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The impact of renewables on upland birds

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Renewable energy production is expanding rapidly, largely in response to climate change predictions, in an attempt to reduce carbon emissions from energy production. In the European Union, for example, there is a target of 20% of energy generation from renewable sources by 2020. The increasing demand for locations for renewable energy production creates a need to understand the impacts on birds, including those in upland areas, which may hold concentrations of species of conservation concern.

In Europe, six main forms of renewable energy production are in use in terrestrial environments (wind, solar, biomass, geothermal, hydropower and biofuel). These vary greatly in extent and capacity, from highly localized to continent-wide. Here we review the deployment of these energy production methods in upland areas, evidence of potential impacts on birds and likely future trends in capacity to meet targets for renewable energy production. Whilst the impacts of wind farms on birds have received the most attention to date, evidence also exists of impacts from other forms of renewable energy production. We focus on the UK and Europe, but draw more widely on studies where these are useful in highlighting potential impacts.

The impacts on birds are explored using information from studies of existing sites. Evidence of the likely main impacts, direct mortality, displacement due to disturbance, barrier effects and habitat loss, fragmentation or modification, is presented and discussed. Important knowledge gaps are highlighted, and mitigation measures that have the potential to minimize impacts are also summarized where relevant.