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# Potential economic and climatic impacts of windstorms in forests

**Windstorms are extreme climatic events: rare occurrences with high environmental and economic costs. INRAE and AgroParisTech researchers used foresight modelling to simulate the effects of windstorms on French forests–important carbon sinks–and the French forestry industry through 2050. In one quarter of simulations, windstorms caused a 24% drop in carbon sequestration. Published in August 2024 in *Environmental Research Letters*, these results highlight that climate mitigation strategies need to account for windstorm-related risks.**

France is aiming for carbon neutrality by 2050, an objective laid out in the country's National Low-Carbon Strategy (SNBC). To be successful, it is crucial to both reduce greenhouse gas emissions and increase carbon storage levels. Forests have an important role to play in the latter, as carbon can be stored in trees, soils, and humus, for example. Forest management regimes can modulate the degree of longer-term carbon storage through decisions around timber harvesting and use.

However, consideration is rarely given to extreme climatic events such as windstorms. Because windstorms can destroy forests, they threaten the economic welfare of forest owners and increase the likelihood of carbon storage non-permanence. Thus, windstorms are low-probability, high-impact events that must be more intensively studied if we wish to better predict their occurrence and manage their effects.

In a recent study, INRAE and AgroParisTech researchers explored the economic and climatic impacts of windstorms on forests.

More specifically, they simulated the potential effects of windstorms on timber and wood availability, the economic activity of industry stakeholders (i.e., forest owners and timber consumers), and carbon storage levels, from the present day through 2050. The researchers used the French Forest Sector Model (FFSM) and data from climate models of European storms to generate 300 simulations in which the inherent uncertainties around windstorms were accounted for.

They found that windstorms can have heterogeneous economic impacts: while owners of unaffected forests may benefit from higher timber prices, economic outcomes for the owners of affected forests will depend on the extent of windstorm damage, which varies among regions. The researchers propose that it would be useful to explore different strategies for storing and creating value from salvaged wood, which could help attenuate the negative economic impacts of windstorms. Additionally, it could be worth implementing a risk-sharing insurance system for forest owners.

The study also showed that windstorms greatly affect the ability of forests to act as reliable carbon sinks, increasing the likelihood that climate change mitigation objectives will not be met. Indeed, in a quarter of simulations, the

researchers observed that carbon sequestration declined by an average of 24%. Moreover, in 5% of cases, carbon stocks took at least 5 years to recover after a windstorm.

Taken together, these findings highlight that forest-based mitigation strategies must account for windstorms—rare events with extremely large impacts—and should therefore prioritise reduced emissions over increased carbon storage. An additional concern is that environmental disturbances like windstorms may intensify under climate change.

**Reference**

Bastit F, Riviere M, Lobianco A et al. (2024). Prospective impacts of windstorm risk on carbon sinks and the forestry sector: an integrated assessment with Monte-Carlo simulations. *Environmental Research Letters,* DOI: https://doi.org/10.1088/1748-9326/ad661b

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