

Assessing Climate Risks and Vulnerability Across Slovenia's Forest Site-Type Groups to Support Climate-Smart Management

Assigned Session: Natural disturbances in Alpine forests: implications for natural hazard protection, other ecosystem services, and their management

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ABSTRACT

Understanding forest site dynamics is essential for close-to-nature forest management. In Slovenia, approximately 80 forest site-types are operationally distinguished and grouped into 19 major forest site-type groups that guide forest management planning. Climate change is

altering natural forest dynamics and may reduce resilience through increased frequency and intensity of climate-related hazards. We cross-analysed climate-related risks, hazards and seasonal occurrence patterns against the biological and ecological characteristics of the 19 forest site-type groups to assess current exposure and vulnerability. Considered threats included forest fire; large-scale disturbances (windthrow, ice and snow breakage); pests and diseases; invasive alien species; torrential processes and floods; drought; and other temperature extremes. Current exposure was quantified using sanitary felling data as a proxy for realised disturbance impacts, while vulnerability was assessed as a composite of sensitivity and adaptability (adaptive capacity) of forest site-type groups to climate change, derived through a structured expert assessment. Results indicate pronounced differences in risk profiles among site-type groups, reflecting contrasting edaphic and climatic constraints, dominant species composition, and disturbance regimes. Combining empirical exposure indicators with expert-based trait assessments enabled identification of site-type groups with potentially high near-term exposure and limited adaptive capacity. Finally, we synthesise feasible measures to enhance future resilience of Slovenian forests, including targeted species and provenance selection, structural diversification, risk-aware regeneration strategies, and adaptive management aligned with site-specific limitations. The proposed framework supports prioritisation of interventions across forest site-type groups under Central European climate-change conditions.

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