EGU21-1271, updated on 27 Jan 2022
https://doi.org/10.5194/egusphere-egu21-1271
EGU General Assembly 2021

Assessing the impact of land-use change for solar park development in the UK: implications for biodiversity and ecosystem services

Fabio Carvalho[1], Alona Armstrong[1,2], Mark Ashby[3], Belinda Howell[4], Hannah Montag[4], Guy Parker[5], Joana Cruz[6], Piran White[6], and Simon Smart[7]

[1]Lancaster Environment Centre, Lancaster University, Lancaster, LA1 4YQ, UK
[2]Energy Lancaster, Lancaster University, Lancaster, LA1 4YF, UK
[3]Whitebeam Ecology, Stone, Staffordshire, UK
[4]Clarkson & Woods, Overbrook Business Centre, Poolbridge Rd, Blackford, Somerset, BS28 4PA, UK
[5]Wychwood Biodiversity, Aveton Gifford, Kingsbridge, Devon, TQ7 4NQ, UK
[6]Department of Environment and Geography, University of York, Wentworth Way, York, YO10 5NG, UK
[7]UK Centre for Ecology & Hydrology, Lancaster Environment Centre, Library Avenue, Bailrigg, LA1 4AP, UK

According to the latest IPCC report, 70 to 85% of electricity generation worldwide will need to come from renewable sources of energy by 2050 if countries are to meet internationally agreed greenhouse gas emissions targets. In the rush to decarbonise energy supplies to meet such targets, solar parks (SPs) have proliferated around the world, with uncertain implications for the biodiversity and ecosystem service (ES) provision of hosting ecosystems. SPs necessitate significant land-use change that could disproportionately affect the local environment compared to other low-carbon sources.

In Britain, SPs are commonly built on intensive arable land and managed as grasslands. This offers both risks and opportunities for ecosystem health, yet evidence for assessing ecosystem consequences is scarce. Therefore, there is an urgent need to understand how net environmental gains can be integrated into land-use change for solar energy development to address the current biodiversity and climate crises.

We used vegetation data from over 70 SPs and 50 countryside survey plots (1 km^2) in England and Wales to assess the effects of land-use change for SPs on plant diversity and ES provision. We assessed ten habitat indicator variables (e.g., species richness, larval food plants, forage grasses, bird food plants) associated to functionally important plant species that have the potential to enhance ecosystem service delivery.

SPs showed higher diversity of habitat indicator species than arable land and improved grasslands, with vegetation between solar arrays showing higher numbers of species important for ES provision (e.g., N-fixing species important for nutrient cycling) than vegetation under solar panels. Overall, the diversity of habitat indicator species seemed highly dependent on former land-use, showing SPs have the potential to enhance ecosystem services provision if built on degraded agricultural land.

Developing this understanding will enable optimisation of SP design and management to ensure delivery of ecosystem co-benefits from this growing land-use.