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Impacts of land use and environmental change on the Eastern European land carbon sink

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Land-based mitigation is essential in reducing carbon emissions. Yet, the attribution of land carbon fluxes to their sinks and sources remains highly uncertain, in particular for the forest-rich but data-poor region of Eastern Europe. Here we integrate various data sources (from top-down and bottom-up modelling, earth observation, inventories) to show that Eastern Europe accounted for an annual aboveground biomass (AGB) carbon sink of ~0.49 GtC in 2010–2019, or about 75% of the entire European carbon uptake. However, we find that the land-based carbon sink is declining. This declining trend is mainly driven by changes in land use and land management, but also by increasing natural disturbances due to ongoing climate change. Despite the high overall importance of environmental factors such as soil moisture, nitrogen and CO₂ for enhancing the land-based carbon sink, we find indicators of a saturation effect of the regrowth in abandoned former agricultural areas, combined with an increase in wood harvest, particularly in European Russia. Our results contribute to a better understanding of the regional carbon budget of Eastern Europe and its trend. This study sheds light on land use and management as drivers of the land-based carbon sink and their role for climate mitigation.