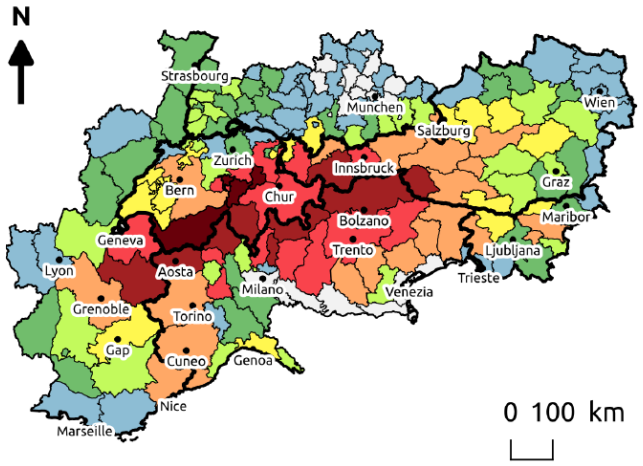
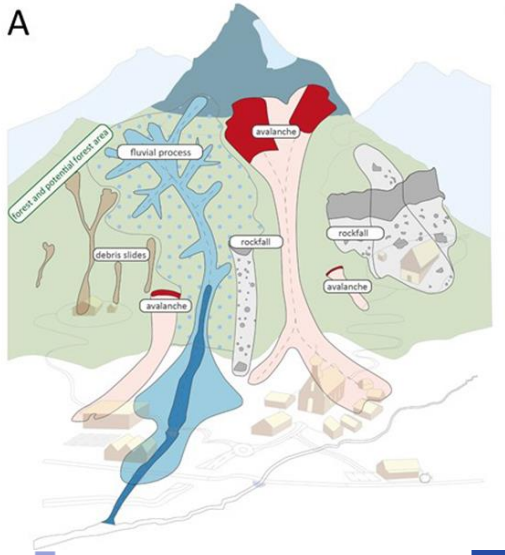
Forest Based Solutions for natural risks mitigation and prevention

An overview of the issues via 3 Interreg Alpine Space projets





Interreg Alpine Space — EUROPEAN UNION

ROCK the ALPS

EUROPEAN RECIONAL DEVELOPMENT FUND

Interreg Alpine Space — EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund

Interreg Alpine Space — EUROPEAN UNION

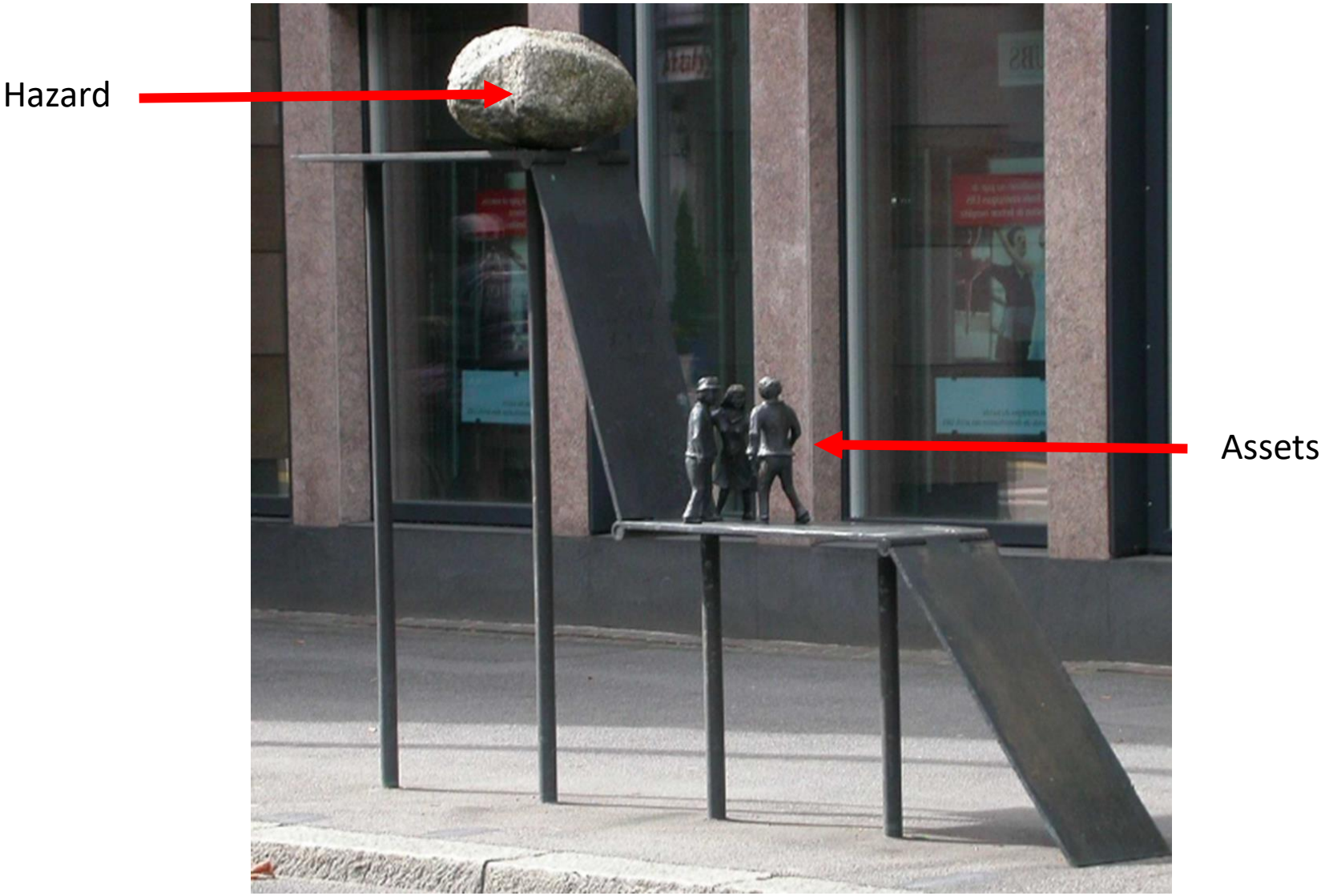
ALPTREES

European Regional Development Fund

INRAE

Frédéric BERGER
frederic.berger@inrae.fr

The risk = hazard * assets



An observation :

Natural risk prevention policies all have a common ancestor: the forester!

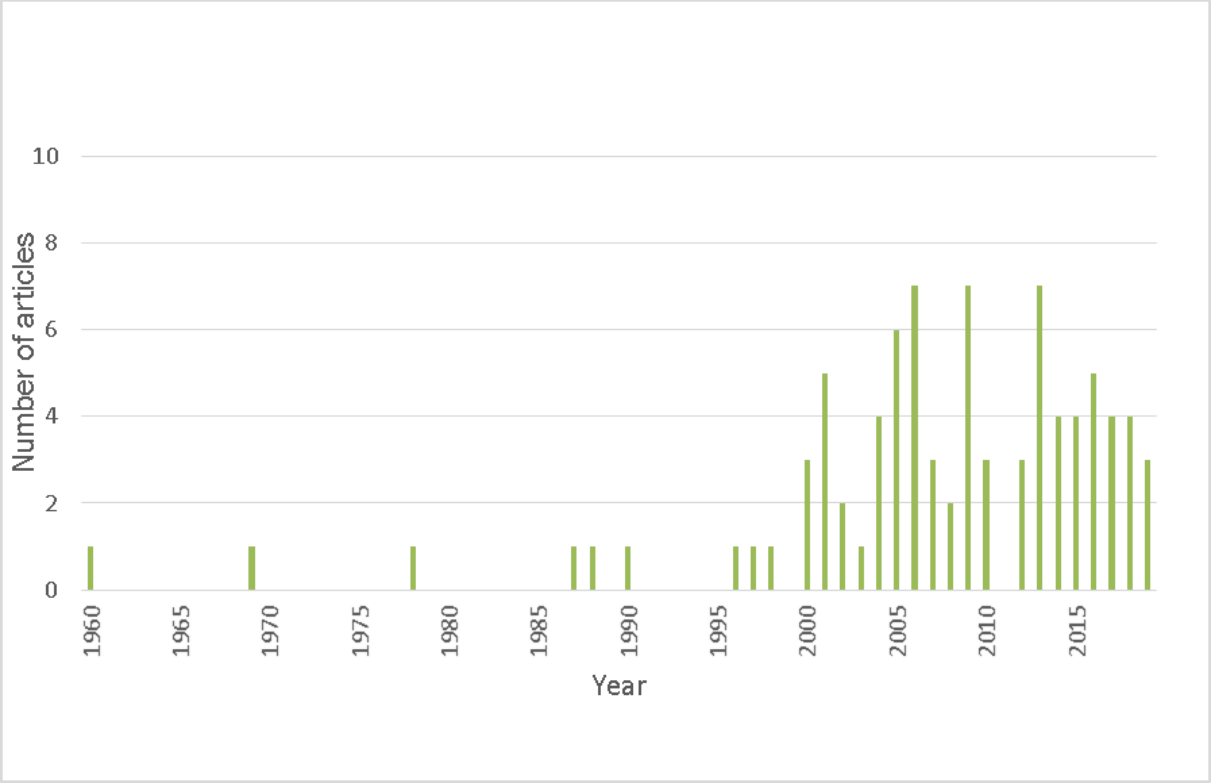
An observation :

Natural risk prevention policies all have a common ancestor: the forester!

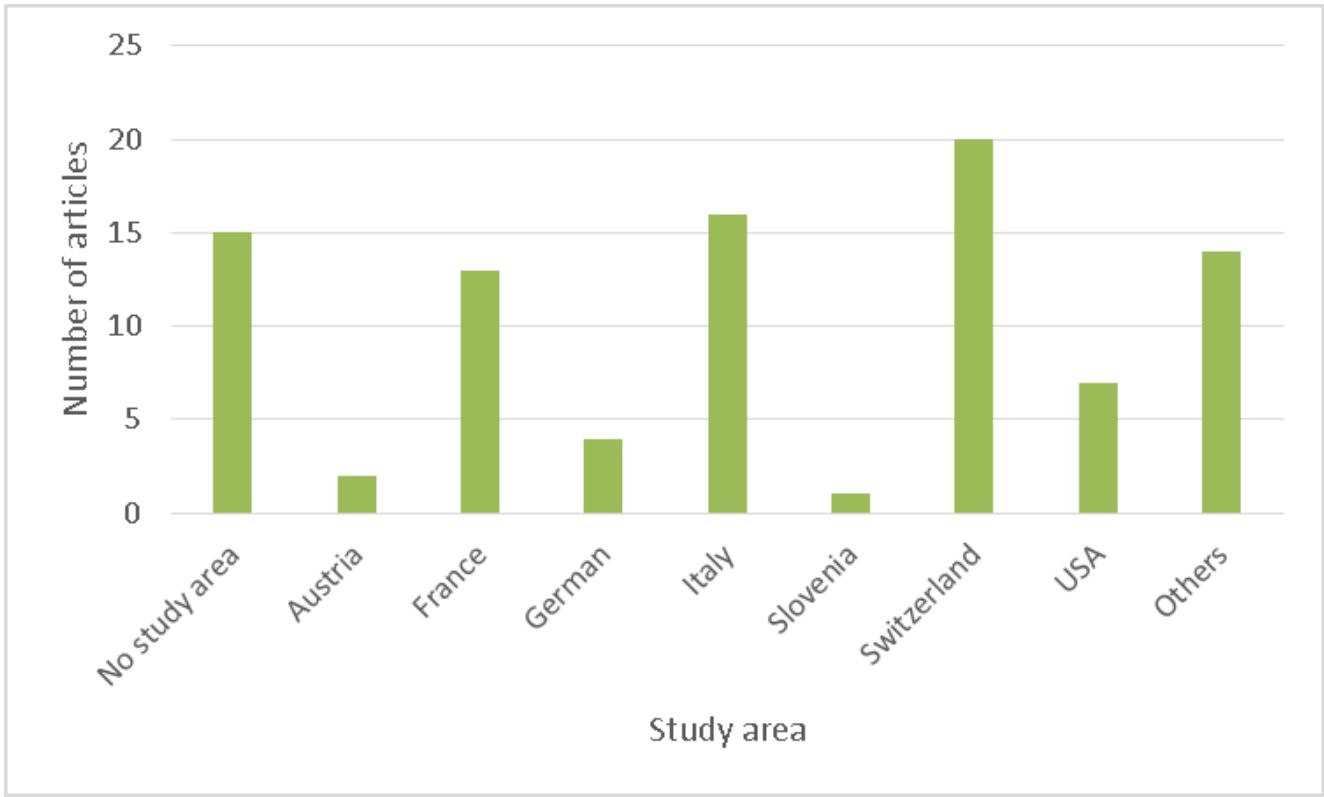
Foresters have worked too well: phenomena are extinguished and the forest masks the potential for problems.

What are the needs?

- Harmonization of the definitions and concepts.
- Improvement of the knowledge based on tools, experiences and data exchanges and developpement of common harmonized database.
- Large scale mapping of this forest ecosystem service for decision/policy makers and foresters.
- A better integration of FBS in the risks prevention policies.
- Communication beteween foresters and the other actors including the general public.
- Funds for the management of FBS.
- Anticipating the impacts of climate changes



Temporal trend between 1960 and 2019 of the number of papers obtained from a literature review (Scopus database) using the query ‘TITLE-ABS-KEY’ (Title, Abstract, Keywords) with the search terms “protection” or “protective” and “forest*” and “natural hazard” or “natural disturbance”.



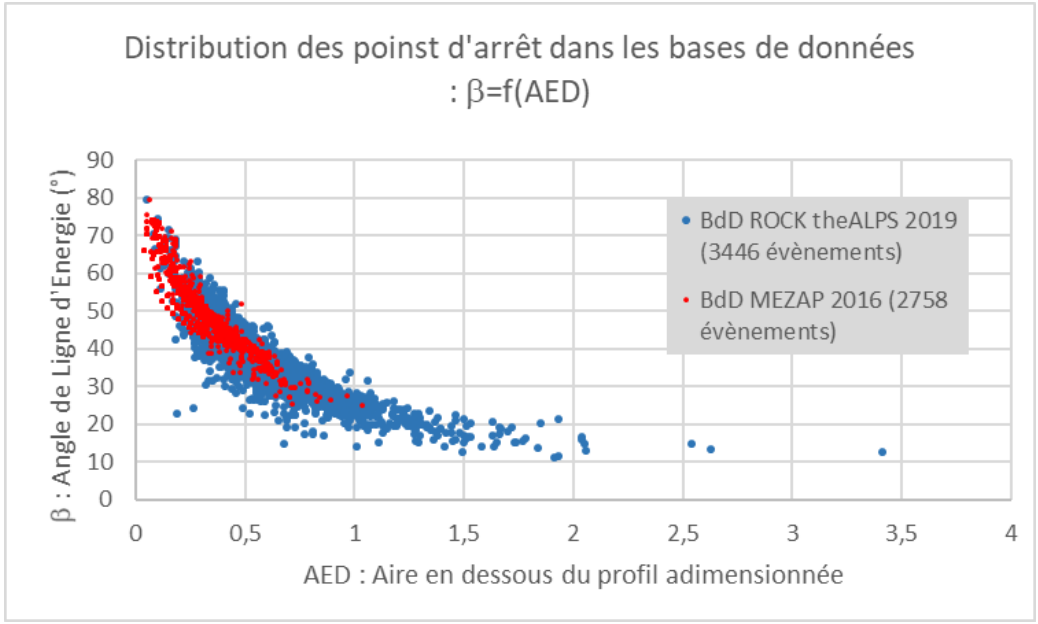
Interreg
Alpine Space

EUROPEAN UNION

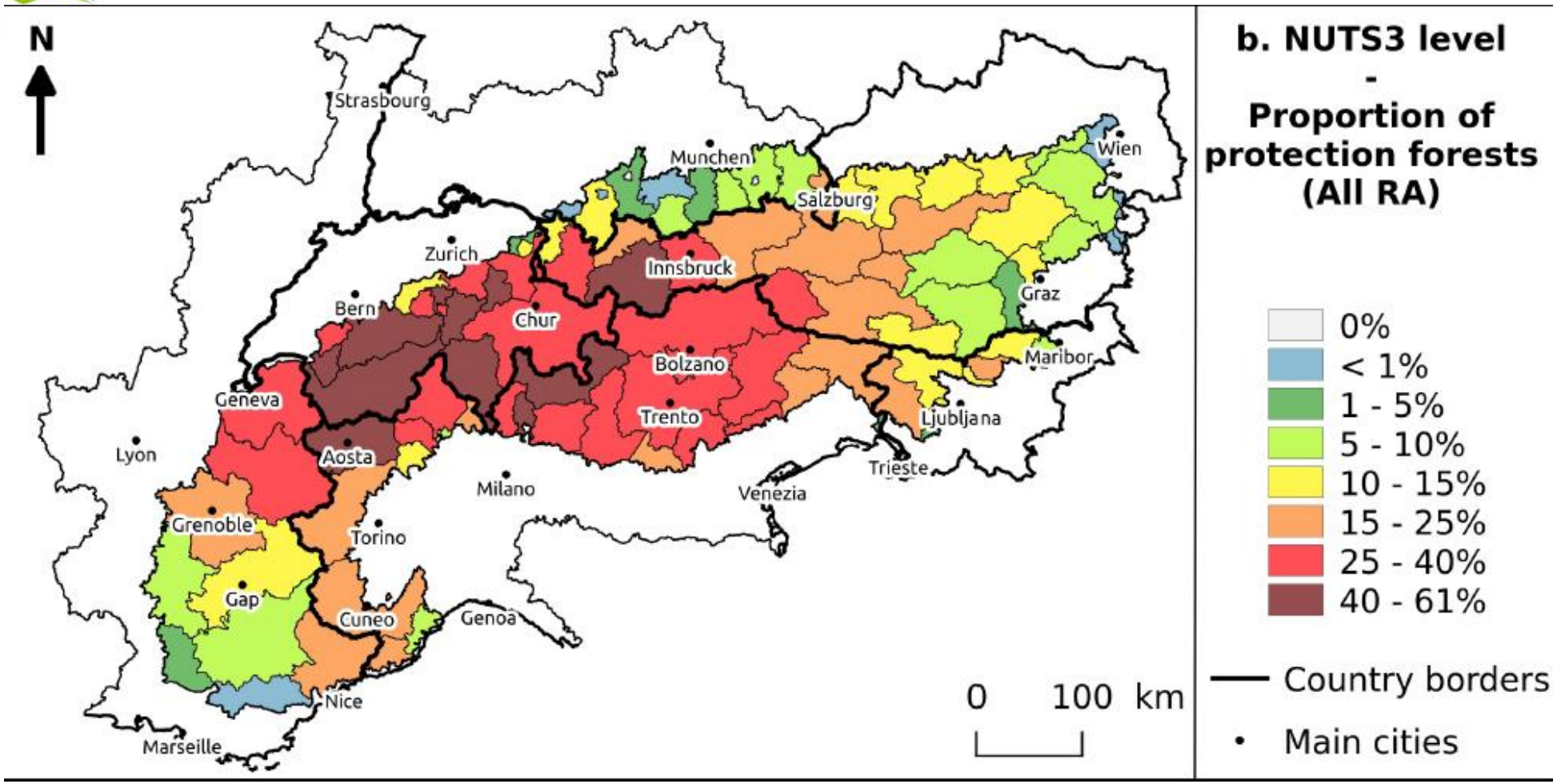
ROCK the ALPS

EUROPEAN REGIONAL DEVELOPMENT FUND

1000 trajectories from 3446 past events recorded and analyzed!!!!



Interreg
Alpine Space
EUROPEAN UNION
ROCK the ALPS
EUROPEAN REGIONAL DEVELOPMENT FUND



Alpine convention area

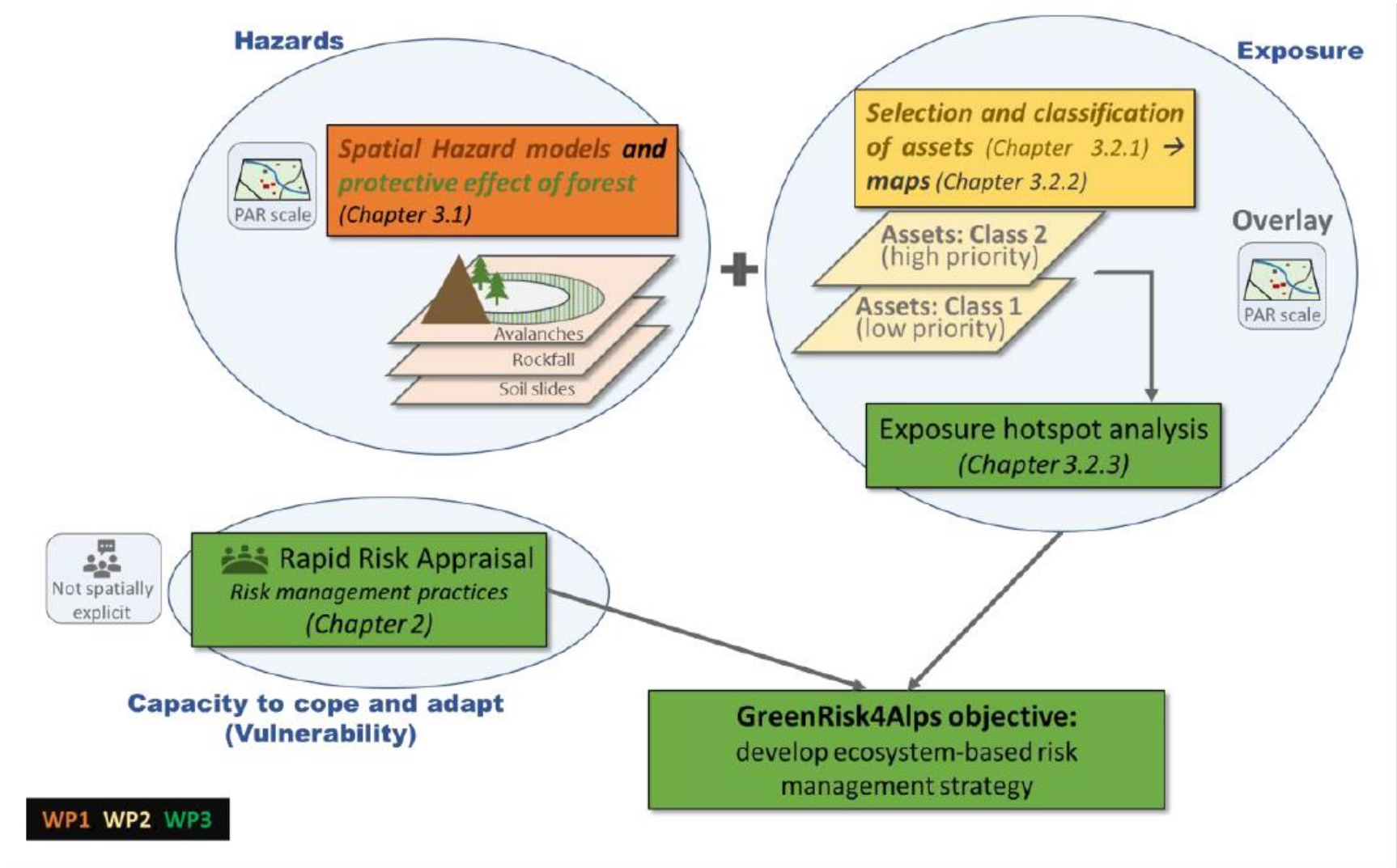
Country	Total area [km²]	Proportion of protection forest
Austria	54630	15,6%
Switzerland	25230	40,5%
Germany	11150	7,1%
France	40785	16,0%
Italy	52030	29,2%
Liechtenstein	160	27,8%
Slovenia	6770	15,9%
Total	**190755**	**21,5%**

Interreg
Alpine Space

EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund

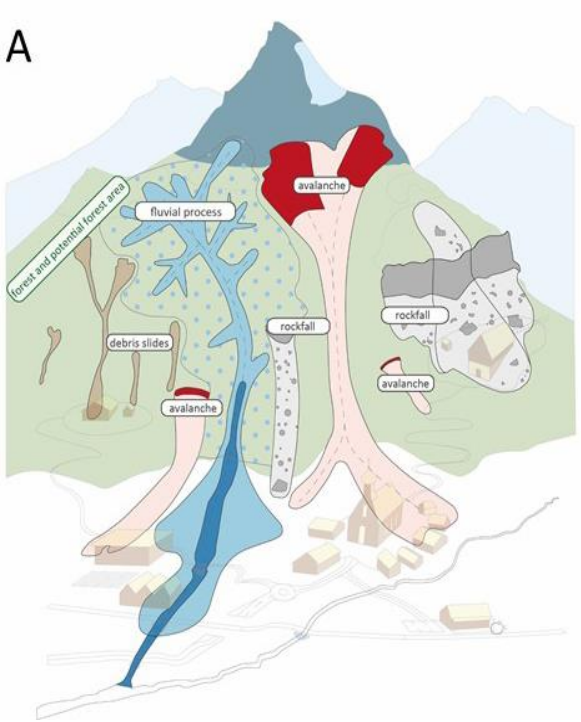


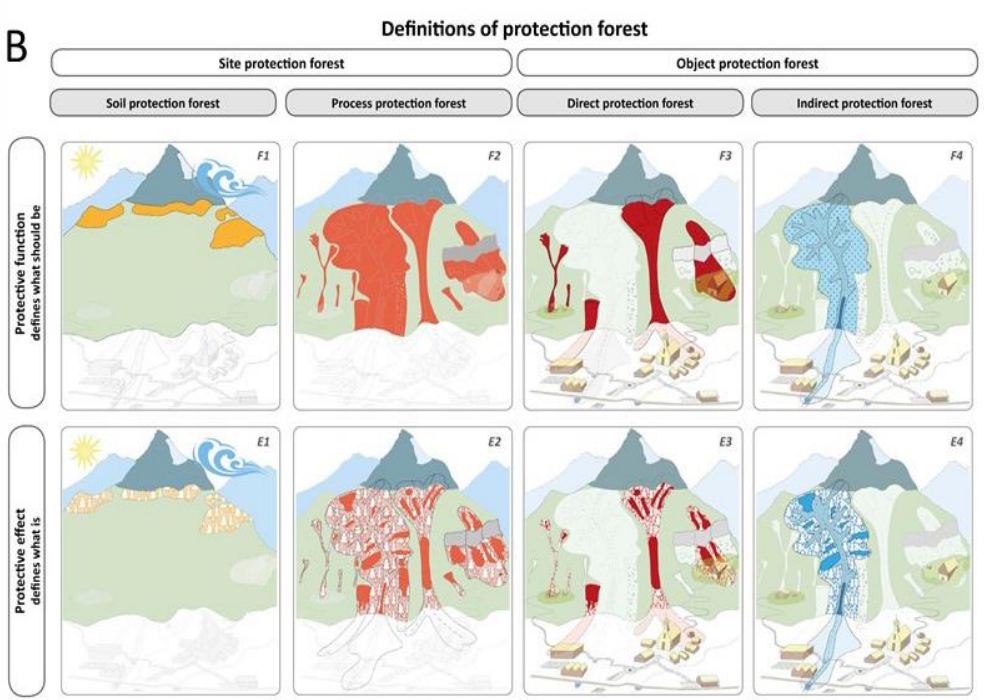
Interreg
Alpine Space

EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund





Interreg
Alpine Space
GREEN RISK 4 ALPS
European Regional Development Fund

EUROPEAN UNI

PROTECTION FOREST CHARACTERISTICS AGAINST AVALANCHES

FOREST CHARACTERISTICS	Release area	Source	Transit and run out zone	Source
canopy cover	Promote evergreen conifers (> 50%) > 80% if slope < 38° in deciduous > 70% if slope < 42°in mixed stands > 35% if slope < 38°in spruce stands > 30% if slope < 35°in spruce and larch stands > 35% if slope < 32°in larch stands	Bebi et al., 2009; Berretti et al., 2006; Meyer-Grass and Schneebeli, 1992,	Maintain effective winter canopy cover, > 30% if slope 30° > 50% if slope 35° > 70% if slope ≥ 40° Most relevant in first 100–200 m from the release area.	Berger et al., 2013; Teich et al., 2012
species composition	< 30 % of deciduous species (and Larch), Depends on the slope: larch →30°, coniferous →35°, mixed forest →35°, Deciduous trees prevent slow gliding at lower quantities of snow	Berger et al., 2013; Berretti et al., 2006, Bebi et al., 2009	Promote evergreen or mixed forest, corridor edge ≥ 70% otherwise ≥ 30%, in areas of powder avalanches, promote deciduous trees	Teich et al., 2012; Berger et al., 2013
terrain roughness	leave 1.3 m high stumps after cutting. snags, stumps, root plates, lying logs promotes roughness but are dangerous, because avalanches with debris are more destructive.	Dorren et al., 2005; Berger et al., 2013	leave 1.3 m high stumps after cutting. snags, stumps, root plates, lying logs promotes roughness but are dangerous, because avalanches with debris are more destructive.	Dorren et al., 2005; Berger et al., 2013
tree size	twice as high compared to snow depth, >2 m	Frehner et al., 2005; McClung, 2001		
gap length [α]	≤ 1.5 x average height of trees, absence of gaps > 25 in length, <60 m if slope ≥30° <50 m if slope ≥35° <40 m if slope ≥40° <30 m if slope ≥45°	Frehner et al., 2005, Berretti et al., 2006, Berger et al., 2013,	≤ 1.5 x average height of trees	Berger et al., 2013

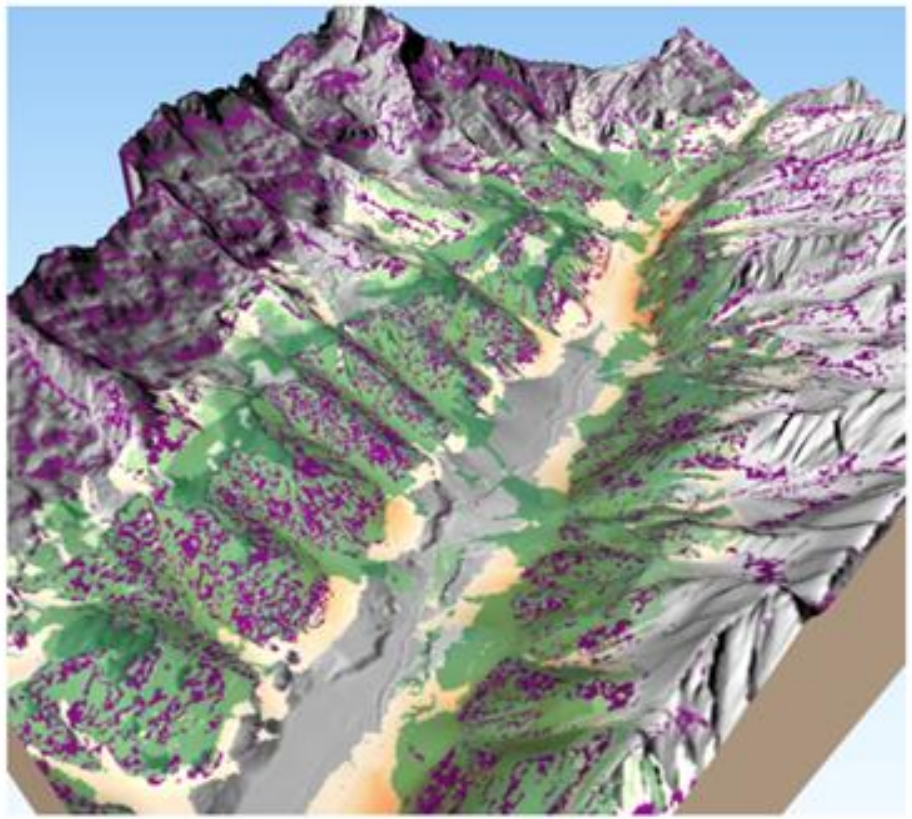
Interreg
Alpine Space

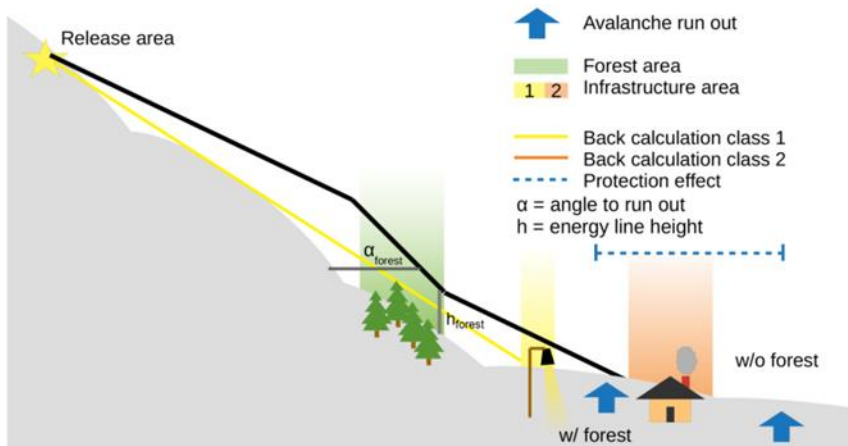
EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund

Avalanche start
Forest
Forest effect



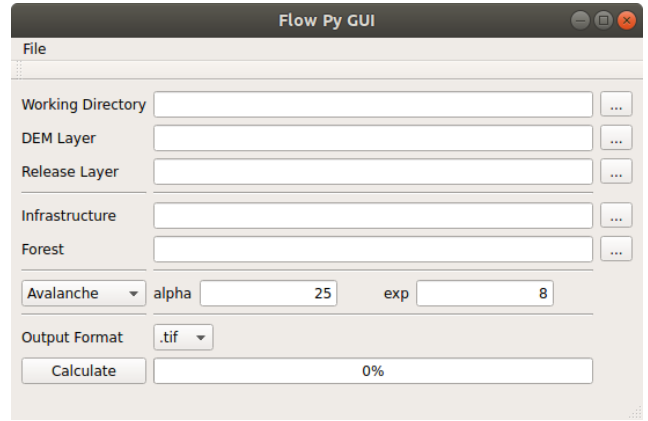


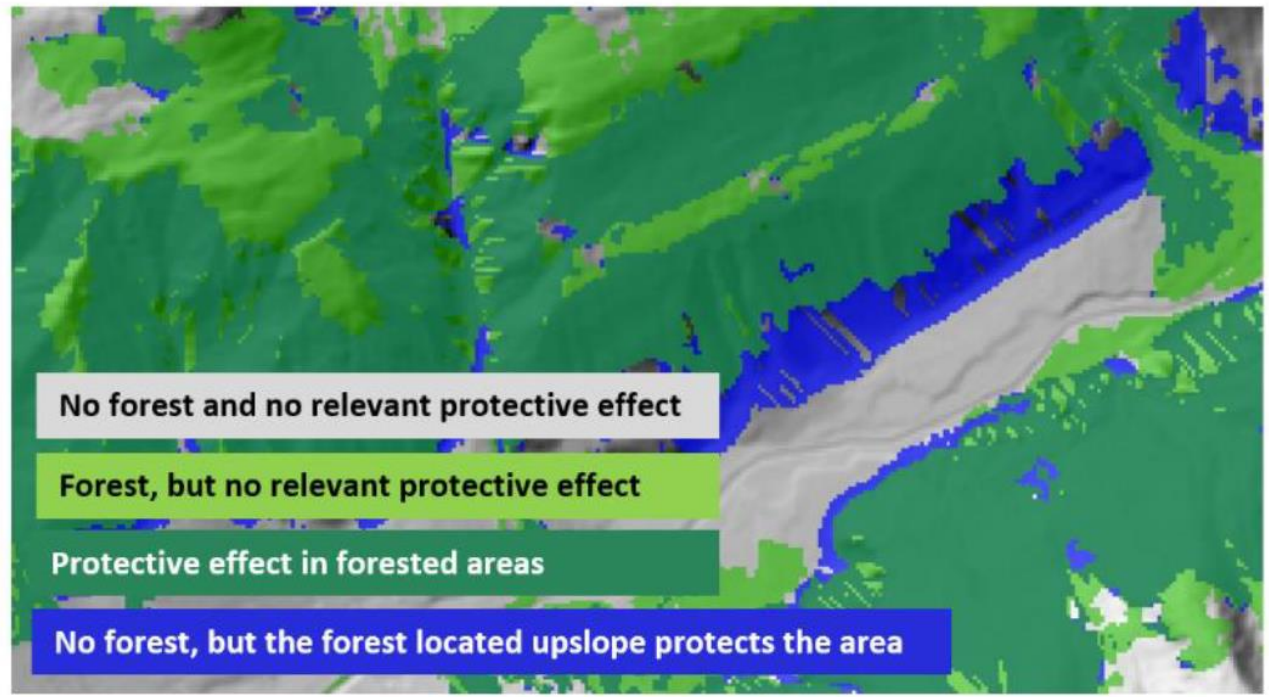
Interreg
Alpine Space

EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund





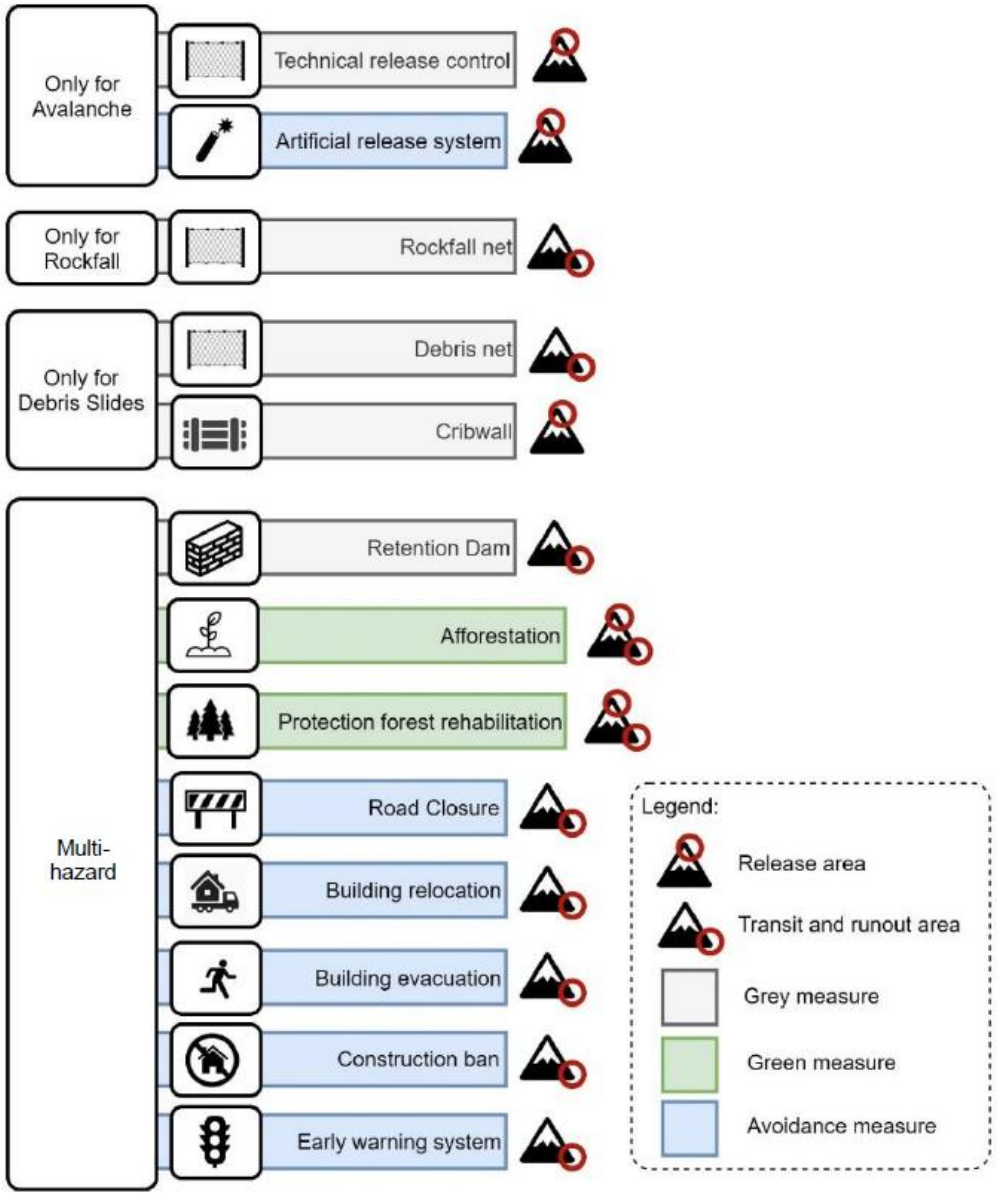
Interreg
Alpine Space

EUROPEAN UNION

GREEN RISK 4 ALPS

European Regional Development Fund

Interreg
Alpine Space
EUROPEAN UNION
GREEN RISK 4 ALPS
European Regional Development Fund



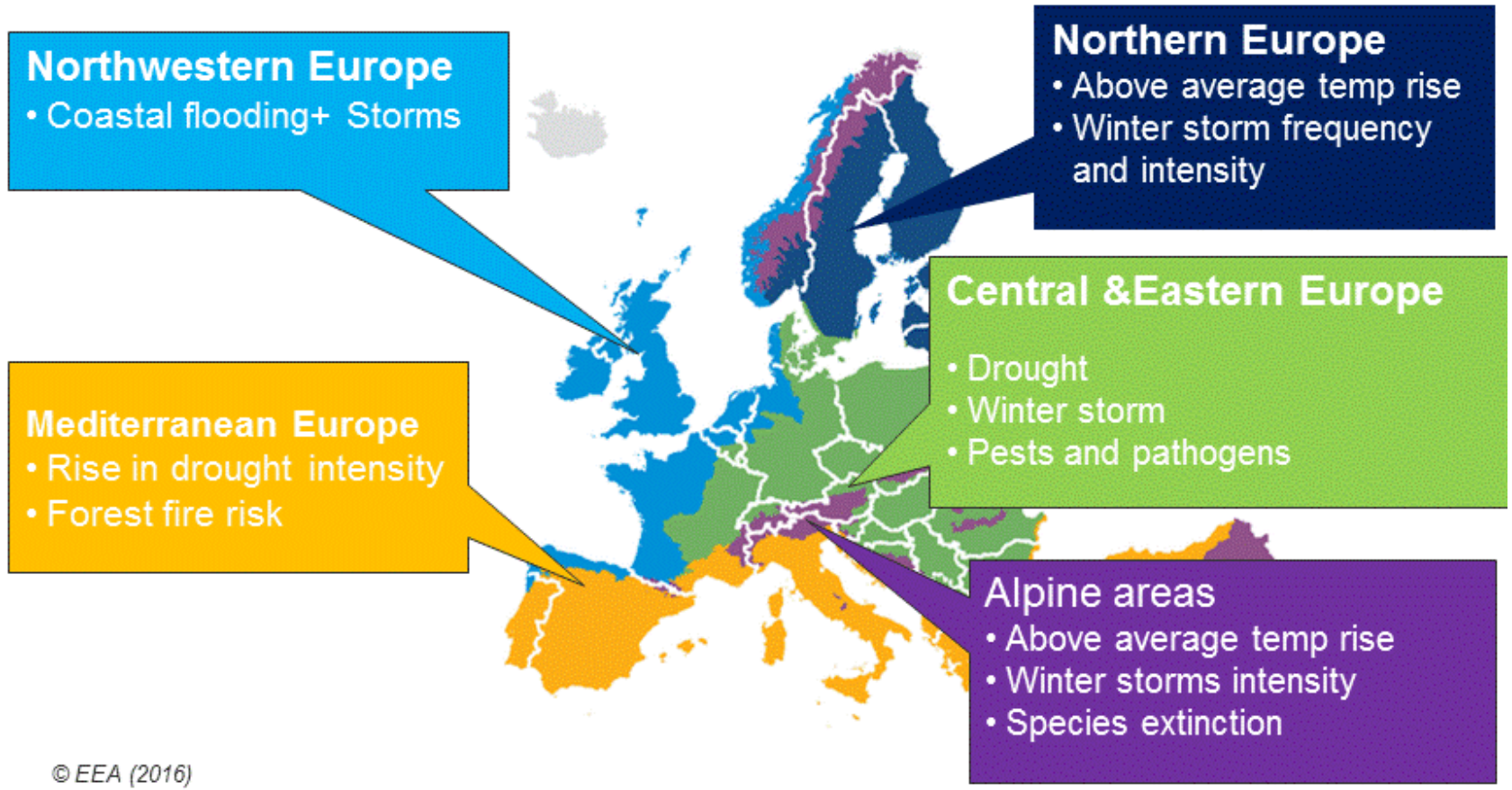
Interreg
Alpine Space
ALPTREES
European Regional Development Fund

EUROPEAN UNION

Interreg
Alpine Space
ALPTREES
European Regional Development Fund

EUROPEAN UNION

Climate change and European Forests

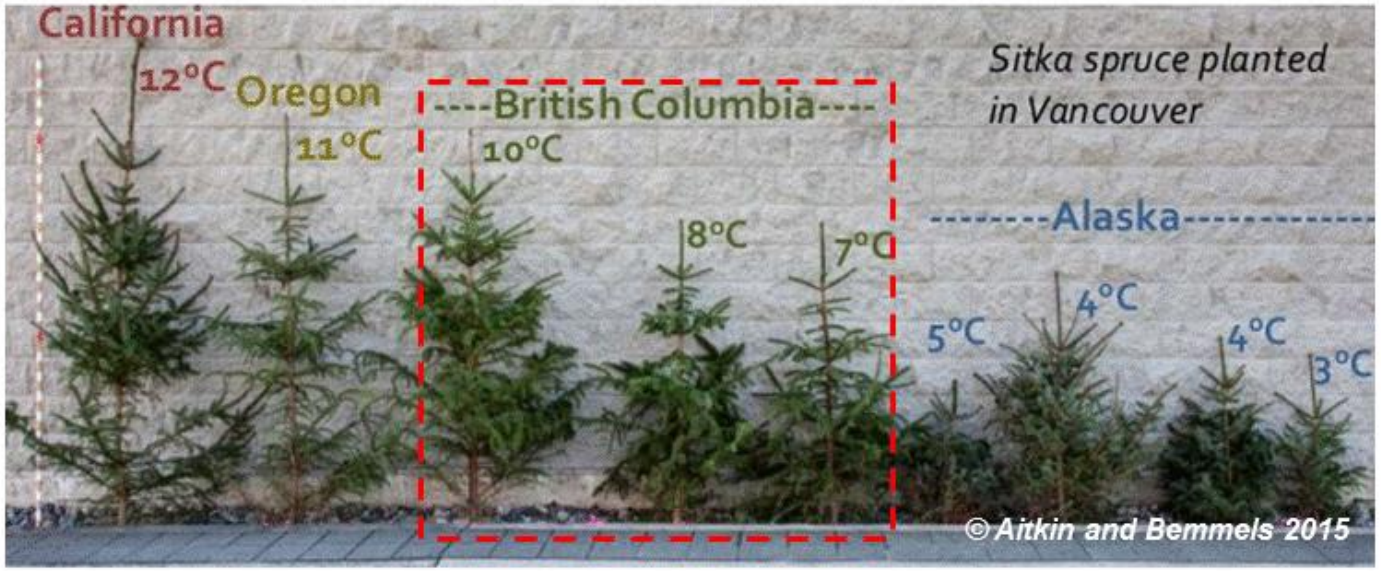


Interreg
Alpine Space
ALPTREES
European Regional Development Fund

EUROPEAN UNION

BFW. Bundesforschungszentrum für Wald

Can we assist adaptation?

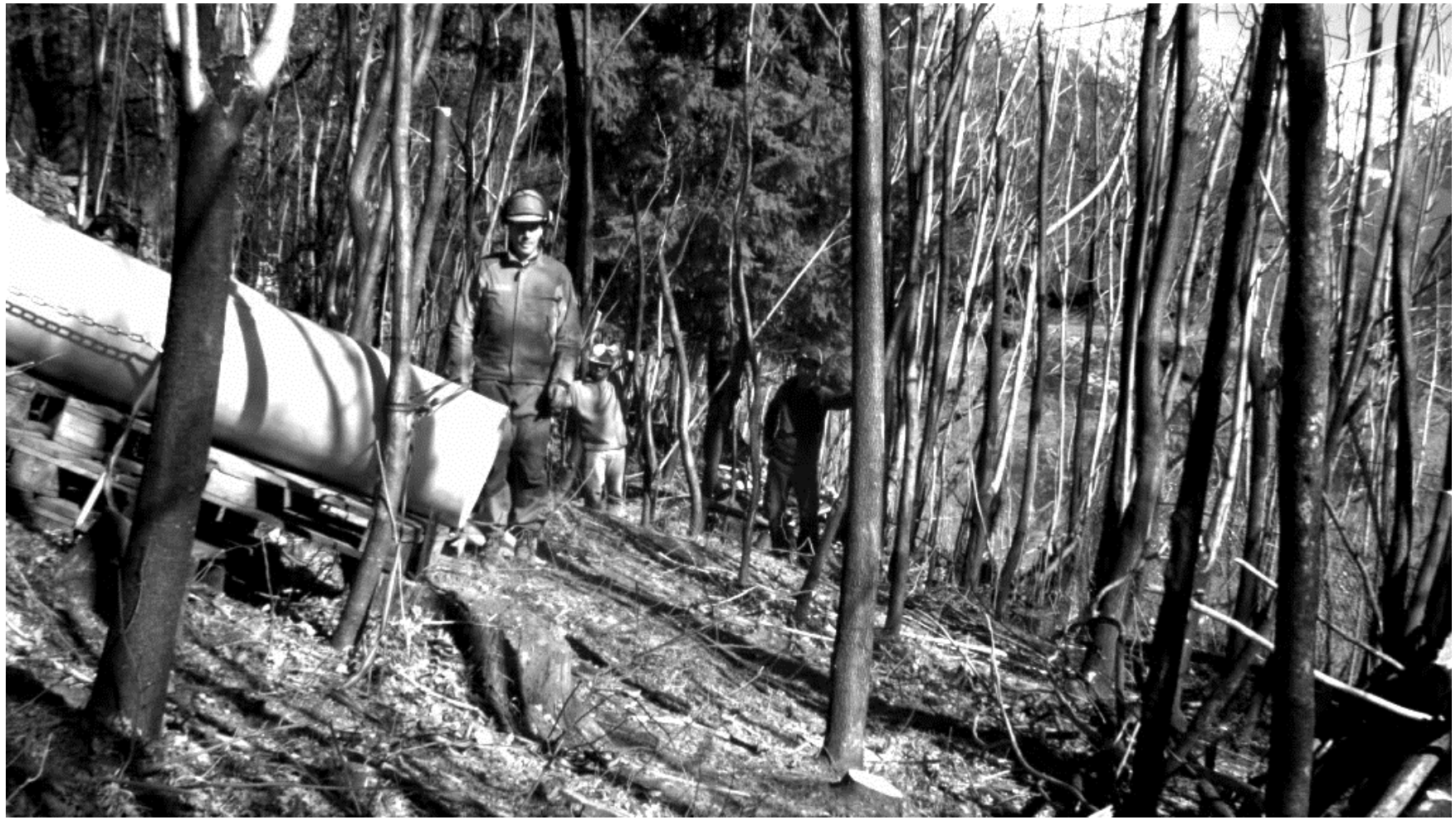


Climate change will alter link to local adaptation

This will result in maladapted populations

Interreg
Alpine Space
ALPTREES
European Regional Development Fund

EUROPEAN UNION

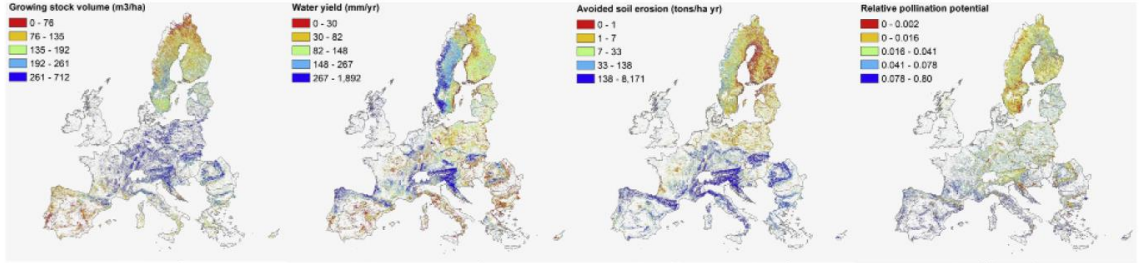


Take home messages :

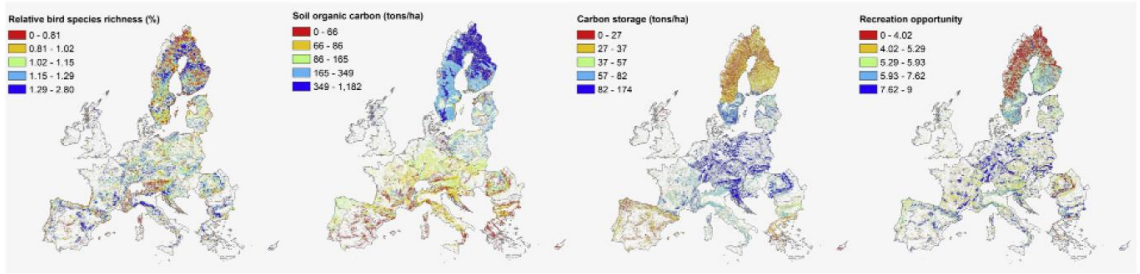
- Forests are an important actor in risks mitigation.
- Need of a clear definition of Forest Based Solutions and what can be or can’t be provided with;
- There is no opposition between FBS and Engineering BS but complementarities.
- FBS are one of the response to the societal request on integrated territorial management including ecosystem services.
- A strong political support is necessary for promoting FBS.
- Still need of scientific and technical knowledge improvement : everybody has a part of th puzzle!

Interreg
Alpine Space
EUROPEAN UNION

- What has been done for rockfall risk has to be reproduced for the other natural risks (SNOWALPS, SLIDEALPS, DEBRISALPS, FIREALPS…).
- Need of multirisks and FES multifunctionality analysis.



Wood | Water supply | Erosion control | Pollination



Habitat | Soil formation | Climate regulation | Recreation

Mapping hotspots and bundles of forest ecosystem services across the European Union

Francesco Orsi[a,b], Marco Ciolli[b], Eeva Primmer[c], Liisa Varumo[c], Davide Geneletti[b,*]

[a] *Landscape Architecture and Spatial Planning Group, Wageningen University & Research, Droevendaalsesteeg 3, Wageningen, 6708 PB, the Netherlands*
[b] *Department of Civil, Environmental and Mechanical Engineering, University of Trento, Via Mesiano 77, 38123, Trento, Italy*
[c] *Finnish Environment Institute (SYKE), Finland*