BIODIVERSITY AND WINDFARMS: THE RISKS AND OPPORTUNITIES

Can Windfarm developments benefit biodiversity?

MVGLA
Landscape Architecture

This report has been produced by Amelia Heywood for MVGLA during a month internship with MVGLA in June/July 2023

Contents Page

BIODIVERSITY AND WINDFARMS
Can Windfarm developments benefit biodiversity?

1. What is biodiversity?

Biodiversity can be defined very simply as, the collection of unique (distinct) forms of life supported by a habitat. Biodiversity loss continues to be a global crisis and national rates have fallen globally by 69% on average since 1970[1].

1.2. Why is it important?

Biodiversity is immensely important as it aids a community within the habitat to recover more quickly to changes within the system. The more biodiverse the habitat, the greater the buffering capacity and subsequently, resilience of the community, allowing it to withstand changes or negative influences more easily.

In an ever-growing world, with a current (2022) global population of 7.9 billion[2] which is predicted to rise to 10.9 billion by the year 2100, there will be an increasing need for more food and natural resources etc.

Of all of the G7 countries, currently the UK has the lowest level of biodiversity. It has failed to meet 14 of the 20 Aichi biodiversity targets, which are the global nature goals the UK committed to meet by 2020[3].

1.3. What affects biodiversity?

The main factors that affect biodiversity are all directly linked to anthropogenic activities: modern human society and biodiversity reduction are intrinsically linked. The main global crisis that we must face is the changing climate. However, as a result of climate change other serious and significantly negative effects have occurred, such as habitat loss, changes in land use, natural disasters, invasive species. Exploitation of natural resources (e.g. deforestation and over-fishing) is also caused by human overconsumption. Every single one of these factors has a direct impact on biodiversity, specifically reducing it. However, deforestation will be discussed again later in a different light.

[1]https://livingplanet.panda.org/en-GB/.

[2]IUCN and Cambridge, UK: The Biodiversity Consultancy. [3]Environmental Audit Committee, (2022)

Amelia Heywood

2. Biodiversity and soil

A good example of how a decline in biodiversity has a global effect is that of the loss of the biodiversity in the soil.

To ensure food security in many regions of the world, over the last 50 years the approach has been towards intensification of farming. One of the main factors in affecting food security is the health of the medium in which food is largely grown: soil. According to statistics published by the UK government's Environment Agency, almost 4 million hectares are at risk of compaction, over 2 million hectares of soil are at risk of erosion and arable soils have lost about 40 to 60% of their organic carbon as a direct consequence of intensive farming.

Photographer: Grant Carstairs

In 2010, soil degradation was calculated to cost the UK economy £1.2 billion every year. Issues such as soil compaction and erosion give rise to reduction in crop yield due to insubstantial root growth leading to reduced nutrient uptake. This, in turn, leads to further damage and a reduction in soil biodiversity as few plants can survive in such conditions.

Soil houses almost a quarter of all living organisms on Earth[4] and, as such, is a key reservoir of the Earth's biodiversity. Some organisms supported by soil habitats are insects, arthropods, bacteria, and fungi. Soil invertebrates in particular, are 'key mediators in soil function'[5]: by means of their physical activities, including their role as pollinators. In conjunction with factors such as leaf litter, they affect soil quality e.g. stability, fertility, pH, and nutrient cycling. This in turn has an effect on soil health which will lead to lower yields or poorer quality crops due to reduced nutrient concentrations.

[4,5]Sims et al, 2019

2.1. Biodiversity and the Energy Crisis

As previously stated, there are many crises the global environment is presently undergoing, however, those of note in this case are the climate crisis and the energy crisis. However, the energy crisis stems from political issues, and some could argue that it may aid biodiversity.

It is clear, in the current situation regarding global climate change, that the shift to renewable energy is a necessity. Renewable energy is a very important player in helping tackle the climate emergency. Clean, renewable energy sources, such as windfarms, can also contribute to the transition to energy independence as a country, increasing resilience to global uncertainty in energy supply caused by war overseas. Windfarms are particularly good infrastructure for energy production and are more advanced than other renewable energy technologies.

Photographer: Grant Carstairs

2.2. How can we mitigate those effects?

Scotland has a strong policy for climate change that boldly states 'Our contribution to climate change will end, definitively, within one generation'[6], and has committed to being a nation of net zero carbon emission of all greenhouse gases by 2045.

In conjunction with the net zero carbon by 2045 commitment is the additional commitment to enhancing biodiversity. The most recent planning guidance of late is Scotland's National Planning Framework (NPF4, published 13/2/23)

NPF4 is a long-term spatial plan, set by the Scottish government to 2050, which will 'set out where development and infrastructure is needed to support sustainable and inclusive growth'. It is a navigation plan to accelerate the active reduction of carbon emissions.

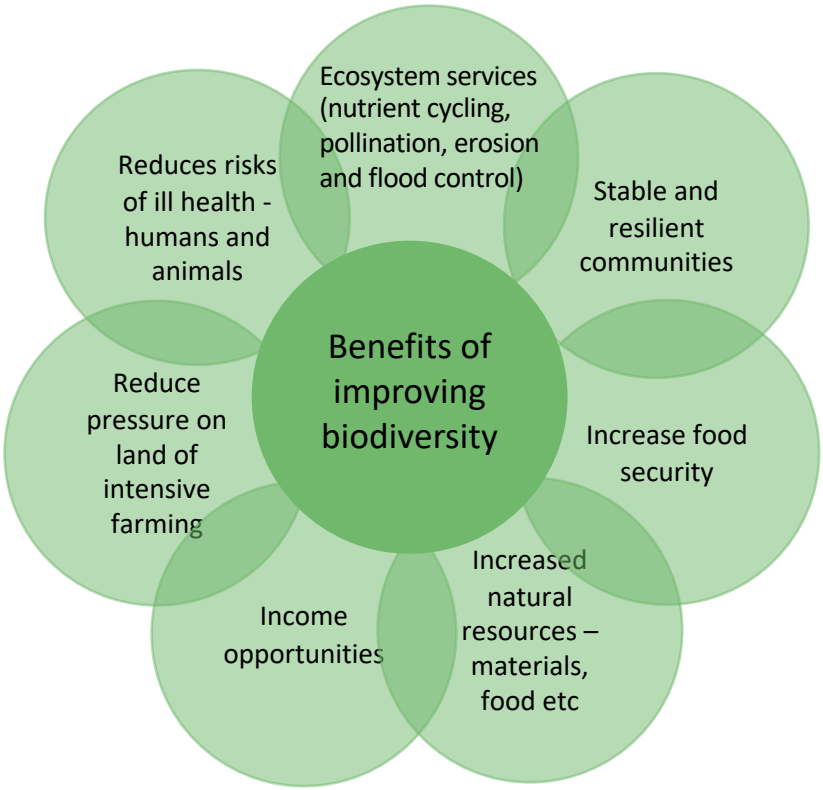
The key takeaway from NPF4 is the need to conserve, restore, and enhance biodiversity with an expectation of those planning any type of development to leave the land better than they found it from a biodiverse perspective.

[6]TheScottishGovernment/ClimateChange

2.3. What are the benefits of improving biodiversity?

The main benefit of improving biodiversity is enhancing the buffering capacities of ecosystems, increasing their resilience to change. This seemingly simple change then has a very significant impactful effect on life on earth, potentially benefitting millions of species.

Another benefit is that improving biodiversity supports the sustainable production of natural resources, e.g. materials or food



2.4. How can we assess and quantify biodiversity?

The first step to improving biodiversity is to assess what currently stands and to find a way of quantifying changes to it. There are various ways to quantify biodiversity. The traditional way is via statistical calculation and the use of indices such as 'Species Richness', 'Species Evenness' and 'Species Dominance' within a community.

In addition to this, due to today's advancements in various technologies, there are other ways to assess and quantify the risk of biodiversity. One of these is the 'IBAT' tool (Integrated Biodiversity Assessment Tool) which is a digital map and reporting tool that provides 'fast, easy and integration access to three of the world's most authoritative global biodiversity datasets: IUCN Red List of Threatened Species, World Database on Protected Areas, and World Database of Key Biodiversity Areas'[7].

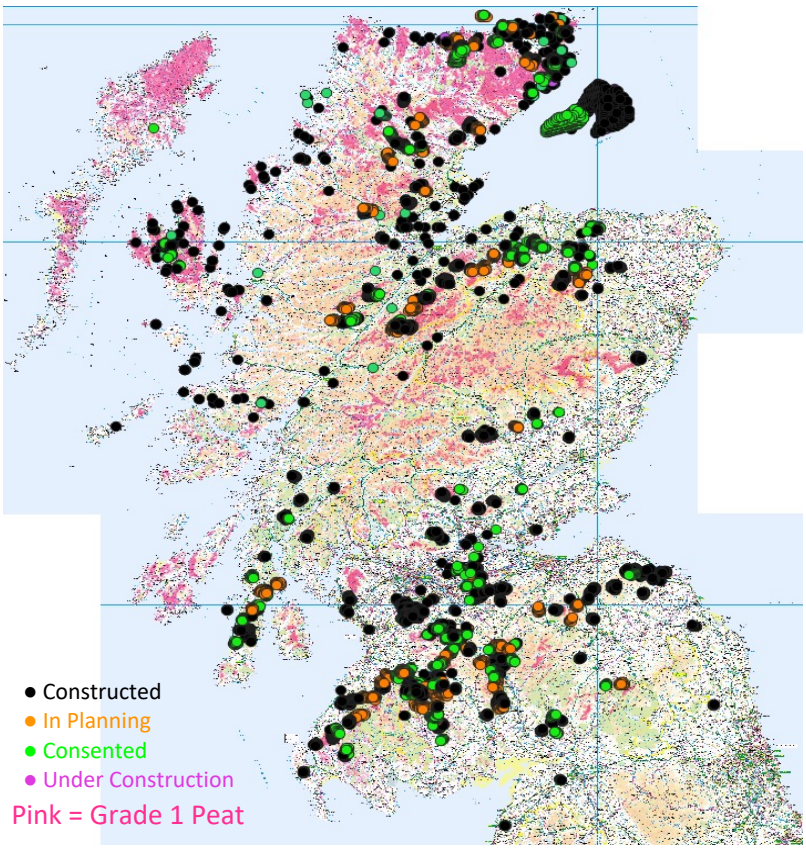
The biodiversity net gain calculation, developed by Natural England and DEFRA, is a reliable metric to understand biodiversity and is used in planning across the UK.

[7]https://www.ibat-alliance.org, accessed June 2023

2.5. Visualising distributions when assessing biodiversity

The GIS maps below show the distributions of specifically designated zones such as Sites of Special Scientific Interest (SSSIs) or RAMSAR sites. They also show the distributions of current windfarms (the key shows to what extent the turbines are present). This visualisation is important as it may lead to rethinking where future turbines should be constructed e.g. avoiding Class 1 peat.

Class 1 peats, are 'nationally important carbon-rich soils' and important in relation to both carbon capturing and biodiversity. Class 1 peat is a well-known carbon sequestration system and peat bogs are understood to be particularly biodiverse. Thus, peat is a valuable and arguably finite resource as regenerating peat bog takes 50-500 years (roughly 10 years/1cm of peat)[8] to achieve. The distribution of Class 1 peat and windfarms is largely similar. This is because these are areas of generally large, open, flat land with a lower population density.

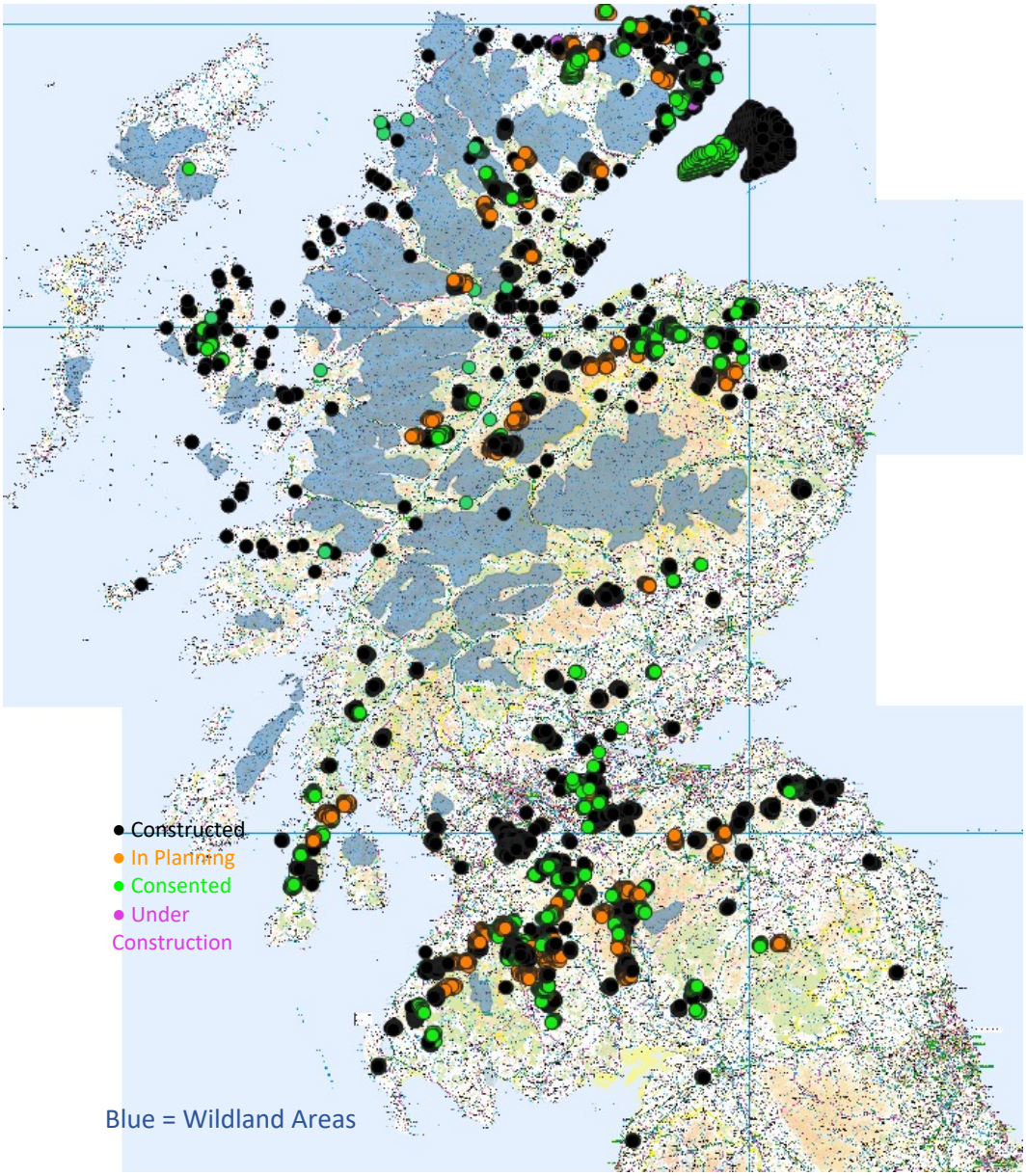


There are a number of issues with windfarms being constructed on Class 1 peat. These issues mainly relate to construction of the site. To build a wind farm, each individual turbine site will cause a lot of ground disturbance while constructing roads or tracks for site access. Any physical damage to peat destroys its structure and releases the sequestered carbon from within the peat. In addition to this it will also destroy any ecosystem and/or ecosystem balance that was present before construction within the peat, which will subsequently have a negative effect on biodiversity. The restoration of peat bog is critical to meet the national net zero carbon emissions and now also the biodiversity targets of NPF4.

[8]https://www.iucn-uk-peatlandprogramme.org, accessed June 2023

BIODIVERSITY AND WINDFARMS
Can Windfarm developments benefit biodiversity?

Areas of Wildland are not formally designated but are recognised as an asset of national importance. They have similar needs for protection with regards to biodiversity but also because they are intrinsically linked to Scotland's history and culture. NPF4 makes the distinction between wind farm development within wild land areas (direct effects on moorland, peat, ecosystems) and those outside wild land areas (no direct effects).



Wild land can exist close to wind farms: e.g. Buolfruich/ Causeymire wind farm (<1km), there was still sufficient wildness present. This means that despite concerns those turbines do not have a negative effect on the wildness of a wildland site. This knowledge is vital to aid a smooth transition into renewable energy.

3. Can biodiversity improvements be achieved through wind farm development?

3.1. Assessing Risk

A key step in understanding the relationship between biodiversity and windfarms is for organisations to assess the risks and opportunities associated with their sites: from acquisition, through development and construction, and on through operation and decommissioning.

Risks → **Opportunities**

There are many ways of assessing risk, by working with specialist ecologists and by using industry recognised tools such as IBAT. This can assess locations against Protected Areas, the IUCN Red List of Species, Key Biodiversity Areas, and other biodiversity sensitivities to highlight location specific risks.

Some potential risks include[9]:

- Birds and bats colliding with turbine blades
- Noise and ground disturbance upon installation of turbine
- Deforestation to make space for turbines
- Carbon release from peat and soils when ground is excavated for turbine construction
- Noise and light pollution that may deter some species

Photographer: Grant Carstairs

[9]IUCN and Cambridge, UK: The Biodiversity Consultancy.

3.2. Opportunities

Often, where there is risk, there is opportunity. Using the example of rare migratory bird species, companies could look to engage with local communities (e.g. bird watching groups) to understand more detail about the real-time migratory patterns and sightings of bird species. This is an opportunity because it increases knowledge. This could optimise the operation of the wind turbines whilst minimising negative biodiversity impacts by reducing the amount of time the turbines need to be turned off and maximising operational output. This would, in turn, increase the social value credentials of the company and potentially make the project more attractive to investors and encourage local people to become more involved in and aware of their local biodiversity and natural environment.

In addition to this, it is prudent to be aware of the opportunity of "nature based solutions" in the field of biodiversity. This is a term often used when talking about how we might tackle carbon but could and should be transferrable to issues of biodiversity. For instance, planting woodlands and the restoration of peat bog would be a way of using nature based solutions to restore and improve biodiversity to a site. Another example is Clyde wind farm, South Lanarkshire where borrow pits were opened to quarry road-stone for access tracks and the pits were left partially unrestored on the quarry back walls to leave craggy nesting sites for birds.

Photographer: Grant Carstairs

4. How can this be applied when within a company setting e.g. MVGLA

- It is very important to be looking at biodiversity with the perspective that every site has a part to play in improving biodiversity; sites cannot be looked at in isolation, they are interlinked nationally and globally by species
- Design a framework for clients that allows them to monitor and quantify their own biodiversity
- Biodiversity heat maps or tools like IBAT to show a 'before' and 'after' of the site area to assess and prove whether the biodiversity has increased - as NPF4 requires
- Encourage community engagement – don't hide the fact that you're working on windfarm development when at sites – show you're making it better than you found it

4.1. Future ideas and conclusions

"Natural capital" being the recognition that the natural world has a value and the idea that we could prescribe an actual value to parts of the world and resources.

"Nature based solutions" are often used when talking about how we might tackle carbon dioxide concentrations e.g., planting woodlands and peat restoration.

One of the most well-respected ways of offsetting carbon emissions is by using "nature based solutions" and proving "additionality". Additionality, in this instance, is "biodiversity credits" (which are not in use yet but on the horizon). These could be developed in a similar way to additionality like carbon credits – e.g. quantifiable ways of improving biodiversity net gain (for instance in the immediate years after development) as necessary evidence for planning requirements.

This will, in turn, encourage investor interest which will mean that there will be a financial incentive to improve biodiversity and so will be fruitful for consultancies (MVGLA) to look at nature based solutions, integrated land management (soil) to capture carbon and having biodiversity measures linked into that.

- When designing a windfarm MVGLA could be looking at creating nature based carbon credits which will end up being a commodity that can be sold to investors but will first and foremost combat biodiversity loss and aid biodiversity net gain

- Careful designing of spaces to create opportunities for carbon credits e.g., low level planting between turbines which then captures carbon and restores it into the soil (certified carbon credits through nature based solutions)

- Improved 'biodiversity' in the future will create its own credit market, leading to more investment upfront e.g., sewing of specific seeds, managing land in specific way but in thinking long-term, the carbon credits will be increasingly valuable and so relatively small investment now could have a huge financial benefit for clients for the future

If a company like MVGLA were to do this then they will be seen by their clients as providing cutting edge advice in a growing market. The benefit loop is that MVLGA clients get sound advice and opportunities to invest in a process that builds windfarms which generate electricity that can be sold, generate carbon credits (which can also be sold) and help biodiversity. This creates a second revenue stream, which will be very attractive to investors, as well as creating genuine offsets, which ultimately lead to increased biodiversity and reduced carbon.

To conclude, it is clear that with a careful approach to steps like those mentioned above, there could be massive, realistically implementable and harmonious change which improves biodiversity, whilst also aiding the energy transfer. Thus, windfarm developments can benefit biodiversity.

The statements, findings and recommendations contained in the report are the view and opinion of the writer only.

Amelia Heywood