



This is an excerpt from IARO Report (IARO24-5):

“Health Report on a Rural Sheep Farm in Scotland.”

[Critical Review of Maijala P, Turunen A, Kurki I, Vainio L, Pakarinen S, et al. (2020) Infrasound does not explain symptoms related to wind turbines. Publications of the Finnish Government's Analysis, Assessment and Research Activities, 2020:34. Prime Minister's Office: Helsinki.

<https://julkaisut.valtioneuvosto.fi/handle/10024/162329>]

(All Figures and Paragraphs referred to, but not included, in this excerpt can be found in the Full Report, available at iaro.org.nz)

II. The Government-Sponsored Finnish Study

228. The 2021 study by Majjala *et al.*³²⁷ is based on the 169-page 2020 Governmental Report on a Research Project carried out by Majjala *et al.*³²⁸
229. The main objective was “to find out whether wind turbine infrasound has harmful effects on human health.”³²⁹
230. Table 3 lists the specific objectives of this 2020 Research Project.

Table 3. Specific objectives of the 2020 Research Project sponsored by the Government of Finland.³³⁰

A. To characterize wind turbine noise as an exposure	
1	What are the full spectrum sound levels, down to 0.1 Hz, inside houses near the wind power plants?
2	What are the characteristics of the sound, both audible and inaudible infrasound?
B. To describe symptoms that are intuitively associated with infrasound from wind turbines, i.e., wind turbine infrasound related symptoms.	
3	What is the prevalence of wind turbine infrasound related symptoms in the vicinity of wind power plants?

327 Majjala PP, Kurki I, Vainio L, Pakarinen S, Kuuramo C, *et al.* (2021) Annoyance, perception, and physiological effects of wind turbine infrasound. *Journal of the Acoustical Society of America*, 149(4): 2238–2248. <https://pubmed.ncbi.nlm.nih.gov/33940893/>

328 Majjala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>

329 Majjala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. pp. 6–7. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>

330 Majjala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. pp. 6–7. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>

- 4 *What factors are associated with wind turbine infrasound related symptoms?*

C. To study how infrasound produced by wind turbines affects humans, in particular, perception, annoyance, and physiological responses

- 5 *Can low-frequency and infrasound wind turbine noise be perceived at typical and at extreme noise levels?*
- 6 *What is the dependence between the depth of amplitude modulation and annoyance at low frequencies?*
- 7 *Does infrasound increase reported annoyance and psychophysiological responses?*
- 8 *What is the reactivity of the autonomic nervous system (ANS) to audible wind turbine sounds and its infrasound?*
- 9 *Are individuals who attribute their symptoms to wind turbines more sensitive to infrasound? Are they more able to detect infrasound and do they experience more annoyance compared to controls?*
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231. Objectives A1 and A2 were accomplished, and Figure 7 shows a representative example of the identified 'dose.'

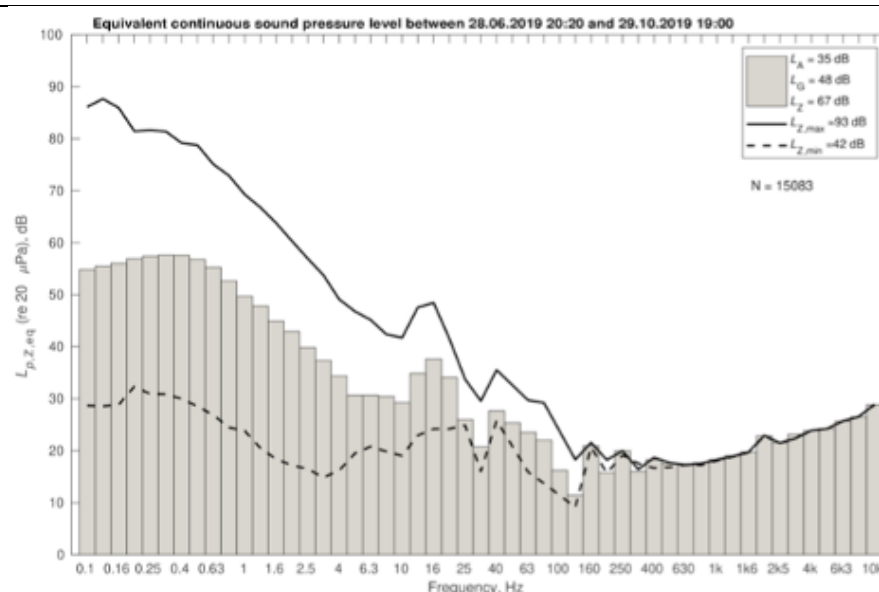


Figure 7. Representative example of the noise characterization (Raahe, indoors, 600-second sample).³³¹ L_Z levels refer to unweighted dB values. L_G refers to G-weighted values.³³² L_A refers to A-weighted values. Maximum and minimum L_Z values are shown as curves.

232. Figure 7 shows a one-third-octave-band segmentation of the acoustic spectrum (similar to that shown in Figure 2). The solid black curve (L_Z max) shows the highest sound pressure levels measured in unweighted dB.
233. There is no cut-off of spectral data as was seen in Figure 6 (i.e., the lower limiting frequency is 0.1 Hz and not 10 Hz), but there is also no recognition of a “wind turbine infrasound signal” as in the previous Marshall *et al.* study (see Paragraph 214). It was however recognized that “the most important frequencies were less than 2 Hz.”³³³
234. Objectives B3 and B4 (see Table 3) were more difficult to achieve, as “infrasound related symptoms” were established by questionnaires and telephone calls. While these types of surveys may have a certain usefulness, their direct results cannot be considered as a measure of Response within the realm of the Medical Sciences’ dose-response

331 Majjala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. pp. 21. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>.

332 See Appendix 2—Physics of Acoustics: V. Can infrasound be measured in dBC or dBG?

333 Majjala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. pp. 77. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>.

relationship,³³⁴ nor as per the WHO definition of noise-induced adverse health effects (see Paragraph 189).

235. Furthermore, there seems to not have been any stratification of the study population regarding prior noise exposure histories.³³⁵
236. Objectives C5 through C9 used “provocation experiments” conducted in an “infrasound chamber” whereby “systematically selected samples from real wind turbine sounds from wind power plant areas where inhabitants report symptoms associated with wind turbine infrasound or sound were used as stimuli.”³³⁶
237. As with the study by Marshall *et al.* (Paragraphs 224 to 226), it is not entirely understood why there is a perceived need to subject individuals in laboratory to a potentially noxious agent (which is very difficult, if not impossible, to reproduce under laboratorial conditions), while tens of thousands of individuals are living in ‘real-life laboratories,’ awaiting an objective, clinical observational study on behalf of the competent authorities.³³⁷

334 See Appendix 1—Medical Sciences: VIII. How is ‘Response’ measured?

335 See Appendix 1—Medical Sciences: II. What parameters are important when investigating the biological effects of exposures to physical agents of disease?

336 Maijala P, Turunen A, Kurki I, Vainio L, Pakarinen S, *et al.* (2020) Infrasound does not explain symptoms related to wind turbines. *Publications of the Finnish Government's Analysis, Assessment and Research Activities*, 2020:34. Prime Minister's Office: Helsinki. pp. 36 and 40. <https://julkaisut.valtioneuvosto.fi/handle/10024/162329>.