

Trade-offs and synergies between disturbance predisposition and the provision of ecosystem services in Swiss forests¹

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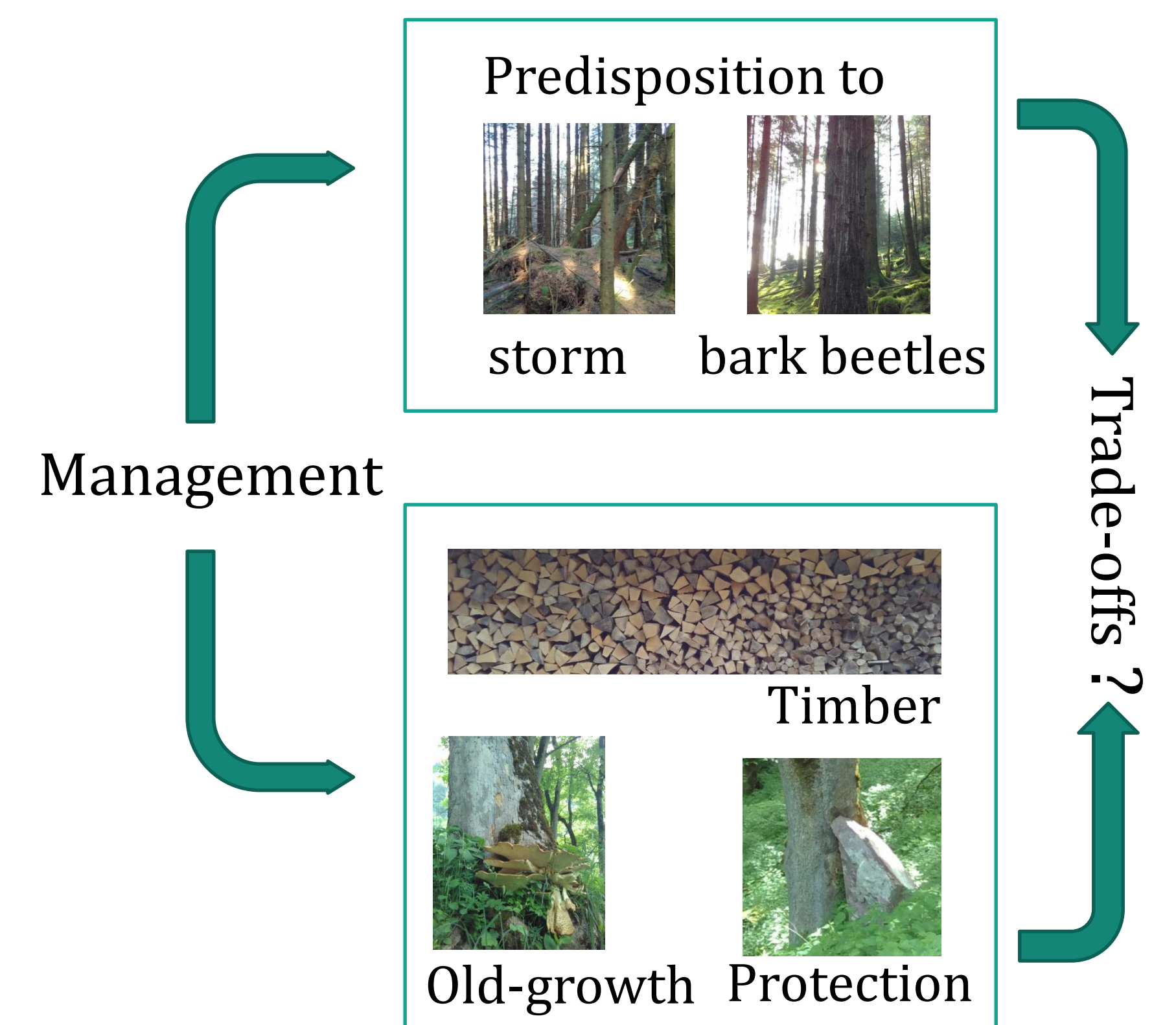
Introduction

Disturbances need to be considered in scenario analyses that evaluate management effects on the long-term provision and sustainability of forest ecosystem services and biodiversity (ESB).

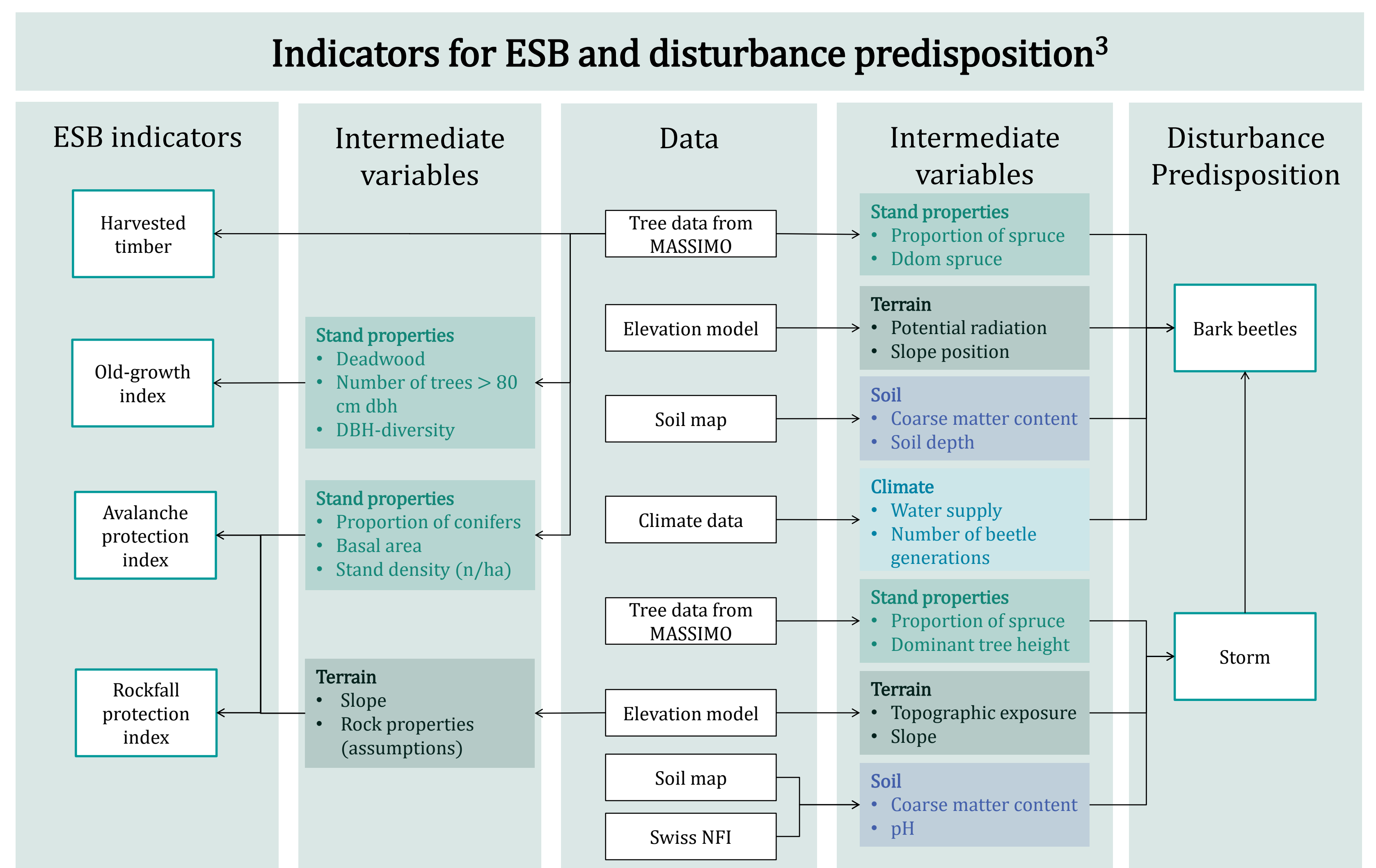
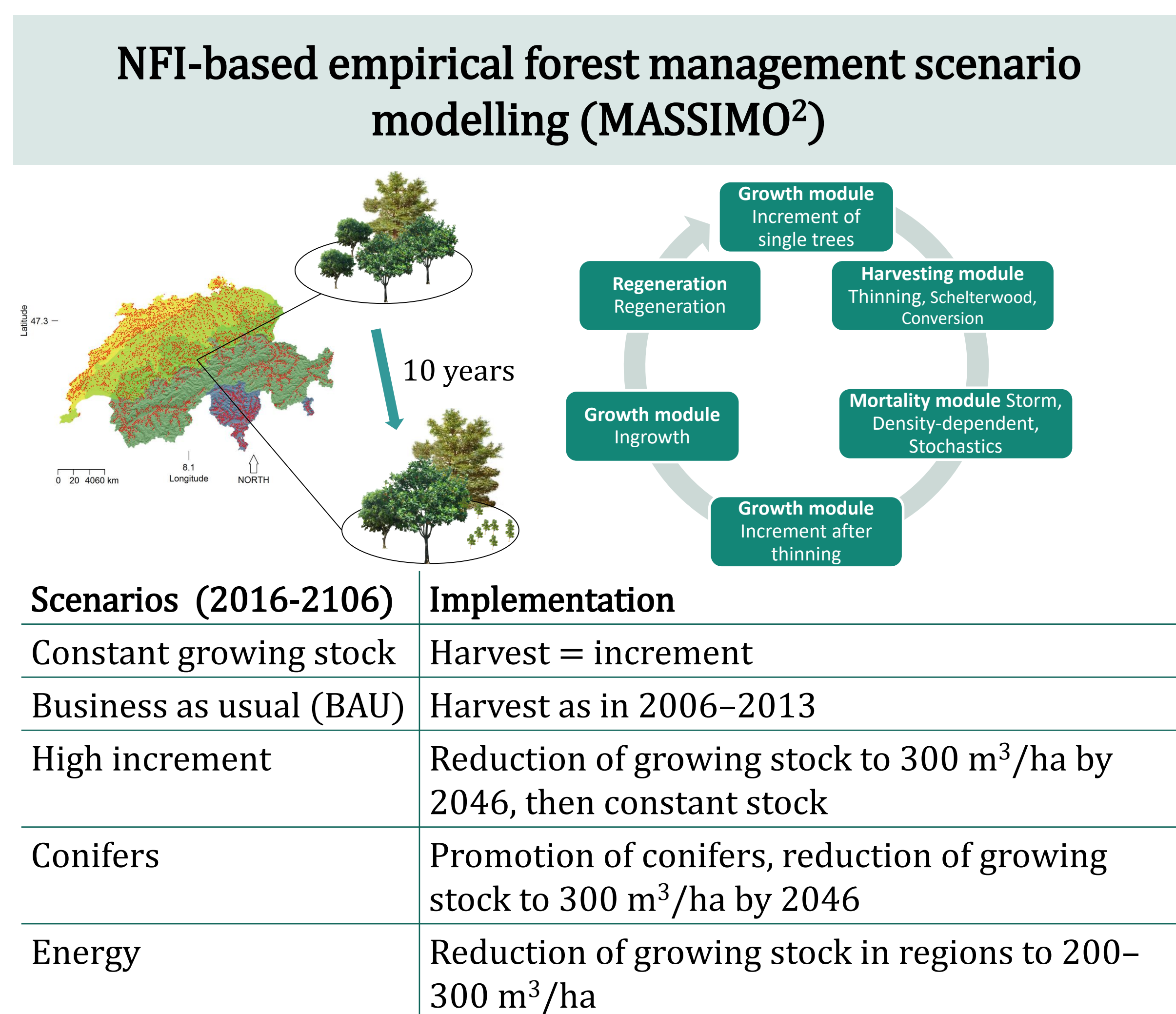
The aim of this study was to reveal potential trade-offs and synergies between ESB and the predisposition to storm and bark beetle disturbance for forests in Switzerland.

We asked how scenarios of increased timber harvesting may affect trade-offs and synergies between disturbance predisposition (DP) and

- timber production
- old-growth forest characteristics as biodiversity proxies
- protection against rockfall and avalanches.



Methods



Results

Table 1. Performance of disturbance predisposition indices to predict observed disturbance damages in logistic regression models.

Disturbance events	N plots (N disturbed)	AUC
Storm Vivian (1990)	9456 (43)	0.82
Storm Lothar (1999)	5538 (118)	0.71
Insect damage (1993–2017)	4396 (275)	0.80

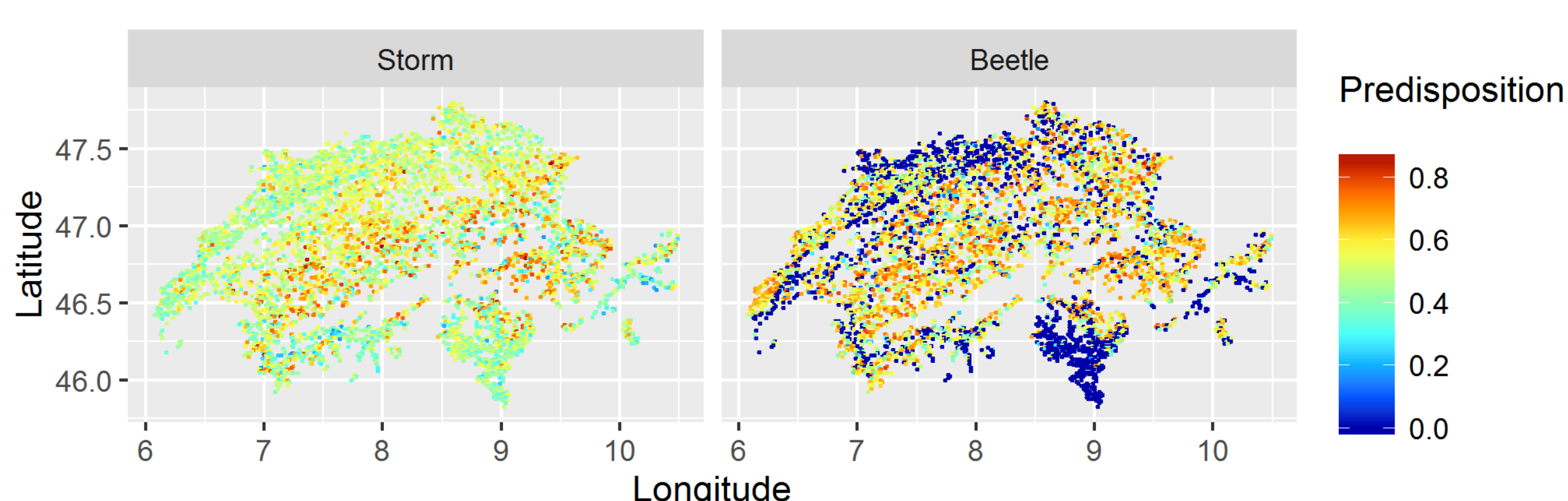


Fig. 1. Spatial distribution of storm and bark beetle predisposition in NFI sample plots at the beginning of the simulation period (2016).

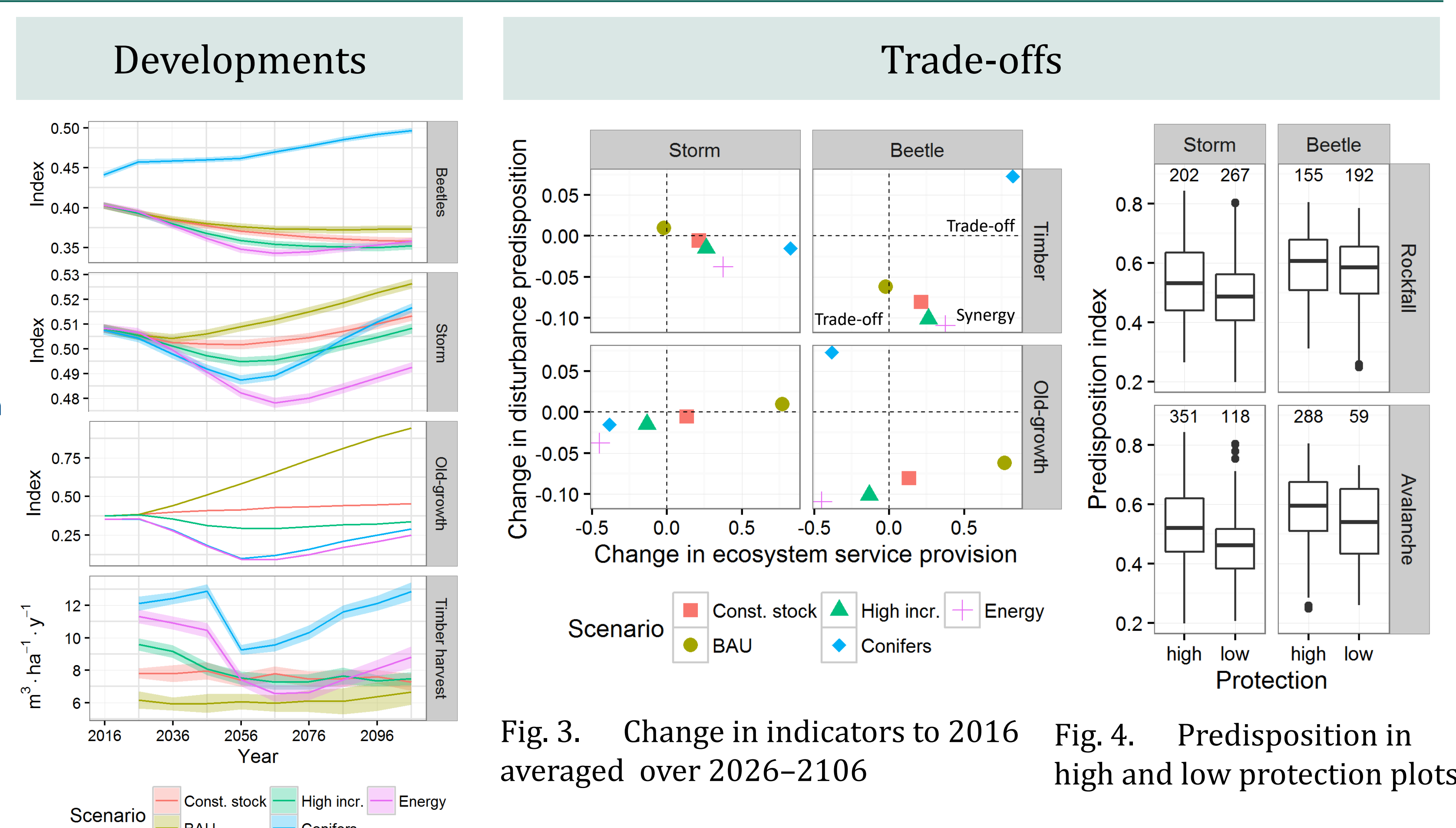


Fig. 2. Development of predisposition and ESB indices

Fig. 3. Change in indicators to 2016 averaged over 2026–2106

Fig. 4. Predisposition in high and low protection plots

Conclusion

- Increased timber harvesting decreased predisposition to storm and promoting conifers increased predisposition to beetle disturbance.
- Indicators of disturbance predisposition complement assessments of ecosystem service provision by showing potentially colliding goals.
- NFI-based results are representative at national level and may thus support national policy making.

References:

- ¹Published as Temperli et al. 2020, *Forest Ecosystem* 7:27
²Stadelmann et al. 2019, *Forests* 10:94
³Netherer 2003, Dissertation, *BOKU*