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The National Institute of Public Health–National Institute of Hygiene’s
Position on Wind Farms

The National Institute of Public Health–National Institute of Hygiene holds the view that wind farms sited too close to buildings intended for permanent human residence may have an adverse impact on the quality of life and on health of residents living in the proximity of wind farms.

The Institute’s position takes into account the following risk factors relating to human health:

- the level of emitted noise and how it relates to the technical parameters of wind turbines, wind speeds, natural topography and land use practices around wind farms;
- the level of aerodynamic noise including emissions of infrasound and its low-frequency components;
- characteristics of emitted noise including its modulation/pulsation/tonality as well as any potential interference of waves emitted by multiple turbines,
- risk of ice fragments coming off rotors,
- risk of turbine failures consisting in broken off rotor blades or blade fragments falling to the ground,
- the presence of shadow flicker,
- the level of electromagnetic radiation (in the immediate vicinity of wind turbines),
- the likelihood of sleep disruption and noise propagation at night-time,
- nuisance level and the likelihood of stress and depression symptoms (due to long-term exposure) related to both noise emissions and non-acceptance of the noise source.

It is the Institute’s opinion, the legal provisions currently in force in Poland (which in practice cover only one risk factor, i.e. noise levels) are not only inappropriate for such structures as wind turbines, but also fail to provide sufficient guarantees that public health is protected.

The currently used methodology to assess impacts of wind farms on the environment (including human health) cannot be applied at wind speeds above 5 m/sec. Moreover, the

full frequency spectrum (especially at lower frequencies) and nuisance levels are not considered.

In the opinion of the Institute, in view of the current lack of comprehensive legal regulations for assessments of health risks related to the operation of wind farms in Poland, it is urgent to develop and implement a comprehensive methodology on the basis of which distances of wind turbines from residences could be established indirectly. Such methodology must take into account all the above-listed potential risk factors, and the result should reflect the worst case scenario. Aside from natural topography and land use, the methodology needs to make allowance for wind turbines' kind, type, height and number as well as the existence of other wind farms in the vicinity. Such legal frameworks, intended to deliver multi-criteria assessments and making use of complex numerical algorithms, are currently in place worldwide.

The Institute recognizes that it may prove very difficult to develop that algorithm at short notice, given the diversity of factors and the complexity of the algorithm. For this reason, it appears that an effective and simpler solution is to adopt a minimum distance of wind turbines from buildings intended for permanent human residence. The setback criteria are also a common normative solution.

Accordingly, as long as the comprehensive methodology for assessing impacts of industrial wind farms on human health has not been finalised, the Institute **recommends 2 km** as the minimum distance between wind turbines and buildings. The recommended distance follows from **a critical review of research results published in peer-reviewed journals** regarding all potential risk factors for average distances that are in most cases stated within the following ranges:

- 0.5-0.7 km, often obtained by calculations, for noise levels (dBA) falling within the currently applicable permissible values (without taking into account any corrections for pulsating/tonal/modulated characteristics of emitted noise),
- 1.5-3.0 km, based on the noise level when modulations and low frequencies as well as infrasound are taken into account,
- 0.5-1.4 km, relating to the risk of wind turbine failure, consisting in broken off rotor blades or blade fragments falling to the ground (depending on the fragment size, fragment flight characteristics, rotor speed, and the size and kind of a wind turbine),

- 0.5-0.8 km, wherever there is the risk of ice fragments coming off rotors (depending on ice formation and weight, rotor speed, and the size and kind of a wind turbine),
- 1.0-1.6 km, taking into account noise nuisance (4% to 35% of the population for noise levels at 30-45 dBA) for people residing in the proximity of wind farms,
- 2.0 km, related to the potential psychological effects resulting from significant landscape alterations (assuming the case when a wind turbine has the predominant impact on the landscape and the rotor's rotations are clearly visible and perceived by people from each location),
- 1.2-2.1 km, with regard to the presence of shadow flicker (for average total heights of wind turbines, including the rotor, in Poland - from 120 to 210 m).

In formulating the above opinions, the Institute has also considered the setbacks of wind turbines from buildings recommended by experts, researchers and government and municipal authority agencies worldwide (in most cases falling within the range of 1.0 to 5.0 km).