Acceptance of Wind Turbines – Social Psychological Research

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our research topics – acceptance, stress impact

- small scale
- large scale
- grid expansion
definition of social acceptance

socio-political acceptance

community acceptance  market acceptance

attitude  intention  behaviour
residents’ attitudes towards wind turbines – four studies

from negative (–3) to positive (+3)

<table>
<thead>
<tr>
<th></th>
<th>in general</th>
<th>local park</th>
</tr>
</thead>
<tbody>
<tr>
<td>offshore close:</td>
<td>M = 1.33 SD = 1.60</td>
<td>M = 0.20 SD = 1.94 r = .68</td>
</tr>
<tr>
<td>offshore far:</td>
<td>M = 1.10 SD = 1.67</td>
<td>M = 1.10 SD = 1.67 r = .90</td>
</tr>
<tr>
<td>obstruction mark.:</td>
<td>M = 1.30 SD = 1.61</td>
<td>M = 0.30 SD = 1.93 r = .79</td>
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<tr>
<td>noise:</td>
<td>M = 1.50 SD = 1.02</td>
<td>M = 0.71 SD = 1.65 r = .83</td>
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<tr>
<td>swiss:</td>
<td>M = 1.88 SD = 0.07</td>
<td>M = 1.82 SD = 0.07 r &gt; .80</td>
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M = mean, SD = standard deviation
acceptance over time

Wolsink 2007
annoyance by wind turbines – fears and complaines

- landscape
- shadow-flickering
- aircraft-obstruction markings
- noise
- opponents: “wind turbine syndrome”
definition of annoyance

• “How much do you feel annoyed by ... “ not at all (0) – very (4)
• visual threat
• definition based on stress psychology:

  annoyance = at least moderately annoyed (2 – 4) + physical and psychological symptoms
**method – stress and environmental psychology**

**German survey**

- 212 participants, 55 years
- flat ground, Lower Saxony
- 9 Enercon E-82, 2 MW, 150 m
- questionnaire interview, 450 items
- complain sheet: self rating, 22 items
- longitudinal study in 2012 and 2014
- audio recorders
- emission, immission measures
- intervention

**Swiss survey**

- 467, 52 years
- 7 locations
- 1 to 16 turbines, 1 MW
- 614 items
selected results
selected results – annoyance by emissions

“How much do you feel annoyed by …” not at all (0) – very (4)

- Blade rotation
- Per. shadow casting
- Night marking
- Day marking
- Landscape change
- WT noise

German survey
Swiss survey
five noise annoyance subgroups based on definition (stress psychology)

- no noise perception 31% 70%
- not at all annoyed (0) 18% 14%
- somewhat annoyed (1) + no symptoms 15% 6%
- at least moderately annoyed (2–4), no symptoms 25% 6%
- at least moderately annoyed (2–4) + symptoms 10% 5%

German study
Swiss study
effect of wind turbines on local residents in Switzerland

Hübner & Löffler, MLU + Hampl & Wüstenhagen, University of St. Gallen

<table>
<thead>
<tr>
<th>emission source</th>
<th>annoyed</th>
<th>strongly annoyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>landscape</td>
<td>18.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>noise</td>
<td>5.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>obstruction m.</td>
<td>9.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>shadow</td>
<td>5.8%</td>
<td>0.2%</td>
</tr>
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</table>

• sample: n = 467, census ≥ 900 kW turbines
• intensifier view
• marginal impact of distance
• moderator planning and construction process

note: mutiple answers | strongly annoyed in total 6%
significant moderators

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<tr>
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<th>Noise Annoyance</th>
<th>Landscape Annoyance</th>
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<tr>
<td>German survey</td>
<td>$r = .37$</td>
<td>$r = .46$</td>
</tr>
<tr>
<td>Swiss survey</td>
<td>$r = .45$</td>
<td>$r = .50$</td>
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</table>

- view
- honest, fair participation of residents
- financial benefits for residents and community
- not significant: distance
360° Visualization Dome, ETH Zurich
Summary

- high acceptance level – local and public
- landscape impact moderately annoying
- no negative impact on tourism
- planning process – most important moderator
- participation and local benefits
- visualization – the Dome
contact

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reports and brochure
www.akzeptanz-windenergie.de

information on RAVE
http://www.rave-offshore.de

information on social acceptance, Task 28 International Energy Agency
http://www.socialacceptance.ch/

Merci!
symptoms attributed to wind turbine noise – at least once a month
German survey

- sleep: falling asleep 7\%, awaking 5\%
- reduced attention 5\%
- tenseness 5\%
- negative mood 7\%
- anger, hostility 6\%