

Soil Policy Evidence Programme SPEP 2021-22/03

The impact of solar photovoltaic (PV) sites on soil and agricultural land quality.

VERSION 2 (Draft)

Introduction:

Solar photovoltaic (PV) sites started commercial distribution in the UK in 2007. The number of solar photovoltaic sites in the UK has increased from c. 1700 in 2010 to just over one million in 2019 <https://www.statista.com/statistics/418830/number-of-solar-photovoltaic-installations-uk/>.

It appears there has not been any systematic review of the impact of these sites on agricultural land, Best and Most Versatile (BMV) land and associated soils. The SPIES project is useful background though soil does not feature heavily <https://www.lancaster.ac.uk/spies/>. Similarly, the Armstrong *et al* (2016) paper: *Solar park microclimate and vegetation management effects on grassland carbon cycling* <https://iopscience.iop.org/article/10.1088/1748-9326/11/7/074016> is useful background.

Solar PV sites can involve significant soil disturbance in installation, operational phase and decommissioning. A recent proposed 34ha site in Wales involved 70,000 solar panels with 140,000 piles driven into the soil to 1.8 metres, 1.75km of access track and 3.5km Security fencing (boundary measurement), plus associated cabling. Because solar PV energy is relatively new, there are no UK examples of decommissioned sites.

There are questions on the reversibility of these sites back to agriculture and the longer term impact on associated land and soil. There are claimed improvements to some soil properties (e.g. increased carbon storage and improved soil structure). However, are these simply just short term for the period of the scheme?

The impact of mineral sites (e.g. sand and gravel extraction / restoration) is reasonably well understood and with field experience. This is not the case for solar PV sites, partly because the decommissioning timescales are long (c40 years) and the evidence does not yet exist. Can parallels could be drawn with other developments such as golf courses, gas pipelines, and pylons. Similarly, are there parallels with horticultural activities such as grubbing out orchards and glasshouse removal? What impacts do these have on soil, how are effects mitigated and how successful are restorations?

This review is to provide an evidence based assessment of the impact of solar PV sites on agricultural land, Best and Most Versatile (BMV) land and associated soils. The scope of the study should be within the UK but look to international experience where possible. The study will inform Welsh Government and Natural England specialists when dealing with solar PV applications.

The review could be used as evidence at planning appeals. Consequently, clarity and accessible is really important, despite the likely complexity of some technical content.

It is anticipated the work will form 4 work packages (WPs):

Work Package 1: Literature review

This work package will:

1. Identify and review any relevant research or experience related to impacts of solar PV developments (published or anecdotal) on land and soil, within the UK or internationally.
2. Identify and review any relevant research or experience, related to (e.g.) golf courses, glasshouse removal, grubbing out of orchards or similar developments / activities (published or anecdotal) on land and soil, within the UK or internationally.
3. Identify and review the key research and experience relating to mineral developments on land and soil, within the UK and internationally.
4. Host a virtual workshop with key soil specialists in the area and record key findings. The key outputs from this need to be recorded as part of the contract.
5. Summarise key findings in a clear and accessible format.

Work Package 2: Description of Solar PV site history and development stages

This work package is intended as a short and simply a statement of facts, rather than in depth interpretation:

1. Provide a summary history of solar PV sites development in the UK. This should include date introduced, number of sites over time and basic explanation of how solar PV sites work. It would be useful to know approximately how many applications there have been (split by UK country), some information on range of site size, preferred types of location, and whether cumulatively large amounts of BMV are likely to be involved. Is the average size of sites increasing?
2. Identify and summarise the main interventions to land and soil with solar PV sites at installation (e.g. pile driving, panel installation, cable laying, track-laying & fencing). Averages (e.g.) of piles / ha or metres of buried cable / tracks / ha would be useful as context. Use of case studies could help. It will be important to summarise the potential levels of disturbance and any differences between different types of site.
3. Identify and summarise the potential benefits and threats to land and soil during the operational phase of the site. Claimed benefits are (for example) topsoil carbon content increases and soil structure improvements.
4. Identify and summarise the main interventions to land and soil when decommissioning sites (e.g. soil disturbance linked with equipment removal).

Work Package 3: Review of Solar PV site impacts on land and soil:

This Work Package is the main review of impacts. It will largely be based on WPs 1 & 2.

1. Review and summarise the main threats to soil and land associated with solar PV site developments. This will need to assess commissioning and decommissioning phases. Assessment of impacts on BMV land - and its reversibility - will be very important.

2. Review and summarise potential effects (positive and negative) on soils during the active phase of the site. Claimed benefits are (for example) topsoil carbon content increases and soil structure improvements. Are such claims realistic and are they only likely to be short term for the duration of the active site? What are the effects of shading and changes in soil microbial activity and microclimates under the panels? Armstrong et al (2016) is useful background: <https://iopscience.iop.org/article/10.1088/1748-9326/11/7/074016>. What effect does 'rilling' have on soil loss / erosion, accelerated run-off and in creating differential areas of soil wetness? A discussion of short term changes in soil properties vs long term physical limitations (as in ALC) would be useful. A summary of claimed benefits to soil from previous cases would be very helpful.
3. Review and summarise to what extent evidence supports solar PV sites are physically reversible to agriculture in the BMV and non BMV context. What are the main issues and what evidence is there to support this? What factors influence reversibility (e.g. soil handling conditions, monitoring, soil types & climate).
4. Discuss the parallels between mineral site restoration and solar PV site restoration? Are the two comparable or do significant differences exist?
5. Discuss the parallels with golf course or similar type developments or activities and their reversibility. Are these comparable or do significant differences exist? IN Wales, Technical Advice Note 6 "TAN 6" (para 6.2.2) - Planning for Sustainable Rural Communities says "*once agricultural land is developed, even for 'soft' uses such as golf courses, its return to agriculture as best and most versatile agricultural land is seldom practicable*".
6. Discuss to what extent soil handling conditions, as part of the planning process, can mitigate or remove any threats to soil and land. Can BMV sites realistically be restored to BMV and what factors influence this? Again, differences between sites will be useful to discuss.

Work Package 4: Summary of key issues and recommendations for future work

Based on the above work packages:

- 1 Summarise the key findings from this work. A non-technical executive summary is needed.
- 2 Identify evidence / knowledge / experience gaps.
- 3 Recommend what future work is needed to better understand the impacts of solar PV sites on soil and land.

The project should be completed by:

Work Package 1: End August 2021

Work Package 2: End October 2021


Welsh Government

29/06/2021