# Managing Alpine forests with close-to-nature forestry to improve climate change mitigation and multifunctionality


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ONEforest


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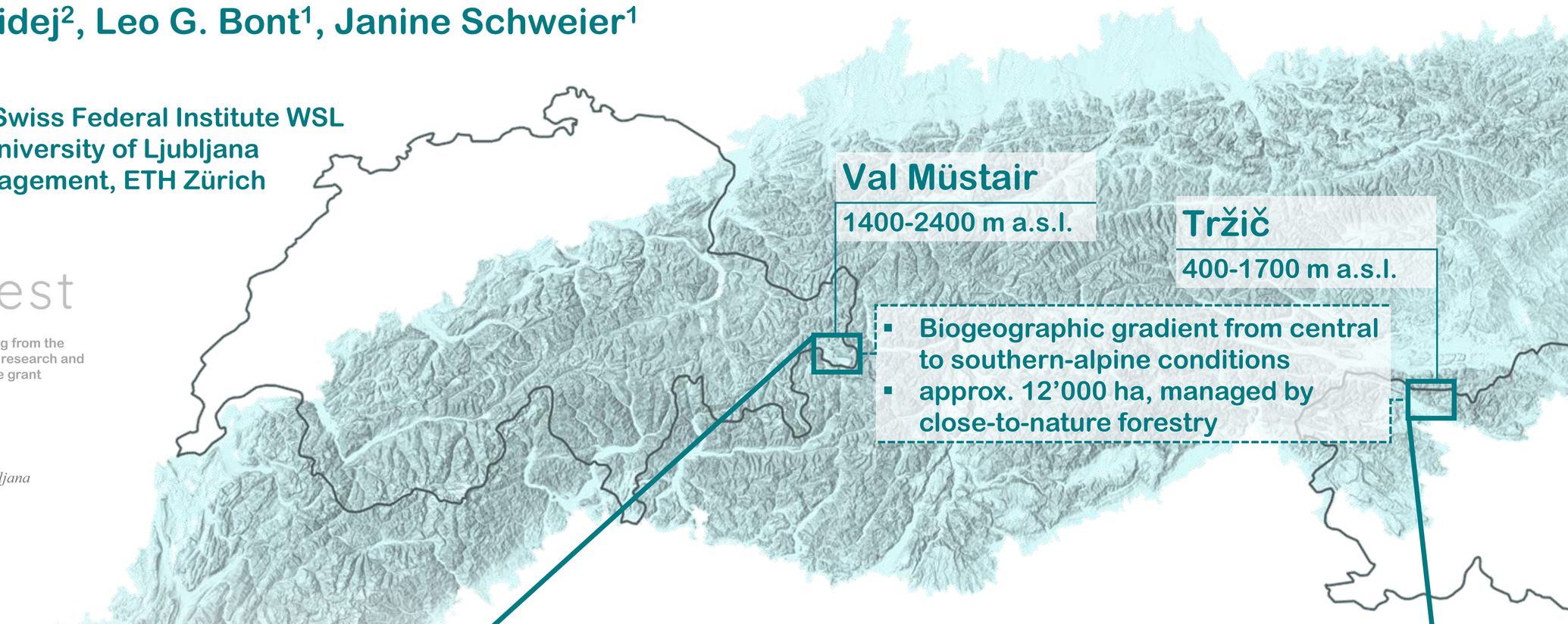



## METHODS

### SCENARIOS

**Climate**
- Historic climate (1981-2010)
- SSP2-4.5
- SSP5-8.5

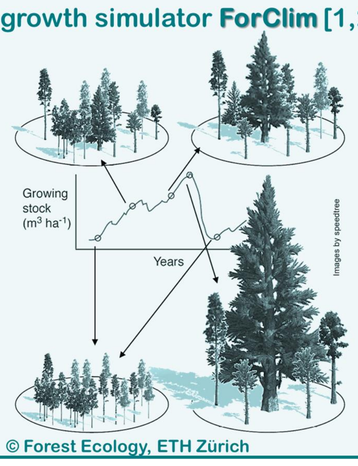
**Forest Management Strategies**

Intensity

- **NO** no management
- CNF-LOW
- **CNF** → CNF-ClimAdapt (fostering climate-adapted species)
- CNF-HIGH
- **Clearcut** intense rotation forestry

### SIMULATION

Climate-sensitive forest-growth simulator **ForClim** [1,2]




### EVALUATION

Indicators for Biodiversity & Forest Ecosystem Services [3,4]

- Timber
- Biodiversity
- Recreation
- Protection
- $CO_2$ C-Sequestration

∑ Living tree biomass
Deadwood
Harvested wood products (HWP)
Substitution (material + energetic)

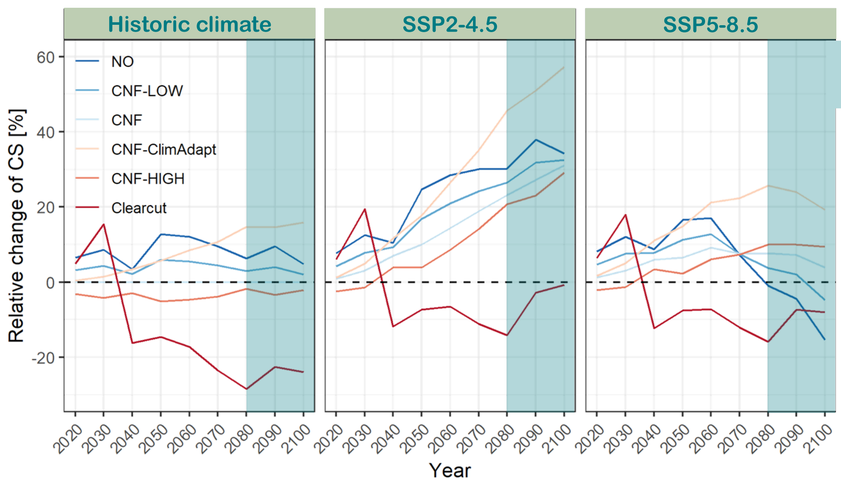
## HIGHLIGHTS

- Close-to-nature forestry (CNF) performs well in ensuring multiple forest ecosystem services and biodiversity
- Climate change requires adaptation of CNF by fostering climate-adapted tree species
- High multifunctionality, including biodiversity, needs diversified management

**Results for the Slovenian Case Study?**
→ Scan & explore here:

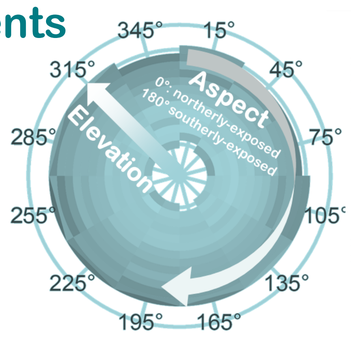
## CARBON SEQUESTRATION

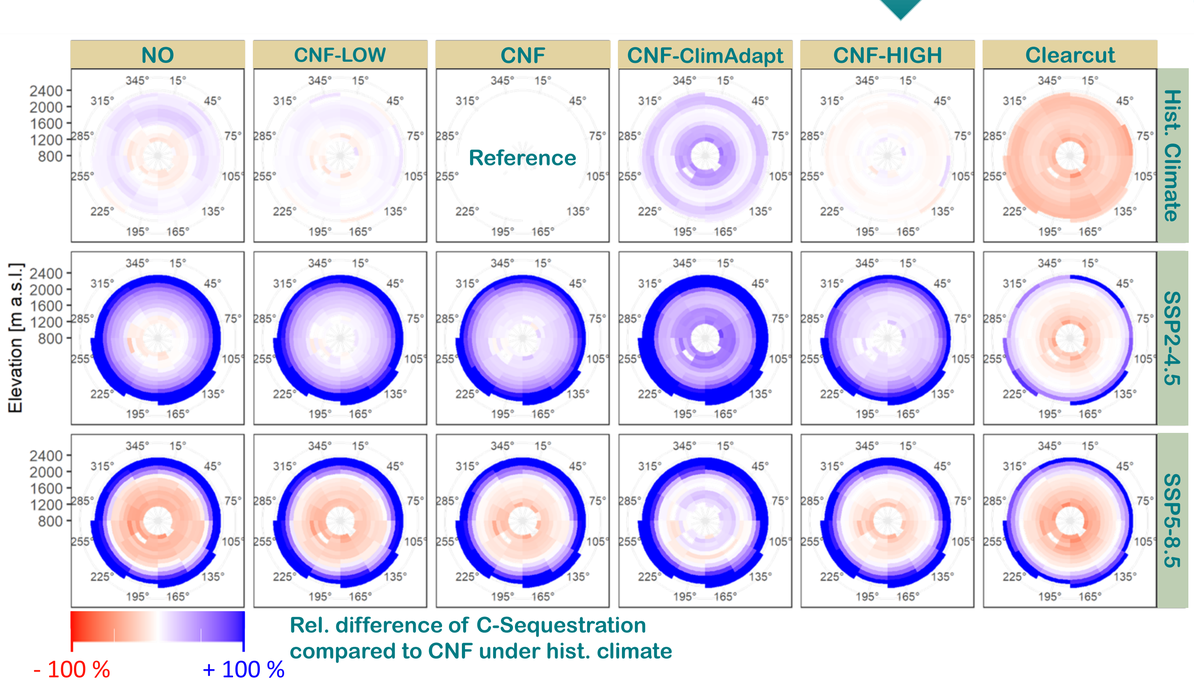
### Rel. Difference compared to CNF under historic climate (---)




**Period: 2080 - 2100**

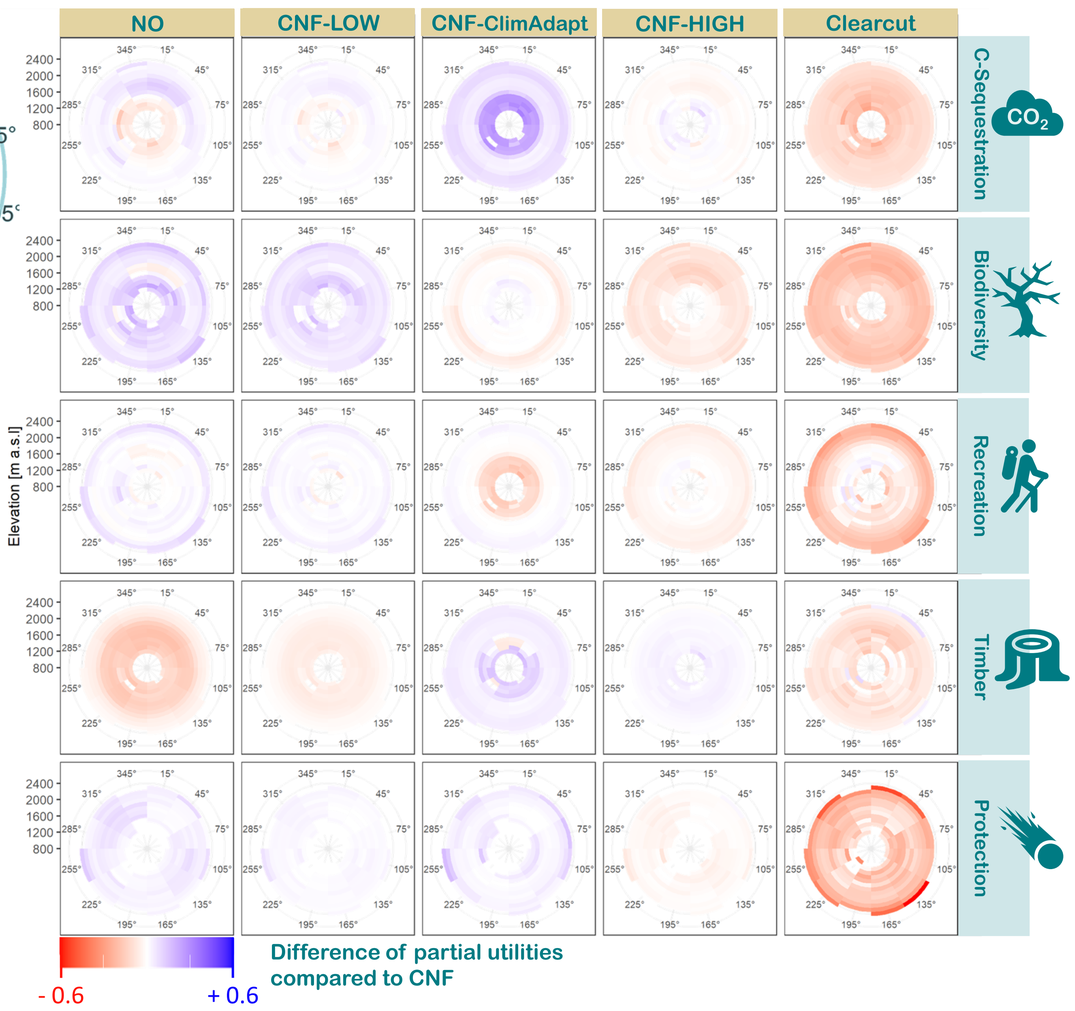
Analysed along environmental gradients




## MULTIFUNCTIONALITY under SSP2-4.5

### Difference of partial utilities compared to CNF





[1] Bugmann (1996):A simplified forest model to study species composition along climate gradients. Ecology.
[2] Huber et al. (2021): Stand-scale climate change impacts on forests over large areas: transient responses and projection uncertainties. Ecological Application.
[3] Blattert et al. (2018): Segregated versus integrated biodiversity conservation: Value-based ecosystem service assessment under varying forest management strategies in a Swiss case study. EcoInd.
[4] Thrippleton et al. (2023): Balancing disturbance risk and ecosystem service provisioning in Swiss mountain forests: an increasing challenge under climate change. RegEnvChange.



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