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Footprint of large scale expansion of wind power in productive boreal forests – forests under a zero-emission strategy

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The increasing demand of emission-free energy enhances the footprint of wind power on landscapes worldwide. Wind power establishments claim considerable areas given their establishment sites and connected infrastructure. Being a major (but late arriving) land-use actor, onshore wind power expands in a landscape context already shaped by other land uses, thereby becoming directly a competitor for area. Being at forefront within the European Union, Sweden in northern Europe has ratified ambitious environmental goals to meet net zero emissions of greenhouse gases by 2045. This asks for substantial expansion in renewable energy sources nationwide, particularly of wind power. In practice, suggested future wind power establishments claim about 3.5% of the total national land surface in Sweden but higher shares in forest-dominated regions. Within the Swedish environmental strategy, forests, however, are key players to provide also other products and services to mitigate impacts of climate change as well as to preserve biodiversity. Notably, a land demand of about 3.5% by wind power is comparable to the share of all formally protected Swedish forestlands below the mountain forest border, which currently is heavily debated due to the experienced loss of forestland for wood biomass production. This makes wind power establishment in forest landscape a serious competitor for space and for meeting different forest goals.

Using Sweden as a case, we quantify the amount of forests in relation to their productivity, landownership (state, company or private) and nature conservation value that we expect to convert into wind power land following the recent national strategy for wind power expansion based on current wind power distribution in Sweden. Our preliminary results suggest a considerable conversion of productive forestland into wind power land, particularly in the southern boreal landscape. Preliminary findings also indicate landowner differ to which degree their productive forestland without conservational value likely become wind power land.

Our results emphasized the need for regional context-specific landscape planning in order to allow for both forests development and utilization meeting different environmental goals, including wind power and other interests.