

# **WIND TURBINE MECHANICAL VIBRATIONS: Potential Environmental Threat**

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## **ABSTRACT**

**This Discussion Paper describes a significant but overlooked potential threat to the environment, community/business interests and land itself posed by wind turbine mechanical vibrations. Their power and frequencies have been measured, and in Ireland magnified similar vibrations caused significant harm. Given the nature of this problem the author is calling on relevant authorities to exercise increased caution when considering turbine installations until urgent threat assessment is completed.**

## **1. PROBLEM OUTLINE**

**1.1 A Russian academic looked at the use of wind power in the USA, Canada and Germany reporting “. . . wind turbines can cause infrasonic vibrations which may damage flora and fauna at the site”. No detail is offered.<sup>1</sup>**

**1.2 Apart from that paper impact of onshore wind turbine mechanical vibrations on the natural environment has never been studied, which is surprising since there are clear indications they may be harmful to life and the fundamental structure of peat and other terrain over considerable distances. Only 1 per cent of all papers on renewable energy published in the past 15 years considers environmental impacts onshore<sup>2</sup> and in the USA (1976) it was remarked that “Many of the supposed independent scientists . . . giving unbiased advice to the government to deal with the (vibrations) issue have received substantial funding . . . from the major producers of noise pollution”.<sup>3</sup> Little has changed since, and the UK is much the same.**

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**1.3 These vibrations derive from complex interaction of mechanical factors associated with machinery including masthead electricity generator; rotation bearings; blade adjustment/braking mechanisms; effects of wind; moments of force on mast/blades/tower, etc.<sup>4</sup>**

**1.3.1 Due to complexities of design and functioning plus weather and other local environment variations over time, it may be impossible to predict these vibrations<sup>5</sup> or their effect on the natural environment, adding to the potential risk factor.**

**1.4 Many living species are specialised, sensitive and vulnerable to small environmental changes; need large areas with little background disturbance for relatively small but crucial populations to survive; and are variously affected by the vibrations and acoustic noise wind farms create. All are fundamental to the universal food chain and turbines are often in Sites of Special Scientific Interest where flora and fauna may be nationally and internationally protected.**

## **2. EVIDENCE**

**2.1 Hard evidence this may be a serious issue comes not only from Russia but from Ireland, where in 2003 vibrations caused by installation work resulted in half a million tonnes of peat slip at Derrybrien burying a home and road. Sludge run off killed 50,000 fish, affected 50,000 more and caused other major problems.<sup>6</sup> Ecologists are currently considering if disappearance of wild trout stocks from Lough Lee is related<sup>7</sup>.**

**2.2 Concerned wind farm vibrations might interfere with its work at Eskedalemuir the Ministry of Defence commissioned a microseismic study from Keele University which measured them.<sup>8</sup> Although this work is now to be extended natural environment impact remains excluded. The British Energy Technology Support Unit considers basic understanding is low, vibrations are difficult to predict, and they may travel considerable distances.**

**2.3 Natural Science academics confirm such vibrations affect the structure of sand, soil and peat all of which will be compacted, some losing fertility. They will impact flora and fauna including invertebrates, fungi, bio-aerosols seen only under magnification, and individual living cells.**

### 3.

2.4 Some indicative offshore installation studies exist one of which speculates impact on living organisms may be minimal but “... there's need to quantify by collecting direct data”, and suggests modulation mechanisms “... are not fully understood”. It notes many other uncertainties and gaps in knowledge. A Danish paper suggests “... short-term intense activities during construction are probably of less importance than operation and maintenance noise from the wind farms”.

2.5 Wind farms are installed on upland peat bogs where visible damage may already be observed - for example Paul's Hill and Thurso in Scotland - with many more and larger in planning on a variety of terrain. The bogs may collapse as fibres unravel and flow away destroying the flora and fauna in them, adversely affecting birds and mammals, and rot into sludge. Subsequent foul run-off would pollute waterways with negative impact on fishing, farming, whisky, mineral/spring water bottling, landowner and other business interests. There would be increased risk of flooding; loss of long enjoyed local amenity; and individuals, business and taxpayers would be left to clean up the mess. To date official bodies, wind farm manufacturers, owners, and installers have not agreed to indemnify such injured parties.

### 3. SPECIFIC INFORMATION

#### 3.1 Terrain: Peat; Soil; Sand<sup>10-12</sup>

3.1.1 Wind turbines impact all terrain landscape and functionality, but landscape is excluded from this paper.

3.1.2 Sand and soils are compacted leading to reduced air and water permeation, with increasing dryness. Canadian researchers found that for the first few minutes high frequency vibrations increase the fertility of soil; but if vibrations continue there's rapid decline.

3.1.3 Peat is an ancient, highly complex material, in many areas a living environment. The macro- and microscopic structure of upland peat bog is comprised of minutely interlocking vegetable fibres supporting dead and living organisms, flora and fauna. This basic structure ranges from more or less decomposed plant remains to a fine amorphous, colloidal mass. Living peat is governed by complex hydrology which amongst other factors maintains stability and resistance to shear, slide and collapse.

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### 3.2 Invertebrates<sup>13</sup>; Fungi<sup>14</sup>

Several fungi species depend on vibration at a specific time to release ripe propagation spores, notably Homobasidiomycetes and Lycogala.

### 3.3 Bioaerosols<sup>15</sup>

Organic and inorganic particles in and above terrain surface ranging in size from less than one micrometer (0.00004") to one hundred micrometers (0.004"). They react to air currents, moving quickly or slowly depending on the environment, and are impacted by gravity. Due to their size air density and currents play a large role in movement.

### 3.4 Living Cells<sup>16</sup>

It has been shown that ultrasonic vibrations deform and move isolated living cells, but we don't know what long term effects these phenomena might have on their development.

## CONCLUSION

I suggest these threats are sufficiently indicated to demand urgent attention. Ignoring them to meet Kyoto, E.U. or other environmental targets may be unwise, particularly when many question the *de facto* value of wind power to the environment on other grounds. Furthermore the U.K. is signatory to the Kyoto Protocol which requires avoiding damage to existing carbon sinks, including peat bog.

My concerns may prove uncalled for but the 'Precautionary Principle' holds and in a responsible world we would expect an immediate moratorium on all new wind turbine installation until these matters are adequately examined and risks properly assessed - but that may be indigestible.

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In which case an alternative approach lies in that many turbines and wind farms are installed on peat bogs and other terrain about which a great deal is known from past ecological surveys. A good start may be to repeat them urgently and establish if changes are found, in what respects, to what degrees, and if further research or other action is indicated. Useful supporting vibration data may be found in rail and road studies<sup>17</sup>. In the meantime I call for significantly increased caution when considering major new turbine installations.

This proposal has been put to Natural England, Scottish Natural Heritage, UK/Scottish Governments and other relevant authorities as well as the British Wind Energy Association of wind turbine manufacturers and key Members. To date there has been no substantive response from any of those approached, which some may regard as playing Russian Roulette with the environment and life itself.

## POSTSCRIPT

I write as a mycologist recognised by the Scottish Forestry Commission but cannot claim to be an authority on these matters. That said my views are academically supported as shown.

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# PERSONAL POSITION STATEMENT

## WIND FARMS

I am not an environmentalist. I have no connection with any anti-wind farm lobby. My concerns are expressed as a responsible citizen with lifelong love of nature, background mycologist. I am not academic in these matters other than to fully prove my concerns are valid

I first took interest in this matter last September, have since researched the issues and now fully support my concerns with appropriate peer reviewed academic literature

Risks I see may well prove negligible or acceptable, but right now we don't know and I think it imprudent to peremptorily dismiss them

So in the public interest I ask three questions of all responsible:

**Can it be denied;** wind turbine mechanical vibrations may seriously impact on sand, soils and peat compacting, loosening and/or otherwise changing their nature; reduce fertility; harm flora and fauna in them? May collapse peat bogs causing pollution significantly harming community and business interests?

**If not;** who will enable research to assess such risks?

**If no one;** who will indemnify public, private and community interests against loss, should they be harmed as suggested?

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November 2007