind energy is a Flemish jurisdiction and the examined area of this study, Maldegem-Eeklo-Kaprijke, lies in Flanders.

In the coalition agreement of the government of Flanders for 2019-2024. Energy and climate is stated as a main topic. The long term goal of Flanders is to be completely climate neutral in 2050, which is in agreement with the target of the EU. To achieve this target renewable energy production is one of the areas of improvement.

Figure 8 shows that in 2019 there were 543 wind turbines operational in Flanders. Since 2017 the growth is slowing down. With 25 new turbines in 2019 the total installed power increased to 1278 megawatt at the end of 2019. Of the 25 new wind turbines, 6 were installed in the study area Maldegem-Eeklo-Kaprijke.

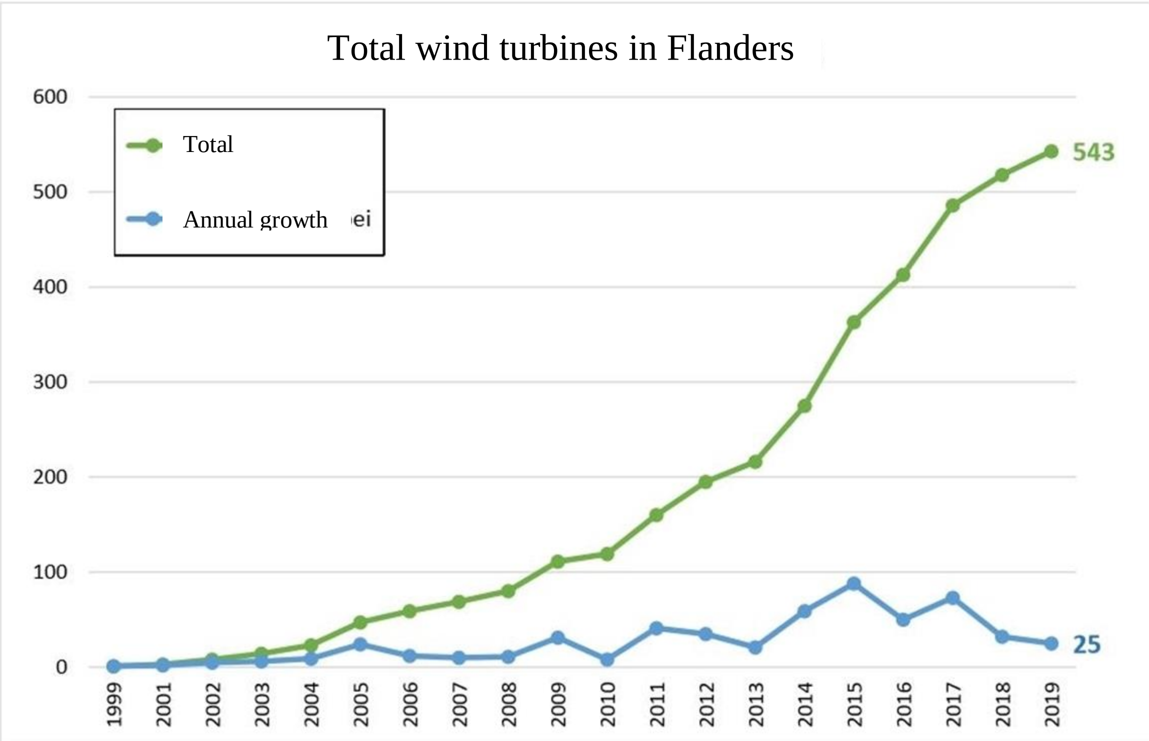

Figure 8: *Number of wind turbines in Flanders. The green line indicates the total number and the blue line indicates the anual growth (adepted from VWEA, n.d.)*

The objectives formulated in the coalition agreement by the Flemish government concerning energy and climate meet the guidelines set by the European Commission. The government is formulating a Flemish energy and climate plan and is helping to formulate a National energy and climate plan for 2021-2030. In addition, to help achieving the European goal for renewable energy, the Flemish government plans to raise the installed power of wind from 1,28 gigawatt in 2019 to

2,5 gigawatt by 2030. This is almost a 50% increase of installed power. (Flemish governement, 2019; VWEA, n.d.)

2.2.3 Eeklo

In this study onshore wind energy in Eeklo and neighbour municipalities Maldegem and Kaprijke will be examined. In **figure 9** the locations of all wind turbines, current and in development, are displayed. At the end of 2020 all projects should be operational and the total amount will be 35 wind turbines with a corresponding 70 MW installed power. By end 2020 Eeklo will be fully powered by wind, since those wind turbines will produce more electricity than used on the territory by industry, households and municipality. Eeklo, a pioneer for wind energy, developed in 1999, as first city in Belgium, a local wind plan and wind vision. That wind vision is based on the fact that wind is a ‘common good’, a local natural resource that belongs to all citizens and must be shared with the community. Following that vision over decades, Eeklo claims that they created a local support base with social acceptance and personal involvement for wind energy. This support base was challenged by a high number of building permits for wind turbines outside the local wind plan and vision. In 2014 the city council decided to approve the directives of the province East-Flanders as long as the application is in line with the local wind vision. This resulted in a policy where only project developers who met specific community rules could get a positive advise for a building permit. Those rules are :

- Pursue 50% of the investment from direct participation for municipality and citizens
- An annual contribution of 5000 € per wind turbine to the neighbourhood fund, that is managed by inhabitants within 800 metres of the wind turbine(s) and can be used for enhancing the living quality of the neighbourhood
- An annual contribution of 5000 € per wind turbine to the municipality climate fund

Beside these rules project developers with the highest participation rate of citizens and government are preferred.

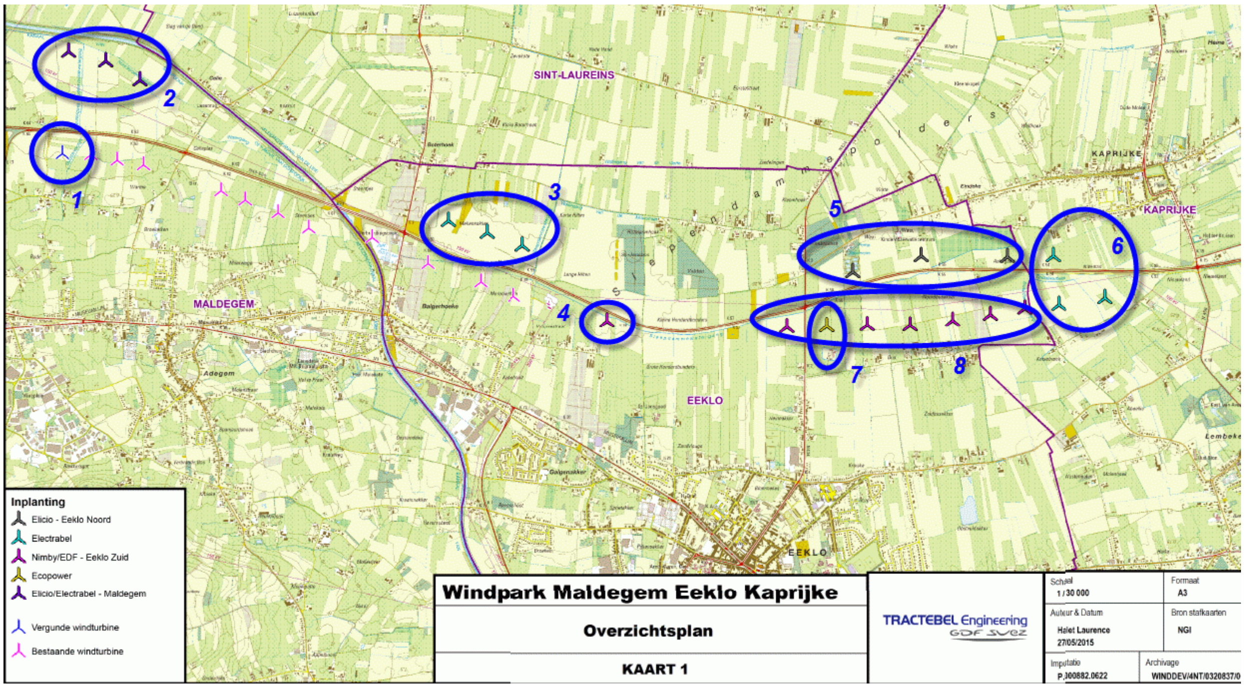

Figure 9: Map PRUP E34 concentration zone wind energy province East Flanders ("Visietekst concetratiezone windturbines meetjesland", 2014)

2.3 Challenges

In the literature renewable energy, such as wind and solar energy, has been identified as a clean and safe energy source (Gupta, 2016; Knopper & Ollson, 2011). However there are some issues inherent to wind turbines that can impact the population that live nearby them. These issues could possibly cause opposition. There are both physical and social challenges concerning wind energy projects. Social challenges concern the achieving of acceptance from the local community through involvement in the development of the project and fair distribution of the benefits and the burdens. The physical challenges concern wind turbine design and infrastructure such as shadow flicker, ice throw and wind turbine noise. These factors could possibly have an impact on population health. Other challenges are linked with the perception of people such as landscape disturbance.

Knopper & Ollson (2011) present a literature review on health effects and wind turbines, comparing peer-reviewed scientific literature to popular literature on the internet. Their goal was to determine if the generally accessible information regarding this topic is in line with the scientific literature. They concluded that in both literature samples it was established that wind turbines can be the cause of annoyance by some people. The difference between the types of literature lied in the reason why there is annoyance. In the popular literature on the internet there are claims that the noise and low-frequency sound emitted by wind turbines is the cause of self-reported health outcomes and annoyance. Yet the low-frequency sound and the self-reported health issues are not unique to the wind turbines. No peer-reviewed scientific literature identifies a causal link between the proximity to wind turbines, the emitted noise (audible and low-frequency) and health effects. Given that the reported annoyance tends to be stronger related to visual clues and attitude towards wind turbines than to the noise itself, the self-reported health effects are more likely caused due to a manifestation from an annoyed state than the low-frequency noise itself. An expert panel review written by Colby (2009) conclude first that the sound from wind turbines does not pose a risk of hearing loss. Second that low-frequency sound from wind turbines does not pose a risk to human health. Their third conclusion is that some people may be annoyed by the presence of wind turbines and their sound but annoyance is not a pathological entity. More recent studies agree with the previous statements. Kamp & Berg (2018) state that the sound of wind turbines is associated with higher odds for annoyance. However the proximity of a wind turbine has not been proven to negatively affect stress responses, quality of life, sleep quality nor other health complaints. They report that other factors such as individual traits and attitudes, visual aspects and the process of wind farm planning and decision-making may influence the response of people to the sound from wind turbines.

Another factor that could be causing health risks is shadow flicker. Inducing a seizure in people with photosensitive epilepsy is the main health concern related to shadow flicker. Knopper et al. (2014) present a review of literature on this topic. The conclusion was that the rotor speed of wind turbines with 3 blades is far too slow to trigger seizures and so it is unlikely that shadow flicker imposes a treat to health. Although shadow flicker cannot trigger medical conditions, it could be a factor that enlarges annoyance. Voicescu et al. (2016) found that shadow flicker is a predictor of a highly annoyed reaction of people to wind turbines. There was also a significant interaction between shadow flicker and wind turbine noise and considered together there was a stronger prediction for annoyance. The strongest predictor of high annoyance found in that study was annoyance to the blinking lights on the wind turbines. They found that it is 8 times more likely to be highly annoyed by wind turbines if people report to be highly annoyed by the blinking lights.

To conclude there is no evidence in scientific literature that wind turbines can cause medical issues. However wind turbines can cause annoyance within the population due to noise, shadow flicker, blinking lights, landscape disruption, etc. This annoyance may be a reason that local residents oppose to local wind turbine projects. The next chapter will handle opposition and acceptance of local projects.

3 Opposition and acceptance

In the previous chapters it was pointed out that wind turbines became taller over the years and that their height will further increase in the future. The physical appearance of wind turbines will become more and more prominent in the Flemish landscape. As wind energy is incentivised by the Flemish government to meet the EU targets, the quantity of onshore wind turbines in Flanders is going to increase. These developments influence the population. Although the general attitude of the European population towards renewable energy, including wind energy, is mainly moderate to strongly positive, there is local opposition against onshore wind projects (Wolsink, 2007). This opposition can result in delays or even failure of projects. Understanding why there is opposition to specific local projects is crucial for implementation of future wind energy projects. This chapter will define acceptance and opposition, explain motives for opposition and identify the decisive factors that will lead to acceptance or opposition.

3.1 Definitions

3.1.1 Acceptance

First of all it is important to distinguish acceptance from acceptability. Although sometimes acceptance and acceptability are used as synonyms, there is a clear distinction between the two terms. Bertsch et al. (2016) gives a definition of both terms. Acceptability refers to '*the judgement of experts as to whether the construction of a particular facility (e.g., a power plant or transmission line) is a reasonable burden under rational consideration of quantifiable criteria (e.g., health impact or noise)*'. Meanwhile acceptance can be defined as: '*a subjective measure of the readiness of people to accept a certain facility in their neighbourhood regardless of rationale judgements*'. In this study the term acceptance will be used.

Roddis et al. (2018) divides (public) acceptance into 3 categories. The first category is socio-political acceptance and is defined as :'*Acceptance by policymakers and the general public, typically gauged through opinion polls which provide an aggregated representation of attitudes*'. Then there is market acceptance: '*Acceptance of new technologies by adopters such as households and businesses, or as indicated through willingness-to-pay models*'. And finally community acceptance: '*Acceptance by local communities affected by the implementation of a technology, for example siting decisions for renewable energy*'. In this thesis the focus lies on community acceptance. Bertsch et al. (2016) gives an overview of existing literature on acceptance. A general definition is formulated: '*an active or passive approval of a certain technology/product or policy*'.

Schweizer-Ries (2008) describes a sub-category of acceptance with a differentiation between valuation and action. The valuation dimension can be positive and result in adoption or it can be negative and result in rejection. The action dimension consist of passive and active behaviour. These dimensions lead to a four quadrant model that explains acceptance/behaviour. Schumann (2015) implies that for large-scale technologies, such as most energy technologies, passive approval or tolerance of concerned parties represent acceptance of those technologies. So it is not necessary to become active or have a positive attitude towards the technology to accept the technology. This means that 3 quadrants result in acceptance: positive active, positive passive and negative passive, and only one quadrant will result in opposition: negative active **(Figure 10)**.

Figure 10: *The crossover between valuation (x-axis) and action (y-axis) to determine acceptance or opposition (Own illustration)*

3.1.2 Opposition

The previous mentioned model defined opposition as active behaviour related to negative valuation (Schumann, 2015; Schweizer-Ries, 2008). Wolsink (2007) defines 4 types of opposition towards local wind projects. The first type is the Not In My BackYard (NIMBY)-motivated opposition and is defined as: '*A positive attitude towards the application of wind power, combined with an intention to oppose the construction of any wind power scheme in one's own neighbourhood*'. The second type is a NIMBY variant: '*Opposition to the application of wind power in the neighbourhood because the technology of wind power as such is rejected, this attitude is based mainly on concerns about landscape values*'. Thirdly there is: '*Resistance created by the fact that some construction plans are themselves faulty, without a rejection of the technology itself*'. The last type: '*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*'. This last type of opposition is related to the dynamic nature of attitude. **Figure 11** shows the average attitude as observed by (Wolsink, 2007) towards wind turbines and farms of people living nearby a project. The development of the attitude shows a U-shape, with a drop in the planning phase and a recovery after the realization of the project. This U-shape development suggest that people tend to be more critical when a project nearby is announced. However in all three phases the majority was still in favour of the wind energy project., because the graph is expressed in standardized units, so the overall average 0 represents the average positive attitude and not a neutral attitude. To conclude Wolsink (2007) suggests that all four types of opposition exist alongside one another, but one can be more dominantly present depending on the nature of the technology and project.

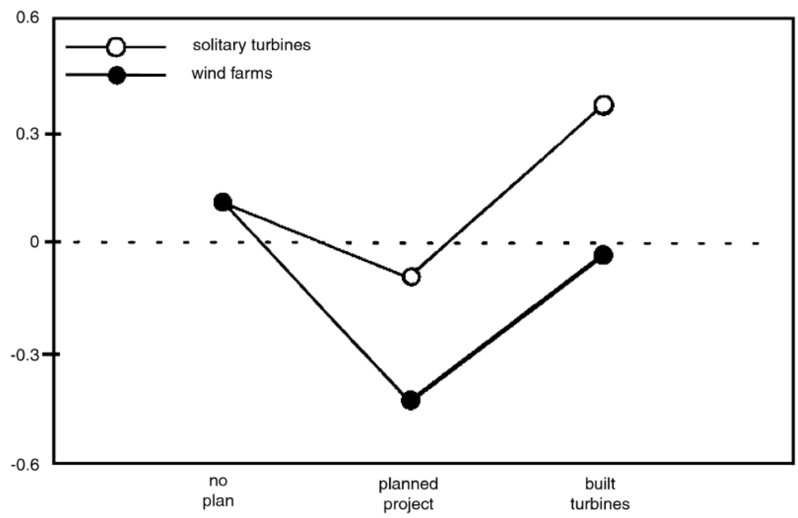

Figure 11: *Development of public attitudes towards wind power. Group averages are standardized (z-scores). The overall average is 0, which represents a clear majority in favour of large scale application of wind energy* (Wolsink, 2007)

3.2 Is Not in my backyard (NIMBY) a relevant concept?

As Wolsink (2007) described 4 types of opposition, one of them was NIMBY-motivated opposition. A large number of studies picked NIMBY as the defining element for opposition. These studies mostly originated in the USA in the late 1980's (Burningham, 2000). The term became very popular amongst the public, media and academics to describe any kind of local opposition to almost every development. Despite the wide use of the term the actual definition of NIMBY is: *'a situation in which someone has a positive attitude towards something in general but accompanies this with a motivation to oppose its installation locally, due to reasons of self-interest'* (Wolsink, 2007). The question later research explored was if all local opposition towards projects, including wind energy, can be explained by this concept.

Some research (Jones & Eiser, 2009; Wolsink, 2007) displays a discrepancy between the high level of general support of wind energy and the low level of implementation success of wind turbines. Jones & Eiser (2009) refer to this phenomenon as the 'social gap'. Devine-Wright (2011) state that NIMBY implies that people have a 'deficit' view, which presumes that they are ignorant of technical issues and cannot or do not want to engage with policies concerning new technologies. The term also dismisses the concerns of the people to be very locally focussed and originated from self-interest. Jones & Eiser (2009) report that research agrees that when using the strict definition, the prevalence of NIMBYism is very small. This term is too simplistic to solely explain all opposition. Both Devine-Wright (2011) and Jones & Eiser (2009), among other studies, agree that the term NIMBY is inaccurate and unfair to describe all local opposition and that, due to its frequent misuse, lost its explanatory value. According to Devine-Wright (2011) the use of NIMBY causes a cycle of increasing opposition. **Figure 12** illustrates the destructive, self-fulfilling cycle described by Devine-Wright (2011). Developers and policy makers interpret local opposition as NIMBYism which leads to actions to decrease the impact of NIMBYism (e.g. by limiting opportunities to participate, remedying information deficits and addressing self-interested concerns). These actions lead to more local opposition e.g. arising from discontent about limited opportunities to participate, the invalidation of emotional response and the preoccupation with financial benefits. This reaction is seen as proof of NIMBYism by the policymakers and developers and the cycle starts over.

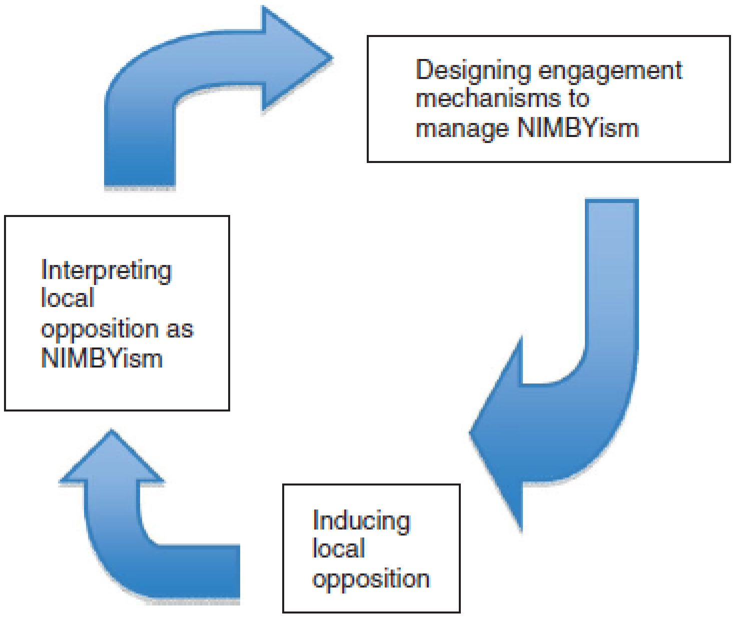

Figure 12: *The cycle of NIMBYism in public engagement with renewable energy* (Devine-Wright, 2011)

The concept of NIMBY is in most cases not useful to explain local opposition to wind projects. Devine-Wright (2009) suggest another concept to explain this local opposition. The basic concept in this approach is place. Place has two components, the physical aspects of a specific location and the personal emotions linked with that location. The last component makes place different of similar concepts such as space and environment. Devine-Wright (2009) defines two, more specific categories: place attachment and place identity. For place attachment the definition Devine-Wright (2009) uses is: *'Place attachment is both the process of attaching oneself to a place and a product of this process. As product, place attachment is a positive emotional connection with familiar locations such as the home or neighbourhood, correlating with length of dwelling'.* This place attachment is different for every individual and can be placed in a spectrum between not connected and very strong connected. The second concept, place identity, is defined as: *'the ways in which physical and symbolic attributes of certain locations contribute to an individual's sense of self or identity'*. However, places can change through natural or human interference. These changes of a place and the impact of it can be described as place disruption. Place disruption can be a threat to place attachment and place identity as change reveals the bond with a place, that is mostly hidden until it is pressured. When there is a place disruption, people want to make sense of what is about to happen or has happened and attempt to cope with the change appropriately. Devine-Wright (2009) proposes a new model based on these principles to explain opposition that can be used instead of NIMBYism. This model does not focus on the physical aspects of development but suggests a multi-stage framework. This framework takes into account the socially constructed, symbolic attributes of a place and how these are interpreted to match with the changes. In **Figure 13** the multi-stage framework of Devine-Wright (2009) for explaining opposition is presented. It consists of 5 stages: identification, interpretation, evaluation, coping and acting. The different stages give a dynamic character to the model, where the interpretation stage is the most critical. During the interpretation stage place attachment has an important role whether the changes are going to be evaluated as positive or negative. The model does not presume that attachment automatically induces resistance. Resistance will only occur whenever change is regarded as an disruption of the place. If the change is interpreted as an enhancement and evaluated as positive, there will be no opposition. (Devine-wright & Howes, 2010)

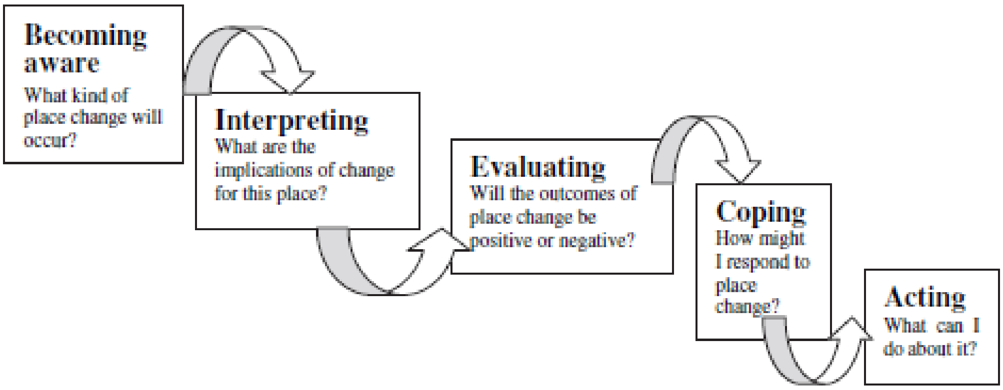

Figure 13: *Stages of psychological response over time to place change* (Devine-Wright, 2009)

Devine-Wright (2009) shows with the multi-stage framework, there are many other factors that may play a role in the acceptance of wind projects in the neighbourhood. Some of the other factors will be discussed in the next chapter.

3.3 Decisive factors shaping attitude towards local wind projects

There are many factors that shape the attitude of a person. Following is a list of most of the decisive factors that can shape the attitude towards local wind energy projects, described in various literature. These are not the only factors playing a role in shaping attitude and acceptance of wind turbines but they are the most common and relevant for this study.

3.3.1 General attitude

The first factor is general attitude, the attitude towards wind energy seen from a global point of view. Jones & Eiser (2009) found that this general attitude is a strong predictor of specific attitude. This means people are guided by their general attitude towards wind energy to form an opinion regarding local wind projects. Besides general attitude, Jones & Eiser (2009) suggest perceived community opinion as another factor. The more people think the opinion of the community regarding a project is positive, the more positive their own opinion is going to be and vice versa. Psychologically speaking, it is normal that opinions of people are guided by judgment of others when there is uncertainty and little information available regarding a new project. It is necessary to note that perceived and actual community opinion do not always align and there can be a vast discrepancy between the two. A third factor, described by Haggett (2011), is the difference in level of thinking between opponents and supporters of local wind projects. While opponents tend to focus on the burdens that local wind turbines bring with them, the supporters focus on the benefits of wind energy in general. This factor is important in the process of changing the attitude of opponents. Nowadays a main argument in support of wind turbines is climate change mitigation, which is a global argument and thus not very effective for combatting local opposition. The argumentation should be as local oriented as possible (Haggett, 2011).

3.3.2 Landscape

The biggest factor for opposition found in the literature is the aesthetic value of the landscape where a project is planned (Bertsch et al., 2016). In the study of Roddis et al. (2018) the authors found that an increase in the visibility score, that rates the proportion of the purview that is taken by modern infrastructure, corresponded with an increase in the likelihood of project approval. In other words the more the people thought the new structure would blend in with the landscape, the higher the chance that the project would succeed. Wolsink (2007) suggests that the type of landscape where the project will be conducted, is crucial. In some types of landscape wind turbines are seen as a positive addition, such as industrial areas and military training grounds. For other landscape types, such as nature reserves and recreational areas, potential placement of wind turbines is rejected by the majority. Another factor mentioned in the literature is distance to the nearest turbine. Ladenburg & Dahlgaard (2012) report a disagreement in the literature. Depending on the type of study the results were drastically different and no systematic effect of distance could be identified. However, Ladenburg & Dahlgaard (2012) did identify the relevance of the number of daily seen wind turbines. They found that people who saw six or more turbines a day had a more negative attitude. In their study they further report that attitude is not influenced by having a wind turbine in the line of sight from homes or gardens. Although landscape is the most dominant factor in the acceptance debate, there are still many discussions on a variety of subtopics concerning landscape. The factor landscape is linked with the previously explained concepts place identity and place attachment in chapter 3.1.

3.3.3 Trust

The final factor is trust. Both Haggett (2011) and Jones & Eiser (2009) describe a link between the level of trust in the developer of the wind project and the level of opposition. Research suggest that wind farms developed by local communities encounter less opposition than distant multinational corporations (Haggett, 2011). Jones & Eiser (2009) suggest that building trust with potential host communities should be a priority for every developer of wind project. Trust can be created and local opposition of the hosting communities can be reduced through '*responsive and fair engagement with host communities and through encouraging local, co-operative ownership of projects*' as described by Jones & Eiser (2009). Other studies, such as Roddis et al. (2018), also describe participation as a possibility to reduce local opposition. Participation alongside other opposition reducing strategies will be the topic of the next chapter.

4 Handling with opposition

Chapter 3 revealed a discrepancy between the global support of wind energy and the frequently encountered opposition against local wind projects. Also the most prominent factors that shape the attitude of people towards local wind projects were identified. This chapter presents the most persistent mitigation mechanisms project developers use to address those factors and reduce opposition. The mechanisms discussed in this chapter are information flow, compensation and participation. These categories are not strictly separated from one another and multiple strategies can be used by project developers.

4.1 Information flow

The way information is exchanged can influence the relationship and engagement between stakeholders. Devine-Wright (2011) identifies three forms of engagement depending on the information flow between developers and communities: communication, consultation and participation (participatory planning). These forms of engagement can be distinguished through information flow between the parties and the significance of the parties in the policy- and decision-making process. Communication is characterised by the one-way information flow from the developer to the community to inform people without asking any feedback. With consultation there can be a two-way information flow but the discussions are controlled by the developers taking the feedback into account or not. Finally participation involves a two way information flow where opinions can be changed and decisions are made together. Devine-Wright (2011) limited participation only to the planning phase, which makes it different from the financial and organisational participation described later in this chapter.

The chosen form of engagement can heavily influence the degree of opposition.

4.2 Compensation

Some project developers and policy makers offer community benefits to compensate the community for the placement of wind turbine(s) in their neighbourhood. Cowell et al. (2011) questions the conventional argument that community benefits automatically create greater acceptance of local wind projects. They suggest that if acceptance can be bought off, all opposition can be explained by localised egoism because only community benefit payments are needed to overcome the gap between high support of wind energy and local opposition against wind projects. This explanation points at NIMBYism. Cowell et al. (2011) reject this way of economic thinking, the focus on the balance of costs and benefits, and they support that other factors may have a greater influence on people's attitude towards development such as the level of trust in the developer and the involvement in the decision-making process. The effectiveness of compensation depends on the interaction linked with the proposal. If there is freedom to decline the offer and/or negotiation possibilities the agreed compensation will result in more acceptance for some community members than post hoc compensation linked with the costs of development. Yet again involvement is a decisive factor for the effectiveness.

4.3 Participation

Involvement was a term that frequently returned in previous two topics. People can be involved in many stages of the project. A generic term for all these types of involvement is citizen participation. Yildiz (2014) defines citizen participation in a narrow and a broad sense. The narrow definition contains following criteria:

- The group of actors consists of private individuals, individual agricultural enterprises or legal entities (except for large corporations and conglomerates) that invest individually or jointly in renewable energy projects.
- The form of participation is a financial contribution by equity, which is equipped with voting and control rights, so that a control of the projects by the citizens is possible.
- A minimum of 50% of the voting rights are held by the citizens.
- The investing members of the enterprise come from or are located in a geographically defined area that is the origin of identity formation processes among the involved citizens.

The broader definition of Yildiz (2014) considers that *'in practice other forms of citizen participation exist. This applies in particular to the participation rate (minority interests), the extent of voting and control rights and the principle of regionalism'*.

Participation is an important mechanism to cope with local opposition against wind projects. In some countries, like Denmark and Germany, participation models regarding wind energy are well established while in other countries, mostly southern Europe, their development is much slower (Bauwens, et al., 2016; Huybrechts & Mertens, 2014). Following the participation models that exist in Flanders for renewable energy projects will be highlighted.

Considering Eeklo there were, in the last 20 years, 21 requests for building permits for one or more wind turbines by several firms. Six were from cooperative companies (CVBA), the other 15 were from private companies. In annex 1 two tables are shown where the amount of objections per request is displayed. Objections can be a sign for the level of opposition.

In total there were 2424 objections against requests from the private companies, which is on average 161,6 objections per request. Notably is that there was one outlier with 1946 objections for that request. When excluding this request, the average is 34,1. For these 15 requests there were only two who had no objections. For the cooperative projects on the other hand, the total objections were 85, which is on average 14,2 objections per request. Here however 4 out of the 6 request had zero objections. Here can be seen that there is a lower average of objections for CVBA's and also a higher count with no objections. However to draw definitive conclusions all these request and ideally more should be thoroughly examined to discover if there is effectively a difference in objections between private and cooperative firms.

There are two dominant participation models used in Flanders. The first is the direct participation model put in practice by 'REScoops' (Renewable Energy Sources cooperatives), where the ownership is in the hands of citizens. The second is the indirect participation model used by 'FINcoops' (Financial cooperatives or closed-end funds), where the ownership remains in the hands of developers. These two models are the most relevant for my study, since they are practiced in the region of this study, so these will be discussed.

4.3.1 REScoop

REScoop stands for Renewable Energy Sources Cooperative. The International Co-operative Alliance (ICA) defines a cooperative as: *'an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically-controlled enterprise'*. The ICA defines in addition cooperative values and principles. The cooperative values are self-help, self-responsibility, democracy, equality, equity, and solidarity. Seven cooperative principles are derived from the ICA-definition:

- Voluntary and open membership
- Democratic member control
- Member economic participation
- Autonomy and independence
- Education - training – information
- Cooperation among cooperatives
- Concern for community.

REScoops lean towards the narrow definition of Yildiz (2014). Members of a REScoop are citizens that participate directly, they become co-owner of a project. The citizens are not only financing the equity of the project, but they are also involved in the planning and decision-making process of the project. Furthermore members can make use of the services or goods from the cooperative, such as energy supply, at cost. REScoop.Vlaanderen is the Flemish federation and unites the Flemish citizen initiatives concerning renewable energy and is a member of the European federation REScoop.eu. (REScoop Vlaanderen, n.d.; REScoop.eu, n.d.; International Cooperative Alliance, n.d.)

Huybrechts & Mertens (2014) give reasons why citizen energy cooperatives are formed. The first reason is to fight excessive market power. In many countries the electricity market was a monopoly. This leaded to displeased customers who wanted more control over the origin of their electricity as well as the price, sometimes resulting in the formation of cooperatives. The second reason mentioned is the opposition-reducing effect that cooperatives can have. Cooperatives can deal with the free-rider problem, foreign stakeholders who take the profits from local projects without experiencing the burdens. Finally, there can be a reduction in information asymmetry. When there is a lack of available information for the customers, for-profit organisations can exploit that and so try to maximize their profit margin. Cooperatives do not search that profit maximization so it can reinforce trust by the members.

Yildiz (2014) describes why citizen cooperatives can be attractive. The first reason is the low financial barrier. Mostly the price of one cooperative share is small. A second and probably more important reason is the active role that can be played in the decision-making process. Since every member has just a single vote in the selection of the board of management/directors, no single shareholder can solely influence the direction of the cooperative. Other reasons can be risk consideration, mostly the liability is limited to the invested capital and additional institutional support, such as screenings of auditing and consulting associations.

However, the cooperative model has some barriers and limitations. Huybrechts & Mertens (2014) listed the most relevant. Firstly there are barriers to entry. The study confirmed that access to capital in the early stages of the cooperative can be an obstacle. Due to the high cost of wind energy projects a high starting capital is needed. In later stages as the supply of electricity is established, financing becomes less a problem. Besides capital, there needs to be access to adequate locations to build wind turbines. Due to a poor spatial planning and heavy regulation, permissible locations for wind turbines in Flanders are scarce. Furthermore there are cognitive barriers. The study showed a clear lack of awareness and recognition for the cooperative model. The unawareness of the ‘public good’ dimension of renewable energy, with the high involvement and the return to the community creates a lack of support of the model. The greatest limitations of the cooperative model are risk of slow decision-making and the possible opposing goals and opinions of stakeholders.

4.3.2 FINcoop

FINcoop stands for Financing Cooperative and is a financing vehicle for raising equity from citizens by a developer. A FINcoop is founded by a mother company that is owner of the project and the installations, and is in control of the business management. The capital raised from the citizens is lent by the FINcoop to the mother company and in return the FINcoop members receive a dividend. This is a form of indirect participation and results in an investment product.

The vast difference between a FINcoop and a REScoop is the autonomy, the ownership and the control over the renewable energy facility. While in a FINcoop the citizens have the right to vote in the general assembly they will always be a minority on the board of directors. So they have no control over the renewable energy source nor the global decision-making. In comparison, in a REScoop every member has one vote in the general assembly and there are no reserved seats in the board of directors. REScoops are democratically controlled communities where all members have both the right to vote and the right to control equally. (REScoop Vlaanderen, n.d.)

Yildiz (2014) describes motives to engage in close-end funds such as FINcoops. First of all none of the partners has full liability if a project should fail. Furthermore this model is ideal for people who are not looking for involvement in issues related to the business, as the mother company has the control over the project. On the other hand the full control by the mother company enhances the manageability of the project.

5 Research questions

There is a need for renewable energy instead of fossil and nuclear energy so problems like global warming and pollution can be tackled. Wind energy is a clean and sustainable energy source and the Flemish government plans to increase the number of wind turbines drastically. In part 1 of this study a discrepancy between general support for wind energy and local opposition against wind project was highlighted. The literature was far from unanimous over the reasons of this gap. Furthermore, this was also the case for the solutions to minimize the discrepancy and so reduce opposition.

The objective of this study is to examine the influence of location and membership in a cooperative on the attitude towards wind turbines in the specific region Maldegem-Eeklo-Kaprijke.

The centre of this region is Eeklo which is the pioneer city for wind energy in Belgium. There have been wind turbines in this region since 2001, so for almost 20 years. The first research question incorporates this commitment of the region.

- What is the general attitude towards local wind projects of citizens region Maldegem - Eeklo – Kaprijke?

The second research question addresses the NIMBY motive for opposition. It explores if this heavily critiqued principle can be observed or rejected in this case study.

- To what extent do wind turbines in the line of sight from the residence or garden influence the attitude towards wind turbines?

The third research question focusses on cooperatives. Some literature suggests that participation, financially and/or in the decision-making process, can help reduce local opposition. The mechanism behind this suggestion could be a difference in attitude or tolerance towards wind turbines.

- What is the difference in attitude towards wind turbines between members of citizen cooperatives and non-members?

PART 2

Methodology

6 Participants

6.1 Recruitment

The recruitment method for this study is convenience sampling. Within the predefined population, inhabitants of the region Maldegem-Eeklo-Kaprijke, people were asked to fill in a questionnaire physically or online. There were 80 participants that filled in the questionnaire on paper and were recruited mainly on two events, a construction site visit to a new wind turbine in Eeklo for local residents/cooperative members, and the new year's reception of the 'Gezinsbond', the local family union. Another 165 were recruited online. To reach citizens of the specified region, Facebook groups of the relevant municipalities were addressed.

The data collection took place from January until April 2020. All participants were informed about the purpose of the study. It was completely voluntary and each participant could stop whenever he/she wanted.

6.2 Inclusion criteria

6.2.1 Region

This thesis is a region-specific case study. All participants had to live within 20 kilometres of the concentration zone of wind turbines to be included in the study. 18 participants were excluded because their residence was not situated within the predefined region. The total sample size for this study is 227 participants.

6.2.2 Line of sight / cooperative

The sample consists of four groups (**Table 1**). When analysing the second and third research question, these four groups are added up to form two relevant groups that can be compared. The second research question concerns the comparison between a group where a wind turbine is in the line of sight from the residence or garden (Backyard) and a group where this is not the case (Distance). Here the totals of the two groups 'Backyard' and 'Distance' are considered. The 'Backyard' group consists of 120 participants (52,9%) and the 'Distance' group has 107 participants (47,1%). For the third research question a comparison is made between a group with members of cooperatives (C member) and a group with non-members (non-C member). Here the totals of the groups 'C member' and 'non-C member' are used. The 'C member' group consist of 98 participants (43,2%) where 84 were member of one or more REScoops (37%), 2 were a member of a FINcoop (0,9%) and 12 were members of both (5,3%). The 'non-C member' group has 129 participants.

Table 1: *Distribution of the sample when the variables 'Line of sight' and 'Cooperative member' are cross-matched (Own table)*

	C member	Non-C member	**Total**
Backyard	58	62	120
Distance	40	67	107
Total	98	129	227

The distribution over the different REScoops and FINcoops is displayed in **Figure 14**

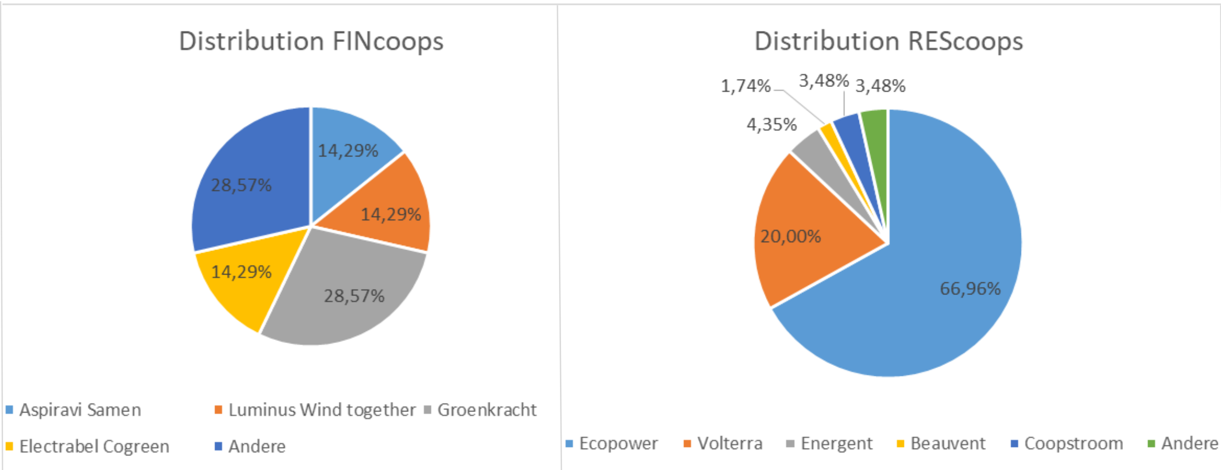

Figure 14: *The distribution of REScoops and FINcoops within the sample (Own illustration)*

7 Questionnaire

The full questionnaire is a reworked version of Penneman (2020) and can be consulted in annex 2. The questionnaire consists of following sections: General, Attitude towards energy transition, Evaluation of wind turbines, Impact on landscape quality and Impact on the living environment.

In the section General there are socio-demographic questions. Gender, age, postcode, education level and distance of the residence from the nearest wind turbine are asked in this question. Other relevant questions are also included in this section such as if participants live in line of sight of a wind turbine and if they are member of a cooperative.

The next section questions the attitude towards energy transition: the willingness to change their life style to reduce the impact on the environment and to pay more for electricity from new technology. Also the perception of the current electricity mix (EM) and the ideal electricity mix in 2030 in Belgium is questioned. This part handles the Belgian EM instead of the Flemish for comparability because only the Belgian EM is reported by Elia, the administrator of the Belgian transmission grid for electricity.

Furthermore there is an evaluation of wind turbines. The perception of several factors related to wind turbines are questioned: Advantages, Electricity cost, Ecological, Beauty, Life span, Safety, Future, Harmless for nature and Energy certainty. Here a 5 point scale was used.

Thereafter is the section Impact on landscape quality. Here three times three statements regarding the topics place attachment/identity, recreation and landscape aesthetics are suggested. On a 5-point Likert scale, from strongly disagree to strongly agree, the perception of the participants is measured. Then the statements of each topic are combined by taking the average.

Last there is the impact on the living environment. In this section the impact of following factors is questioned using a 5-point Likert scale (Very negative – Very positive): Safety and health for local residents, development local economy, employment local residents. Furthermore the influence of following aspects of wind turbines is questioned with a 4-point scale (Very negative, Negative, Slightly negative, No influence): sound, shadow flicker, landscape, smell and transport of building parts. Lastly the perception of the impact on house prices is questioned with a 5-point scale (Decrease heavily – Increase heavily).

8 Processing method

Data is processed and analysed using SPSS Statistics 26, a statistical program. The outliers, participants not living in the predefined region, are excluded. All qualitative variables are recoded to quantitative variables. Furthermore all variables are recoded so that for every variable the highest value corresponds with the most positive evaluation.

For the General section, the sample is compared with the distribution of the actual population of the region. ("Provincie.incijfers.be", n.d.)

The section Attitude towards energy transition consists of two parts. Part one handles the variables Willingness to change lifestyle and Willingness to pay more for new technologies. The mean is calculated and a Chi-Square test, as these are ordinal variables, is performed twice to compare the Backyard group with the Distance group as well as the C members with the non-C members. The second part consists of the ideal Belgian electricity mix. Here the relative distribution over the different energy sources will be displayed.

Furthermore for Evaluation of wind turbines the means of the general dataset and the separate groups are calculated. Then a Chi-Square test is performed twice to compare the Backyard group with the Distance group as well as the C members with the non-C members.

For the analysis of the impact on landscape quality the three combined variables (Aesthetics, Recreation and Place identity) are taken into account. As these scale variables are not normally distributed, a non-parametric T-test (Mann-Whitney U Test) is performed twice to make the comparison between the Backyard and the Distance group as well as the C member and non-C member group.

The Impact on the living environment is once again analysed through mean calculation for the general dataset and the separate groups as well as the Chi-Square tests to compare two times the two different groups.

For the Chi-Square tests a difference between groups will be interpreted as significant if the Pearson Chi-Square is below 0,05. Categories with an expected count less than 5 are combined, if this is rational, until there is less than 25% of the cells with an expected count less than 5 or it is no longer rational to combine categories. For the Mann-Whitney U Test a Sig. value less than 0,05 will indicate a significant difference

PART 3

Results

The questionnaire had 5 sections: The first section was the general part questioning the participants characteristics. The other sections were: Attitude towards energy transition, Evaluation of wind turbines, Impact on landscape quality and Impact on the living environment. In this part the results of each section will we presented. The general values from the whole undivided dataset, the comparison between the Backyard and the Distance group, and the comparison between the C member group and the non–C member group will be presented.

9 Participant characteristics

The total sample (n = 227) consists of 128 males (56,4%), 91 females (40,1%) and 8 with gender X (3,5%). **Table 2** shows the distribution of gender matched with age in relative terms. These figures are compared with those of the region Eeklo (n = 21 249) ("Provincie.incijfers.be", n.d.).

Table 2: *Relative comparison of the sample with the region for gender matched with age (Own table)*

	Sample (%)			**Region (%)**	
Year	Male	Female	X	Male	Female
< 15	/	/	/	7,58	7,33
15-24	7,95	7,50	0,44	5,68	5,25
25-34	2,65	3,09	/	5,83	5,54
35-44	15,40	15,88	1,31	6,46	6,34
45-54	14,55	9,26	0,44	7,14	6,93
55-64	11,00	4,41	0,88	6,60	6,55
65-74	3,95	/	0,44	5,23	5,75
75-84	0,90	/	/	3,60	4,52
> 84	/	/	/	2,94	2,40
Total	56,4	40,1	3,5	49,4	50,6

Furthermore, the distance to the nearest wind turbine was questioned alongside if the wind turbine was in the line of side of the residence. **Figure 15** displays the relation between these two variables. This chart shows that the majority of the participants in the Backyard group live near a wind turbine so that they could possibly be impacted by it.

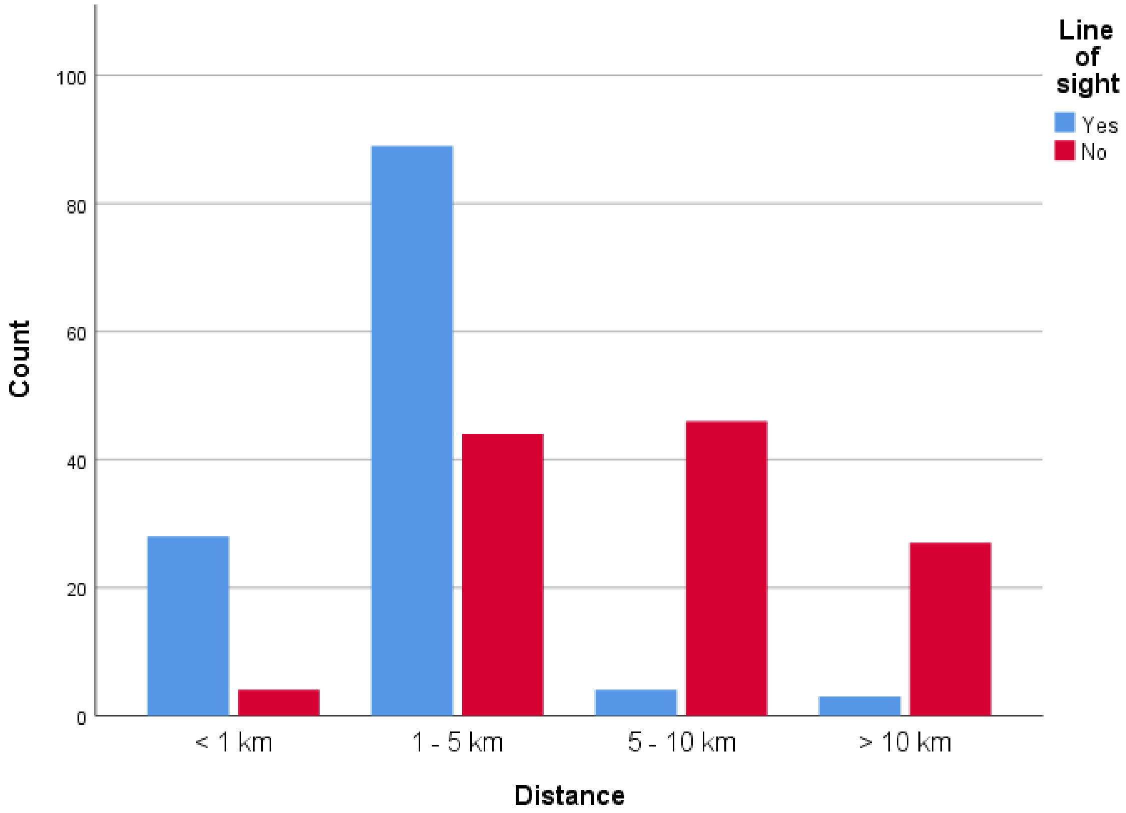

Figure 15: *Relation between distance of nearest wind turbine and whether or not that wind turbine is in line of sight of the residence (Own illustration)*

10 Attitude towards energy transition

10.1 Willingness to change lifestyle and pay more new for technologies

In this part the results willingness to change the lifestyle to reduce the impact on the environment and to pay more for electricity from new technologies are reported. This was measured via a 5-point Likert scale. All comparisons are executed through a Chi-square test.

By combining both questions there is in general an average neutral to positive attitude observable towards the energy transition. The necessity that everyone changes their lifestyle to reduce the impact in the environment is evaluated positively. The average attitude towards a greater cost of energy from new technology is neutral. When comparing the Backyard with the Distance group there is no significant difference observable for both Willingness to change lifestyle and

Willingness to pay more for new technologies. Furthermore the Chi-Square test between the C member and non–C members shows a significant difference for Willingness to pay more for new technologies, where the C members show more willingness to pay more. The Willingness to change the lifestyle is not evaluated significantly different between the groups.

The corresponding means and Pearson Chi-Square (PCS) value are displayed in **Table 3**

Table 3: *The means and Pearson Chi-Square values of the attitude towards energy transistion for the whole dataset and each separate group. (Own table)*

		General (n = 227)	Backyard (n = 120)	Distance (n = 107)	C member (n = 98)	Non-C member (n = 129)
Willingness to change lifestyle	Mean	4,02	4,00	4,05	4,15	3,92
	PCS value	-	0,87		0,18	
Willingness to pay more for new technologies	Mean	3,14	3,04	3,24	3,40	2,94
	PCS value	-	0,75		0,045*	

To be able to perform both Chi-square tests for the variable Willingness to change life, the two negative categories are combined. The * indicates a significant difference with significance level 0,05.

10.2 Ideal Belgian electricity mix

In this part the ideal Belgian electricity mix (EM) for 2030 is examined on a 4–point scale. The categories are: less than 10%, between 10 and 30%, between 30 and 50%, more than 50%.

Considering the whole dataset there are two groups observable. The first group includes Import, Fossil and Nuclear where more than 55% of the participants indicate that these forms of electricity production should be les then 10% of the Belgian EM. The second group consists of Solar and Wind. Here respectively 69,2% and 82,4% of the participants suggests that their contribution to the Belgian EM should be more than 30%.

All percentages for the evaluated energy sources are displayed in **Table 4**

Table 4: Relative distribution of the evaluation of the ideal Belgian EM for different energy sources (Own table)

	< 10%	10% - 30%	30% - 50%	> 50%
Import	70,0%	26,4%	2,6%	0,9%
Fossil	60,4%	31,3%	7,5%	0,9%
Nuclear	55,1%	26,4%	14,1%	4,4%
Solar	2,2%	28,6%	45,4%	23,8%
Wind	1,3%	16,3%	52,0%	30,4%

11 Evaluation of wind turbines

In this section the perception of 9 variables related to wind turbines are examined. A higher value indicates a more positive perception. The means considering the whole dataset, the comparison between the Backyard and distance group (**Figure 16**), and the comparison between the C member and non-C member group (**Figure 17**) are displayed. Furthermore all means and PCS values are shown in **Table 5**.

In general Beauty is the most negatively evaluated variable for wind turbines. The variables Electricity cost, Life span, Harmless for nature and Energy security are evaluated neutral to positive. The other variables (Advantages, Ecological, Safety and Future) are positively assessed.

The Chi-Square tests between the Backyard and Distance group shows no significant differences for every variable. So the groups evaluated these variables similarly as can be seen in **Figure 16**.

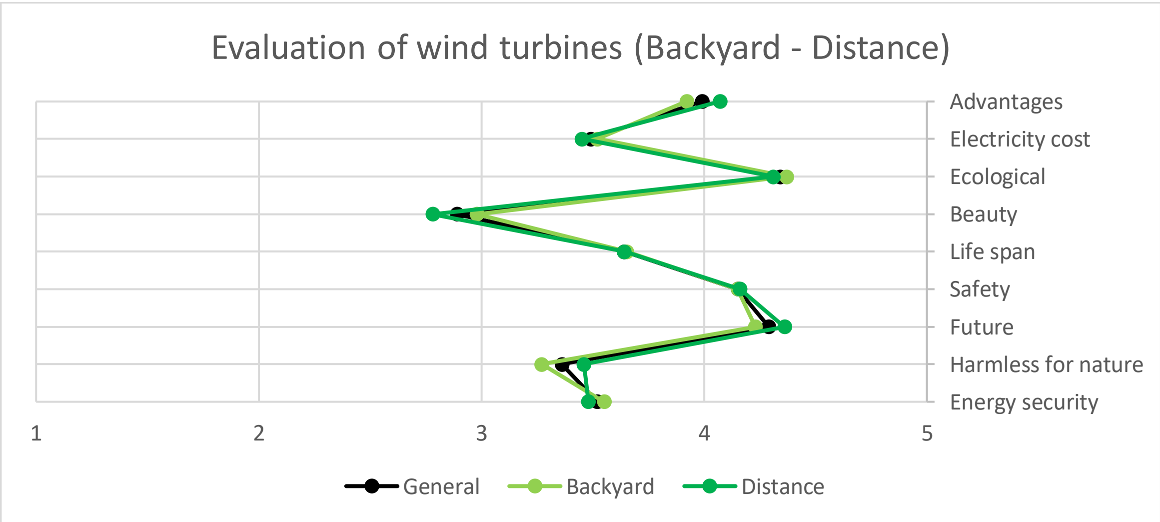

Figure 16: Semantic differential presentation of the variables for the evaluation of wind turbines, comparing the Backyard and Distance group (Own illustration)

When examining the comparison between the C members and non-C members, significant differences are found for Advantages, Electricity cost, Beauty and Safety. For all these variables the C member group has a more positive evaluation than the non-C member group. The other variables show no significant difference which means these were evaluated in a similar way between the groups.

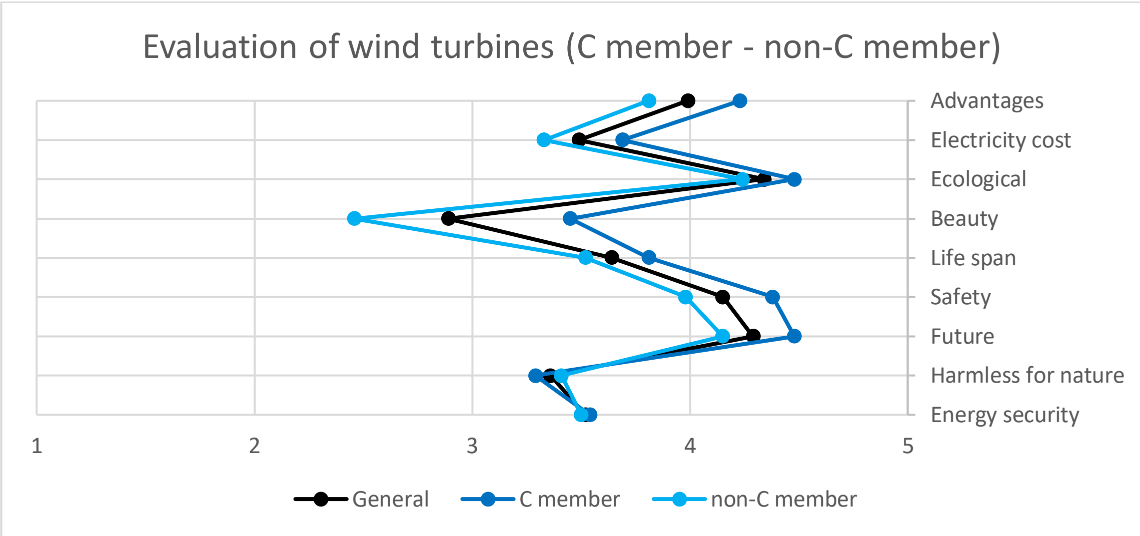

Figure 17: *Semantic differential presentation of the variables for the evaluation of wind turbines, comparing the C member and non-C member group (Own illustration)*

Table 5: *The means and Pearson Chi-Square values of the evaluation of wind turbines for the whole dataset and each separate group. (Own table)*

		General (n = 227)	Backyard (n = 120)	Distance (n = 107)	C member (n = 98)	Non-C member (n = 129)
Advantages	Mean	3,99	3,92	4,07	4,23	3,81
	PCS value	-	0,50		0,005*	
Electricity cost	Mean	3,49	3,52	3,45	3,69	3,33
	PCS value	-	0,46		0,004*	
Ecological	Mean	4,34	4,37	4,31	4,48	4,24
	PCS value	-	0,14		0,19	
Beauty	Mean	2,89	2,98	2,78	3,45	2,46
	PCS value	-	0,088		< 0,001*	
Life span	Mean	3,64	3,65	3,64	3,81	3,52
	PCS value	-	0,63		0,10	
Safety	Mean	4,15	4,15	4,16	4,38	3,98
	PCS value	-	0,64		0,012*	
Future	Mean	4,29	4,23	4,36	4,48	4,15
	PCS value	-	0,68		0,12	
Harmless for nature	Mean	3,36	3,27	3,46	3,29	3,41
	PCS value	-	0,26		0,25	
Energy security	Mean	3,52	3,55	3,48	3,54	3,50
	PCS value	-	0,95		0,16	

To be able to perform both Chi-square tests for the variables Advantages, Electricity cost, Ecological, Life Span, Safety and Future, the two negative categories are combined. The * indicates a significant difference with significance level 0,05.

12 Impact of wind turbines

In this chapter the results of the sections Impact on landscape quality and Impact on the living environment are presented. These sections examine on which variables wind turbines could have an impact and which inherent factors of wind turbines cause that impact.

First of all the impact on landscape quality is discussed. Considering the whole dataset the variable Aesthetics is evaluated more negatively than the other variables, Recreation and Place identity. Wind turbines are thus considered to impact the landscape aesthetics more than the recreation possibilities and place identity.

The Mann-Whitney U Test, which compared the Backyard with the Distance group, showed no significant difference for all three variables. Between the C members and non-C members all three variables are found significantly different, with the C members having a more positive perception for all variables.

The corresponding means and Sig. values are displayed in **Table 6**

Table 6: *The means and Sig. values of the impact on landscape quality for the whole dataset and each separate group. (Own table)*

		General (n = 227)	Backyard (n = 120)	Distance (n = 107)	C member (n = 98)	Non-C member (n = 129)
Aesthetics	Mean	2,78	2,79	2,74	3,10	2,51
	Sig. value	-	0,66		< 0,001*	
Recreation	Mean	3,48	3,44	3,52	3,63	3,36
	Sig. value	-	0,48		0,001*	
Place attachment	Mean	3,55	3,54	3,56	3,78	3,38
	Sig. value	-	0,70		< 0,001*	

The * indicates a significant difference with significance level 0,05.

Second the impact on the community is analysed. In general the impact of wind turbines on all three variables Safety and health, Development local economy and Deployment are assessed as neutral to positive.

The Chi-Square test for the comparison of the Backyard with the Distance group shows a significant difference for the variable Development local economy. Here the people with no wind turbine in line of sight of the residence or garden indicated a more positive impact of wind turbines on the development of the local economy. Furthermore the comparison between the C members and non-C members result in a significant difference for Employment, where the C members evaluate the impact of wind turbines on the employment more positively. For the other variables no significant differences are found.

The corresponding means and Pearson Chi-Square values are displayed in **Table 7**

Table 7: The means and Pearson Chi-Square values of the impact on local community for the whole dataset and each separate group. (Own table)

		General (n = 227)	Backyard (n = 120)	Distance (n = 107)	C member (n = 98)	Non-C member (n = 129)
Safety and health	Mean	3,26	3,27	3,25	3,32	3,22
	PCS value	-	0,41		0,24	
Development local economy	Mean	3,51	3,42	3,61	3,64	3,40
	PCS value	-	0,035*		0,18	
Employment	Mean	3,26	3,18	3,35	3,42	3,14
	PCS value	-	0,069		0,026*	

To be able to perform both Chi-square tests, the two negative categories for all variables are combined. The * indicates a significant difference with significance level 0,05.

To conclude the inherent factors of wind turbines which can cause the impact on landscape quality and living environment are analysed. The perception of these factors is measured via a 4–point scale (very negative – no influence).

For the whole dataset the variables Sound, Shadow flicker and Landscape are on average slightly negatively evaluated. The variables Smell and Transportation have no influence.

No significant differences are found between the Backyard and Distance group. This is in contrast to the comparison between the C member and the non–C member group. Here three variables (Sound, Shadow flicker and Landscape) show significant differences. Here the non-C members evaluate the impact of these variables more negatively than de C members. A comparison for the other two variables is pointless as the data should be recoded to only 2 categories to perform a valid Chi-Square test.

The corresponding means and Pearson Chi-Square values are displayed in **Table 8**

Table 8: *The means and Pearson Chi-Square values the inherent potential negative factors of wind turbines for the whole dataset and each separate group. (Own table)*

		General (n = 227)	Backyard (n = 120)	Distance (n = 107)	C member (n = 98)	Non-C member (n = 129)
Sound	Mean	3,21	3,18	3,23	3,46	3,02
	PCS value	-	0,87		< 0,001*	
Shadow flicker	Mean	3,05	3,07	3,03	3,24	2,90
	PCS value	-	0,095		0,002*	
Landscape	Mean	3,13	3,12	3,15	3,38	2,95
	PCS value	-	0,25		0,004*	
Smell	Mean	3,93	3,93	3,93	3,97	3,90
	PCS value	-	-		-	
Transport parts	Mean	3,67	3,73	3,62	3,83	3,56
	PCS value	-	-		-	

The * indicates a significant difference with significance level 0,05.

PART 4

Discussion

From the literature can be derived that there is a discrepancy between the high level of general support of wind energy and the low level of implementation success of wind turbines due to opposition (Wolsink, 2007). This opposition is driven by many factors that shape the attitude of people towards wind energy projects. In this study the impact of three factors is examined. First of all the general attitude of the specific region (Maldegem-Eeklo-Kaprijke) is investigated. Furthermore the impact of whether or not a wind turbine is in line of sight of the residence is examined. To conclude the third aim is to identify if there is a difference in attitude whether or not people are a member of an energy cooperative.

13 General attitude towards wind projects

On average the participants showed a moderate to positive attitude towards energy transition, wind turbines and their evaluation of the impact on the living environment. Hardly any variable is, on average, evaluated negatively.

Wolsink (2007) described that despite the global support for wind energy, much opposition arises against local wind projects. This global support matches the results found for the ideal Belgian electricity mix for 2030. 82,4% of the participants want that wind energy has a contribution of more than 30% in the Belgian EM which is the highest of all proposed electricity sources. This suggest that the biggest contribution within the Belgian EM should be from wind. If the findings of the Belgian electricity mix are compared with the current electricity mix in Belgium, reported by Elia for 2019 (Elia, n.d.), there are some differences. To achieve the average ideal Belgian EM, indicated by the participants, the contribution of solar and wind energy needs to increase from respectively 4% and 9% in 2019 to more than 30%. This relative increase should be compensated in a decrease in nuclear and fossil energy. This increase of both renewable energy sources to rise above 30% is an ambitious target because the goal set by the European Commission for the contribution of all renewable sources is 32% of the total European electricity mix (European commission, 2020). These results imply that investments in renewable energy globally has the support of the population, which corresponds again with the findings of Wolsink (2007).

These findings can be linked with the results regarding the energy transition and perceived electricity cost of wind turbines. The average agreement to be willing to change the lifestyle in order to reduce their impact on the environment, points in the direction that people are aware of the importance of the energy transition. The neutral position on the variable Pay more for electricity from new technologies proposes that this change would preferably not impact the electricity cost. The participants perceive the electricity cost for wind energy between low and neutral. Today the actual electricity cost of onshore wind is the cheapest compared to all other energy sources, stated in the New Energy Outlook 2018 of Bloomberg New Energy Finance (Bloomberg, 2018). These results suggest that wind energy should play a big role in the energy transition.

Besides electricity price, almost all other evaluated factors have means in the positive half of the Likert scale, only Beauty is evaluated neutral. This suggests that the advantages weight more heavily than the disadvantages of wind turbines. Combining this with the results for the impact of wind turbines, the only slightly negative evaluation is made regarding landscape aesthetics. This is in line with Bertsch et al. (2016) who suggest that aesthetic value of the landscape is a big factor in shaping the attitude towards wind projects. These general positive results can be explained by the selected region. Eeklo is the pioneer city concerning wind energy, with a wind plan and vision since 1999. This implies stimulating participation and local added value. Due to this efforts of the city throughout almost two decades, Eeklo is known for as a true wind city. These efforts could possibly influence the attitude of the citizens towards wind turbines. Another explanation could be the overrepresentation of cooperative members in the sample. There are relatively more members of energy cooperative included in the sample than there are in the population of the region. As will be discussed later in this study, the attitude of cooperative members is in many areas significantly more positive than non–cooperative members. This could influence the general results towards more positive.

14 Influence line of sight on attitude towards wind projects

The concept Not In My Backyard is a much debated subject in the literature with proponents and opponents. The opponents claim that the term is to narrowly defined to explain all opposition towards wind projects. They suggest that there are many factors shaping the attitude towards local wind projects and that the NIMBY factor solely leading to opposition is the case in very limited cases (Devine-Wright, 2011; Jones & Eiser, 2009).

The results of this study correspond with the claims of the opponents of the NIMBY concept. With no relevant significant differences for all variables between people who see a wind turbine from the residence or the garden and people who don't, the influence of the variable line of sight on the attitude towards local wind projects is very limited. These results do not mean that line of sight plays no role in the shaping of the attitude towards, but there can be stated that it is surely not the solely explanatory factor leading to the specific attitude towards local wind projects.

It is surprising that there are absolutely no significant differences. The proximity and visibility of one or more wind turbine could have influenced the attitude towards wind turbines. The results show that a wind turbine in line of sight does not influences the perception of the negative impact of inherent wind turbine factors such as noise, shadow flicker and landscape modification as the most participants in the Backyard group lived within 5 kilometre of the closest wind turbine. The Backyard group is therefore more affected by these factors than the Distance group but they show no difference in perception of the impact of them. An explanation could be that Flanders has very strict ruling concerning noise, shadow flicker and spatial planning. In Vlarem II the ruling of noise and shadow flicker is described (Vlaanderen, n.d.). For noise of wind turbines the guidelines are area specific. For each type of area the guideline values can be found on following website: https://navigator.emis.vito.be/mijn-navigator?woId=42564. The values for residential areas are the lowest with 44 decibel during the day and 39 decibel overnight. For shadow flicker Vlarem II gives following guidelines for regions with residences: *'a maximum of eight hours of effective shadow flicker per year, with a maximum of thirty minutes of effective shadow flicker per day'*. Furthermore for spatial planning Flanders developed *Ruimtelijke uitvoeringsplannen* (RUP's), which translates to Spatial execution plan, where every piece of land is appointed a specific function. Building permits will not be advised positively by the province for buildings outside their predefined zone. All these ruling ensures that the impact of these negative inherent factors is reduced to a minimum.

These results are in line with recent literature that rejects the NIMBY-hypotheses to explain opposition towards local projects, in this case for wind energy. Ladenburg & Dahlgaard (2012) reported similar results that there is no influence of a wind turbine in the line of sight of the residence or garden. The NIMBY-concept is widespread and famous amongst the general population and the media, but it is easily verified as this study amongst the others display. There should be a more accurate concept that takes the place of NIMBY. Rejecting the concept can prevent the destructive and self-fulfilling cycle described by Devine-Wright (2011) and it can help project developers handle with opposition. By recognising that opposition mostly not stems from purely selfish reasons, what NIMBY implies, and not classifying everyone who opposes in the same category, there can be worked towards solutions in a constructive way with all stakeholders.

15 Influence citizen cooperatives on attitude towards wind projects

The final research question concerns the influence of whether or not people are member of a cooperative. For this comparison there are more variables that show significant differences.

In the section Attitude towards energy transition both variables, Willingness to pay more for new technologies displays a significant difference between the two groups, with the C member group showing a more positive attitude. This could indicate that people who want to invest and participate in local wind projects are more aware of the urgency that energy transition should be handled considering climate change and that the transition can influence the electricity price. They could be more interested in the topic climate and so be more informed. This awareness could lead to more willingness to pay more for electricity from new, green technologies.

When examining the evaluation of wind turbines, four variables are perceived significantly different between the two groups. The C members evaluate wind turbines to have more advantages, a lower electricity cost, a more beautiful sight and to be more safe than non-C members. Furthermore, the is a significant difference regarding the perception of the inherent ‘negative’ wind turbine factors, noise disturbance, shadow flicker and landscape impact. C members perceived this impact as less negative. These results show that members of a cooperative perceive the benefits more than the burdens that wind turbines bring with them. Pepermans & Loots (2013) state that since the industrial revolution people have been alienated from the production of electricity as it shifted from local energy resources to fossil-fuelled and nuclear energy. Wind turbines break with this distant energy production and makes the production process of electricity again visible in residential areas. However the benefits of this visible electricity source cannot be claimed by the local communities who bear the burdens but they are reaped away by the project developers. This is not the case with energy cooperatives where the benefits and burdens are equally distributed. Huybrechts & Mertens (2014) state also that the unequal distribution of the benefits and the burdens can lead to opposition. Cooperatives however redistribute these benefits to those who suffer from the burdens. Cooperative members are involved in the planning and decision-making process, are co-owners of the visible wind turbine and can purchase electricity at cost. This redistribution of benefits could be an explanation why members of cooperatives have a more positive perception towards wind turbines.

To conclude the impact of wind turbines is discussed. There was a significant difference for all variables of landscape quality (Aesthetics, recreation, place attachment), where the non-cooperative members evaluate the impact on these variables more negatively. The variables noise, shadow flicker and landscape are also evaluated significantly more negative by the non-C members. These results indicate that there is a different framing and perception of landscape between these two groups. Pepermans & Loots (2013) discusses this difference in framing. The opponents see the uniqueness of the landscape and a source of rest and peace where the supporters see a site perfect for a wind turbine and electricity production. Haggett (2011) identified also a difference in framing of opponents and supporters. Here there was a discrepancy between the local focus of the opponents on the costs of wind turbines and the global focus of the supporters on the benefits of wind energy. This could be an explanation for the results of this study that the non-C members are more focussed on the negative impact on landscape aesthetics, recreation, etc. of wind turbines in the region and that the C members focus more on the benefits obtained through the cooperative.

Combining all these significant differences, there can be stated that for some areas C members have a more positive attitude towards wind turbines than non-C members. Besides redistribution of benefits and burdens, and framing difference, another explanation for this more positive attitude can come from trust in the project developers. Jones & Eiser (2009) suggests that building trust between the project developer and the hosting community is vital as his study shows that the higher the level of trust, the lower the level of opposition. Haggett (2011) states that projects developed by local communities face less opposition than projects from distant multinationals. This can be directly linked with energy cooperatives as they search for a local support base within the community and they develop the project together. Through this trust and involvement in the project, it can be that the perception of the project, that is their own, is more positive than people that are not involved.

PART 5

Conclusion

This study was built around three research questions that examined the influence of a specific variable on the attitude towards wind turbines. These three questions considered the attitude in the specific region, whether or not there was a wind turbine in the line of sight from the residence or the garden and whether or not people were member of a cooperative. The data was collected through a questionnaire in the region Maldegem-Eeklo-Kaprijke where at the end of 2020 there will be 35 wind turbines situated. The ownership of these wind turbines is divided between big players on the European energy market like Engie and EDF-Luminus, and local cooperatives like Ecopower and Volterra. The goal was to examine the general attitude of the inhabitants and if there were differences when the dataset was divided regarding line of sight or regarding membership of a cooperative.

Firstly, the general attitude of the participants was on average fairly positive. Almost no variables were evaluated negatively. This could be due to the efforts of the wind energy supportive city Eeklo towards their citizens through ruling, promotion and consultation. This implies for instance citizen participation and creation of local added value. Another explanation for this positive attitude could be the overrepresented group of cooperative members in the sample compared to the population as the cooperative members show a more positive attitude then non-cooperative members.

Secondly there was no difference found in attitude towards wind turbines whether or not there was a wind turbine in the line of sight of the residence or the garden. These findings disprove the NIMBY concept and support that opposition toward wind turbines arises from individually different factors such as cooperative membership. This study shows that the focus of the literature should shift from trying to explain opposition, e.g. through NIMBY, but rather focus on how to handle with this local opposition. The cooperative approach can be one of the solutions.

Thirdly comparing cooperative members with non-cooperative members significant differences in attitude towards wind turbines were found. The attitude of cooperative members towards wind turbines was more positive than the non-cooperative members in many areas. C members perceive wind turbines to have more advantages, a lower electricity cost, a more beautiful sight and to be more safe than non-C members. Furthermore the impact of wind turbines on landscape quality and the factors causing the impact (noise, shadow flicker and physical presence) are also evaluated more positive by C members. These results show that C members have a more positive attitude towards wind turbines. This could be explained by more involvement and knowledge regarding climate and climate change of C members that lead to the awareness of the necessity of renewable energy. Another explanation is that cooperatives redistribute the benefits of wind turbines to their members and the local community. In contrast to non-cooperative members who only face the burdens. Furthermore could there be a difference in framing with the non-cooperative members focussing on the local costs of wind turbines and the cooperative members focussing on the global benefits of wind energy.

16 Limitations of the study

The first limitation of the study is the sample size and correspondence of the sample with the population regarding socio-economic factors. This study had a rather small sample of 227 retained participants, that could possibly be better matched with the population. The bigger and more resembling the sample size, the more representative it is for the population and the more the results can be extrapolated to the population.

A second limitation was the distribution of cooperative and non-cooperative members within the sample. To draw conclusions for the general population, there needs to be a representative distribution of every group in the sample. In this study the C member group in the sample was relatively more present than they were in the population.

A third limitation was the convenience sampling. A more credible way of selecting participants is random sampling, where every person in the intended population has an close to equal chance to be chosen. This was not possible from my position as student and the time limit of the study.

17 Recommendations for further research

First of all future research should focus on the reasons why the attitude towards wind turbines is different between cooperative members and non-cooperative members. These specific reasons could help project developers and municipalities to adjust their project to the expectations of the local community and so reduce opposition.

Another interesting topic for future research is what the barriers are for project developers to integrate more participation in their projects as participation leads to a more positive attitude towards wind turbines.

Furthermore there must be other variables rather than cooperative membership, such as trust in developers and public support models of the municipality, that can change a negative attitude or strengthen a positive attitude toward wind turbines. These should be identified and brought together into a model that can guide project developers and municipalities to reduce opposition in the future.

PART 6

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Appendix

Annex 1: Comparison objections private – cooperative companies

Annex table 1: *The amount of objections per request for private companies in Eeklo*

Year	Firm	Granted	Objections
2002	NV Electrawinds	Yes	0
2008	NV Electrabel	No	9
2009	NV Electrabel	No	1
2009	NV Air energy	No	2
2010	NV Electrabel	Yes	18
2010	NV Electrabel	No	0
2011	BVBA Stucoo	No	1946
2011	NV Aspiravi	Yes	39
2011	BVBA Final Energy	No	1
2012	NV Aspiravi	Yes	1
2013	NV Electrabel	No	1
2017	BVBA Windkracht Vlaanderen & NV EDF Luminus	Yes	96
2017	NV Engie Electrabel	Yes	120
2017	BVBA Windkracht Vlaanderen & NV EDF Luminus	Yes	94
2017	NV Elicio	Yes	96
		Total	2424
		Average	161,6
		Average (without outlier)	34,1

__Annex table 2:__ The amount of objections per request for cooperative companies in Eeklo

Year	Firm	Granted	Objections
2000	CVBA Ecopower	Yes	0
2000	CVBA Ecopower	Yes	0
2003	CVBA Wind - en Waterkracht Vlaanderen	No	6
2009	CVBA Ecopower	Yes	0
2012	CVBA Ecopower	Yes	0
2017	CVBA Ecopower	Yes	79
		Total	85
		Average	14,2

Annex 2: Questionnaire

Achtergrond onderzoek en onderwerp

Klimaat en milieu zijn hot topics in de media. Er gaat geen dag voorbij of de opwarming van de aarde is door iemand aangekaart. Dat er veranderingen nodig zijn op vlak van energie is duidelijk. Eén van de methoden om duurzaam energie op te wekken is door middel van windturbines. De Vlaamse regering wil onder andere inzetten op windenergie om de klimaatdoelstellingen van Europa te behalen. Daarvoor is een maatschappelijk draagvlak nodig.

Het doel van deze masterproef is dan ook te bekijken hoe aanvaardbaar windturbines op land zijn voor de bevolking.

Opbouw vragenlijst

De vragenlijst bestaat uit 20 vragen. Het eerste deel zijn algemene vragen om u als persoon te kunnen plaatsen binnen de gemeenschap en de omgeving. In de volgende delen vragen we uw persoonlijke mening over bepaalde onderwerpen zoals energietransitie, energievormen, landschap en leefomgeving. Om het onderzoek te kunnen laten slagen is het zeer belangrijk dat u eerlijk en waarheidsgetrouw antwoord geeft. Denk niet te veel na over elke vraag maar volg wat uw buikgevoel zegt. Bij voorbaat dank. 11 januari 2020.

Privacy en verwerking persoonlijke gegevens

Alle bekomen gegevens zullen anoniem verwerkt worden.

Vragen?

Heb je nog vragen over het onderzoek? Stuur dan zeker een e-mail naar onderstaand e-mailadres.

pbdpauw.depauw@ugent.be

Algemeen

1. Geslacht: ☐ Man ☐ Vrouw ☐ X
2. Leeftijd: ___________________
3. Hoogst behaalde diploma (indien student, hoogst reeds behaalde diploma):

   ☐ Lager onderwijs

   ☐ Lager Secundair onderwijs (diploma na 3 of 4 jaar secundair onderwijs)

   ☐ Hoger Secundair onderwijs (diploma na 6 of 7 jaar secundair onderwijs)

   ☐ Bachelor (diploma hoger onderwijs van het korte type / vroeger graduaatsdiploma)

   ☐ Master (diploma hoger onderwijs van het lange type / vroeger licentiaatsdiploma)

   ☐ Postuniversitair (master na master, doctoraat, …)

4. Postcode van uw woonplaats: ___________________
5. Woont u:

   ☐ In het centrum van uw gemeente of dorp

   ☐ In het stadscentrum

   ☐ In een buitenwijk van de stad

   ☐ Op het platteland / landelijk

6. Bent u (of is uw gezin) eigenaar/huurder van uw woning?

   ☐ Eigenaar. ☐ Huurder.

7. Hoe ver woont u ongeveer van de dichtste windturbines?

   ☐ minder dan 1 km

   ☐ tussen 1 – 5 km

   ☐ tussen 5 – 10 km

   ☐ meer dan 10 km

8. Ziet u één of meerdere windturbines staan van uw woonplaats?

   ☐ Ja, vanuit de woning

   ☐ Ja, vanuit de tuin

   ☐ Neen

9. Heeft u een groene stroomcontract bij uw energieleverancier?

   ☐ Ja ☐ Neen

10. Bent u lid van één of meerdere energiecoöperaties?

☐ Ja ☐ Neen

Indien Ja: Welke?

REScoops (eigenaarschap):	**FINcoops (lening):**
☐ Ecopower	☐ Groenkracht
☐ Volterra	☐ Electrabel cogreen
☐ Energent	☐ Luminus wind together
☐ Beauvent	☐ Aspiravi samen
☐ Coopstroom	☐ Storm
☐ Andere	☐ Andere

11. Is uw mening ten opzichte van windenergie het laatste jaar veranderd?

☐ Ja ☐ Neen

Indien ja: Waarom?

____
____
____
____

12. Geef een waarde tussen 0 en 10 voor de volgende vragen: 0 betekent helemaal niet tevreden, 10 betekent heel tevreden.

	Score
A. Hoe tevreden bent u met uw leven in het algemeen?	....
B. Hoe tevreden bent u met uw levensstandaard?	....
C. Hoe tevreden bent u met uw gezondheid?	....
D. Hoe tevreden bent u met wat u op dit moment bereikt heeft in uw leven?	....
E. Hoe tevreden bent u met uw persoonlijke relaties?	....
F. Hoe tevreden bent u met uw veiligheidsgevoel?	....
G. Hoe tevreden bent u met de mate waarin u zich onderdeel van uw gemeenschap voelt?	....
H. Hoe tevreden bent u met uw zekerheid voor de toekomst?	....
I. Hoe tevreden bent u met de kwaliteit van de lokale omgeving?	....

Attitude tegenover energietransitie

13. Duid aan in welke mate u akkoord gaat met de volgende stellingen, met slechts één antwoord per rij.

	Helemaal niet akkoord	**Niet akkoord**	**Neutraal**	**Akkoord**	**Helemaal akkoord**
Ik ben bereid mijn levenswijze aan te passen om mijn impact op het milieu te verminderen.	☐	☐	☐	☐	☐
Ik ben bereid meer te betalen voor elektriciteit afkomstig van nieuwe technologieën in de energiesector.	☐	☐	☐	☐	☐

14. Hoe ziet volgens u de **huidige** Belgische elektriciteitsmix er uit?

Elk land heeft zijn eigen elektriciteitsmix. Deze geeft de totale geleverde elektriciteit weer volgens hun energiebronnen. Duid aan welk percentage van de elektriciteit volgens u, momenteel, door de volgende energiebronnen wordt geleverd in België.

	Minder dan 10 %	Tussen 10 en 30 %	Tussen 30 en 50 %	Meer dan 50 %
Kernenergie	☐	☐	☐	☐
Zonne-energie	☐	☐	☐	☐
Windenergie	☐	☐	☐	☐
Fossiele energiebronnen (o.a. Olie en Gas)	☐	☐	☐	☐
Import	☐	☐	☐	☐

15. Hoe ziet volgens u de **ideale / gewenste** elektriciteitsmix **in 2030** er uit?

Hoe wil u de elektriciteitsmix in 2030? Duid aan welk percentage van de elektriciteit, volgens u, moet worden geleverd door de volgende energiebronnen in 2030.

	Minder dan 10 %	Tussen 10 en 30 %	Tussen 30 en 50 %	Meer dan 50 %
Kernenergie	☐	☐	☐	☐
Zonne- energie	☐	☐	☐	☐
Windenergie	☐	☐	☐	☐
Fossiele energiebronnen (o.a. Olie en Gas)	☐	☐	☐	☐
Import	☐	☐	☐	☐

Beoordeling van windturbines

16. Duid aan waarmee u windturbines op land het meeste associeert. Duid het antwoord aan dat volgens u het beste past, met slechts één antwoord per rij.

Meer voordelen dan nadelen	☐	☐	☐	☐	☐	Meer nadelen dan voordelen
Lage elektriciteitsprijs	☐	☐	☐	☐	☐	Hoge elektriciteitsprijs
Lage investeringskost	☐	☐	☐	☐	☐	Hoge investeringskost
Proper/milieuvriendelijk	☐	☐	☐	☐	☐	Vuil/ milieuvervuilend
Mooi	☐	☐	☐	☐	☐	Lelijk
Lange levensduur	☐	☐	☐	☐	☐	Korte levensduur
Veilig	☐	☐	☐	☐	☐	Gevaarlijk
Toekomstgericht	☐	☐	☐	☐	☐	Niet toekomstgericht
Schadelijk voor natuur	☐	☐	☐	☐	☐	Onschadelijk voor natuur
Energiezekerheid	☐	☐	☐	☐	☐	Energieonzekerheid

Impact op kwaliteit van het landschap

17. Duid aan in welke mate u akkoord gaat met de volgende stellingen, slechts één antwoord per rij.

Windturbines op land …	**Helemaal niet akkoord**	**Niet akkoord**	**Neutraal**	**Akkoord**	**Helemaal akkoord**
… zorgen ervoor dat ik mij minder gehecht voel aan de regio.	☐	☐	☐	☐	☐
… zorgen voor bijkomende mogelijkheid voor recreatie.	☐	☐	☐	☐	☐
… zorgen er voor dat het gevoel van ongerepte natuur verdwijnt.	☐	☐	☐	☐	☐
… weerhouden mij er van mijn vrije tijd in de omgeving te besteden.	☐	☐	☐	☐	☐
… zorgen voor kunstmatig uitzicht.	☐	☐	☐	☐	☐
… symboliseren voor mij de toekomst.	☐	☐	☐	☐	☐
… zorgen voor een toegevoegde waarde in het landschap.	☐	☐	☐	☐	☐
… maken het moeilijker te ontspannen in de omgeving.	☐	☐	☐	☐	☐
… maken deel uit van de identiteit van de regio.	☐	☐	☐	☐	☐

Impact op de leefomgeving

18. Duid aan in welke mate de volgende aspecten beïnvloed worden door de constructie en operatie van windturbines op land, met slechts één antwoord per rij.

	Zeer negatief	Negatief	Neutraal	Positief	Zeer positief
Veiligheid en gezondheid van de plaatselijke bevolking	☐	☐	☐	☐	☐
Ontwikkeling van de lokale economie	☐	☐	☐	☐	☐
Werkgelegenheid voor de lokale bevolking	☐	☐	☐	☐	☐

19. Duid aan in welke mate de volgende aspecten van windturbines op land voor u persoonlijk een invloed hebben in de regio, met slechts één antwoord per rij.

	Zeer negatief	Negatief	Enigszins negatief	Geen invloed
Het geluid	☐	☐	☐	☐
Slagschaduw	☐	☐	☐	☐
Het landschap	☐	☐	☐	☐
De geur	☐	☐	☐	☐
Het transport van onderdelen voor de constructie	☐	☐	☐	☐

20. In welke mate worden de huizenprijzen beïnvloed door de constructie van windturbines op land. De huizenprijzen, geen rekening houdend met andere mogelijke invloeden, ...

Dalen sterk	Dalen	Blijven gelijk	Stijgen	Stijgen sterk
☐	☐	☐	☐	☐