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Position of the National Institute of Public Health – National Institute of Hygiene on wind farms

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The National Institute of Public Health – National Institute of Hygiene is of the opinion that wind farms situated too close to buildings intended for permanent human occupation may have a negative impact on the well-being and health of the people living in their proximity.

The human health risk factors that the Institute has taken into consideration in its position are as follows:

- the emitted noise level and its dependence on the technical specifications of turbines, wind speed as well as the topography and land use around the wind farm,
- aerodynamic noise level including infrasound emissions and low-frequency noise components,
- the nature of the noise emitted, taking into account its modulation/impulsive/tonal characteristics and the possibility of interference of waves emitted from multiple turbines,
- the risk of ice being flung from rotors,
- the risk of turbine failure with a rotor blade or its part falling,
- the shadow flicker effect,
- the electromagnetic radiation level (in the immediate vicinity of turbines),
- the probability of sleep disruptions and noise propagation at night,
- the level of nuisance and probability of stress and depression symptoms occurring (in consequence of long exposure), related both to noise emissions and to non-acceptance of the noise source.

In the Institute's opinion, the laws and regulations currently in force in Poland (regarding risk factors which, in practice, include only the noise level) are not only inadequate to facilities such noise source as wind turbines, but they also fail to guarantee a sufficient degree of public health protection. The methodology currently used for environmental impact assessment of wind farms (including human health) is not applicable to wind speeds exceeding 5 m/s. In addition, it does not take into account the full frequency range (in particular, low frequency) and the nuisance level.

In the Institute's view, owing to the current lack of a comprehensive regulatory framework governing the assessment of health risks related to the operation of wind farms in Poland, an urgent need arises to develop and implement a comprehensive methodology according to which the sufficient distance of wind turbines from human habitation would be determined. The methodology should take into account all the above-mentioned potential risk factors, and its result should reflect the least favourable situation. In addition to landform (natural topography) and land use characteristics, the methodology should also take into consideration the category, type, height and number of turbines at a specific farm, and the location of other wind farms in the vicinity. Similar legislative arrangements aimed to provide for multi-criteria assessment, based on complex numerical algorithms, are currently used in the world.

The Institute is aware of the fact that owing to the diversity of factors and the complicated nature of such an algorithm, its development within a short time period may prove very difficult. Therefore, what seems to be an effective and simpler solution is the prescription of a minimum distance of wind turbines from buildings intended for permanent human occupation. The setback criteria are also a common standard-setting arrangement.

Having regard to the above, until a comprehensive methodology is developed for the assessment of the impact of industrial wind farms on human health, **the Institute recommends 2 km** as the **minimum distance of wind farms from buildings**. The recommended value results from a critical assessment of research results published in reviewed scientific periodicals with regard to all potential risk factors for average distance usually specified within the following limits:

- 0.5-0.7 km, often obtained as a result of calculations, where the noise level (dBA) meets the currently acceptable values (without taking into account adjustments for the impulse/tonal/modulation features of the nose emitted),
- 1.5-3.0 km, resulting from the noise level, taking into account modulation, low frequencies and infrasound levels,
- 0.5-1.4 km, related to the risk of turbine failure with a broken rotor blade or its part falling (depending on the size of the piece and its flight profile, rotor speed and turbine type),
- 0.5-0.8 km, where there is a risk of ice being flung from rotors (depending on the shape and mass of ice, rotor speed and turbine type),
- 1.0-1.6 km, taking into account the noise nuisance level (between 4% and 35% of the population at 30-45 dBA) for people living in the vicinity of wind farms,
- the distance of 1.4-2.5 km, related to the probability of sleep disruptions (on average, between 4% and 5% of the population at 30-45 dBA),
- 2,0 km, related to the occurrence of potential psychological effects resulting from substantial landscape changes (based on the case where the wind turbine is a dominant landscape feature and the rotor movement is clearly visible and noticeable to people from any location),
- 1.2-2.1 km, for the shadow flicker effect (for the average wind turbine height in Poland, including the rotor from 120 to 210 m).

In its opinions. the Institute has also considered the recommended distances of wind farms from buildings, as specified by experts, scientists, as well as central and local government bodies around the world (in most cases recommended from 1.0 to 5.0 km).

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