Social Acceptance and the expansion of Wind Farms

A quantitative analysis of the acceptance of wind farms and the expansion of existing wind farms, including a case study in Groningen

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Abstract

This paper covers the widely discussed topic of social acceptance of wind farms, within the wider context of the energy transition in the Netherlands. Different factors that influence social acceptance of wind farms are investigated in a quantitative analysis. Through survey questionnaires conducted in the area of Delfzijl Zuid, a wind farm that is subject to plans for expanding, those factors are assessed.

The paper contributes to the ongoing debate about the social acceptance of wind farms, including the criticized concept of NIMBY. Process-related factors that influence the acceptance of wind farms are covered as well, although no statistical evidence is found in this research. Markers were found that suggest that the process site-decision for wind farms is of great importance when it comes to acceptance.

This paper contributes to the debate by introducing the view at the spatial distribution of the level of acceptance around Delfzijl Zuid. The comparison between the acceptance of newly built wind farms and the expansion of existing ones is another aspect that is new to the debate of acceptance of wind farms. Although conclusive answers stay off, the contribution of those aspects could lead to more research and knowledge about the acceptance of wind farms.

Contents

1 Introduction

The theme of this research is the Energy Transition in the Netherlands. Because of the traditional fossil-fuelled energy system, carbon dioxide accumulates in the atmosphere. This causes the earth to warm up, also known as the greenhouse effect (Pachauri et al., 2014). Given this fact, governments of many countries recognize that this energy system has to be replaced by a more sustainable system. This is partly fuelled by the creation of policy objectives by the European Union in order to increase the share of renewable energy in Europe towards 2020 (Van Leeuwen et al. 2017). These goals consist of the cutting of greenhouse gas emissions from 1990 levels, increasing the share of renewable energy and improving energy efficiency. For the share of renewable energy, the EU set a goal of 27 percent of the entire energy consumption. This goal was revised upwards in 2018, to 32 percent (European Commission, 2019).

To reach these goals, change is needed. A pathway toward a transformation of the global energy sector from fossil-based to zero-carbon, through reduction of energy-related CO2 emissions, to limit climate change is necessary. This is the definition of the Energy Transition given by the International Renewable Energy Agency (2018). In other words, fossil-fuelled energy sources like coal plants need to be replaced by sustainable sources like solar panels and wind turbines.

This transition causes conflicts that are of great complexity. Firstly, this is because of the global urgency of the issue. Secondly, this is because renewable energy sources like wind farms and solar parks relatively take up much more land than traditional power sources, such as a coal plant. Especially in dense countries like the Netherlands, where every square inch has a certain function assigned to it through land use plans, this causes major problems for planners (Koelman et al. 2018). Evidently, the Energy Transition causes a lot of challenges for spatial planners. These challenges do not only consist of the literal transition from a fossil-based energy system to a renewable and sustainable one. The Energy Transition consists of many transitions within society, both socially, economically and planning-wise (Van Leeuwen et al. 2017).

2 Research Problem

In this paper, the acceptance of wind farms in the Provence of Groningen is investigated. The goal is to get insight into the different (spatial) factors that affect the acceptance of wind farms. Furthermore, the level of acceptance for newly built wind farms is compared with the acceptance of the expansion of existing wind farms. This comparison is not investigated much yet and therefore could be relevant for future planning problems involving wind farms. Also, the topic of wind farms and the spatial planning problems that it brings with it is a topic that is very current in the Netherlands, especially in the three northern provinces.

In this research the main question is:

What factors affect the level of acceptance of wind farms in the province of Groningen?

Questions that follow from the main research question are:

- *What are the main factors that influence the acceptance of wind farms (in Delfzijl)?*
- *To what extent does proximity to a wind farm affect the acceptance of planned wind farms (in Delfzijl)?*
- *To what extent is an expansion of a wind farm prone to be more accepted than a newly planned wind farm (in Delfzijl)?*

Derived from the literature study, the expected factors that influence acceptance of wind farms in Delfzijl most are process-related factors like perceived fairness and the level of involvement in the decision-making process. Proximity as a factor as well as the comparison between the newly built wind farms and expansion of existing ones are not dealt with yet in the existing literature. This research may answer these questions.

The structure of this paper is as follows. First, a thorough analysis of the existing literature concerning the topic of this paper is written upon. Then, the conceptual framework that forms the base of the research is shown. After that, the methodology of the quantitative analysis is explained and the results of this analysis is given. Finally, those results are discussed and reflected in order to answer the main research question.

3 Theoretical Framework

3.1 Acceptance of Wind Farms

The most common problem with renewable energy sources (from now on called RES) is the social acceptance of it. When trying to develop successful planning or a successful decision-making process, it seems essential to consider the acceptance of innovations, measures or projects (Busse, 2018). Logically acceptance is needed to realize new projects. A lot of research has been done about acceptance, especially within the field of spatial planning and social sciences. But how to define acceptance? And why is it such a widely investigated topic when it comes to RES? Given the time constraining, binding targets that the EU sets for EU countries, this topic is of major importance in the transition towards a sustainable energy system (Hyland et al., 2018).

RES, especially wind energy projects, feature characteristics that increase the difficulty of reaching acceptance of these projects compared to conventional energy sources. RES tend to be smaller relatively and absolutely. They tend to be smaller in terms of actual size and therefore a larger number of siting decisions is needed. On top of that, RES is characterized by lower energy density, which results in higher relative visual impact. Also, renewable energy production often occurs more close to where energy consumers live, due to the availability of resources (Wustenhagen et al., 2007). Lastly, the movement of blades attracts people's sight and makes wind turbines a strong visual center of the landscape (Pedersen, 2007). Particularly the social or community acceptance of wind farms is heavily investigated, because of the visibility and noise disturbance of those farms (Sunak et al., 2016). This is the reason why wind farms are chosen to be analyzed in this paper.

3.2 Expansion of Wind Farms

A lot of research has been done about sites where wind farms not yet have been placed (Bel et al., 2005; Burningham, 2015; Kontogianni, 2014). At the same time, relatively few researchers have focused on sites where wind farms are already built. This could allow for further investigation of whether experience with wind farms influences the level of acceptance in a community. An investigation in opinions of communities where wind farm installations already have been placed could give insights into the role that experience with wind farms play in the shaping of opinions; something that wouldn't be possible only analyzing places without wind farms (Kontogianni et al., 2014). This is the reason why this paper is of relevance. Analyzing opinions on sites with a built wind farm can lead to a better understanding of determinants of social acceptance. I may also give insight into the option of expanding existing wind farms, instead of creating new ones.

The reason for picking Delfzijl Zuid as the wind farm of examination is the fact that there are plans for expanding this wind farm. Also, wind energy is a widely discussed topic in the area of Noord Groningen. Therefore, it is interesting to ask inhabitants of that specific area, about their opinions on this expansion.

3.3 NIMBY'ism

Social acceptance of wind energy is a major problem in the Netherlands when trying to achieve a transition towards renewable energy. The problem that is described a lot within existing literature is the 'social gap' between on the one hand high public support for renewable energy, but on the other hand, low success rates achieved in planning applications for wind power developments (Bell et al., 2007). People are in favor of the technologies that are being implemented to harvest renewable energy 'in itself, but they are against local projects involving these technologies in the near area.

A related concept to this gap is NIMBY'ism (NIMBY= Not In My Back Yard). Wolsink (2000) describes NIMBYs as ''people that combine a positive attitude (towards sustainable energy) and resistance motivated by calculated benefits and costs''. Individuals or communities, according to NIMBY explanations, favor the abstract concept of wind power but are opposed to wind power projects in their own area (Warren et al., 2000).

The NIMBY acronym is criticized a lot in past research. NIMBY is not accurate in characterizing and identifying opposition to siting of RES. It is difficult to find individuals who do support developing of renewable energy but are motivated by calculating their own benefits and costs and therefore oppose local siting (Burmingham et al., 2015)

Kontogianni et al. (2014) state that the most common critique on NIMBY is the fact that the concept seems to imply a spatial effect. The closer a wind farm is to someone's backyard, the stronger their opposition will be. Research done in the past cannot give a conclusive confirmation about this assumption. Also, The NIMBY concept does not give a clear answer to the complex human motives and therefore does not explain the social data gap mentioned before (Bell et al., 2007). Hence, it is interesting to investigate whether the proximity of a wind farm does indeed influence the acceptance of new wind farms.

3.4 Process-related factors

Besides proximity, there are other process-related factors that determine the level of social acceptance of planned wind farms. Involvement in the process of determining sites for wind farms tends to have a significant role in the acceptance of local residents. Not only the involvement in the decision-making process but also the option for locals to become involved in investing in wind projects can further enhance the acceptance by locals (Wolsink, 2007). Involvement does not only mean involvement in the decision-making process. Locals are prone to acceptance when they have a chance to be involved financially, in the form of stakeholdership or financial compensation. The last option tends to have to

most impact on acceptance (Hyland et al., 2018). Another term that is related to this compensation is community benefits. Community benefits are the provision of financial or material compensation by the developers to the area affected by the facilities created by those developers. Those benefits are seen as fair because of the unequal distribution of environmental and economic costs and benefits. In other words, the more rural areas must deal with the costs of housing wind farms, while urban areas consume most of this energy (Cowell et al., 2010).

The perceived fairness of the decision-making process also tends to have an effect on acceptance. Local residents that face a wind farm to be planned nearby them, prefer to be treated fairly in order to accept the building of the new wind farm (Firestone et al., 2012). Being treated fairly means that there is participatory justice and distributive justice. Participatory justice means the opportunity of being involved in the planning process. This concept has been discussed within social sciences a lot, starting with the Citizen Participation Ladder created by Sherry Arnstein (1969). This ladder describes different scenarios in which citizens have different levels of decision making power. After this paper, thinking about the participation of civilians became a widely discussed topic. Participatory justice was found to be an important factor in public acceptance (Liebe et al., 2017). Distributive justice refers to the fair distribution of turbines across regions. As mentioned above, this distribution is not spatially equal as there is a difference between urban, dense areas and rural, less dense areas. Participatory justice seems to be more important concerned acceptance of wind farms (Liebe et al., 2017).

Not only does the process of planning wind farms influence the level of acceptance. The actual specifics of a wind farm also play a role in the willingness of local residents to accept it. Specifics like size, level of noise nuisance, created shadow and number of wind turbines have to be taken into account when analyzing the acceptance of surrounding residents on the chosen site (Sardado et al., 2019).

3.5 Conceptual Model

Given the findings and remaining questions that arise from earlier research, the conceptual model that is used for this research is as follows:

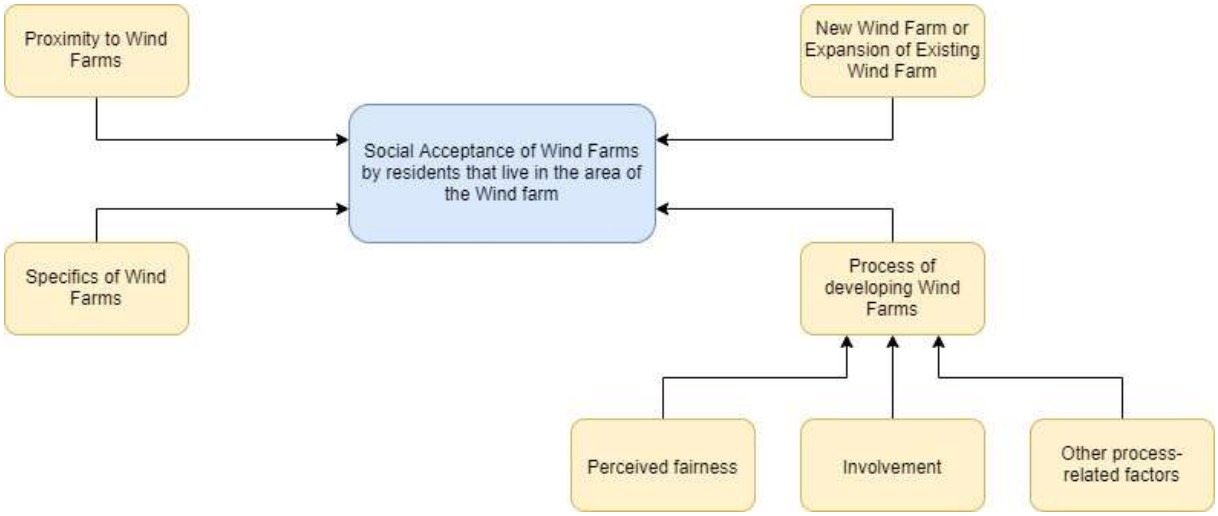


Figure 1. Conceptual model of social acceptance of wind farms.

This model represents the relation between factors of wind farms and the acceptance of them. The yellow boxes represent the different aspects that influence acceptance as discussed above. The aspect of the process of developing Wind Farms is split up between perceived fairness by local residents and the involvement in the decision-making process. The arrows between the yellow boxes and the blue box represent the relation between the factors of wind farms and the acceptance of wind farms. These relations are examined in this research.

The aspect of *specifics of Wind Farms* as stated in the conceptual model, will not be covered in this paper, as the research is done within the domain of social sciences. The researcher has insufficient technical knowledge about technical aspects of wind farms, which makes it hard to make statements about them. The interest lies within the social aspects of acceptance of wind farms. But because of the fact that specifics of a wind farm do influence acceptance, the aspect is integrated into the conceptual model.

4 Methodology

4.1 Data Collection

In order to measure or discover the relationship between local acceptance of wind farms and the different factors that possibly affect acceptance, it is necessary to conduct a survey questionnaire. Surveys research is particularly useful for eliciting people's attitudes and opinions about social, political and environmental issues (Clifford et al., 2010). The goal of surveys is to acquire information about the characteristics, behaviors, and attitudes of a population by administering a standardized survey, or questionnaire, to a sample of individuals (Clifford et al., 2010). In contrast with in-depth interviews, questionnaires are useful to make statements about a population. An in-depth interview for example, and other qualitative research methods, cannot be used to make those statements (Punch, 2014). That is why a survey questionnaire is chosen as the instrument for this research.

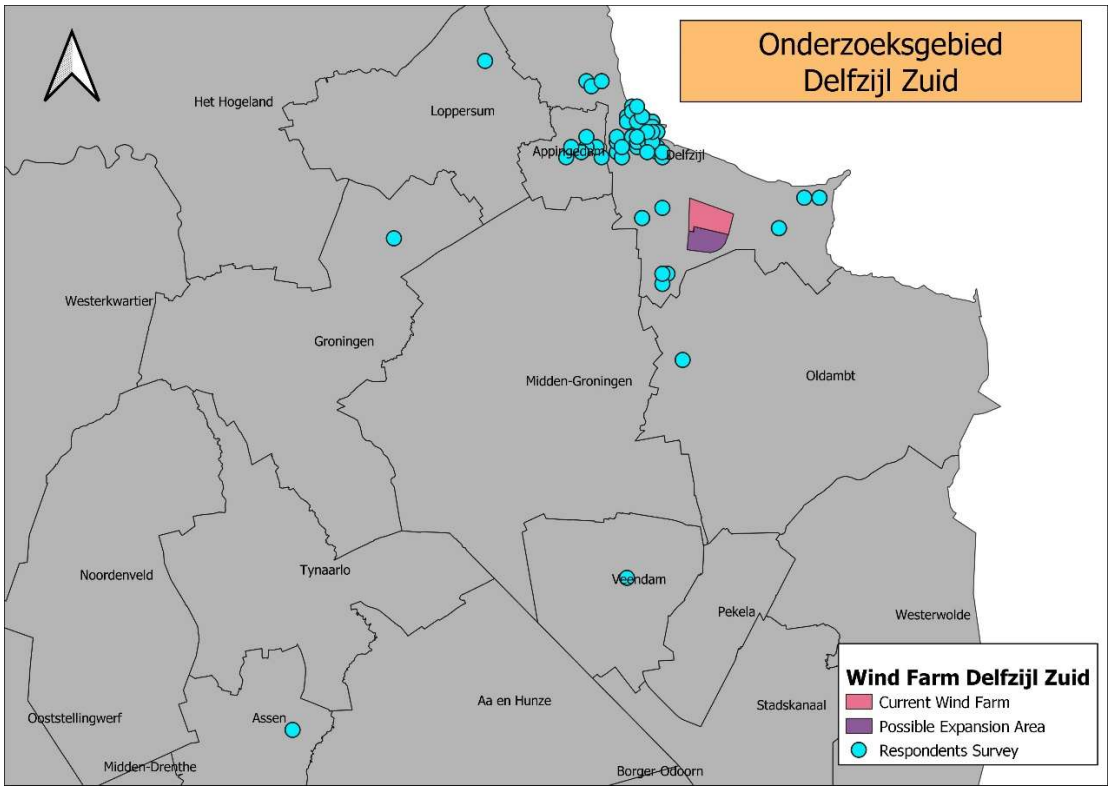
Acceptance of the expansion of Delfzijl Zuid, as well as other variables that comprise the opinion of people, is measured by using a Likert-scale. A Likert-scale is best used for measuring opinions and attitudes, as it is a fixed-response format, in which fixed answers are given based on a scale. A simple yes-or-no question about the acceptance would turn into a great loss of information. Because an odd-numbered scale presents a neutral option for the respondent, a 5-answer-scale will be used (Clifford et al., 2010).

In order to investigate the ''social gap'' as mentioned before, a term closely related to the acronym of NIMBY, the respondent is asked about his or her opinion on renewable energy in general. The opinion on renewable energy can be compared with the opinion on the wind farm in Delfzijl. Furthermore, a couple of demographic factors will be asked, such as age, level of education finished and gender. They will function as ''control variables''. It is possible that those factors influence the level of acceptance as well.

Another variable that is measured in this research is the proximity of respondents their residents to Delfzijl Zuid. When measuring distance, two types of assessment can be used, relative or perceived distance and absolute distance. The first one implies asking respondents of the survey for the distance between their resident and the wind farm. Because it is very hard to standardize the measurement "living close to a wind farm'', it is necessary to ask respondents about their perception of this variable. "Do you feel like you live close to an existing wind farm?'' is a question that is added in order to address this. The second, and more precise, option is asking the respondents about the postal codes of their home. With the use of the ArcGIS-tool NEAR, the distance between features of data is calculated and put into the statistical model. This way, a new variable is created, which gives a more precise insight into the distance from resident to Delfzijl Zuid.

In order to assess the difference between acceptance of the expansion of a wind farm and the acceptance of a newly planned wind farm, respondents that lived in the area of Delfzijl Zuid at the time of the building of the original farm will be asked about their opinion at that point of time. This variable can be compared with the level of acceptance of the expansion as it is planned currently.

4.2 Data Collection Method



Map 1, an overview of the area surrounding Delfzijl Zuid.

The data was collected in the surrounding area of the wind farm ‘’Delfzijl Zuid’’. An overview of the area is given in map 1. The population consists of: people that live in the area of a wind farm. According to research done on the visibility of wind turbines, a threshold of 20 kilometers is set as being the area in which turbines are easily visible (Sullivan et al., 2012). Therefore, people that live in the area of a wind farm is defined as people that live within 20 kilometers from the Delfzijl Zuid wind farm. The researcher intended to conduct questionnaires in the center of Delfzijl, because this is where most people will be during the daytime. This is also a place where people from different villages within the area of the wind farm will go to for shopping or groceries. For convenience, this seems the most efficient way of gathering data. The sampling strategy for this research was convenience sampling (Punch et al., 2014). In order to get a complete and representative image of the opinion of the population, the surveys were conducted on different days of the week and at different times of the day. This is done because different people of different social classes are in the city center on different time slots.

4.3 Data Analysis Scheme

When the data is collected, it will be analyzed using the statistical program SPSS. A multiple linear regression seems to be the best way of declaring acceptance of wind farms because multiple factors can be put into this statistical tool. Multiple linear regression is used to find the relation between a dependent ratio variable, in this case, the acceptance of wind farms, and two or more independent variables. These are the factors displayed in the conceptual model. Those independent variables can be ordinal, ratio or nominal variables. The weight of the factors can be measured as well (Moore et al., 2008).

In order to strengthen and verify the use of a multiple linear regression model in this research, the assumption of equidistant intervals is used. It is assumed that the 'measured distance' between the different numbers in the Likert scale questions is the same among all numbers. The distance between 'strongly disagree' and 'disagree' is equal to the distance between 'disagree' and 'neutral', et cetera. By assuming this, the outcome of the survey can be treated as a ratio variable, instead of an ordinal variable (Dobson et al., 1979). In the reflection of this paper, this assumption will be discussed further.

One variable that is used in the model is the absolute distance between the respondents their homes and windfarm Delfzijl Zuid. This variable had to be calculated with the help of the program ArcGIS Pro. In this program, a map is created with different layers of data. First, a polygon is drawn from the locations of the existing wind turbines of Delfzijl Zuid and the area in which the supposed new wind turbines should be placed. Then, a layer with zip-code areas was downloaded from ArcGIS Online. These areas, which were displayed as polygons, are transformed into points that represent the demographic center of gravity from every zip code area. This is done in order to generate a distance variable as representative as possible. With the geoprocessing tool NEAR, the distance between all zip-codes within a distance of 30 km of the wind farm polygon and this polygon could be measured. After processing a table with this information, a new variable could be imported into the statistical program SPSS.

In addition to the closed questions, respondents are asked what it is exactly that influences them when they feel influenced by wind farm Delfzijl Zuid. This is an open question and gives more insight into the reasons why people are bothered by the wind farm and are not accepting it.

4.4 Data Quality

When conducting survey questionnaires it is necessary to discuss the trustworthiness of the data that will be collected. Data collected through survey questionnaires needs to be reliable and valid. If the survey would have been repeated multiple times, the outcome should be more or less the same, and therefore reliable (Punch et al., 2014). Other scientists should be able to perform this research again, with the same results. This is the case for this data collection method, also because the dataset and the used model are significant and thus say something about the population, as shown in the results part.

Although, the fact that this paper makes use of the assumption of equidistant intervals does create some unreliability, as people interpret the distance between values on the Likert Scale differently.

The questionnaire also should be valid, which means that it should measure what it supposes to measure (Punch et al., 2014). This will be the case for almost all questions, except for the question about the difference between the expansion of a wind farm and a newly built wind farm. The goal of the question is to measure the level of acceptance of the original farm at the time just before the plans were definite. Given the fact that people already are in a situation of a built wind farm, it is perhaps difficult to imagine a situation where no wind farm is built yet. The answers people give may be different now compared to the answers they would give at the time.

4.5 Ethics and Positionality

The respondents of the questionnaire and their information should be treated in an ethical manner. This research should not harm any respondent. Therefore, the data collected is completely anonymous and is only used for scientific purposes.

Another important aspect of ethical issues is the positionality of the researcher. I am fully aware of my position as a researcher and know that this paper and its content cannot affect anybody. The outcome of a research about acceptance of a project that involves a lot of big financial players, could negatively affect players involved in the project. Therefore, I will try to be as neutral and objective as possible in this paper.

5 Results

5.1 Descriptive statistics

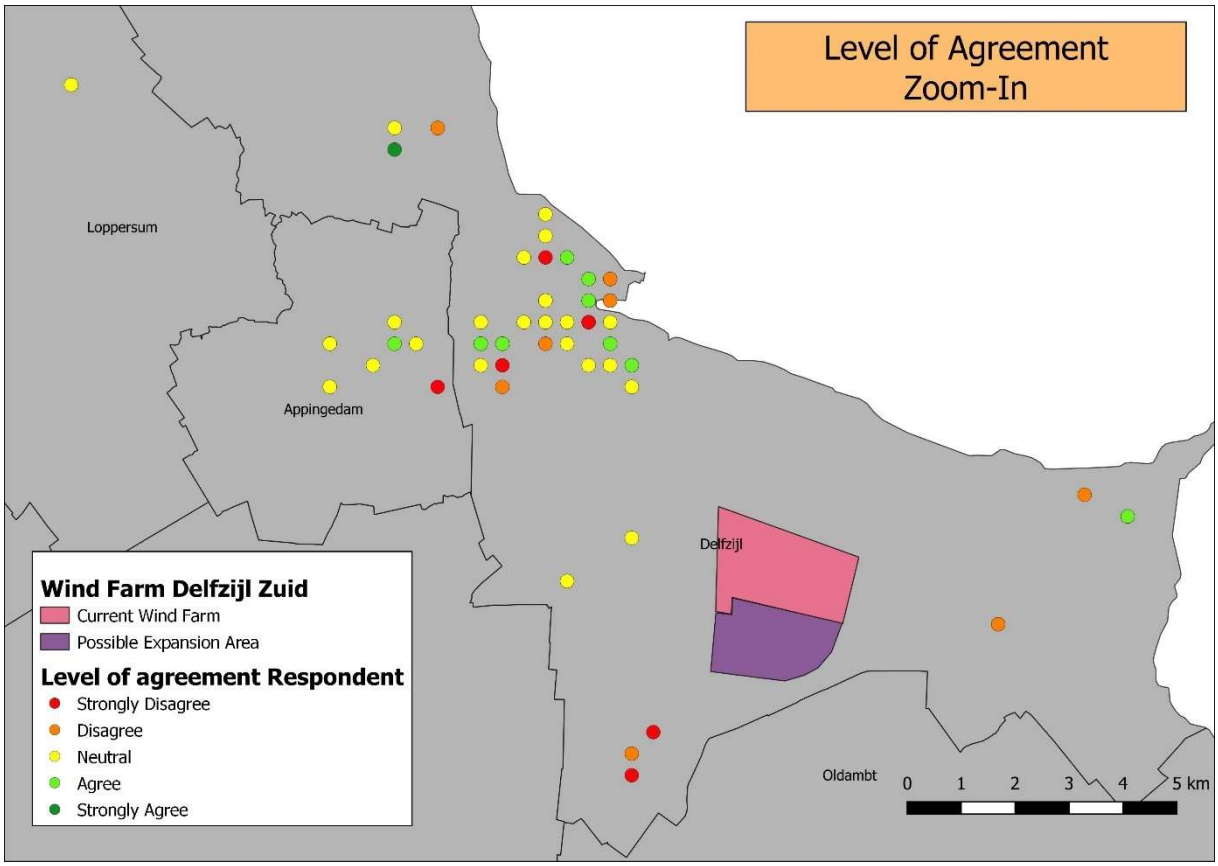
Firstly, an overview of the data that is collected will be shown. This is done to get a feel of the data and to see what kind of results actually is found. The following table is showing the statistics and demographic features of the sample of the population.

	N	Minimum	Maximum	Mean	Standard deviation	Variance
N	101					
Gender	99	0	1	0.49	0.503	0.253
Age	99	18	83	48.83	18.781	352.736
Education Level	95	1	8	4.27	1.704	2.903
Absolute distance zipcode to Delfzijl Zuid	83	1447.11	9157.15	4779.2487	1675.20216	2806302.284

Table 1, Descriptive Statistics.

The total amount of respondents, or N, is 101. The variable gender is classified as a 0 for women and a 1 for men. The share of men and women is almost evenly distributed and thus representative for the population. The age of the respondents is varying a lot. The average age of the respondent is relatively high. Nevertheless, this gives a representative image of the population in Delfzijl, because the age group 45 to 65 is the biggest age group in Delfzijl (CBS, 2019). Education level is classified as a 1 for the lowest possible education level reached (preliminary school) and an 8 for the highest possible education level reached (master's degree). This number also varies a lot, but the average person surveyed was not highly educated. An average education level value of about 4 means that the average respondent of the sample has a finished MBO degree. MBO is translated as Intermediate Vocational Education.

5.2 GIS Map



Map 2, The level of agreement with Delfzijl Zuid in the surrounding area.

In the map above a spatial visualization of the responses is shown. A statistical analysis alone is not sufficient to get a complete image of the spatial distribution of respondents and responses. That is why a map like above is implemented in this paper. The map shows the current area in which turbines are placed and the area in which the expansion is planned to be built. Besides that, zip codes of respondents their home are displayed. Each colored dot represents the demographic gravity point of the zip code in question. This way the dots are most likely to be as close as the respondents their homes as possible. In order to get a clear image of the outcome, this map is zoomed in to the area surrounding Delfzijl Zuid, which causes some respondents to be left out of this overview.

A first look at the map tells that respondents that live the closest to Delfzijl Zuid are not positive towards the expansion. Respondents that live further away from the wind farm have mixed opinions on the expansion.

5.3 Regression Model

The model summary as given below provides information about the significance and quality of the model. R shows the correlation between on the one hand the real results and on the other hand the predicted results based on the findings of the survey. A high number means a better prediction. The R of this model is relatively high. The R Square number represents the share of variance that is explained by the model. In this case, 56,1% of the variance can be explained by the variables integrated into this model. The adjusted R square also holds into account the number of variables used in the model. The last component of the model summary is the Standard Error of the Estimate. The value represents the distance of every point towards the regression line. In other words: the lower the number, the stronger the linear correlation between the dependent and the independent variables is. The number in this model is somewhat high, which means that the linear correlation of all dependent variables with the dependent variable is not strong.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.749	0.561	0.501	0.638

Table 2, Model summary.

Before the next table can be interpreted, a null hypothesis must be made. In the ANOVA table, the F results of the F test is shown. The F test compares a model with no predictors, or an intercept-only model, with the model that is used in this model. If the significance level is below 0.05, the model fits better than the model without predictors, or the intercept-only model. As can be seen in the ANOVA table, this is the case for this model. This means that the model can be used for interpretation.

Model	Sum of Squares	df	Mean Square	F	Sig	
Regression	34.313	9	3.813	9.373	0.000	

Table 3, ANOVA.

5.4 Statistical outcomes

When interpreting the coefficients table, a null hypothesis needs to be formulated. The null hypothesis for the regression model is as follows: In the population, there is no relation between the dependent variable and the independent variables. In other words: In the population, there is no relation between acceptance of Delfzijl Zuid and all independent variables. As mentioned before, the whole model is significant because the F-test is significant. This means the null hypothesis can be rejected. This also means that the b-values can be interpreted. Only b-values from independent variables that have a

significant level below 0,05 can be used for interpretation. This is the case for the variables 'Attitude towards Renewable Energy Sources', 'Feeling of being influenced by Delfzijl Zuid' and 'Age'.

For interpretation, standardized beta-values are used. This is because the unstandardized b-value does not hold into account the different measuring units that different variables have. For example, age is measured in years while the acceptance of Delfzijl Zuid is measured in points on a Likert Scale. The standardized Beta-value is dealing with this because it is measured in units of standard deviation. This makes it more precise, but harder to interpret.

The standardized Beta-value for age, for example, is -0,249. This means that there is a weak negative correlation between age and acceptance of Delfzijl Zuid. If the age of a person goes up with one standard deviation (18,781 years), the level of acceptance (as asked on the Likert scale) will drop with 0.249 standard deviation. This comes down to a drop of 0,225345 points on the Likert scale.

The same calculation can be done for 'Attitude towards Renewable Energy Sources'. If this variable rises with 1,065, acceptance rises with 0,4525. And for 'Feeling of being influenced by Delfzijl Zuid, a rise with 0,975 on the Likert Scale will cause a fall of -0.245255 in Likert scale points in the acceptance of the expansion of Delfzijl Zuid

	Standard Deviation	Standardized coefficients Beta	Coefficients Std. Error	t	Sig
Constant			0.0682	3.118	0.003
Attitude towards Renewable Energy Sources	1.065	0.500	0.083	5.073	0.000
Feeling of living close to Delfzijl Zuid	1.025	0.057	0.089	0.594	0.555
Feeling of being influenced by Delfzijl Zuid	0.975	-0.271	0.085	-2.836	0.006
Level of involvement in decision making process	0.831	0.001	0.093	0.010	0.992
Being aware of plans of expansion of Delfzijl Zuid	0.502	0.085	0.169	0.903	0.370
Gender	0.905	0.042	0.162	0.465	0.644
Age	18.781	-0.249	0.004	-2.768	0.007
Education level	1.704	-0.109	0.047	-1.212	0.230
Absolute distance to Delfzijl Zuid	1675.2021	0.100	0.000	1.055	0.295

Table 4, Regression model, the dependent variable is 'Attitude towards expansion Delfzijl Zuid'.

5.5 Factors influencing acceptance

Sub-question one is: *What are the main factors that influence the acceptance of wind farms (in Delfzijl)?* To answer this question solely based on the conceptual model as well as the statistical model in this paper, the factors that have an effect on the acceptance of wind farms in the Provence of Groningen are as follows. A rise in age negatively affects the acceptance of Delfzijl Zuid. Perhaps older inhabitants are new to the urge of the Energy Transition, as older people tend to have more difficulties in a social transition (Van Leeuwen et al. 2017).

The concept of NIMBY plays a huge role in the literature about the acceptance of wind farms (Wolsink, 2000; Warren et al., 2000). The model shows that a positive attitude towards renewable energy sources is positively correlated with the acceptance of wind farm Delfzijl Zuid. This means that NIMBY'ism is not the case in the Provence of Groningen, or at least according to this model. If NIMBY was the case, the correlation would be negative. In the model, the correlation is 0,420, which is positive. NIMBY'ism, as discussed in the theoretical framework, was criticized quite heavily in recent literature. It is hard to find people with a positive attitude towards Renewable Energy Sources whilst not accepting a wind farm in their neighborhood by calculating costs and benefits (Burningham, 2014). The outcome of the model strengthens these criticisms.

Some factors that are described and confirmed by other researches as being affective on acceptance of wind farms are not found in this model and thus in contrast with the findings presented in this paper. The level of involvement in the decision-making process turned out to be insignificant when it comes to affecting the acceptance of wind farms within this model. This goes against a lot of social scientists that suggest otherwise (Wolsink, 2007; Hyland et al., 2018; Liebe et al., 2017). Perhaps people in the area have never been introduced to the possibility of getting involved in the process of decision of wind farm sites.
Nevertheless, the feeling of being influenced by Delfzijl Zuid is a significant factor and has a negative effect on the acceptance of the expansion of Delfzijl. As mentioned in the theoretical framework, acceptance of wind farms is subject to the feeling of distributive justice (Liebe et al., 2017) and the perceived fairness (Firestone et al., 2012). People who do not accept the expansion feel as if they should at least be less influenced by the wind farm because otherwise, they would accept the expansion, and therefore distributive justice seems to play a role in acceptance of wind farms here. Despite the fact that involvement in the decision-making process, in this statistical model, turns out to be insignificant, distributive justice is an important part of the perceived fairness of the decision making process in determining sites for wind farms.

5.6 Proximity

When zooming in to another concept included in the conceptual model, the role of proximity of people's homes to the wind farm and the effect that this has on acceptance, the following can be concluded: Despite the fact that observing the GIS map noticeably effectuates a visual pattern, nothing can be stated about the role that proximity plays in the level of acceptance of inhabitants in the area of the wind farm. Within a radius of 20 kilometers, there appears to be no significant difference in the level of acceptance. Another critique on NIMBY'ism is that NIMBY seems to imply a spatial effect, and research could not confirm this (Kontogianni et al., 2014). The findings in this model are in line with this inability and therefore strengthens criticism even more.

5.7 Expansion versus New

The last sub-question and remaining feature of the conceptual model is about the difference between acceptance of a newly built wind farm and the expansion of an existing one cannot be answered using the regression model, because the two variables showed multicollinearity. Nevertheless, the distribution of responses does tell something about the difference. In figure 2 below, two histograms are shown with the distribution of answers on 'Attitude towards expansion Delfzijl Zuid' and 'Attitude towards built of original farm Delfzijl Zuid'.

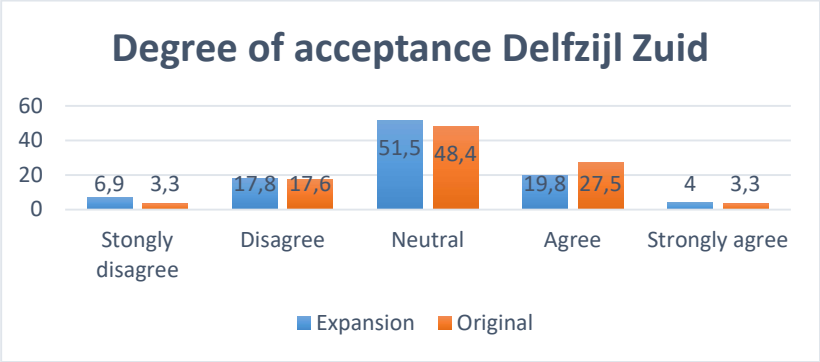


Figure 2, Degree of acceptance of Delfzijl Zuid.

The numbers insinuate that acceptance of the original wind farm Delfzijl Zuid are somewhat higher compared to the acceptance of the expansion of Delfzijl Zuid. The plans of expanding Delfzijl Zuid are looked upon more neutral, whereas the original farm was welcomed slightly better. Because the difference between the expansion of wind farms and newly planned wind farms in terms of acceptance is hardly encountered in existing literature, it is hard to place these results in a wider context.

6 Conclusion

Social acceptance of wind farms is widely investigated in social sciences. Despite the ongoing efforts of scientists to get a conclusive answer on what it is that drives acceptance of wind farms, there is still a lot to discover. This paper gives more insights into the factors that are influencing acceptance, addresses new and hardly discussed factors, and creates questions and opportunities for an ongoing debate.

It is because of the shortage of time and resources used for this research that the dataset is limited. This might be the reason that factors found in other literature to be significantly influencing acceptance of wind farms, such as process-related factors, are not verified by this research. Still, markers are found that process-related factors are in fact of influence on acceptance. For instance, the feeling of being influenced by Delfzijl Zuid, which connotes the feeling of distributive injustice. The process of determining sites for wind farms in general, and for the expansion of Delfzijl Zuid in particular, should be subject to more extensive research, in order to create optimal choices for certain sites.

Age does influence the acceptance of wind farms as well according to the model. And because of the fact that age has not been covered in existing literature, combined with the relatively old population of Delfzijl, research specifically focused on creating a larger support base for Delfzijl Zuid or RES in general in the Netherlands, could speed up the transition towards a sustainable energy system, as the Energy Transition has to occur anyway (van Leeuwen et al., 2017).

The role of NIMBY in acceptance of wind farms has been criticized and this paper builds on to that. The ongoing debate on NIMBY as a major and driving factor continues to be a big difficulty. Although a spatial pattern could not be proven to be significantly influencing acceptance of wind farms, visual evidence of the GIS map suggest that more research should be performed on spatial patterns concerning acceptance of wind farms. Perhaps bigger datasets covering several sites could give more insights. The data used in this paper is just insufficient for giving clear answers.

The fairly new contribution of this research is the comparison between two different types of sites at which developing of wind farms could take place. Thoroughly investigating the difference between acceptance of newly planned wind farms and acceptance of expanding existing wind farms could give more insights for planners and policymakers on where to aim for developing wind farms and where not. This research did not possess the right amount of time and resources to come to a conclusive answer to this exciting point within the topic of social acceptance of Renewable Energy Sources

7 Reflection

The assessment of acceptance of Delfzijl Zuid was done through presenting the respondents a Likert scale-based question, with a range from strongly disagree to strongly agree. Also, every point on the scale in between those points was specified by the researcher. The variable that this type of assessment created was useable for analysis based on a ratio variable, by assuming equidistant intervals between all points on the Likert scale. Firstly, using an ordinal variable in a linear regression model is not the most trustworthy way of analysis. This is also questioned often within the scientific world as being scientific or not. If this research could have been redone, another scale would have been chosen to assess the acceptance of a wind farm. A scale from 1 to 10 with no specified points in between, creates a ratio variable. This type of variable is more fit for a linear regression model.

Another point of improvement regarding this research is the place of conducting survey questionnaires combined with the design of data analysis. The new and exciting part of this paper is the comparison between social acceptance of expanding a wind farm and of building a new one. Unfortunately, because of the fact that only one place was used for conducting surveys, this comparison could not be made with the use of proper statistics. Further research should focus on gathering data from sites that already accommodate a wind farm and sites where no wind farm is built yet. This way two different possible sites for new wind turbines can be compared. This would open up a variety of other options for statistical analysis.

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Appendix 1, Survey Questionnaire

Enquete Windmolenpark Delfzijl Zuid

Hartelijk dank voor het deelnemen aan dit onderzoek! Mijn naam is Niek Schiphof en ik studeer Sociale Geografie en Planologie aan de Rijksuniversiteit Groningen. Voor mijn scriptie doe ik onderzoek naar windmolenparken en de acceptatie van de bouw en uitbreiding hiervan.
Hieronder volgen een aantal vragen over windmolenpark **Delfzijl Zuid**.
Een deel van de vragen heeft een vijftal mogelijkheden. Omcirkel hierbij het nummer van het antwoord dat het beste uw mening weergeeft.

Vraag 1: Bent u tegen of voor het bouwen van hernieuwbare energiebronnen in het algemeen?

1 Sterk tegen
2 Tegen
3 Neutraal
4 Voor
5 Sterk voor

Vraag 2: Bent u tegen of voor de bouw van windmolens?

1 Sterk tegen
2 Tegen
3 Neutraal
4 Voor
5 Sterk voor

Vraag 3: In hoeverre heeft u het gevoel dat u dicht bij windmolenpark ''Delfzijl Zuid'' woont?

1 Zeer ver weg
2 Ver weg
3 Niet ver weg en niet dichtbij
4 Dichtbij
5 Zeer dichtbij

Vraag 4: In hoeverre bent u in uw dagelijks leven beïnvloed door windmolenpark Delfzijl Zuid

1 Totaal niet beïnvloed
2 Nauwelijks beïnvloed
3 Neutraal
4 Beïnvloed
5 Sterk beïnvloed

Vraag 5: Als u zich beïnvloed voelt door het windmolenpark, beschrijf kort hoe u beïnvloed bent door het windmolenpark.

_____

Vraag 6: In hoeverre bent u betrokken geweest bij het besluitvormingsproces rondom het windmolenpark Delfzijl Zuid

1 Helemaal niet betrokken geweest
2 Nauwelijks betrokken geweest
3 Licht betrokken geweest
4 Betrokken geweest
5 Sterk betrokken geweest

Vraag 7: Bent u bekend met de plannen om het bestaande windmolenpark Delfzijl Zuid uit te breiden?

1 Ja
2 Nee

Vraag 8: In hoeverre bent u het eens met de plannen om windmolenpark ‘’Delfzijl Zuid’’ uit te breiden?

1 Sterk tegen
2 Tegen
3 Neutraal
4 Voor
5 Sterk voor

Beantwoord de volgende vraag alleen als u ten tijde van de bouw van het huidige windmolenpark al in Delfzijl of omstreken woonde. De volgende vraag gaat over de bouw van het huidige park.

Vraag 9: In hoeverre was u het eens met de bouw van het huidige windpark ‘Delfzijl Zuid’?

1 Sterk tegen
2 Tegen
3 Neutraal
4 Voor
5 Sterk voor

Vraag 11: Wat is uw postcode?

__ __ __ __ __ __

Vraag 12: Wat is uw geslacht?

- Man
- Vrouw
- Geen van beide

Vraag 13: Wat is uw leeftijd?

_____

Vraag 14: Wat is uw hoogst behaalde opleidingsniveau? Omcirkel het juiste antwoord:

Basisschool VMBO HAVO VWO MBO HBO WO Master