A note on the cumulative effects of daily wind power encounters on the relative acceptance of increasing the wind power capacity offshore and onshore.

Author: Jacob Ladenburg

Affiliation: KORA, Danish Institute for Local and Regional Government Research

Address: Købmagergade 22, 1150 Copenhagen K, Denmark

E-mail: jala@kora.dk.

Phone +45 42493610

Abstract

An increasing number of studies suggest that the cumulative impacts of wind turbine encounters might have a negative impact on the acceptance of onshore wind power development. In many countries offshore wind resources are seen as the new wind energy resource, though the offshore cost of energy is markedly higher compared to onshore. In the present paper it is tested if the cumulative effect of wind turbines makes people favour offshore wind turbine development to onshore development. The results suggest that the cumulative effects from wind turbine encounters have weak effects on the relative attitude towards more onshore and offshore wind power development. This suggests that increasing onshore wind power development does not make people favour offshore wind power development to a higher extent.

Keywords: relative attitude, cumulative effects, onshore, offshore, wind power

1. Introduction

In order to fulfil the energy target for 2030, Denmark has planned to develop wind power onshore and offshore. As found in Ladenburg [1], the population seem to favour offshore wind power development relative to onshore. These findings are in line with the general literature on the subject, see for example [2-5]. Generally, the expectations with regard to future wind power development targets are positive [6, 7]. With higher wind power shares, the population can expect more wind turbines in both rural and urban landscapes. Accordingly, the wind turbine pressure on the individual will increase. It is therefore noteworthy that Ladenburg and Dahlgaard [8] and Ladenburg et al. [9] find evidence that an increase in the wind power pressure can have a negative impact on the acceptance of onshore wind power. More specifically, the more wind turbines people see on a daily basis, the more negative their attitude will be towards existing and future onshore

wind farms. Ladenburg et al. [9] stress that acceptance among people who have onshore wind turbines in the viewshed of their residence or summer house is particularly sensitive towards the daily wind turbine pressure/number of turbines seen daily. So far, the cumulative effects studies have only shed light on how the wind power pressure influences attitude towards future onshore wind power development. Consequently, an imperative question presents itself – does the number of turbines seen daily/wind pressure affect the relative attitude towards onshore and offshore wind power development? Though offshore wind power development is preferred to onshore, the attractiveness from a generation cost of view is less convincing. More specifically, in a new report from the Danish Energy Agency, the costs of producing wind power offshore are estimated to be twice as high as the costs of onshore production [10].Accordingly, if the number of turbines seen on a daily basis causes people to favour offshore wind power development to a higher degree this could lead to a demand for more offshore wind power development relative to onshore development. This, in turn, would lead to higher generation costs. The consequences would have significant and dynamic effects on onshore and offshore wind power planning.

The present paper builds on the data and results in Ladenburg et al. [9] and aims at shedding further light on how the cumulative numbers of turbines influence acceptance of wind power. It is analysed whether the number of turbines seen daily has an impact on the relative acceptance of onshore and offshore wind power development. The article is structured as followed. First, a brief introduction is given to the sparse literature dealing with cumulative effects from wind power. As the present paper is heavily based on the findings of Ladenburg et al. [9], the reader interested in a more detailed review is encouraged to consult that paper. This is followed by a presentation of the present study, the data and the results. Finally, the results are discussed, followed by a conclusion.

2. Does wind turbine density influence acceptance of wind power?

Based on the review by Ladenburg et al. [9], there seems to be some evidence that the more turbines people see, the less positive is their attitude towards onshore wind power [8, 9, 11, 12] Jointly, the results from the studies point towards the acceptance of onshore wind power being dynamic and sensitive towards how wind turbines are grouped and the number of turbines people see on a daily basis. However, as demonstrated in Ladenburg et al [9] and Ladenburg and Möller [13], the cumulative effects may be dependent on where the turbines are located.

Ladenburg and Möller [13] find that the number of wind turbines in the nearest offshore wind farms significantly influences attitudes. The more turbines the nearest wind farm has, the higher is the acceptance of existing offshore wind farms. Ladenburg et al. [9] only find significant cumulative effects among respondents who have an onshore wind farms in their viewshed in relation to a wind power development scenario that represents an overall increase in the onshore wind power capacity. Interestingly, they do not find significant cumulative effects when the respondents are asked about a

repowering scenario (the term replacement is used in the original paper), in which numerous smaller turbines are replaced by fewer larger turbines. For a more detailed review, see Ladenburg et al.[9]

In this perspective, no studies have tested whether the cumulative effects from the number of turbine encounters influence the relative acceptance of onshore and offshore wind power development.

3. Study

The influence of the daily wind turbine encounters on the relative attitude towards future wind power development onshore and offshore is based on the same data as Ladenburg et al. [9]. The relative attitude analysis is based on the general attitude towards three wind power development schemes:

1. More onshore wind turbines
2. Replace small onshore wind turbines with larger ones
3. More offshore wind turbines.

The first wind power development scheme represents an overall increase in the number of wind turbines and a change in distribution of the size of the wind turbines. Generally, new wind turbines are larger than the existing ones. Consequently, when the number of turbines increases the distribution of the size of the wind turbines is pushed towards larger turbines, and the average size of wind turbines increases. On the other hand, the replacement scheme represents a wind power development in which the number of wind turbines is reduced and the average size of the wind turbines increases. The third development scheme represents an increase in the size and number of offshore wind turbines.

Relative to Ladenburg et al. [9], the contribution to the literature is a test of whether the cumulative effects from wind turbine encounters make offshore wind turbines more acceptable compared to the two onshore wind power scenarios analysed in Ladenburg et al. [9]. The analysis and conclusion in the present paper are thus conditional on the relative general formulation of attitude questions, which, as highlighted in some of the literature, might not provide a clear picture of the same attitude relationships on a local scale [14-16] also known as the social gap [17]. However, as in Ladenburg et al.[9] the focus is on the relative level of attitudes.

The analyses are based on a randomised sample of respondents from a nationwide Internet panel consisting of approximately 17,000 people. In total, the effective sample was set to 1,050 answers.

To obtain this sample, invitations to answer the questionnaire were emailed to the 1,860 panel members in July 2006. 1,076 respondents answered all three attitude questions. The characteristics of the samples are presented in the sample below (Table 1).

>>Table 1 about here<<

Overall, the distribution of males, females and the age categories are representative of the Danish population. The respondents in the sample generally come from households with a relatively high income level compared to average for the Danish population. Likewise, the educational level is higher in the sample. With regard to the wind turbine related demographics, 5% and 14% of the respondents have stated that they can see an offshore wind turbine/wind farm or an onshore turbine/wind farm from their permanent or summer residence. Apparently, it has been difficult for the respondents to recollect how many turbines they see on a daily basis. As many as 49.3% have stated that they do not recall how many turbines they see daily. As presented in the next section, these respondents will be controlled for in the analyses. Focusing on respondents recalling the number of turbines seen daily, 23.6% of the respondents see 5 or fewer turbines daily. 13.9, 7.8 and 5.5% see between 6-10, 11-20 or more than 20 turbines daily, respectively.

4. Setup of the analyses

The attitudes towards More Onshore Wind Turbines (MOWT), Repowering Onshore Wind Turbines with larger ones (ROWT) and More Offshore Wind Turbines (MOFWT) are stated on a five point scale with the option of answering "Do not know". The 12 respondents answering "Do not know" to one or more of the three attitude questions are disregarded in the analysis. In the analysis, the following ordinal attitude values are connected to the stated attitude:

Very positive = 5
Positive = 4
Neutral = 3
Negative = 2
Very Negative = 1

Based on this ordinal scale, a discrete relative attitude measure can be constructed as follows.

$$DRA_{MOFWT\text{-}MOWT} = 1 \text{ if } Attitude_{MOFWT} - Attitude_{MOWT} < 0$$

(Onshore wind farms are preferred to offshore)

$$DRA_{MOFWT\text{-}MOWT} = 2 \text{ if } Attitude_{MOFWT} - Attitude_{MOWT} = 0$$

(Indifference between onshore and offshore wind power development)

$DRA_{MOFWT\text{-}MOWT} = 3$ if $Attitude_{MOFWT} - Attitude_{MOWT} > 0$

(Offshore wind farms are preferred to onshore)

A similar discrete variable is constructed for the relative attitude between repowering onshore and more offshore wind power development. ($DRA_{MOFWT\text{-}ROWT}$)

The DRA is estimated using a multinomial logit model in which the probability of having a relative attitude is

$$DRAi = \frac{e^X}{\sum_i^3 e^X}$$

where X is a vector of variables that might influence the relative attitude DRA_i. Though, the focus is on the potential cumulative effects on the relative attitude towards onshore and offshore wind power development, the multinomial logit models control for the demographics of the respondents, Z_i, such as gender, age, education, income etc. These have been found to influence attitude towards wind power significantly [18-23]. A set of variables, θ_i, which controls for experience with wind turbines, is also added, i.e. $q_i^* = Z_i\beta + \theta_i\varphi + \varepsilon_i$, where ε_i is the individual specific error term, assumed to have a logistic distribution with a zero mean and a variance of σ^2 [1]. In the models, θ_i includes whether or not the respondents have onshore and offshore wind turbines in the viewshed of their residence and variables representing the cumulative effects from the number of turbines seen daily (*No. turbines*). As in Ladenburg et al. [9] the effect is estimated using a set of dummy variables controlling for whether the respondents see 6-10 turbines, 11-20 turbines or more than 20 turbines on a daily basis. The effect is estimated relative to respondents who only see 0-5 turbines daily. As presented in Table 1, nearly 50% of the respondents do not recall the number of turbines seen daily. The respondents who do recall the number of turbines daily on the attitude are controlled for with a specific dummy variable for these respondents. Again, the reference category is the respondents who see 0-5 turbines daily. As found in Ladenburg [24] and Ladenburg et al. [9], the influence of the experience variables on attitude could be conditional on the level of other variables (visits to the beach and onshore wind turbines in viewshed, respectively). However, given that very few respondents seeing more than 6 turbines on a daily basis have a higher acceptance of onshore wind power relative to offshore wind farms, it has not been possible to estimate viewshed-conditional attitude models. Ladenburg and Möller [13] find that the acceptance of existing offshore wind farms is a function of the travel time to the nearest offshore wind farms and the number of

[1] Given the nature of the binary attitude data, a positive parameter estimate indicates that the variable influences the attitude positively.

turbines in the nearest offshore wind farm. The travel time and the number of turbines might also influence the relative attitude towards onshore and offshore wind farms. Variables controlling for these potential relationships are included in the model.

5. Results

Overall, the respondents have a more positive attitude towards offshore wind turbines relative to more onshore wind turbines and repowering onshore wind turbines, respectively, see Figure 1 below.

>>Figure 1 about here <<

A chi test of homogeneity with four degrees of freedom reveals that there are no differences in the distribution of attitudes toward more onshore wind turbines and repowering wind turbines (chi test value 6.12, *p*-value = 0.19. However, the respondents have a significantly more positive attitude towards more offshore wind farms relative to more onshore wind turbines (Chi test value = 297.04, *p*-value = 4.71e-63) and repowering onshore wind turbines (Chi test value=245.29, *p*-value = 6.23e-57). The higher acceptance of more offshore wind power is thus in line with the results in [1]. Moving on to the test of the cumulative effects on the relative attitudes using a multinomial logit model, the results in Table 2 below suggest few and weak effects.

>>Table 2 about here<<

Cumulative effects

First of all, none of the estimated relationships between the number of turbines seen daily and the relative attitude towards more/repowering onshore wind turbines and more offshore wind turbines are significant at a 95% level of confidence, but are significant on a 90% level and only in the $DRA_{MOFWT\text{-}MOWT}$ models. All else being equal, this suggests weak cumulative effects on the relative attitudes. Going into further detail, in the $DRA_{MOFWT\text{-}MOWT}$ models the respondents who see more than 10 turbines daily have a higher propensity to be indifferent between more onshore and offshore wind turbines ($\beta_{>10\ turbines|Indifferent}>0$). However, $\beta_{>10\ turbines|Indifferent}$ is only significant on a 90% level of confidence in the second model, in which respondents who see 6-10 turbines daily are included in the reference group. Again, this suggests that though there may be some minor relationships between the number of turbines seen daily and the relative attitude towards more onshore wind turbines and more offshore wind turbines they are very weak, almost to the extent of being non-detectable.

The are no significant relationships between the number of turbines seen daily and the relative attitude between repowering onshore and more offshore wind farms.

Gender

In the $DRA_{MOFWT\text{-}MOWT}$ models, male respondents ($\beta_{Male}>0$) have a significantly higher propensity to be indifferent between more onshore and offshore wind turbines or to have a more positive attitude towards more offshore wind turbines. However, these results are not significant in the $DRA_{MOFWT\text{-}ROWT}$ models.

Age

Age enters the model as a linear variable. In the $DRA_{MOFWT\text{-}MOWT}$ model, $\beta_{age|Indifferent}$ and $\beta_{age|More\ offshore}$ are positive, suggesting that older respondents are more indifferent between onshore and offshore wind turbines or prefer offshore wind turbines. However, the results are significant on a 90% level of confidence only. This also means that younger respondents to a greater extent have a more positive attitude towards more onshore wind turbines/onshore repowering relative to more offshore wind power development. To the author's knowledge, the differences in the relative attitude between more onshore and offshore wind power development have not been reported in the literature. In the $DRA_{MOFWT\text{-}ROWT}$ model, the estimates are not significant.

Education and Household Income

The models do not suggest relationships between the levels of household income and education and the relative attitudes towards more/repowering onshore wind turbines and more offshore wind turbines.

Viewshed effects

Interestingly, the results from the $DRA_{MOFWT\text{-}MOWT}$ models suggest that respondents who can see onshore wind farms from their residence or summer house have a lower propensity to be indifferent between more onshore/repowering onshore wind turbines and offshore wind turbines or have a more positive attitude towards more offshore wind turbines relative to more onshore wind turbine/repowering onshore wind turbines $0<\beta_{View\ Onshore|Indifferent}$ and $0<\beta_{View\ Offshore|More\ offshore.}$ Or stated differently, they have a higher propensity to have a more positive attitude towards more onshore wind turbines relative to more offshore wind turbines. The respondents who can see offshore wind farms from their residence or summerhouse do not have a significantly different relative attitude from the respondents who do not have an offshore wind farm in their viewshed.

Beach visit rate

The visit rate seems to have non-linear effects. Respondents who visit the beach at least once per week do not have significantly different relative attitudes compared to the reference group (respondents who visit the beach less than once every second month). However, respondents who

visit the beach at least once every month or every second month have a higher propensity to be indifferent to more onshore and offshore wind turbines or favour more offshore wind turbines relative to more onshore wind turbines ($B_{\text{Beach 1/second month|Indifferent}}$ and $B_{\text{Beach 1/second month|More offshore}}>0$). These results are puzzling, as, in accordance with the findings in Ladenburg and Dubgaard [25], we would expect frequent beach visitors to have weaker attitudes for more offshore wind power development. In light of this, it is thus less clear why the respondents who visit the beach seldom also have a higher propensity to favour more onshore development. All else being equal, we should expect non-users and seldom users to be less concerned about the potential impacts of offshore wind farms on the utility gained from visiting the beach.

Travel time to the nearest existing offshore wind turbines and the number of turbines in the nearest offshore wind farms

The travel time to the nearest offshore wind farm and the number of turbines in the nearest offshore wind farm do not influence the relative acceptance of onshore and offshore wind power development significantly.

6. Conclusion

The analysis of the influence on the number of turbines seen daily on the relative attitude towards more onshore wind power development, repowering onshore wind power and more offshore wind power development is based on the attitudes of 1,072 respondents. The results indicate that there are no, or only weak/borderline significant, relationships between the number of turbines seen daily (cumulative effects) and the relative attitudes for more /repowering onshore wind turbines and more offshore wind turbines. Thus, it seems that seeing many wind turbines daily does increase the acceptance of more offshore wind turbines relative to more/repowering onshore wind turbines and vice versa.

Conflict of interest

The author holds no conflict of interest

References

1. Ladenburg, J., *Attitudes towards on-land and offshore wind power development in Denmark; choice of development strategy.* Renewable Energy, 2008. **33**(1): p. 111-118.
2. Ladenburg, J., *Stated public preferences for on-land and offshore wind power generation—a review.* Wind Energy, 2009. **12**(2): p. 171-181.
3. Ek, K. and L. Persson, *Wind Farms – Where and how to put them?*, in *Umeå economic studies*, *ISSN 0348-1018; 854*. 2012.
4. Ek, K., *Public and private attitudes towards "green" electricity: the case of Swedish wind power.* Energy Policy, 2005. **33**(13): p. 1677-1689.

5. Campbell, D., C.D. Aravena, and W.G. Hutchinson, *Cheap and expensive alternatives in stated choice experiments: are they equally considered by respondents?* Applied Economics Letters, 2011. **18**(8): p. 743-747.
6. EWEA, *Wind energy scenarios for 2020*, A.r.b.t.E.W.E. Association, Editor. 2014.
7. GWEC and Greenpeace International, *Global Wind Energy Outlook 2014*, R.b.t.G.W.E.C.a.G. International, Editor. 2014.
8. Ladenburg, J. and J.-O. Dahlgaard, *Attitudes, threshold levels and cumulative effects of the daily wind-turbine encounters.* Applied Energy, 2012. **98**(0): p. 40-46.
9. Ladenburg, J., M. Termansen, and B. Hasler, *Assessing acceptability of two onshore wind power development schemes: A test of viewshed effects and the cumulative effects of wind turbines.* Energy, 2013. **54**(0): p. 45-54.
10. Energistyrelsen, *El produktionsomkostninger for 10 udvalgte teknologier*. 2014, Notat. p. 1-8.
11. Thayer, R.L. and C.M. Freeman, *Altamont: Public perceptions of a wind energy landscape.* Landscape and Urban Planning, 1987. **14**: p. 379-398.
12. Warren, C.R. and M. McFadyen, *Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland.* Land Use Policy, 2010. **27**(2): p. 204-213.
13. Ladenburg, J. and B. Möller, *Attitude and acceptance of offshore wind farms—The influence of travel time and wind farm attributes.* Renewable and Sustainable Energy Reviews, 2011. **15**(9): p. 4223-4235.
14. Wolsink, M., *Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support.* Renewable Energy, 2000. **21**(1): p. 49-64.
15. van der Horst, D., *NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies.* Energy Policy, 2007. **35**(5): p. 2705-2714.
16. Jones, C.R. and J. Richard Eiser, *Understanding local' opposition to wind development in the UK: How big is a backyard?* Energy Policy, 2010. **38**(6): p. 3106-3117.
17. Bell, D., T. Gray, and C. Haggett, *The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses.* Environmental Politics, 2005. **14**(4): p. 460-477.
18. Ladenburg, J., *Acceptance of Wind Power An Introduction to Drivers and Solutions*, in *Wiley Encyclopidia of Energy*, J.H. Lehr, Editor. Forthcomming John Wiley & Sons.
19. Klick, H. and E.R.A.N. Smith, *Public understanding of and support for wind power in the United States.* Renewable Energy, 2010. **35**(7): p. 1585-1591.
20. Firestone, J. and W. Kempton, *Public opinion about large offshore wind power: Underlying factors.* Energy Policy, 2007. **35**(3): p. 1584-1598.
21. Molnarova, K., et al., *Visual preferences for wind turbines: Location, numbers and respondent characteristics.* Applied Energy, 2012. **92**(0): p. 269-278.
22. Jones, C.R., B.J. Orr, and J.R. Eiser, *When is enough, enough? Identifying predictors of capacity estimates for onshore wind-power development in a region of the UK.* Energy Policy, 2011. **39**(8): p. 4563-4577.
23. Ladenburg, J., *Dynamic properties of the preferences for renewable energy sources - a wind power experience-based approach.* Energy 2014. **Volume 76**(November): p. 542-551.
24. Ladenburg, J., *Attitudes towards offshore wind farms—The role of beach visits on attitude and demographic and attitude relations.* Energy Policy, 2010. **38**(3): p. 1297-1304.
25. Ladenburg, J. and A. Dubgaard, *Preferences of coastal zone user groups regarding the siting of offshore wind farms.* Ocean & Coastal Management, 2009. **52**(5): p. 233-242.

Tables

Table 1: Descriptive statistic of the sample

Variable	Variable name	%	Coding of variable
Male	Male	53.6	= 1 if male, else = 0
Age	Age		
16-24 years		13.9	
25-34 years		16.6	
35-44 years		16.9	Continuous, linear
45-54 years		23.0	
55-64 years		18.9	
≥65 years		10.6	
Annual Household Income (DKK)	H. Income		
<200.000		13.5	
200.000-399.999		26.8	Continuous, linear
400.000-599.999		23.5	
600.000-799.999		18.7	
≥800.000		8.8	
Income not available	H. Income N.A.	8.7	= 1 if income not stated, else = 0
Education			
Maximum seven years in elementary school	Max 7 yrs. Elem. Sch.	4.0	= 1 if max seven years in elementary school, else = 0
Secondary education	Sec. Education	88.2	= 1 if secondary education completed, else = 0
Master degree	Master	18.3	= 1 if master degree obtained, else = 0
View turbines off-shore from residence	View Offshore	4.9	= 1 if view from residence or summer house, else = 0
View turbines on-land from residence	View On-land	24.2	= 1 if view from residence or summer house, else = 0
Number of turbines seen daily			
0-5 turbines	No.Turb.0-5	23.6	Reference
6-10 turbines	No.Turb.6-10	13.8	= 1 if 6-10 turbines daily, else = 0
11-20 turbines	No.Turb.11-20	7.8	= 1 if 11-20 turbines daily, else = 0
> 20 turbines	No.Turb.>20	5.5	= 1 if >20 turbines daily, else = 0
Don't know the number of turbines	No.Turb. D. K.	49.3	= 1 if don't know the number of turbines, else = 0
Visit to the beach			
Visit beach at least once or more/week	VB 1/week	9.6	= 1 if 1/week daily, else = 0
Visit beach at least 1-3/month	VB 1/month	24.3	= 1 if 1/month daily, else = 0
Visit beach 1/second month	VB 1/second month	24.3	= 1 if 1/second month, else = 0
Less frequently		58.2	Reference
Travel time to the nearest offshore wind farm (20 percentiles)	WF_Ttime, WF_Ttime^1 and F_Ttime30		
4-18 minutes		20.3	Continuous, linear and squared

19-43 minutes		19.8	Dummy variable =1 if Travel time ≤30, else =0
44-71 minutes		20.0	
72-102 minutes		20.0	
101-241 minutes		20.0	
Number of turbines in nearest offshore wind farm	WF_N.Turb.		
10		34.4	
11		9.9	
20		44.2	Continuous, linear
72		1.6	
80		9.9	

Table 2: Multinomial logit model on the relative attitudes towards more/repowering onshore wind turbines and more offshore wind turbines.

	More onshore wind turbines vs. more offshore wind power		Repowering onshore wind turbines vs. more offshore wind power	
	Model I	Model II	Model I	Model II
Indifferent between onshore and offshore wind power development[a]				
Male	0.829*	0.825*	0.384	0.378
	(2.49)	(2.48)	(1.42)	(1.40)
Age	0.0187+	0.0187+	0.0115	0.0114
	(1.88)	(1.87)	(1.17)	(1.16)
H. Income	-0.150	-0.151	-0.0503	-0.0515
	(1.17)	(1.17)	(0.43)	(0.44)
Max 7 yrs. Elem. Sch.	-0.635	-0.645	-0.789	-0.800
	(0.91)	(0.92)	(1.13)	(1.15)
Sec. education	-0.611	-0.621	0.205	0.195
	(1.25)	(1.29)	(0.50)	(0.48)
Master	0.304	0.307	-0.102	-0.101
	(0.64)	(0.65)	(0.27)	(0.27)
VB 1/week	0.236	0.224	0.373	0.363
	(0.40)	(0.37)	(0.81)	(0.78)
VB 1/month	0.685+	0.678+	0.638+	0.632+
	(1.84)	(1.83)	(1.75)	(1.73)
VB 1/second month	1.247*	1.246*	1.125**	1.125**
	(2.54)	(2.55)	(2.87)	(2.87)
View Offshore	0.651	0.637	0.429	0.417
	(0.65)	(0.63)	(0.56)	(0.55)
View On-land	-0.990**	-1.000**	-0.166	-0.179
	(2.79)	(2.81)	(0.47)	(0.51)
No. turb. 6-10	-0.170		-0.160	
	(0.35)		(0.33)	
No. turb. >10[b,]	1.025	1.093+		
	(1.55)	(1.67)		
No. turb. 11-20			-0.472	-0.408
			(0.84)	(0.78)
No. turb. >20			0.335	0.407
			(0.40)	(0.51)
WF_Ttime30	-0.125	-0.133	-0.443	-0.448
	(0.20)	(0.22)	(0.78)	(0.79)
WF_TTime	-0.0243	-0.0246	-0.0130	-0.0133
	(1.28)	(1.32)	(0.82)	(0.84)
WF_TTime^2	0.000146	0.000147	0.0000642	0.0000653
	(1.48)	(1.51)	(0.84)	(0.86)
WF_N.Turb	0.00478	0.00467	0.00352	0.00339
	(0.57)	(0.56)	(0.49)	(0.47)
Constant	2.444*	2.430*	1.601+	1.587+
	(2.18)	(2.14)	(1.74)	(1.73)
H. Income N.A	-0.851	-0.851	-0.218	-0.219
	(1.46)	(1.46)	(0.38)	(0.38)
No. turb. D. R.	0.0580	0.110	-0.227	-0.175
	(0.16)	(0.33)	(0.66)	(0.57)
More positive towards offshore to onshore wind power development[a]				
Male	0.894**	0.899**	0.157	0.158
	(2.72)	(2.72)	(0.58)	(0.58)
Age	0.0364***	0.0364***	0.0274**	0.0274**
	(3.55)	(3.56)	(2.80)	(2.80)
H. Income	-0.0623	-0.0604	-0.0485	-0.0474

	(0.47)	(0.46)	(0.42)	(0.41)
Max 7 yrs. Elem. Sch	-0.873	-0.863	-0.570	-0.568
	(1.41)	(1.38)	(0.84)	(0.84)
Sec. education	-0.901^{+}	-0.893^{+}	-0.294	-0.291
	(1.81)	(1.82)	(0.72)	(0.72)
Master	0.529	0.528	0.0232	0.0213
	(1.08)	(1.08)	(0.06)	(0.06)
VB 1/week	0.0452	0.0551	-0.219	-0.214
	(0.08)	(0.09)	(0.47)	(0.46)
VB 1/month	0.555	0.559	0.521	0.522
	(1.56)	(1.57)	(1.43)	(1.43)
VB 1/second month	1.293**	1.294**	0.941*	0.943*
	(2.63)	(2.65)	(2.40)	(2.40)
View Offshore	1.121	1.133	0.477	0.482
	(1.10)	(1.11)	(0.63)	(0.63)
View On-land	-0.724*	-0.718*	-0.123	-0.125
	(2.06)	(2.02)	(0.35)	(0.36)
No. turb. 6-10	0.123		0.0292	
	(0.26)		(0.06)	
No. turb. >10 [b,]	1.036	0.982		
	(1.54)	(1.47)		
No. turb. 11-20			-0.224	-0.238
			(0.40)	(0.46)
No. turb. >20			0.144	0.129
			(0.17)	(0.16)
WF_Ttime30	0.0900	0.0966	-0.252	-0.248
	(0.15)	(0.16)	(0.44)	(0.44)
WF_TTime	-0.0177	-0.0174	-0.00961	-0.00950
	(0.93)	(0.92)	(0.61)	(0.60)
WF_TTime^2	0.000130	0.000129	0.0000603	0.0000600
	(1.31)	(1.31)	(0.79)	(0.79)
WF_N.Turb	0.0125	0.0126	0.00571	0.00573
	(1.48)	(1.49)	(0.80)	(0.81)
Constant	1.125	1.133	1.108	1.107
	(1.01)	(1.01)	(1.20)	(1.21)
H. Income N.A	-0.237	-0.233	0.0580	0.0612
	(0.39)	(0.39)	(0.10)	(0.11)
No. turb. D. R.	0.00725	-0.0365	-0.0732	-0.0854
	(0.02)	(0.11)	(0.21)	(0.28)
N	1072	1072	1072	1072
LL(0)	-908.4	-908.4	-949.2	-949.2
LL(β)	-861.8	-862.6	-924.5	-924.9
Pseudo R2	0.051	0.050	0.026	0.026

Notes: [a)] The references group is the respondents who have a more positive attitude towards more/repowering onshore wind turbines relative to more offshore wind turbines. b) There are no observations of having more positive attitude towards more onshore wind turbines among the respondents who see more than 20 turbines daily. These respondents are therefore modelled jointly with the respondents who see 11-20 turbines daily.

Figures

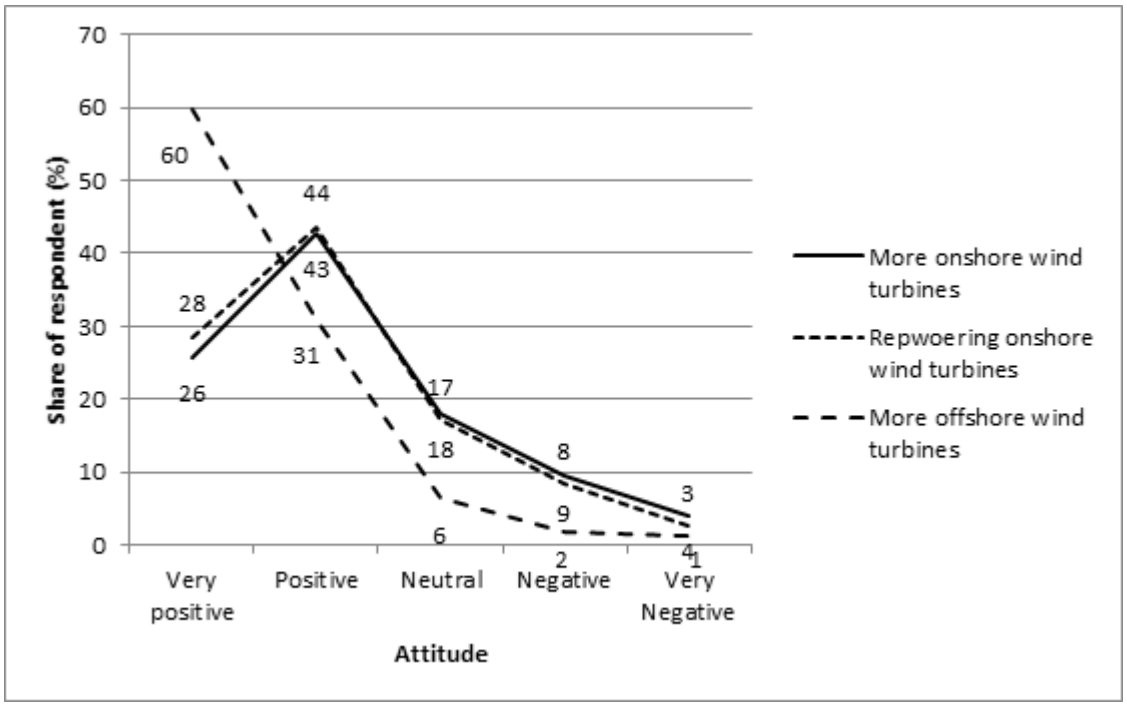

Figure 1: Attitude towards more onshore wind turbines, repowering onshore wind turbines and power offshore wind turbines.