

EGU22-1677, updated on 16 Aug 2022  
<https://doi.org/10.5194/egusphere-egu22-1677>  
EGU General Assembly 2022  
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## Effects of land use change for solar park development in the UK on ecosystem services

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In the rush to decarbonise energy supplies to meet internationally agreed greenhouse gas emissions targets, solar parks (SPs) have proliferated around the world, with uncertain implications for the provision of ecosystem services (ES). SPs necessitate significant land use change due to low energy densities that could significantly affect the local environment. In the UK, SPs are commonly built on intensive arable land and managed as grasslands. This offers both risks and opportunities for ecosystem health, yet evidence of ecosystem consequences is scarce. Therefore, there is an urgent need to understand how ES assessments can be incorporated into land use decision making to promote SP development that simultaneously addresses the climate and biodiversity crises. We aim to provide some of the first scientific evidence to help answer this question by determining the effects of land use change for SPs in the UK on the provision of ecosystem services (e.g., biomass production, soil carbon storage) of hosting ecosystems. Through a Knowledge Transfer Partnership project between Lancaster University and Clarkson & Woods Ecological Consultants, 35 SPs in England and Wales were surveyed in summer 2021. Soil and vegetation data were collected from 420 sample plots (900 cm<sup>2</sup>) under different types of land use: underneath solar panels, between rows of solar arrays, and control sites (e.g., pastureland, areas set-aside for conservation). Total plant cover was significantly lower underneath solar panels and between solar arrays than on land set-aside for conservation, while land around the margins of SPs showed higher aboveground biomass of monocotyledons and forbs than on land underneath solar panels. Some measures of soil fertility (e.g., nitrogen) and soil organic matter, fractionated into particulate and mineral-associated organic matter, also varied significantly between these different land uses. These results have implications for land management within SPs and will enable optimisation of SP design and management to ensure the long-term delivery of ecosystem services within this fast-growing land use.