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Integrating wind energy forecasting and species population models to consider trade offs in a lower carbon future.

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Renewable energy has crossed key technological hurdles related to costs and energy system stability yet impacts to wildlife may present a long-term challenge to the development and operation of renewables. We describe a number of approaches to address interdisciplinary questions related to enhancing renewable energy development while minimizing unintended consequences to wildlife and habitat. These approaches range from relatively simple geospatial models and Monte Carlo simulations to more sophisticated integration of spatially explicit techno-economic/physics wind energy forecasting models with bat population models. We present results from demographic models estimating impacts from future wind energy development, how including geographic constraints related to conserving natural capital and ecosystem services may impact wind energy development and costs, and early work on temporally dynamic integration of energy and population models. We then summarize a few broader ideas on integrated modelling related to ecosystem services and energy systems.