



Researching the Relationship between Place Attachment and Attitudes towards Wind Turbines in the Wadden Sea region of Schleswig-Holstein, Germany

A Case Study in Dithmarschen and Eiderstedt

Bachelor project for the fulfillment of the course: B.S Human Geography and Planning

Theme: Rural Landscapes and Agricultural

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Colophon

Cover Image: Taken near Barlt, Dithmarschen (Kell, 2022a)

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Version: Final Thesis

Words: 6589

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Date: 17.06.2022

Abstract

Research on the relationship between place attachment and attitude towards wind turbines has been done before, but not extensively in the context of the Wadden Sea region in Schleswig-Holstein. This study aims to answer the following question using two case studies *“To what extent does place attachment affect the attitude towards wind turbines of residents in the Wadden Sea region in Schleswig-Holstein, Germany?”*. Dithmarschen and Eiderstedt are two regions located in the close vicinity to the Wadden Sea and are similar in their landscape characteristics. While Dithmarschen has about 924 turbines, Eiderstedt has none. This should clarify the differences between place attachment and attitude towards wind turbines for a region with and without turbines. Place attachment and attitude towards wind turbines as well as wind energy have been captured through a survey in both regions. While respondents in both regions were attached to their place, a Spearman Correlation showed no relationship to attitude towards wind turbines. Nevertheless, wind turbines and wind energy are overall valued and even deemed necessary by inhabitants in both regions. This is especially surprising for the region Eiderstedt since results do show that inhabitants were inclined to agree wind turbines would damage the landscape, animals, tourism, and land prices if constructed. Strikingly, Dithmarschen’s respondents disagree that wind turbines damage the landscape. With the long history of wind turbines in Dithmarschen, it is assumed wind turbines have been a constant aspect of the landscape and are therefore not seen as abnormal. The study concluded that attitudes towards wind turbines are not dependent on place attachment. Therefore, in this research, place attachment is likely not formed by the emotional connection to physical aspects. It is suggested to conduct further research into community attachment, to test if place attachment is rather formed through social aspects.

Table of contents

1. Introduction	5
1.1 Background	5
1.2 Relevance	7
1.3 Problem Statement	7
1.4 The Structure	7
2. Theoretical Framework	8
2.1 Place Dependence and Place Identity	8
2.2 Wind Turbines	8
2.3 Landscape and Landscape Change	8
2.4 Conceptual Model	9
2.5 Hypothesis	9
3. Methodology	10
3.1 Participant Recruitment	10
3.2 The Survey	10
3.3 Measurement - PlaceAttachment	10
3.4 Measurement - AttitudeWindEnergy	11
3.5 Measurement - Acceptance	11
3.6 Measurement - Effects	12
3.7 Analysis	12
3.8 Ethical Considerations	12
4. Results	13
4.1 Demographics	13
4.2 Place attachment and Wind Turbines	14
4.3 Spearman Correlation	15
5. Discussion	16
5.1 Time in Residency	16
5.2 The Link between Place Attachment and the Environment	16
5.3 The Importance of the Landscape	17
5.4 Limitations	17
6. Conclusion	18
References	19
Appendix A – The Survey	22
Appendix B – Reliability Analysis	23
Appendix C - Descriptive Statistics	24
Appendix D - Spearman Correlation	26

1. Introduction

1.1 Background

The Wadden Sea region in Schleswig-Holstein, Germany proved to be suitable for the construction of wind turbines, due to excellent wind conditions. Between 1981 and 2000, annual average wind speeds along the North Sea coast ranged from 6,7 to 7,8 meters per second (Windkarten zur mittleren Windgeschwindigkeit, 2004). According to *Argumente für die Windenergie* (2021) and *BImSchG - Genehmigungsverfahren für WKA* (2012) an approval program is responsible for ensuring minimal damage to nature, animals, and the landscape by wind turbines. While effects on the environment are often mitigated through planning institutions, people's emotions are not adequately considered (Leitfaden Bürgerwindpark, n.d.). In the field of environmental psychology, the concept of place attachment is widely studied and has proven to capture people's emotions towards their surroundings (Chappell et al., 2020; Raymond et al., 2010;). Thus, an emotional connection to a specific environment can lead to different attitudes towards wind turbines located in that environment.

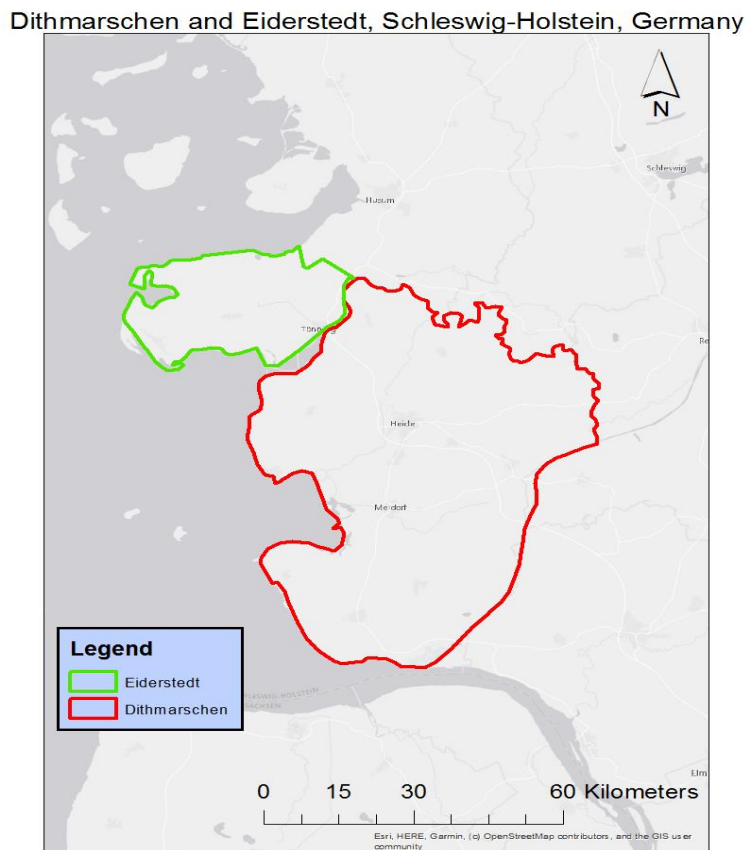


Figure 1 Boundaries of Dithmarschen and Eiderstedt (ESRI, 2020)

Two case studies, namely Dithmarschen and Eiderstedt, are chosen. The regions are located in the German federal state of Schleswig-Holstein. Both are directly connected and merge into the Wadden Sea to the west. While the peninsula Eiderstedt has zero wind turbines, there are 924 in Dithmarschen (Open-Data Schleswig-Holstein, 2022). That makes up almost one-third of all 3047 wind turbines in Schleswig-Holstein (ibid.).

Dithmarschen and Eiderstedt tend to be equal in their visual landscape characteristics, to ensure an unbiased comparison and to draw wider conclusions for the Wadden Sea region.



Figure 2 Wadden Landscape Dithmarschen, Germany (Kell, 2022b)



Figure 3 Wadden Landscape Eiderstedt, Germany (Kell, 2022c)

Eiderstedt and Dithmarschen’s sizes are 249 and 1.405 square kilometres respectively (Statistisches Amt für Hamburg und Schleswig-Holstein, 2020). Eiderstedt has 11.396 inhabitants and Dithmarschen 133.000 (ibid.) Eiderstedt can be considered a marsh/dune landscape while Dithmarschen is a marsh-landscape toward the sea and turns agricultural/industrial land inwards (Comparative Analysis Of The Landscape And Cultural Heritage Of The Wadden Sea Region, 2010). Dithmarschen displays a sea marsh with village mounds and open marsh landscape, dikes, and an overall flat land (The Schleswig-Holstein Wadden Sea Region, 2001). Village and farmstead mounds, dykes, and marshes are visual characteristics that are present in both areas. Hauberg, a special type of farmhouse, is well known in Eiderstedt. Unique to both landscapes are the windbreaker trees planted in Eiderstedt and the polders in the south of Dithmarschen (Schäfer, 1906, pp.114–121). While Dithmarschen is significantly larger and more industrial than Eiderstedt, the overlapping landscape is especially visible towards the West.



Figure 4 Landscape Dithmarschen (Kell,2022d)



Figure 5 Landscape Eiderstedt (Kell, 2022e)

1.2 Relevance

Studying the relationship between place attachment and attitude towards wind turbines can be beneficial in future planning processes. It is important to include place attachment for location suitability analysis. Regions where inhabitants have a negative attitude towards wind turbines due to higher place attachment, might hinder planning processes. It is therefore not only interesting for Germany but also in an international context. Place attachment in relation to energy projects has been studied before. For example, place attachment in relation to wind turbines for the Nairobi national park (Nordman & Mutinda, 2016). This study can complement existing literature by testing established methods for place attachment and attitudinal measures while introducing those measures into new regions.

1.3 Problem Statement

A comparative analysis of two regions, namely Dithmarschen and Eiderstedt, will investigate the attitude of inhabitants towards wind energy, the acceptance of wind turbines and the perceived effects of wind turbines on the environment. Additionally, methods are employed in each region to capture respondents place attachment. Place attachment will be examined for possible relationships with attitudes towards wind turbines, using a statistical test. The results are to be discussed. Since Eiderstedt does not have wind turbines, it is interesting to observe the differences between the regions.

The main research question is as follows:

To what extent does place attachment affect the attitude towards wind turbines of residents in the Wadden Sea region in Schleswig-Holstein, Germany?

1. To what extent does place attachment differ between Dithmarschen and Eiderstedt?
2. To what extent is wind energy valued by respondents in Dithmarschen and Eiderstedt?
3. What is the general attitude by inhabitants towards wind turbines in Dithmarschen and Eiderstedt?

1.4 The Structure

Section 2 will be comprised of the theoretical framework, the conceptual model, and the hypothesis. The reader will be informed about the key concepts. The conceptual model is a visual representation of the theoretical framework and aids in the understanding of the theory. Section 3 describes the methodology; how survey participants were recruited, how data was processed, and what statistical methods have been used. Section 4 provides an overview of the result, while section 5 discusses the results from existing literature and lists possible limitations. The thesis is concluded in section 6 through a summary of the results, a policy recommendation, and possible future research ideas.

2. Theoretical Framework

2.1 Place Dependence and Place Identity

Place attachment can be interpreted as an emotional connection between people and a geographical region (Clarke et al., 2018). The feeling of attachment is often established by living a long time in a place (S Wijaya et al., 2018). Place attachment is known to be divided into two subgroups: place dependence and place identity. Place dependence can be understood as gaining an advantage from a geographical location (Clarke et al., 2018). It can relate to the need of achieving a goal (Boley et al., 2021). These advantages and goals can vary but are often nothing more than personal leisure activities (Clarke et al., 2018). Place identity on the other hand refers to emotional and symbolic attachments towards geographical or physical items. Inhabitants define themselves through place identity and the environment they live in (Raymond et al., 2010). This can vary between places. For example, one community might value mountains or forests while others attach themselves through the aesthetics of a coastal region. Therefore, if a place is subject to change, people's feelings about that place can change as well (Clarke et al., 2018). Since place attachment can be formed by physical and geographical aspects, visible alteration to a place, such as disruptions, can be related to place attachment (Inalhan & Finch, 2004). High place attachment caused by visual aesthetic aspects in the landscape can lead to the opposition of the disruption and intensify protective feelings (Manzo & Devine-Wright, 2014).

2.2 Wind Turbines

Attitude towards wind energy, acceptance of wind turbines and the perceived impact of wind turbines on the environment are concepts adapted from multiple scholars and build upon the theory above (Clarke et al., 2018; Devine-Wright & Howes, 2010). To research the effect of place attachment on wind turbines, wind turbines need to be defined. They are not studied as single objects. Instead, a construct of attitudes and opinions surrounding wind turbines is established. Attitude towards wind energy represents the value and necessity of wind energy. Acceptance of wind turbines and their perceived effect provides information if inhabitants see wind turbines as disruption and how protective inhabitants are over their region (Burley et al., 2007; Clarke et al., 2018). While acceptance of wind turbines measures if inhabitants are generally against wind turbines in the region and perceive them as a disruption, the perceived effects measure the impacts of the wind turbines on the landscape, health, animals, tourism, and land prices. The items health, animals, tourism, and land prices are not studied independently in depth. They serve the purpose to capture the concept of perceived effects and protectiveness (Clarke et al., 2018). It has been hypothesized, that possible disruptions in a place will affect place attachment and might even increase it, which leads to an increasing willingness to “fight” against the disruption (Burley et al., 2007). The disruptions, in this case, are possibly wind turbines.

2.3 Landscape and Landscape Change

Because the landscape is an important aspect of place identity and thus contributes to the formation of place attachment (Raymond et al., 2010), landscape change needs to be defined. Firstly, a landscape can be understood as composition of natural but also man-made structures that are visible in a region (Duncan, 1995; Miklós et al., 2018). Emphasis is placed on the word “visual” since landscapes can be distinctive to a region and may or may not be aesthetically pleasing. While specific geological features are one aspect of a landscape, human interference with the natural landscape is another aspect (ibid.). Thus, many wind turbines in an environment can give a region a landscape which is characterized by wind turbines. In this study, landscape change is part of the perceived impacts of wind turbines. The concept of change in the landscape can be divided between natural and man-made change. In the case of wind turbines, this change is induced by man.

Antrop (1998) defines multiple dimensions of change. Each change in landscape has a starting point, meaning a point in time where the landscape has been regarded as “better”. This point in time is arguably before the introduction of wind turbines. However, one single wind turbine will likely not cause disturbance to most inhabitants. The frequent construction of turbines leads to clusters and changes the characteristics of the landscape. Antrop (1998) confirms this by making clear distinctions between the frequency of landscape changes. Thus, larger changes of low frequency will not alter the landscape as a whole. Frequent-small scale events are far more powerful and suit the construction of a single wind turbine that multiplies over time. The quality of a landscape is important as well. Past research showed that wind turbines in an agricultural landscape were positively received, while they were not tolerated in coastal regions Lothian (2008). The visual beauty of shorelines is constituting place attachment; thus, any interference can lead to negative attitudes towards the cause of interference (Manzo & Devine-Wright, 2014). The Wadden Sea region is arguably such a place of visual beauty, however, Dithmarschen is interestingly characterized by agriculture and the coast.

2.4 Conceptual Model

The Wadden Sea in Schleswig-Holstein can be seen as an umbrella term, which encompasses Dithmarschen and Eiderstedt. This is due to the similar landscape characteristics as defined in the background section 1. According to the theory, place attachment can be linked to physical characteristics of a region. Meaning, place attachment formation is ultimately a result of emotional attachments to visual aspects. If these physical characteristics in a region are subject to change or threatened by a possible disruption, inhabitants can react in a certain way towards the disruption. Therefore, opinions on wind turbines are captured by three categories: attitude towards wind energy, the acceptance of turbines and the perceived impact of turbines. This allows for statistical tests to examine if place attachment influences the peoples attitude towards wind turbines in the selected regions of interest.

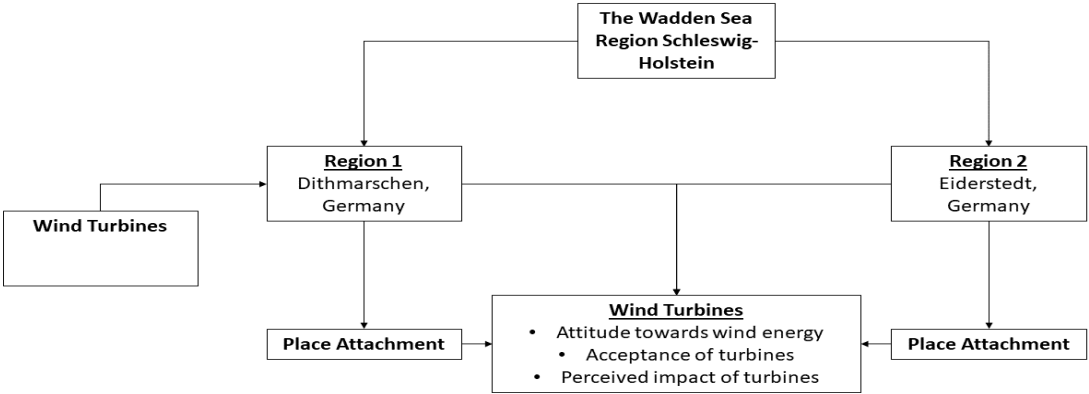


Figure 6 Conceptual model (Kell, 2022f)

2.5 Hypothesis

Regarding the decision under section 3.7, the following null hypothesis can be stated for both regions:

- H0 1: There is no association between place attachment and attitude towards wind energy.
- H0 2: There is no association between place attachment and the acceptance of wind turbines.
- H0 3: There is no association between place attachment and the perceived impact of wind turbines.

3. Methodology

3.1 Participant Recruitment

The selection of the regions is mainly based on similar landscape characteristics (Comparative Analysis Of The Landscape And Cultural Heritage Of The Wadden Sea Region, 2010) and the number of wind turbines in each region (Open-Data Schleswig-Holstein, 2022). Research into place attachment has been done extensively in academic literature, which led to reliable measurements in surveys. The primary data collection is therefore limited to anonymous survey responses and does not include interviews. The same survey has been distributed to both regions using Facebook groups. Additionally, respondents have been recruited with the snowball method via the messenger service WhatsApp for the case of Eiderstedt.

3.2 The Survey

The survey has been created in the German language with Qualtrics and can be further inspected in Appendix A. Respondents opened the survey with a link and answered all questions online. A five-point Likert scale has been used for all questions with the following options of answering (1=completely disagree, 2=disagree, 3= neither agree nor disagree, 4=agree, 5=completely agree). Age, gender, and duration of residency are demographic variables asked at the beginning of the survey through open questions. Place attachment (PlaceAttachment), Attitude towards wind energy (AttitudeWindEnergy), acceptance of wind turbines (Acceptance), and perceived effects of wind turbines (Effects) are the main variables captured with the Likert scale. At the beginning of the survey, respondents were asked if they currently live in the mentioned region, to ensure all respondents are inhabitants of Dithmarschen or Eiderstedt.

3.3 Measurement – Place Attachment

The statistical program IBM SPSS (Nie et al., 2018) has been used for the analysis of the survey. Place attachment has been established by computing the average value of the questions for place identity and place dependence (Table 1). There is some controversy in performing this combination since the new variable place attachment will be continuous instead of ordinal. However, this study is not reinventing this process and is simply following past research designs (Chappell et al., 2020; Clarke et al., 2018). Furthermore, Likert scales can be considered as continuous under certain circumstances. The questions regarding place attachment fit very well together and measure the same outcome. Furthermore, respondents were also presented the numerical values of the Likert scale in an evenly spaced manner, assuming equal distances from 1 to 5. Therefore, the overall place attachment score was calculated (Blaikie, 2003; Boone & Boone, 2012; Clarke et al., 2018; Robitzsch, 2020).

Place identity and place dependency was established by presenting specific statements that the respondent had to evaluate with the Likert scale. Place identity and place dependence has been established through the statements in Table 1. Special attention was put into the wording of the statements. All statements for place identity and place dependence have been phrased positively to achieve consistency. This is backed up through a Cronbach's Alpha test in SPSS (Appendix B.1). All eight items of place identity and place dependence have a Cronbach's Alpha of ($\alpha=0,893$) for the region Dithmarschen and ($\alpha=0,933$) for the region Eiderstedt, indicating high internal reliability and consistency (von Wirth et al., 2016). This shows the selected statements fit well together and respondents answered consistently across all statements.

Place Identity
Dithmarschen/ Eiderstedt is a special place to me
Dithmarschen/ Eiderstedt means a lot to me
I feel connected with Dithmarschen/ Eiderstedt
Dithmarschen/ Eiderstedt is part of my identity
Dithmarschen/ Eiderstedt is a part of me
Place Dependence
Dithmarschen/ Eiderstedt is unique and cannot compare to other regions
The activities I do in Dithmarschen/ Eiderstedt cannot be done elsewhere
Dithmarschen/ Eiderstedt is most suitable for my personal activities

Table 1 Place Attachment survey statements

3.4 Measurement – Attitude Wind Energy

Attitude towards wind energy (AttitudeWindEnergy) is a measure, to see if respondents are in favour of the product of wind turbines, namely wind energy (Chappell et al., 2020). It was measured through positively worded statements that the respondents evaluated with the Likert scale. The statements were equally worded for both regions (Table 2). The mean has been calculated, following the decision under 3.3, to arrive at the new variable AttitudeWindEnergy. Cronbach's Alpha is ($\alpha=0,926$) and ($\alpha=0,850$) for Dithmarschen and Eiderstedt respectively, indicating that the items fit well together (Appendix B.2).

AttitudeWindEnergy
Wind energy is a clean alternative to fossil fuels
Wind energy is important for our future

Table 2 AttitudeWindEnergy survey statements

3.5 Measurement - Acceptance

Acceptance of wind turbines (Acceptance) indicates if respondents accept the wind turbines in their environment and if they are seen as disruption (Clarke et al., 2018). It is computed by the mean value of two negative-worded statements (Table 3). It is important to note that the first statement has been phrased hypothetically in the case of Eiderstedt. This is due to the absence of wind turbines and aims to capture if constructions of wind turbines would be accepted. Cronbach's Alpha values are ($\alpha=0,906$) and ($\alpha=0,909$) for Dithmarschen and Eiderstedt respectively (Appendix B.3).

Acceptance (Dithmarschen)	Acceptance (Eiderstedt)
I am against wind turbines in Dithmarschen	I am against the construction of wind turbines on Eiderstedt
Wind turbines are not necessary for Dithmarschen	Wind turbines are not necessary on Eiderstedt

Table 3 Acceptance statements

3.6 Measurement - Effects

The variable perceived effects (Effects) captures the perceived specific effects of wind turbines on the environment (Table 4). It provides an indication of how protective respondents are over their environment (Clarke et al., 2018). It is calculated through the mean value of five negative-worded statements. Again, it is important to note that all statements are phrased in a hypothetical way for Eiderstedt. In essence, it demonstrates the perceived possible effects of wind turbines in the case they would be constructed. Cronbach's Alpha values are ($\alpha=0,856$) and ($\alpha=0,782$) for Dithmarschen and Eiderstedt, indicating that respondents answered in a consistent way across all items (Appendix B.4).

Effects (Dithmarschen)	Effects (Eiderstedt)
Wind turbines...	Wind turbines...
damage the landscape of Dithmarschen	would damage the landscape of Eiderstedt
are harmful to my health	would be harmful to my health
are harmful to animals	would be harmful to animals
are harmful to tourism	would be harmful to tourism
influence prices of land	would influence prices of land

Table 4 Components for the variable Effects

3.7 Analysis

A linear regression could in principle be used to test if place attachment explains the aforementioned variables, however an analysis of the residuals showed a violation of the assumptions. Instead, a Spearman Correlation is chosen (Appendix D. 1; Appendix D. 2). This correlation can determine the strength and direction of the relationship between place attachment and the wind turbine variables and follows the methodology of Clarke et al. (2018). The data fulfills the requirements of having a monotonic relationship and being ordinal as well as continuous. Additionally, the relationship between place attachment and the demographic variables have also been evaluated with the Spearman Correlation, to examine possible influences of age and duration of the residency on place attachment.

The Spearman Correlation will indicate if a relationship is significant at ($p=0,05$). Furthermore, the correlation coefficient will indicate the strength and direction of the correlation. Negative values therefore indicate that if one variable increases, the other variable decreases. The strength ranges from 0 (no correlation) to 1 (very strong correlation). Values from 0.40 to 0.69 indicate moderate correlations (Schober et al., 2018)

3.8 Ethical Considerations

Each survey link that was distributed on social media had a message included that summarized the research intentions (Appendix A). Participants have been informed that participation is not mandatory and that the survey can be canceled at any moment. Respondents were informed that no personal data will be collected. Age, gender, and duration of residency in the region were the only personal questions asked. In the survey, an introduction of the research, a contact e-mail, and the option of receiving a summary of the results have been provided. Before the respondents could start the survey, they had to acknowledge that no personal data is collected and that the minimum age is 18 years old.

4. Results

The collection process itself went well in the case of Dithmarschen, with a response return of (n=215). The response return of Eiderstedt is lower at (n=70). In Dithmarschen there was a high interest of respondents in the topic and a high willingness to complete the survey. In Eiderstedt, on the other hand, the responses are significantly lower, which could indicate a lower interest in the topic.

4.1 Demographics

In Dithmarschen the lowest age of the respondents is 18 years, and the maximum age is 82 years. This is according to the requirement for respondents of having a minimum age of 18 years. The average age of the respondents is 42,99 years. This result is relatively close to the average age of 46,7 years for Dithmarschen's population (Statistisches Amt für Hamburg und Schleswig-Holstein, 2020). The minimum years lived in Dithmarschen is 5 years, with a maximum of 81 years lived in the region. On average, respondents live 33,25 years in Dithmarschen (Table 5). Appendix C.1 shows the original SPSS output.

Same as in Dithmarschen, the youngest age of respondents in Eiderstedt is 18 years, with a maximum of 72 years (Table 5). The average age is 34,49 years. The peninsula Eiderstedt is not listed in regional statistics, and it is therefore not possible to determine the average age of the population (Statistisches Amt für Hamburg und Schleswig-Holstein, 2020). Compared to Dithmarschen, respondents from Eiderstedt are about 10 years younger on average. The minimum years lived on Eiderstedt is 5 years, with a maximum of 72 years. The average number of years lived in the region is 25,26 years and less compared to Dithmarschen (Appendix C.5).

Dithmarschen	Minimum (Years)	Maximum (Years)	Mean (Years)
Age	18	82	42,99
Duration In Residency In Dithmarschen	5	81	33,25
Eiderstedt	Minimum (Years)	Maximum (Years)	Mean (Years)
Age	18	72	34,49
Duration In Residency On Eiderstedt	5	64	25,26

Table 5 Age and DurationInResidency for Dithmarschen and Eiderstedt

The response for Dithmarschen shows an unequal gender distribution of 156 females and 59 males (Table 6). Eiderstedt has a more equal distribution of 37 females and 33 males. However, it must be noted that this may be due to fewer responses (Appendix C.2 & Appendix C.6)

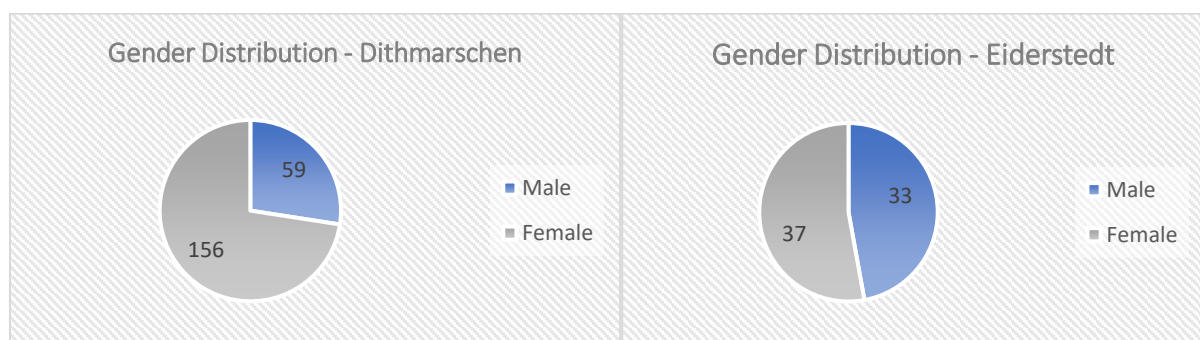


Table 6 Gender distribution for Dithmarschen and Eiderstedt

4.2 Place Attachment and Wind Turbines

The following section evaluates the results of the four variables place attachment (PlaceAttachment), attitude towards wind energy (AttitudeWindEnergy), acceptance of wind turbines (Acceptance) and the perceived effects (Effects). Table 7 and Table 8 show the median and mean of the variables for both regions (Appendix C.3 & Appendix C.7). To describe each variable one by one, the median is an appropriate measure of central tendency. It indicates the middle of the data and provides an overview of what the respondents mostly answered (Jamieson, 2004).

Dithmarschen	Median	Mean
Place Attachment	4,0	3,9
Attitude Wind Energy	4,0	4,1
Acceptance	2,0	1,9
Effects	3,0	2,7

Table 7 The median and mean for Place Attachment, AttitudeWindEnergy, Acceptance and Effects- Dithmarschen

Eiderstedt	Median	Mean
Place Attachment	4,0	3,6
Attitude Wind Energy	4,0	4,2
Acceptance	2,0	2,3
Effects	3,0	3,0

Table 8 The median and mean for Place Attachment, AttitudeWindEnergy, Acceptance and Effects- Eiderstedt

Considering the Likert scale of the survey, values from 1,0 to 2,0 indicate clear disagreement with the statements in the survey. The value 3,0 can be considered neutral and values 4,0 to 5,0 agree with the presented statements in the survey. To interpret the data, the median has been chosen. It presents the data center and is often used to analyze Likert data (Boone & Boone, 2012). Place attachment in Dithmarschen and Eiderstedt is 4,0. This indicates agreement with the statements regarding place attachment and concludes that respondents are attached to Dithmarschen and Eiderstedt, but not highly attached. For the variable AttitudeWindEnergy, most respondents agree with the statements “Wind energy is a clean alternative to fossil fuels” and “Wind energy is important for our future”. Acceptance scored 2,0 for both regions, indicating overall disagreement towards the negative-worded statements regarding wind turbines. Respondents, therefore, disagree with the statements “I am against wind turbines in Dithmarschen/ I am against the construction of wind turbines on Eiderstedt” and “Wind turbines are not necessary in Dithmarschen/ Eiderstedt”.

The variable (Effects) is not as clear as the other variables since the score is 3,0 for both regions. This indicates that respondents mostly neither disagree nor agree regarding the perceived effects of wind turbines. To get a better understanding of the regional differences, table 9 and 10 examine each component of the variable (Effects) (Appendix C.4 & Appendix C.8)

Dithmarschen	Median
Wind turbines damage the landscape of Dithmarschen	2,0
Wind turbines are harmful to my health	2,0
Wind turbines are harmful to animals	3,0
Wind turbines are harmful to tourism	2,0
Wind turbines influence the prices of land	3,0

Table 9 Each median from the items relating to Effects- Dithmarschen

Eiderstedt	Median
Wind turbines would damage the landscape of Eiderstedt	4,0
Wind turbines would be harmful to my health	2,0
Wind turbines would be harmful to animals	4,0
Wind turbines would be harmful to tourism	3,0
Wind turbines would influence prices of land	4,0

Table 10 Each median from the items relating to Effects- Eiderstedt

Respondents in Dithmarschen chose to disagree with the statement “Wind turbines damage the landscape of Dithmarschen”, while respondents on Eiderstedt chose a value of 4,0 and therefore agree with the statement “Wind turbines would damage the landscape of Eiderstedt”. Both regions disagree that wind turbines have an impact on health with values below 3,0. While Dithmarschen remains neutral, Eiderstedt agrees that wind turbines would be harmful to animals. Dithmarschen disagrees with the effects on tourism, while Eiderstedt neither agrees nor disagree. Dithmarschen neither agrees nor disagrees that wind turbines would influence land prices, Eiderstedt on the other hand does agree.

4.3 Spearman Correlation

The following section discusses the result of the Spearman Correlation analysis (Appendix D.1; Appendix D.2). Though Spearman’s Rank does not require the definition of a dependent variable, it is viable to assume that place attachment would influence attitudes towards wind turbines. However, wind turbines can also influence place attachment (Mutinda, 2016). This study is assuming that place attachment is shaping attitudes and not the other way around, though the direction of relatedness is not always immediately apparent and can certainly be studied both ways.

The analysis includes the correlation between place attachment and the four wind turbine variables, as well as the correlation to respondents age and time in residency. Furthermore, each item of the Effect variable has been tested, with specific interest in the statement regarding the landscape. Spearman’s Rank correlation indicated positive weak correlations between the duration of residency and place attachment for both regions ($\rho=0,278$) and ($\rho=0,268$). There is no significant correlation between place attachment and age of the respondents. No significant correlation between place attachment, attitude towards wind energy, acceptance of wind turbines and the perceived effects could be observed for both regions (Appendix D.1; Appendix D.2). This indicates that place attachment and attitudes towards wind turbines share no relationship.

5. Discussion

5.1 Time in Residency

The statistical analysis between demographic variables and place attachment revealed an increase in place attachment if years lived in the region increases. It is believed that more time spent in a region can lead to stronger attachment to a specific place (Chappell et al., 2020). With an increase in years lived in a place, it is believed that the lived experiences, comfortability, or familiarity of a place increases (Smaldone, 2007). These are aspects people attach meaning to and are therefore part of place identity.

5.2 The Link between Place Attachment and Attitudes toward Wind Turbines

The absence of a relation between place attachment, attitude towards wind energy, acceptance of wind turbines and perceived effects of wind turbines shows that place attachment is no predictor for emotional responses towards wind turbines. This result is questionable but has been reproduced by studying the relationship between the place attachment of the Nairobi National Park and a wind farm (Nordman & Mutinda, 2016). Results showed no relationship between the wind farm and place attachment toward the Nairobi National Park. The participants were, however, Tourists that likely do not share the same attachment as inhabitants (ibid.). Past research on the relationship between place attachment and flood defence structures in the environment revealed that higher place attachment results in negative perceived effects onto the environment by the flood defence systems (Clarke et al., 2018). Opposition towards energy projects is often related to high place attachment. Inhabitants feel the need to protect the environment they live in. Being uninformed about the energy project in question can intensify place protective behaviour, due to widespread myths about possible effects (Devine-Wright, 2009). One explanation for the absence of a relationship in this study, is that respondents have been recruited from cities in Dithmarschen and Eiderstedt. Therefore, a lack of connection between inhabitants and the physical aspects of the regions is possible. Place attachment is formed by physical aspects, thus living in a city might not create those connections. Secondly, inhabitants might only oppose wind turbines if planning processes, and constructions are imminent (Devine-Wright, 2009). In the case of Eiderstedt, there are no wind turbines planned for construction. If inhabitants are not directly affected by planning and construction phases, reactions can be less negative (ibid.). However, research in south Africa also found that the support of wind turbines and place attachment can be both independently high, which is in line with the result of this research. This insight is crucial, as it indicates that place attachment in this study is possibly not linked to physical aspects in the environment at all. Raymond et al. (2010) and Nordman & Mutinda (2016) introduced the concept of community attachment, stating that place attachment is sometimes less formed by the environment itself but through social interactions. Additionally, place attachment and support for wind turbines can both be independently high, if residents think wind turbines are necessary to overcome climate change (Clarke et al., 2018). Since climate change is a visual phenomenon in recent times, the support for renewable energy projects is expected to grow (ibid.). The realization of inhabitants that renewable energy sources are necessary can overrule any relationship to place attachment (ibid.) The results in this study show that inhabitants for both regions agree to statements “Wind energy is a clean alternative to fossil fuels” and “Wind energy is important for our future”, highlighting that the respondents are aware of its importance.

5.3 The Importance of the Landscape

Other research explained how place attachment is only linked to negative attitudes toward wind turbines if the residents perceive the landscape as not suitable for the construction of wind turbines. Vice versa, place attachment can be linked to support of wind turbines if the landscape is perceived as suitable (Brownlee et al., 2015). What suitable means is unclear. In a past study tourists in Schleswig-Holstein associated wind turbines with a safe environment (Zieseimer et al., 2014). Linking this to the results, the landscape item in the survey appears to be of importance. Yet, the correlation between place attachment and perceived effects on the landscape was insignificant for both regions (Appendix D.1; Appendix D.2). This is against what Manzo & Devine-Wright (2014) found. They argue that place attachment is related to pro-environmental behavior. In the UK, local communities defined this as keeping the visual beauty of their shoreline intact and opposing wind turbines to achieve this goal. These communities showed high place attachment that directly related to the opposition of wind turbines. This finding was not reproduced by this study, however, respondents in Eiderstedt did indicate that wind turbines would harm the landscape.

Antrop (1998) defined how inhabitants may perceive landscape change. The author is stating that landscape change is often recognized through the recollection of the past. Inhabitants could oppose landscape change if they regarded the previous state of the landscape, before any change, as better or more appealing. The survey indicates that inhabitants in Dithmarschen do not see wind turbines as negative effect on the landscape, while inhabitants in Eiderstedt do think wind turbines influence the landscape. GROWIAN (Grosse Windkraftanlage) is the name of the first major wind turbine in Germany, which was constructed in 1980 in Dithmarschen. It marked the start of a series of construction of wind turbines in the region (Hauschildt & Pulczynski, 2004). With an average time in residency in Dithmarschen of 33,25 years, it can be assumed that respondents experienced Dithmarschen with the presence of wind turbines all their life. Linking this back to Antrop (1998), wind turbines have been a consistent aspect of the landscape and no change occurred in the eyes of the respondents. The respondents for Eiderstedt on the other hand, experienced all their time in residency without wind turbines in the landscape, meaning that wind turbines would be a disruption to the known and consistent landscape characteristics of Eiderstedt. It is therefore logical that respondents on Eiderstedt largely agree with the statement that wind turbines would influence the landscape.

It becomes increasingly apparent, that in this study place attachment and attitudes towards wind turbines are completely disconnected. Which also means that, in this study, the place attachment is not linked to physical or visual aspects in the landscape. Positive or negative attitudes towards wind turbines might be formed by the perceived importance of renewable energy sources. The literature also suggested community attachment as possible leading cause for the formation of place attachment

5.4 Limitations

Possible bias occurred during the collection of responses with the help of social media. It can be assumed respondents come from the same city in Dithmarschen and Eiderstedt, as many Facebook groups were named after cities. The cities are Heide in Dithmarschen and Tönning in Eiderstedt. Opinions that originate from a single area might be different than the overall discourse across the regions. The survey can be limiting in its own right. The Likert scale could be improved by utilizing seven to ten points instead of five. The degree of place attachment and emotions can thus be captured more accurately. Likewise, respondents had no option to voice what they think about the topic. Interviews or open questions could have improved the quality and depth of responses.

Asking inhabitants for their postal codes can be a good addition to distinguish respondents from cities and rural areas. Additionally, this study does not map the location of wind turbines. Mapping the locations of wind turbines in Dithmarschen with the use of GIS, could reveal how attitudes towards wind turbines change, if one's residence is located closer or further away to wind turbines.

An overall lack in responses for the case of Eiderstedt can be observed. The cause cannot be immediately identified, however, a lack of wind turbines in Eiderstedt might indicate a lack of interest in the research topic. While 70 responses are sufficient for the conducted statistical tests, it will not be as accurate as the 215 responses in the case of Dithmarschen.

6. Conclusion

The study concludes that there is no relationship between place attachment and attitudes towards wind turbines. Inhabitants in both regions agree that they are attached to their place, indicating an emotional connection to their environment. Respondents showed agreement to the importance of wind energy and agreed to accept wind turbines. The perceived effects have been judged as neutral in both regions. A closer examination of the single items revealed that respondents in Eiderstedt agree that wind turbines affect the landscape, animals, and land prices. Respondents in Dithmarschen only agreed or stayed neutral in the case of influences on animals and land prices. It is somewhat surprising that Eiderstedt would not be against the construction of wind turbines in their region, even though there is a clear agreement to the perceived effect on the landscape. Furthermore, the results show that place attachment is likely not influenced by physical environmental features. Future research can focus on the relationship between social factors and place attachment, to see if community values play a part in place attachment formation. Even though the study regions are similar in their characteristics, conclusions about the Wadden Sea region in Schleswig-Holstein should be stated carefully. Even regions in very close proximity can highly vary in terms of place attachment (Brownlee et al., 2015). More comparisons between regions in the Wadden Sea area are needed to draw meaningful conclusions. Still, the general acceptance of wind turbines in both regions indicate a positive outlook for the future. Planning institutions responsible for the placement of wind turbines could include place attachment as a parameter for location suitability analysis. Kazak et al., (2017) point out that placement criteria for wind turbines are often incomplete for western countries and that social aspects need to be considered. As previous studies suggested, regions where place attachment relates to negative attitudes toward wind turbines, should theoretically be avoided for wind turbine construction (Brownlee et al., 2015). Otherwise, inhabitants may hinder planning processes and slow down the overall development. On the other hand, regions such as Dithmarschen and Eiderstedt can be good regions for the placement of wind turbines.

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Appendix A – The Survey

Sehr geehrte Damen und Herren,

vielen Dank, dass Sie sich die Zeit nehmen an dieser Umfrage teilzunehmen. Mein Name ist Henrik Kell und ich bin Student an der Universität Groningen (Fakultät der räumlichen Wissenschaften) in den Niederlanden. Im Rahmen meiner Bachelorarbeit führe ich eine wissenschaftliche Untersuchung zu dem Thema 'Heimatverbundenheit und Windkraftanlagen' in Dithmarschen und Eiderstedt durch. Diese Umfrage bezieht sich speziell auf **Einwohner in Dithmarschen oder Eiderstedt**. In der Umfrage wird untersucht, in wie weit Sie sich mit Dithmarschen verbunden fühlen. Außerdem werden Sie nach ihrer persönlichen Meinung zu dem Thema Windkraftanlagen und Windenergie befragt. Ihre Antworten übermitteln sie auf einer Skala von 1 bis 5 (Stimme überhaupt nicht zu, Stimme nicht zu, Stimme weder zu noch lehne ich ab, Stimme zu, Stimme voll und ganz zu). Es wird kein spezielles Wissen benötigt, um die Fragen zu beantworten. Alle Antworten sind anonym. Persönliche Daten werden nicht gesammelt. Bei Fragen oder Anmerkungen können Sie mich gerne unter dieser E-Mail erreichen: h.kell@student.rug.nl. Auf Wunsch können Sie eine Zusammenfassung der Ergebnisse über meine E-Mail anfragen.

Einverständniserklärung

- Hiermit bestätigen Sie, dass Sie an der Umfrage zu dem Thema Heimatverbundenheit und Windkraftanlagen teilnehmen
 - Das Mindestalter beträgt 18 Jahre
 - Eine Beschreibung zu dem Projekt sowie eine Möglichkeit Fragen zu stellen, wurde bereitgestellt
 - Die Umfrage kann zu jeder Zeit, ohne Angabe von Gründen, abgebrochen werden
 - Alle Antworten sind anonym und es werden keine persönlichen Informationen gesammelt.
-

Person bezogene Fragen

1. Wohnen Sie in Dithmarschen/ Eiderstedt
 - Ja
 - Nein
2. Wie lange wohnen Sie bereits in Dithmarschen/Eiderstedt (open question)
3. Wie alt sind Sie? (open question)
4. Geschlecht
 - Weiblich
 - Männlich
 - Anders

Im Folgenden werden Ihnen einige Aussagen zu dem Thema Heimatverbundenheit präsentiert, die Sie mit Hilfe der Skala bewerten. Es geht hierbei nur um Ihre persönliche Meinung.

Likert Skala: (1=stimme überhaupt nicht zu, 2=stimme nicht zu, 3=stimme weder zu noch lehne ich ab, 4= stimme zu, 5= stimme voll und ganz zu)

1. Dithmarschen/ Eiderstedt ist ein besonderer Ort für mich
2. Dithmarschen/ Eiderstedt bedeutet mir viel
3. Ich fühle mich mit Dithmarschen/Eiderstedt verbunden
4. Ich identifiziere mich mit Dithmarschen/Eiderstedt
5. Dithmarschen/ Eiderstedt ist ein Teil von mir
6. Dithmarschen/ Eiderstedt ist einzigartig und mit keinem anderen Ort vergleichbar
- 7- Die Aktivitäten, die ich Dithmarschen/Eiderstedt ausübe, würde ich an keinem anderen Ort ausüben
8. Dithmarschen/Eiderstedt eignet sich am besten für meine persönlichen Aktivitäten

In diesem Abschnitt werden Ihnen Aussagen bezüglich Windenergie und Windkraftanlagen präsentiert. Es geht hierbei nur um Ihre persönliche Meinung.

1. Windenergie ist eine saubere Alternative für fossile Brennstoffe
2. Windenergie ist für unsere Zukunft wichtig
3. Ich bin gegen Windkraftanlagen in Dithmarschen/ Eiderstedt
4. Windkraftanlagen sind in Dithmarschen nicht notwendig

Bitte bewerten sie die folgenden Aussagen bezüglich der möglichen Auswirkungen von Windkraftanlagen.

Windkraftanlagen...

1. schaden der Landschaft Dithmarschens/ würden der Landschaft Eiderstedts schaden
2. beeinträchtigen meine Gesundheit/ würden meine Gesundheit beeinträchtigen
3. beeinträchtigen die Tierwelt/ würden die Tierwelt beeinträchtigen
4. beeinträchtigen Tourismus/ würden Tourismus beeinträchtigen
5. beeinträchtigen Grundstücks-/Immobilienpreise/ würden Grundstücks-/Immobilienpreise beeinträchtigen

Appendix B – Reliability analysis

B.1 Place attachment

Dithmarschen		Eiderstedt	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,893	8	,933	8

B.2 – AttitudeWindEnergy

Dithmarschen		Eiderstedt	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,926	2	,850	2

B.3 – Acceptance

Dithmarschen		Eiderstedt	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,906	2	,909	2

B.4 – Effects

Dithmarschen		Eiderstedt	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,856	5	,782	5

Appendix C - Descriptive Statistics

Appendix C.1 Discriptive statistics Dithmarschen

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	215	18	82	42,99	13,712
DurationInResidency	215	5	81	33,25	15,819
Valid N (listwise)	215				

Appendix C.2 Gender distribution Dithmarschen

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	156	72,6	72,6	72,6
	Male	59	27,4	27,4	100,0
	Total	215	100,0	100,0	

Appendix C.3 Wind turbine variables Dithmarschen

Dithmarschen

		PlaceAttachm ent	AttitudeWindE nergy	Acceptance	Effects
N	Valid	215	215	215	215
	Missing	0	0	0	0
Mean		3,9000	4,1302	1,9279	2,7284
Median		4,0000	4,0000	2,0000	3,0000

Appendix C.4 Effects - single items Dithmarschen

Dithmarschen

		schaden der Landschaft Dithmarsche ns	beeinträchtigt en meine Gesundheit	beeinträchtigt en die Tierwelt	beeinträchtigt en Tourismus	beeinträchtigt en Grundstücks- /Immobilienpr eise
N	Valid	215	215	215	215	215
	Missing	0	0	0	0	0
Median		3,00	2,00	3,00	2,00	3,00

Appendix C.5 Descriptive statistics Eiderstedt

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	70	18	72	34,49	14,782
DurationInResidency	70	5	64	25,26	14,384
Valid N (listwise)	70				

Appendix C.6 Gender distribution Eiderstedt

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	37	52,9	52,9	52,9
	Male	33	47,1	47,1	100,0
Total		70	100,0	100,0	

Appendix C.7 Wind turbine variables Eiderstedt

Eiderstedt

		PlaceAttachm ent	AttitudeWindE nergy	Acceptance	Effects
N	Valid	70	70	70	70
	Missing	0	0	0	0
Mean		3,6487	4,2071	2,3286	3,0807
Median		4,0000	4,0000	2,0000	3,0000

Appendix C.8 Effects – single items Eiderstedt

Eiderstedt

		würden der Landschaft Eiderstedts schaden	würden meiner Gesundheit schaden	würden die Tierwelt beeinträchti gen	würden Tourismus beeinträchti gen	würden Grundstücks- /Immobilienpr eise beeinträchti gen
N	Valid	70	70	69	70	70
	Missing	0	0	1	0	0
Median		4,00	2,00	4,00	3,00	4,00

Appendix D Spearman Correlation

Appendix D.1 Correlations Dithmarschen

Correlations Dithmarschen

			PlaceAttachm ent	Age	YearsLivedIn Region	AttitudeWindE nergy	Acceptance	Effects	Wind turbines damage the landscape
Spearman's rho	PlaceAttachment	Correlation Coefficient	1,000	,004	,278	,078	-,028	,018	-,002
		Sig. (2-tailed)	.	,954	,000	,252	,678	,798	,973
		N	215	215	215	215	215	215	215

Appendix D.2 Correlations Eiderstedt

Correlations Eiderstedt

			PlaceAttachm ent	Age	YearsLivedIn Region	AttitudeWindE nergy	Acceptance	Effects	Wind turbines would damage the landscape
Spearman's rho	PlaceAttachment	Correlation Coefficient	1,000	,043	,268	,109	,013	-,152	-,210
		Sig. (2-tailed)	.	,721	,025	,369	,918	,208	,080
		N	70	70	70	70	70	70	70