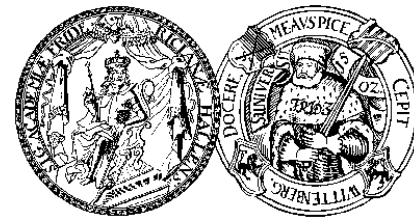


Health Impact of Wind Turbines

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annoyance by wind turbines – fears and complains

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



research on annoyance – what we know

- landscape – taste, no stress impact, no impact on tourism (Hübner et al., 2013, 2014)
- shadow flickering – regulations on duration (Pohl et al., 1999)
- aircraft-obstruction markings – no severe stress impact (Pohl, Hübner and Mohs, 2012)
- noise – sleep disturbances despite low sound levels (e.g., 2009; Pedersen, 2011; Pohl, Gabriel and Hübner, 2014)

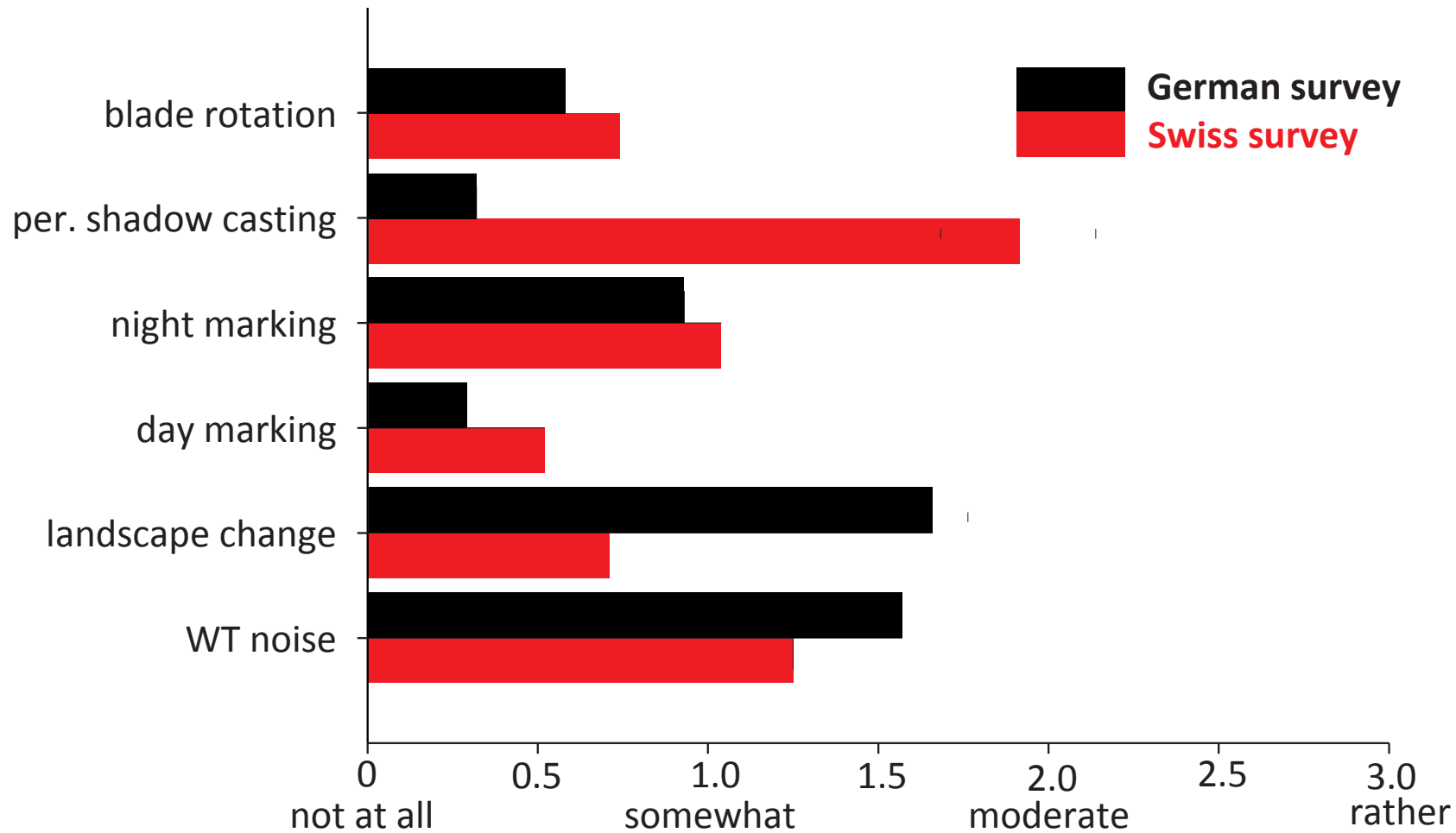
wind turbine noise – frequency of annoyed residents

- annoyance scales 0 to 10, examples:
4%, rather or very (Pedersen & Person-Waye, 2007)
15 %, very or extremely (Yano et al., 2013)
- annoyance scales 0 to 4, examples:
10% rather, 22% very annoyed (Hübner & Pohl, 2010)
- unclear definitions, examples
17% in Ontario, 6% on Prince Edwards Island (Health Canada, 2014)
10% “bothersome sound” (Firestone et al., 2015)
- inside / outside/ no distinction

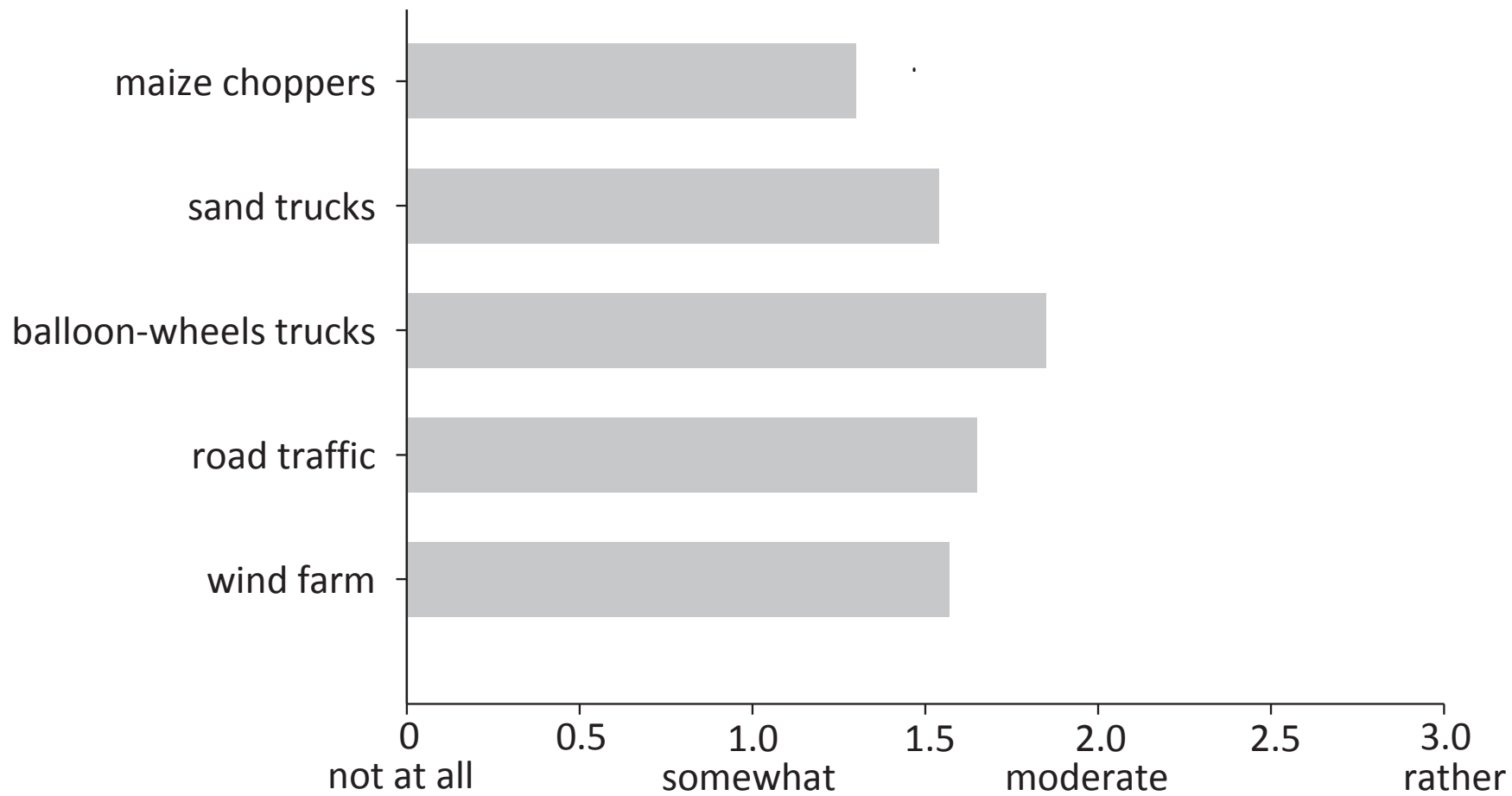
emissions in comparison – average annoyance

Pohl, Gabriel & Hübner, 2014; Hübner & Löffler, 2013)

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



annoyance in comparison – German survey



five noise annoyance subgroups based on 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 %
- traffic noise in comparison: 16 % with symptoms

German study
Swiss study

different definition – different result (German survey)

strong annoyance by definition:

- reduced psychological and physical well-being and work performance (BlmschG): 10 %
- upper 28 % of annoyance scale (G. Acoustic Association): 6 %
- any protective action taken (environmental offices): 27 %

- ongoing danish health survey – illness, e.g. heart attack, stroke

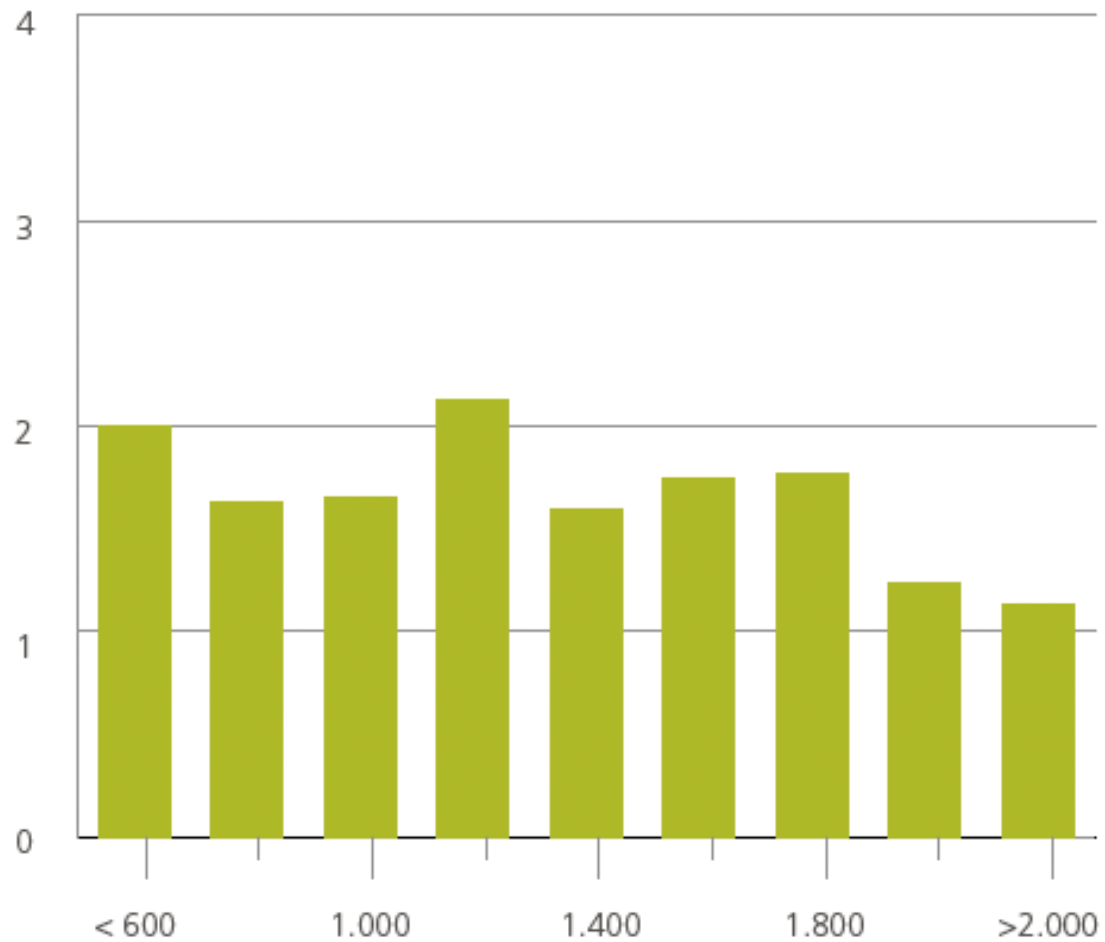
significant moderators

	noise annoyance planning	noise annoyance constructing	landscape annoyance planning	landscape annoyance constructing
German survey	$r = -.37$	$r = -.34$	$r = -.54$	$r = -.46$
Swiss survey	$r = -.45$	$r = -.50$	$r = -.50$	$r = -.50$

- view
- fair participation of residents
- financial benefits for residents and community
- not significant: distance

noise annoyance by distance to wind turbine

(example from Hübner & Pohl, 2015)



infrasound

- impact found – 6 persons in 3 houses (Acoustic Group, 2014)
- Health Canada – ongoing measurement
- German Federal Environment Office – study on impact of infrasound just started
- interdisciplinary project submitted – seismographic, acoustic, environmental medicine and psychology

summary

- a minority is annoyed strongly – mainly noise
- traffic noise – comparable degree of annoyance
- definitions and assessments – missing standards
- research on infrasounds just starting
- longitudinal studies are missing – just one
- valid and reliable homo sapiens monitoring needed
- you can't win strict opponents –
but lose the undecided residents

Kontakt

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**Information zu social acceptance,
Task 28 International Energy Agency**

<http://www.socialacceptance.org>

Geräusch-Studie

<http://www.dbu.de>

**Broschüre zu Offshore und
Forschungsbericht zum Netzausbau
in Schleswig-Holstein**

<http://www.akzeptanz-windenergie.de>

vielen Dank!

