

Evaluating the impact of natural disturbances on protection forests: a multi approach analysis

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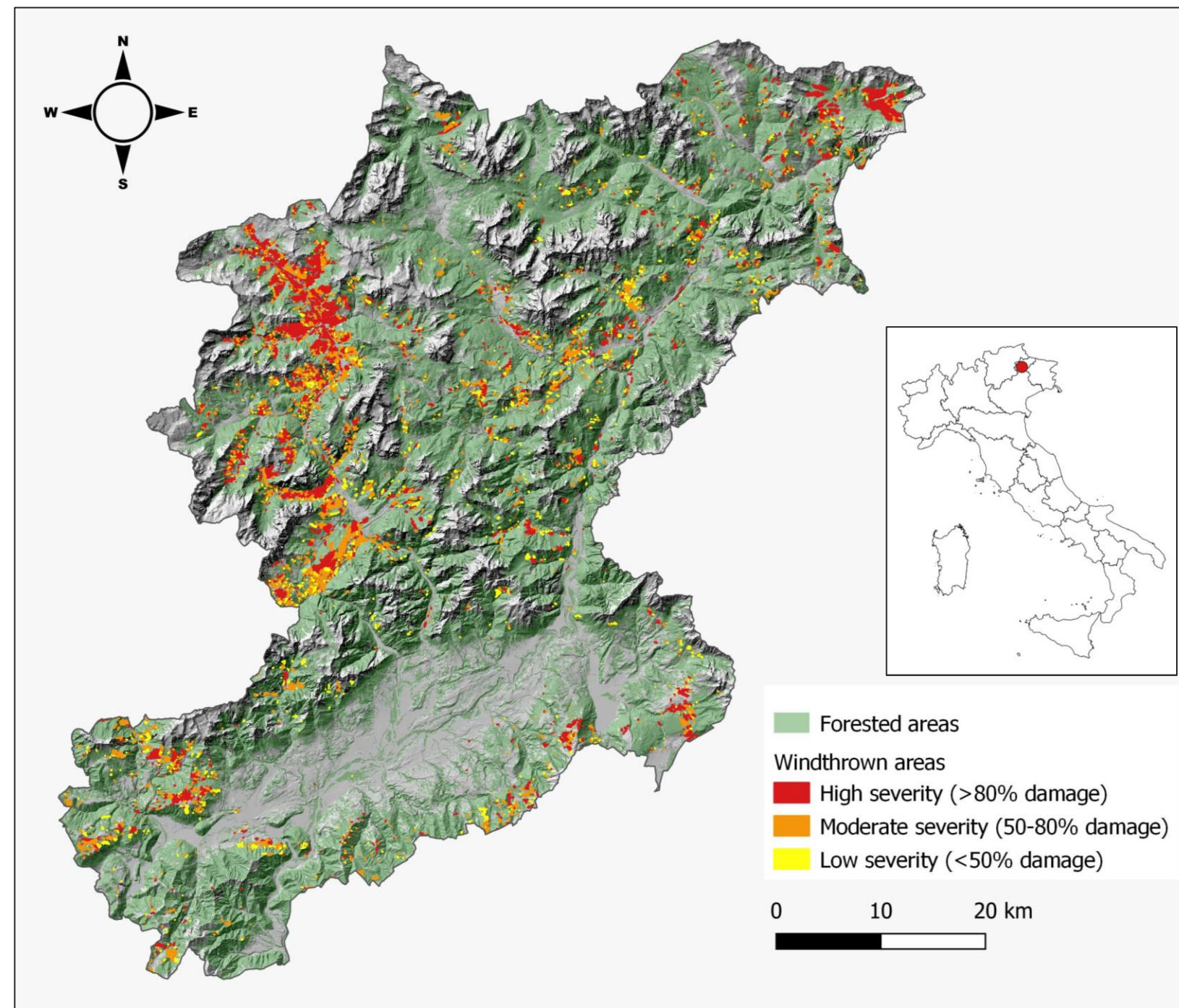


Figure 1. The impact of the storm Vaia on the forests of Belluno province, Italy

General framework

Mountain forests play a major role in preventing and mitigating natural mass movements such as rockfall or shallow landslides.

CASE STUDY
Storm Vaia, October 2018
Study area : Belluno province, Italy

The storm Vaia affected 8'680 ha in the Belluno province, northeastern Italian Alps (Fig. 1), moreover, most of the windthrown forests have a slope angle higher than 20° (Fig. 2), so they potentially provided protection against gravitative hazards.

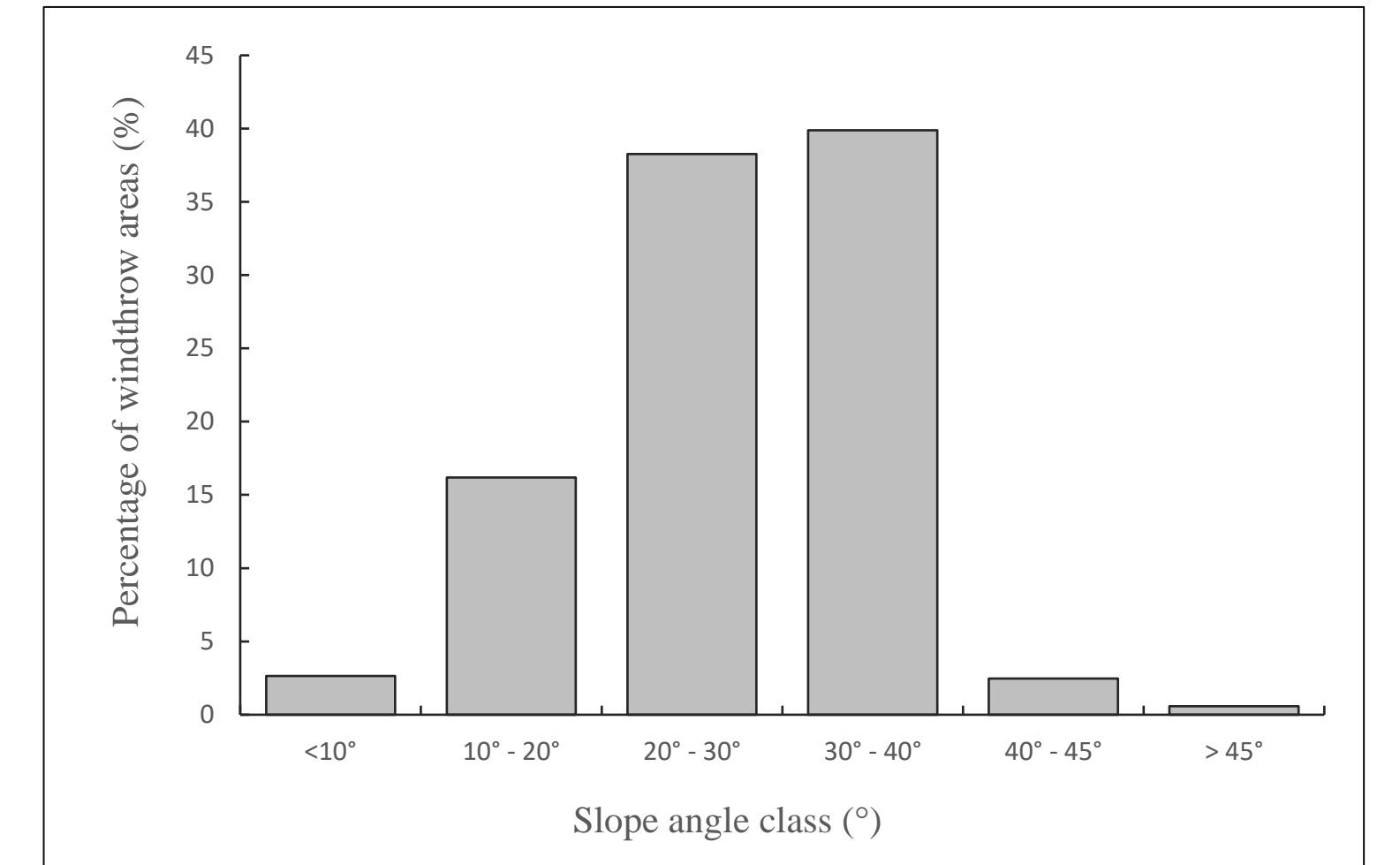


Figure 2. Percentage of windthrow areas by slope class.

Research question: How natural disturbances affect protection forests efficiency?

Different dynamics when considering different natural hazards

Rockfall hazard

In order to evaluate how a windthrown forest may provide protection against rockfall hazard we performed different rockfall simulations in pre and post-storm scenario using Rockyfor3D*. Simulations allow to evaluate the protective effect of biological legacies, lying logs and stumps, against this hazard. Moreover, the use of LiDAR data allowed a precise spatialization of legacies and the evaluation of their height above ground.

Rockfall simulations

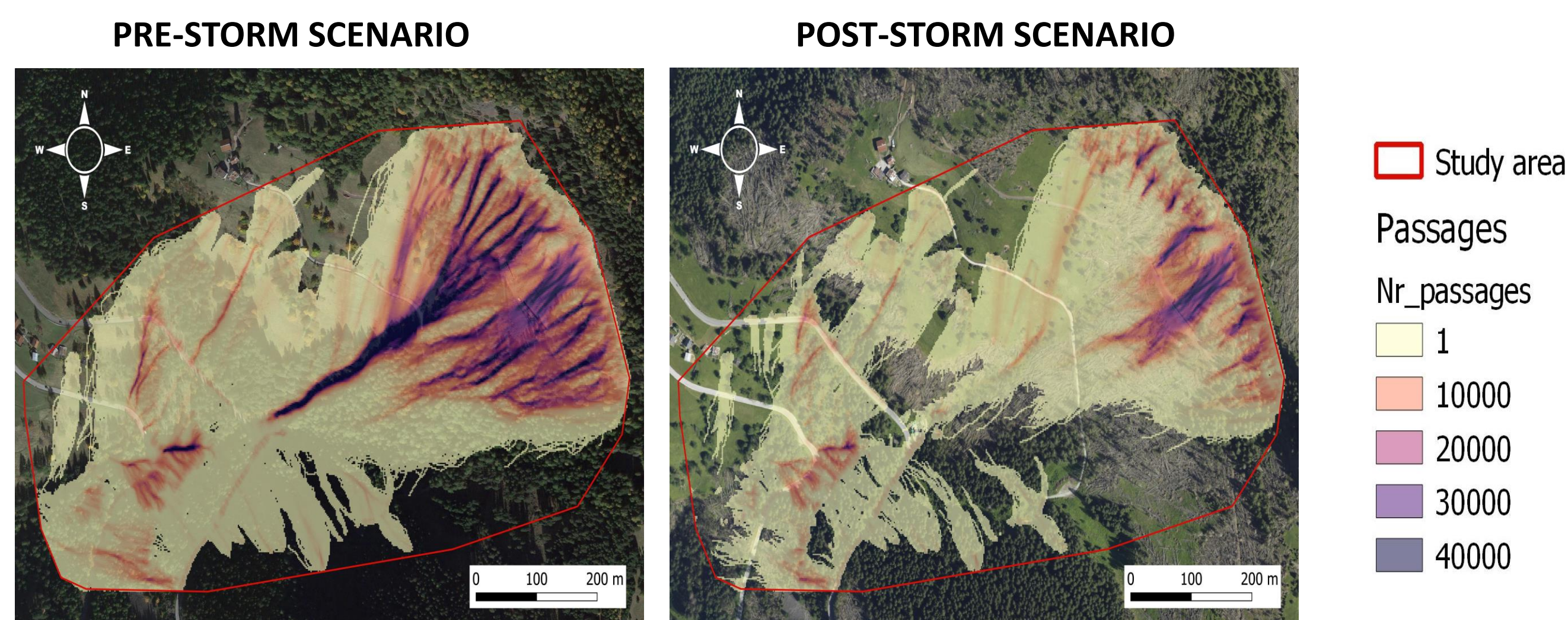


Figure 3. Rockfall simulations in a study site in the Belluno province.

Preliminary results

Structural legacies (mainly lying logs) may provide a good protective effect in the first years after the storm. Correct management of damaged protection forests should aim to avoid salvage logging to benefit the barrier effect of deadwood (Costa et al., submitted).



Figure 4. Rockfall activity evidence in the study site either before the storm Vaia (on the left) and after it (on the right).

Shallow landslides

New possible landslide prone slopes



Figure 5. Steep slopes salvage logged after the storm Vaia

New triggered shallow landslides

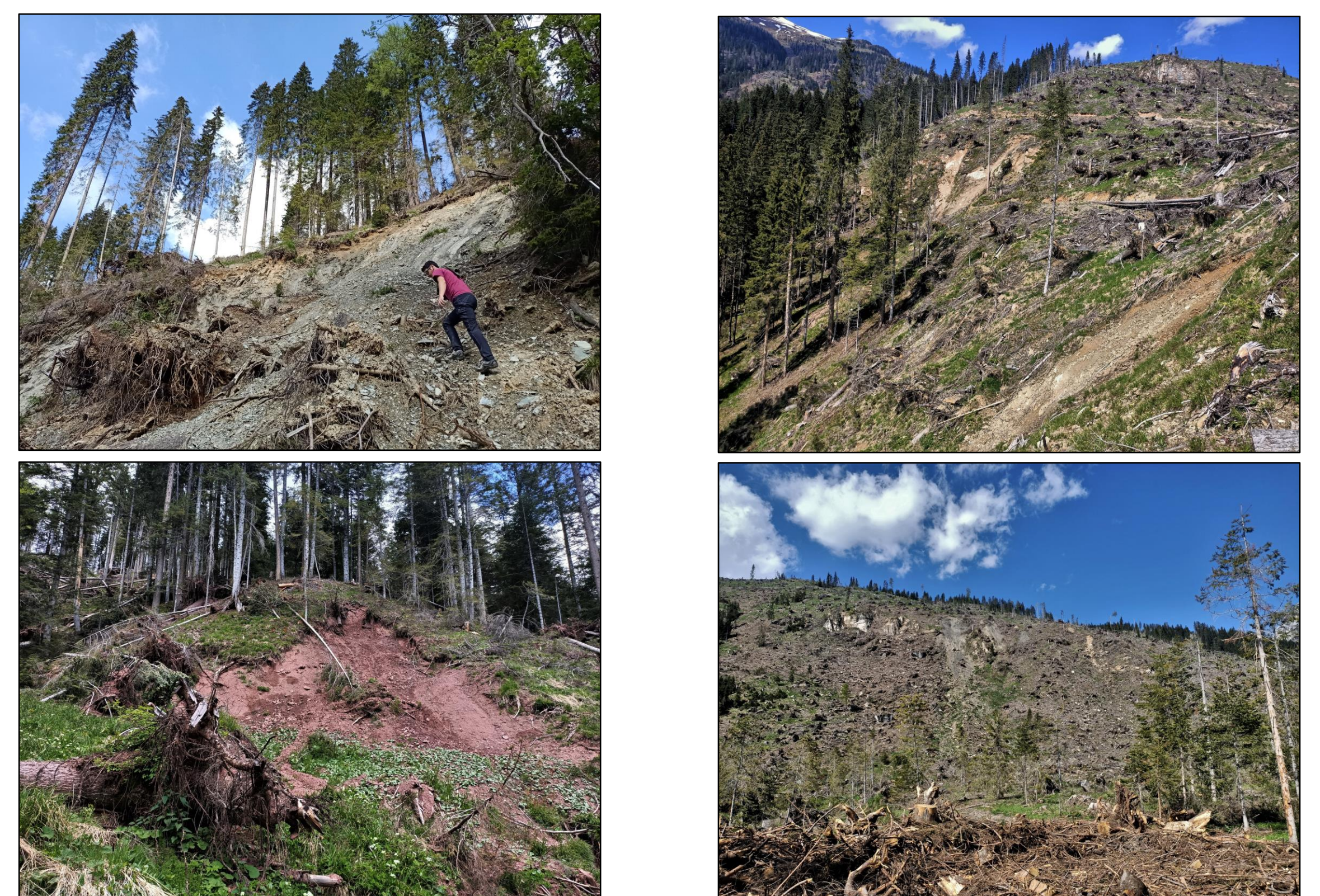


Figure 6. Shallow landslides triggered in windthrow sites

Vaia storm, through both uprooting and stem breakage, may have led to an increase in landslide susceptibility in forested slopes due to the leak of hydrological and mechanical (root reinforcement) components in slope stability. Critical areas could be in particular those steep slopes salvage logged and characterised by a high severity of disturbance (Fig. 5). In some sites, shallow landslides yet occurred in post – windthrow scenario (Fig. 6).

Next steps

