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Ecological effects of photovoltaic power plant – a case study from Bulgaria

Slaveya Petrova^{1,2,*}, Bogdan Nikolov¹, Iliana Velcheva¹, Rumen Popov¹, Slavi Lyubomirov¹, Stanislav Asenov¹, Hristo Kanevski¹, Megi Dakova¹, Nikola Angelov¹, Svetlozara Kazandzhieva¹, Emil Yordanov^{1,3}, Georgi Popgeorgiev³, Yanina Klimentova-Nikolova³

1 University of Plovdiv “Paisii Hilendarski”, 24 Tzar Asen Str., 4000 Plovdiv, Bulgaria

2 Agricultural University, 12 Mendeleev Boul., 4000 Plovdiv, Bulgaria

3 Bulgarian Society for Protection of Birds, Bulgaria

Abstract

Due to the intensive transition to renewable energy sources, the development of photovoltaic power plants in Europe, including in Bulgaria, is very dynamic. However, there is a lack of sufficient scientific papers quantifying the direct and indirect impacts of photovoltaics on the biological diversity and ecosystems integrity. Such data will provide important support to the national development of clean energy and sustainable land use planning. The goal of the present study was to assess the ecological effects of a photovoltaic power plant and to determine the potential significance for the surrounding ecosystem. Some field studies during the vegetation period of 2023 have been done and the plant performance as well as invertebrate diversity on the power plant's territory have been observed. Simultaneously, some physical parameters (air temperature, light intensity, soil temperature, moisture and pH) of the environment have been measured also. Data revealed that there are significant differences between the ecological impact of solar trackers and stationary installed solar panels ($p < 0.05$). Soil humidity and temperature under the solar panels differed significantly by those of the soil between panels' rows ($p < 0.05$). The presence of photovoltaic panels alters the vegetation species composition. Plant coverage under the stationary solar panels was very poor as a whole and even missing, but this effect is not found below and around the solar trackers. Similar trend was observed in relation to the invertebrate fauna. So, it is obvious that the photovoltaics panels alter site conditions but to some extent the vegetation and invertebrates can adapt.

Keywords: habitat fragmentation, habitat degradation, biodiversity