
Summary:

Community reactions to windmill noise – Lista Windmill Park 2015

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An environmental health impact assessment was undertaken around Lista windmill farm located near the coastal area at the very south of Norway. The socio-acoustic study was required by the local health authority to look into possible causes for local noise complaints. The survey results are influenced by the local conflict situation and a small sample size. Simple exposure effect-relationships, indicate that the local population reacts stronger to windmills and windmill noise than shown internationally. Pulsating swishing sounds and turbine engine hum are the main causes of annoyance. About 60 per cent of those who participated in the survey thought windmills degraded the landscape aesthetically. Exposure effect relationships for Lista suggest that windmill noise is perceived by local residents as 17-18 dBA worse than road traffic noise, and that wind mills should be located at least 1 km distant. Reactions from respondents who did not regard the windmills aesthetically displeasing or degrading the visual landscape and those more favourable towards wind mills as a renewable source of energy, are more in line with what has been shown internationally.

It is known from international studies that wind mill noise is perceived as more annoying than noise from road traffic. Norwegian land areas zoning restrictions are imposed on areas exposed to an evening and night time equivalent noise level of 45 dBA, 10 dBA stricter than for road traffic noise.

The wind farm at Lista at the South Coast of Norway has been established in accordance with these regulations, and is located in a sparsely populated area with few housing units and many part-time dwellings to minimize adverse noise impacts. After the wind farm was put into operation in 2012, the residents complained about noise and that they were surprised by how persistent and bothersome the noise turned out to be. The socio-acoustic study was required by the local health authority to look into possible causes for local complaints.

The population of Lista more annoyed than anticipated

Different noise sources, generate different levels of annoyance. To establish noise zones that give equal protection, an adjustment factor, bonus or malus, is added to the noise level so that zones along roads or railway lines, air ports, industry sites or windmills provide the same protection. For road traffic noise the proportion of the population that is highly annoyed at the zonal limit of 55 dBA is approximately 21 per cent (according to a 5-point scale).

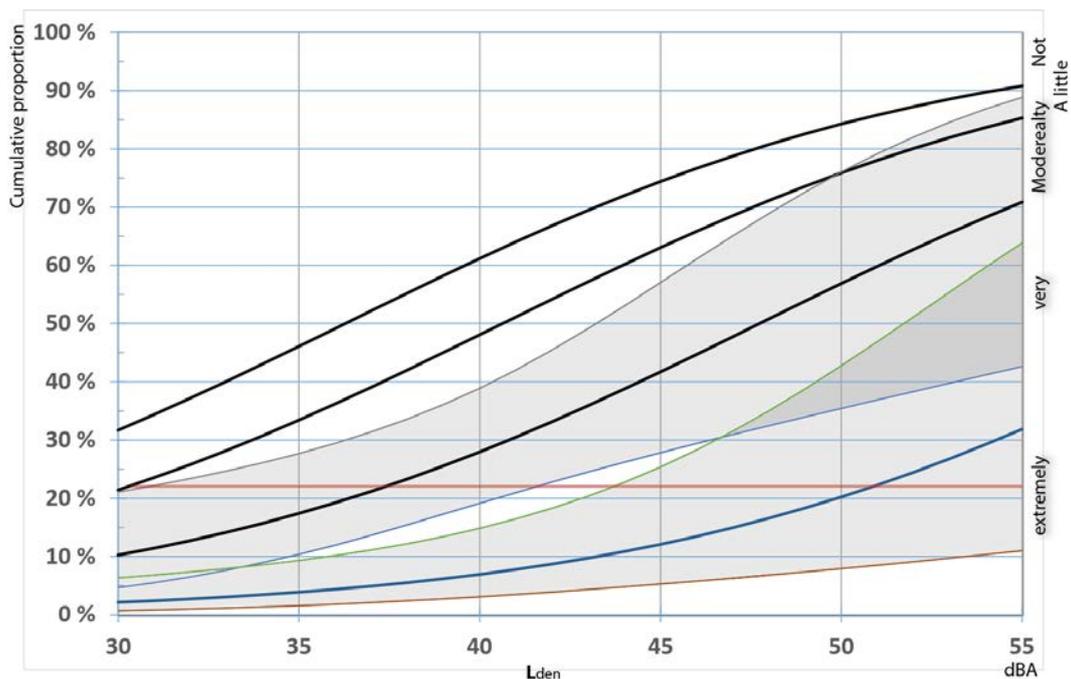
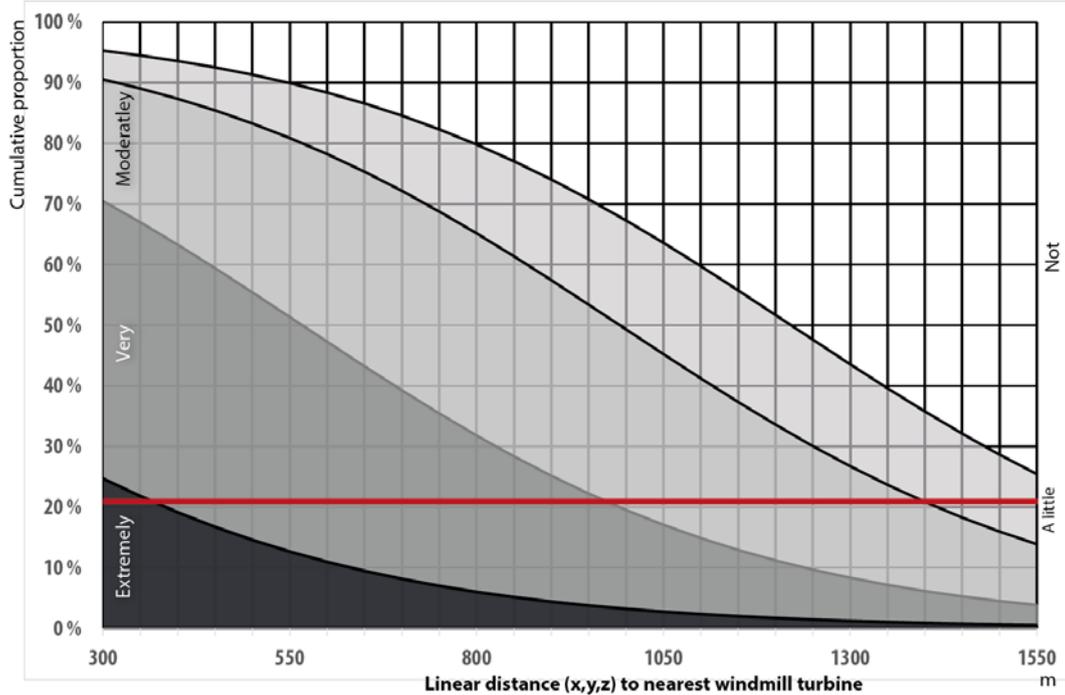


Figure S-1 Exposure-effect relationships for annoyance right outside the dwelling from windmill noise as a function of evening and night weighted equivalent noise levels (L_{den}). $N=87$. 95- per cent confidence bands for extremely and extremely +very annoyed are shown.

We find that the cumulative proportion of respondents who are predicted to be extremely or very annoyed crosses the 21 per cent norm at 37-38 dBA (figure S.1.)

Noise from will mills is thus considered 17-18 dBA worse than road traffic noise - if we take the results at face value and disregard the large impact on annoyance from non-acoustic factors.

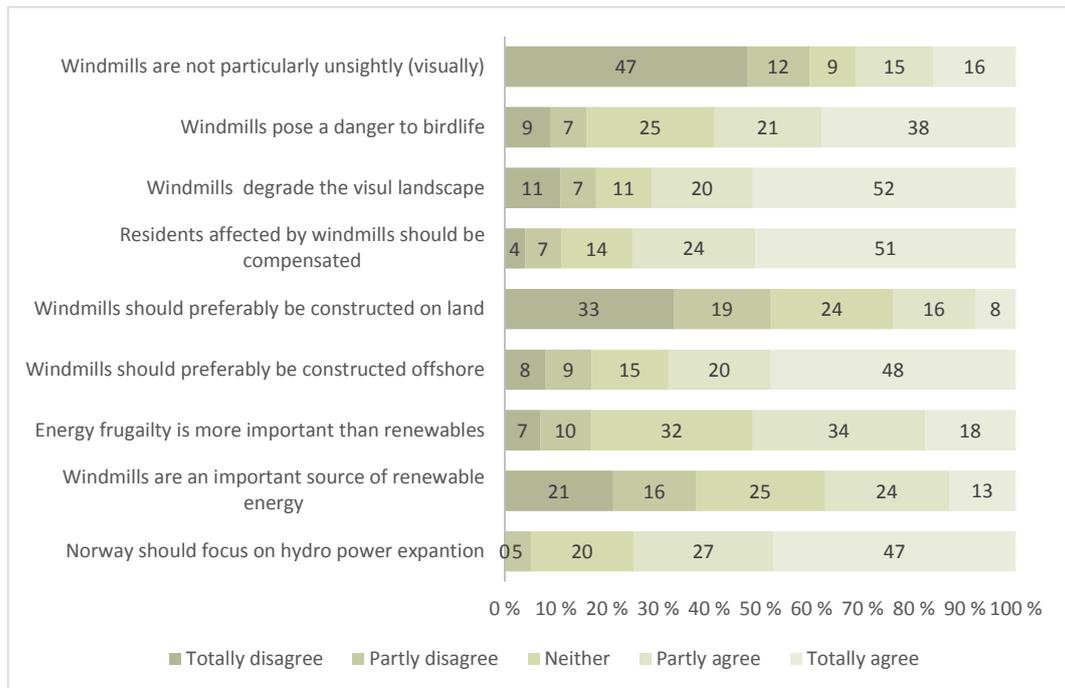
We have also plotted the annoyance reactions as a function of distance (straight line taking vertical distance, but not intervening obstacles into account).



Figur S-2 Exposure-effect relationships for annoyance right outside the dwelling from windmill noise as a function of linear distance.. N=87.

If we take the results at face value the zonal limit stretches out 1 km from each of the windmills (see figure S-2)..

It would be wrong to regard noise annoyance as only a result of noise. We find that visual and aesthetic factors play a large role as well as attitudes, and where a significant proportion of the population are in opposition to reigning policies facilitating investments in wind mill parks (see figure S-3).



Figur S-3 Respondents who agree or disagree to a set of prepared opinion statements. N=90.