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Hevia Koch, Pablo Alejandro

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# ***THE VISUAL IMPACT OF WIND TURBINES: GUIDELINES FOR STATED PREFERENCE STUDIES***

Pablo Alejandro Hevia-Koch, Technical University of Denmark, +45 50 29 77 85, phev@dtu.dk

## **Overview**

It is of high interest for policy makers to be able to quantify the attributes of wind power projects acceptance in economic terms i.e. external costs, as these costs can give important information when considering the economic trade-off between the placement and the disamenities created and facilitate a more cost efficient wind power deployment. Currently, one of the main drivers for acceptance of wind turbines by the public is their level of visual impacts. In attempts to quantify the visual impacts in economic terms, a vast number of economic valuation studies methodologies have emerged the past 10-15 years, see (Knapp and Ladenburg, In Press). Most studies have estimated preferences for visual impact reduction either directly as a function of distance/number or turbines/formation of wind farms or indirectly as a function of the location of the wind turbines. However, despite focusing on estimating the welfare loss of visual impacts from wind turbines, a large share of the applied studies have used no or very simple visualisation of the actual visual impacts at stake. These studies thus in principle rely on the cognitive skills of the respondents to image wind turbines of different sizes and locations and on the prior experience people have with wind turbines. In a study comparing perceptions of visual impacts and subsequently stated preferences supported by realistic visualisations Ladenburg (2007) finds that visualisations are supportive in the stating preferences.

Based on the resource quality information model developed by Blomquist and Whitehead (1998), this paper makes a critical review of the past studies focusing on their approach towards estimating visual disamenities costs, discusses their limitations and strengths, and gives a series of recommendations regarding the design of state-of-the-art stated preference studies for the assessment of visual disamenities costs of wind turbines, with a special emphasis on improving current visualisation problems.

## **Methods**

By reviewing relevant papers of recent years regarding stated preferences studies with respect to the acceptance costs of wind turbines, the main shortcomings are identified, with a particular emphasis on the visual impact assessment and the used visualisation methods. These visualisation methods are then classified in a “visualisation ladder” framework, based on the economic resource quality model by Blomquist and Whitehead (1998). More specifically, we relate the type of visualisation applied in the individual studies to the perceived resource quality changes  $q_i^*$  being a function of the prior knowledge of the visual impacts  $\theta_i$ , the information on the impacts given through visualisations  $I_i$  and the associated learning parameters  $\delta$  and  $\beta$ . This framework, gives qualified reasons to identify the main shortcomings and benefits for each approach, giving suggestions regarding their applicability.

## **Results**

Based on the previous analysis of utilised visualisation methods, it can be seen that there is a lack of proper visualisations in a vast share of the recent literature. More specifically, we conclude that unless the respondents in the survey have an appropriate level of prior knowledge,  $\theta_i$ , regarding the visual impact from wind turbines, we can expect increasing biases with decreasing quality in the visualisations of the wind turbines,  $I_i$ . Given that the visual impact has been shown to be one of the main drivers for acceptance in wind projects both onshore and offshore, the conclusions of many of these papers might be questionable, due to the lack of rigour in the application of visualisations.

## **Conclusions**

The proposed suggestions, and the observed visualisations methods utilised so far in most recent literature indicate that the field of stated preference studies applied to acceptance costs of wind turbines has much room for improvement. Given the current marked increased of proposed wind energy projects, it is necessary to raise the bar in regards to the quality of the stated preferences studies conducted, as so far they are one of the main tools both policy makers and industry leaders have to gauge the public acceptance for these projects.

While so far, the conclusions gained from most of previous studies have been useful, the full potential of the method has not been harnessed, and as such, a more rigorous approach would greatly benefit the quality and scope of the studies and their conclusions.

## References

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