

# The day after the VAIA storm: an experience from the Dolomites & Experiences with wind damages in Central Italy

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The logo for unibz, featuring the text "unibz" in white lowercase letters on a green square background, with two horizontal white lines above and below the text.

unibz

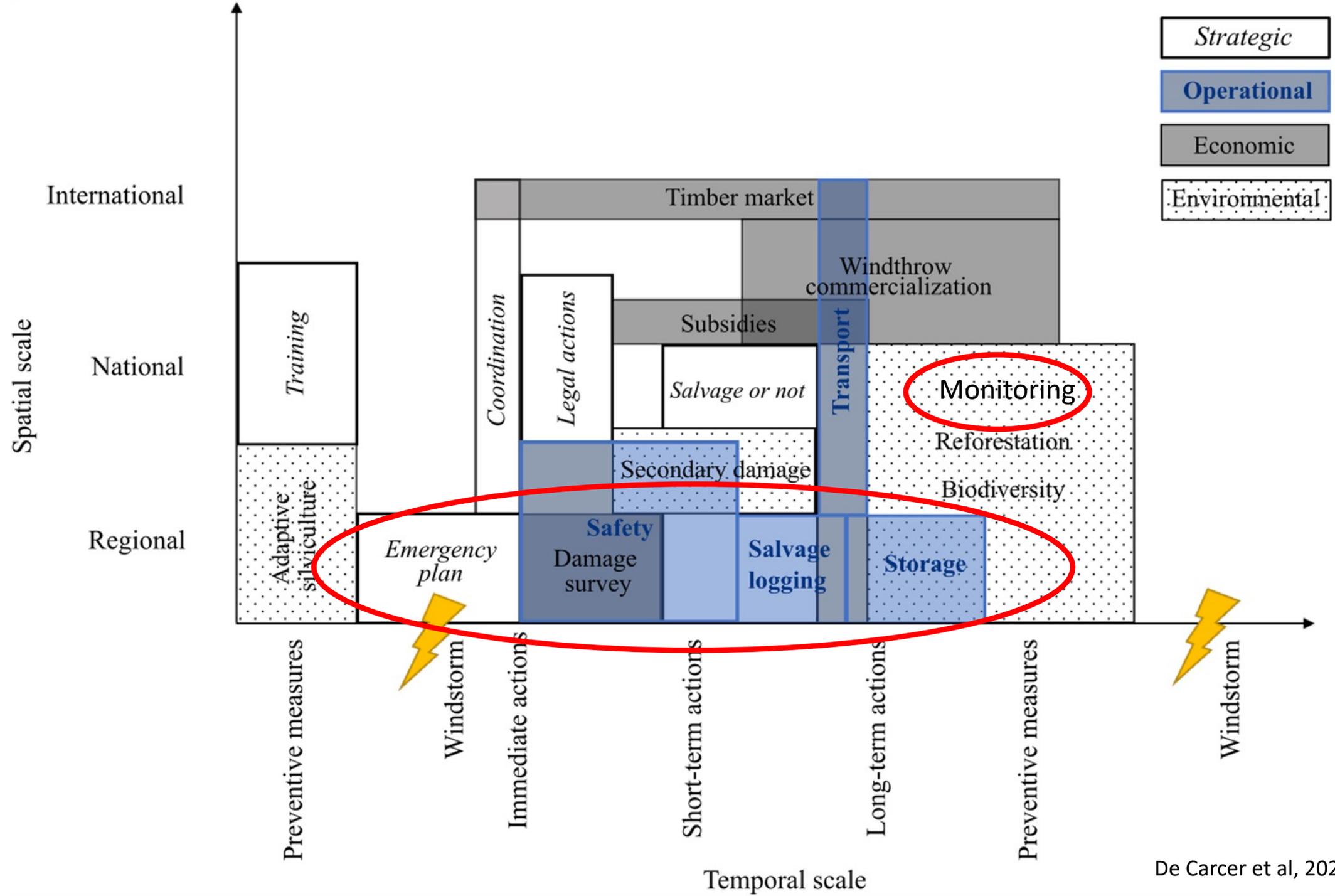
The logo for TESAF, with "TESAF" in a bold, black, sans-serif font. The letter "E" is stylized with three horizontal red bars.

**TESAF**  
Dipartimento Territorio  
e Sistemi Agro-Forestali  
Università di Padova

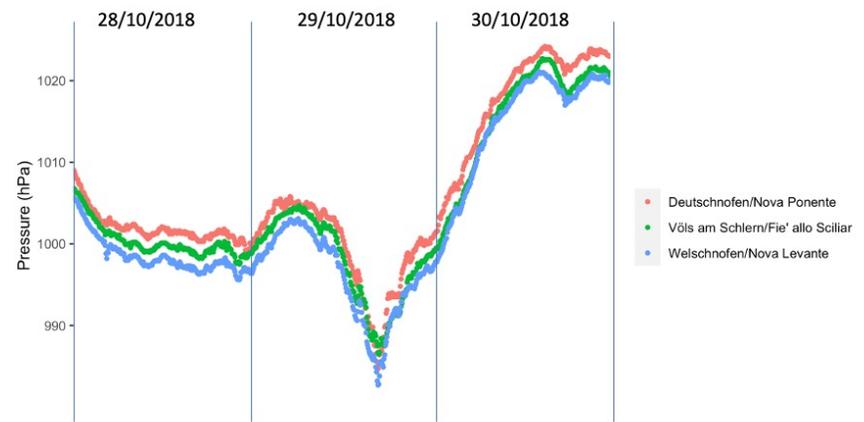


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FOOD, ENVIRONMENT AND FORESTRY

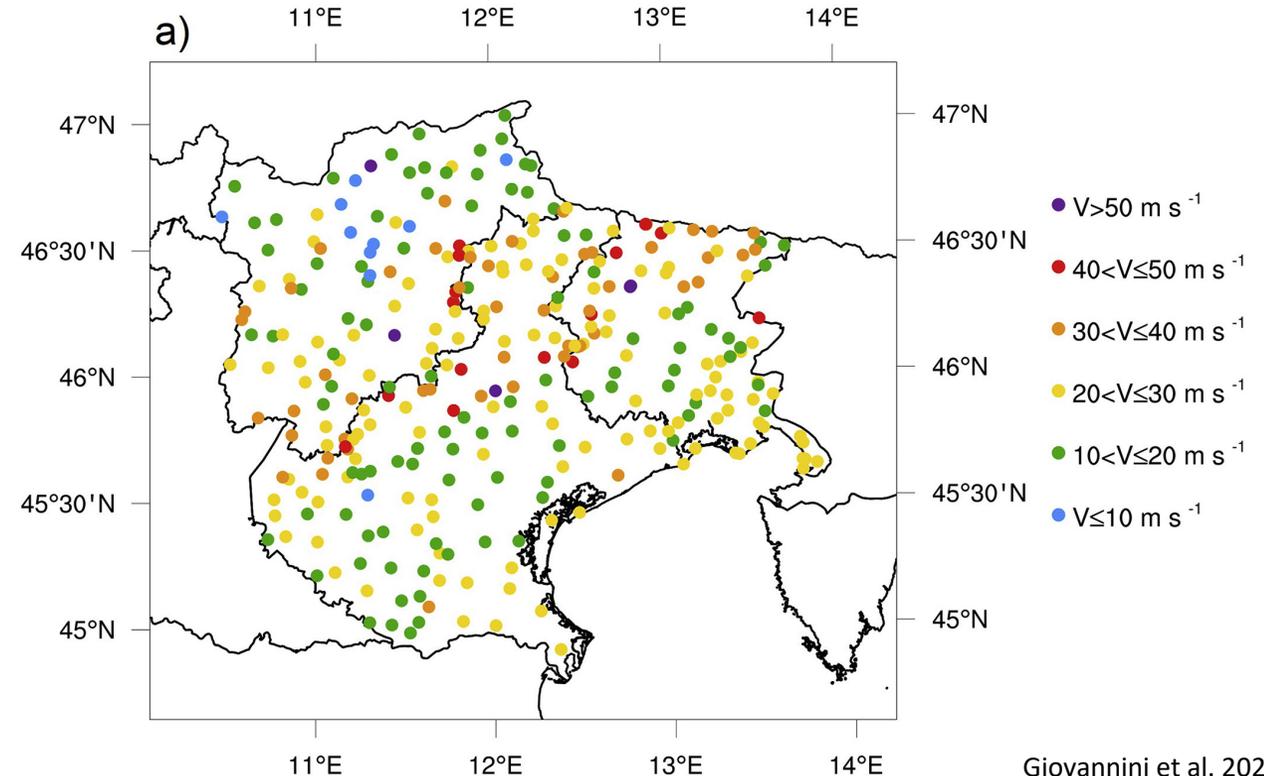
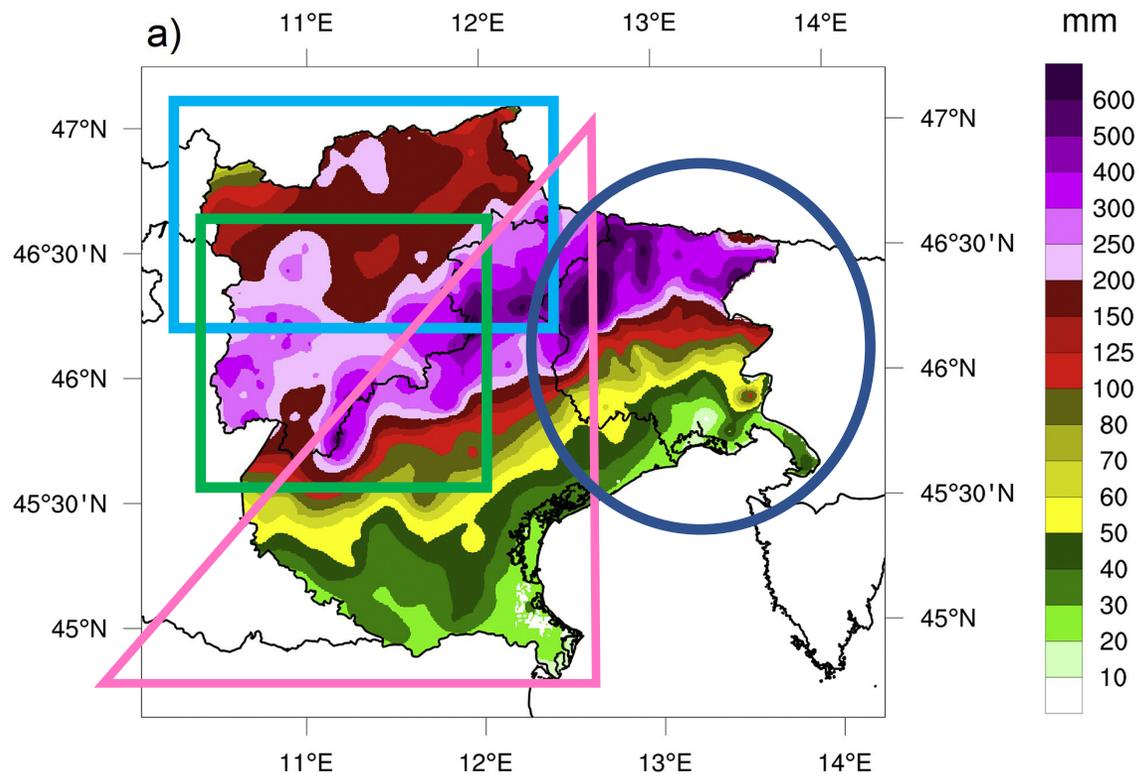


# Meteorological situation



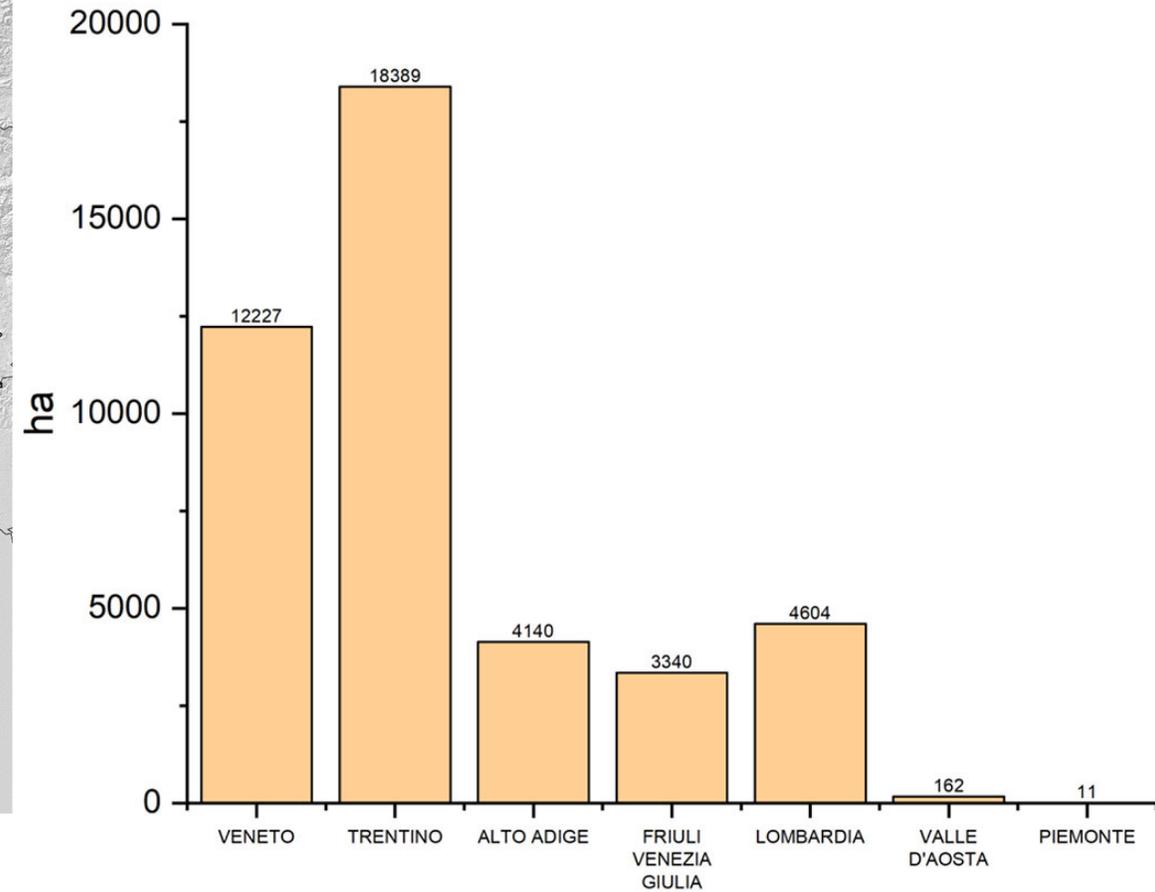
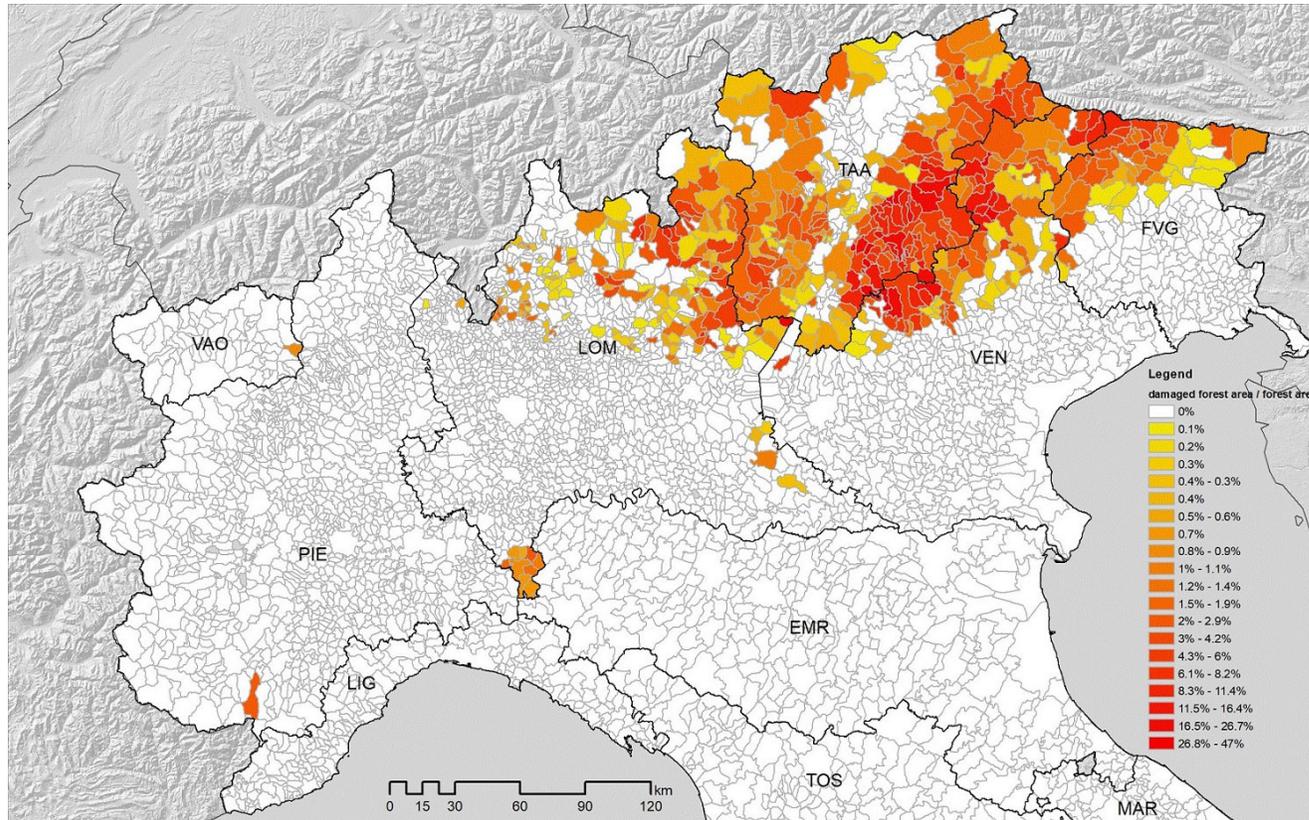
Maximum wind gust at 10 m AGL over the entire event at the available weather stations

72-h accumulated precipitation



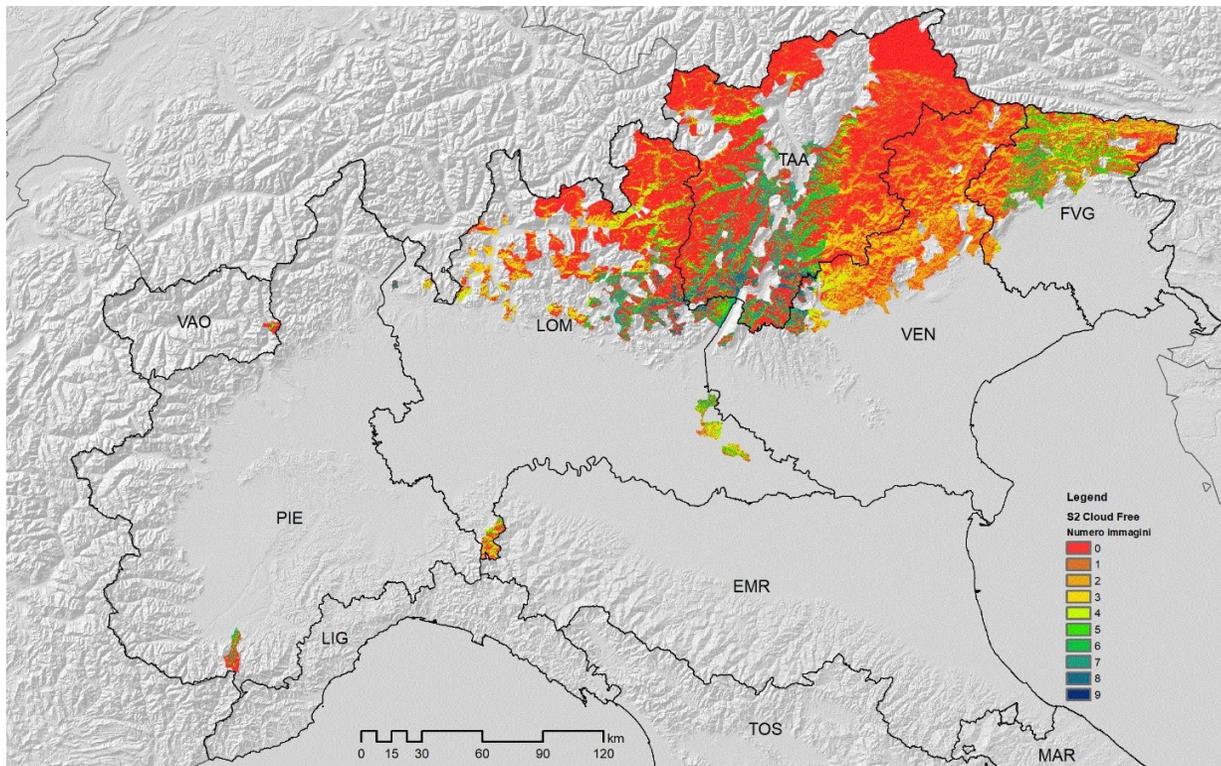
# Large scale forest damage

Damaged forest area/forest area per municipality

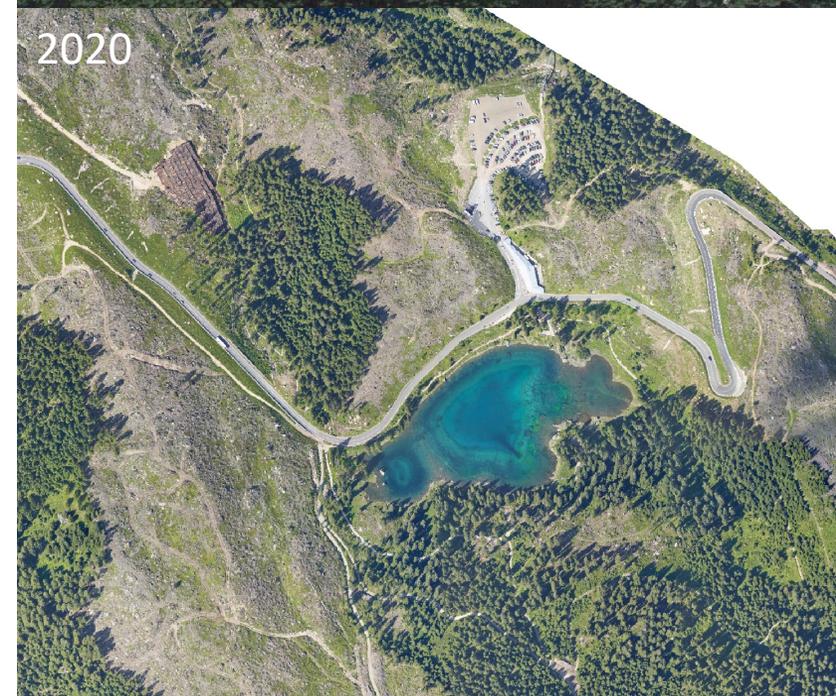


# The day after the event...

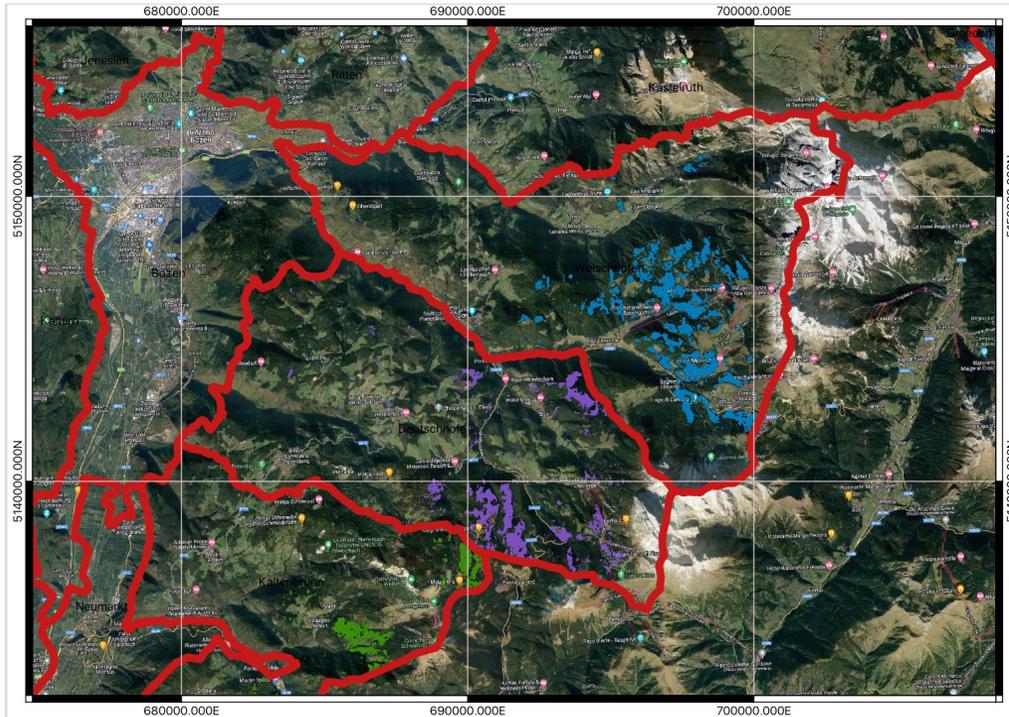
- During the winter 2018-2019 we couldn't retrieve cloud free Sentinel 2 images. Copernicus emergency management, mapping service was activated over the area.
- We could develop the first useful damage maps during the spring 2019.



Chirici et al 2019



# Damages for forest district in South Tyrol



Stazione Forestale	Schianti stimati (mc)	Ripresa annuale (mc/anno) (anno di riferimento 2015)	Massa schiantata rispetto alla ripresa (%)	Massa legnosa sgomberata al 30/11/2020 (mc)	Massa legnosa lavorata rispetto alla massa stimata (%)	Massa legnosa lavorata rispetto alla ripresa annuale (%)
Nova Levante	436.484	24.400	1.788	388.176	89	1.591
Nova Ponente	270.000	25.400	1.063	250.000	93	984
Fontanefredde	205.300	24.700	799	181.893	89	736
San Viglio d. M.	120.000	24.700	486	100.808	84	408
St. Valburga	32.000	31.600	101	94.800	296	300
Dem. Latemar	90.000	5.600	1.607	85.000	94	1.518
Monguelfo	33.700	32.300	104	50.700	150	157
Valdaora	16.000	19.400	82	44.500	278	229
Campo Tures	23.000	23.200	99	40.000	174	172
Castelrotto	43.000	12.700	339	37.534	87	295
Chiusa	34.000	26.500	128	37.380	110	141
San Candido	15.000	17.700	85	32.000	213	181
Brunico	10.000	19.100	52	31.470	315	165

By the end of November 2020, approximately 80 % of the crashed areas was cleared. The clearing work was very fast in some areas (e.g. in Val d'Ega), since due to orographic issues many of the areas were worked using means such as the harvester. The work was faster in the larger crashed areas. In fact, already by the end of September 2019 more than 90% of the areas larger than 100 ha had been cleared (85% above 50 ha and 75% above 30 ha).

# Some numbers from the Latemar state owned forest

In the Autonomous province of Bolzano the corresponding amount of damaged wood is estimated at 1,500,000 cubic metres

Almost 100,000 cubic metres of damaged timber were estimated in the Latemar forest. The normal annual logged stock is 5,600 cubic metres, VAIA damaged the planned utilisation quantity of approx. 18 years.



The costs for the processing of almost 30 €/m<sup>3</sup> did not cover the entire amount of damaged timber (3 million € pre-financing).

Harvest loss 10,000 cubic metres  
Bark loss 9,000 cubic metres

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Own workers 20,000 cubic metres  
Hire of cable cranes 10,000 cubic metres  
Hire of harvester 20,000 cubic metres  
Stock sales 31,000 cubic metres

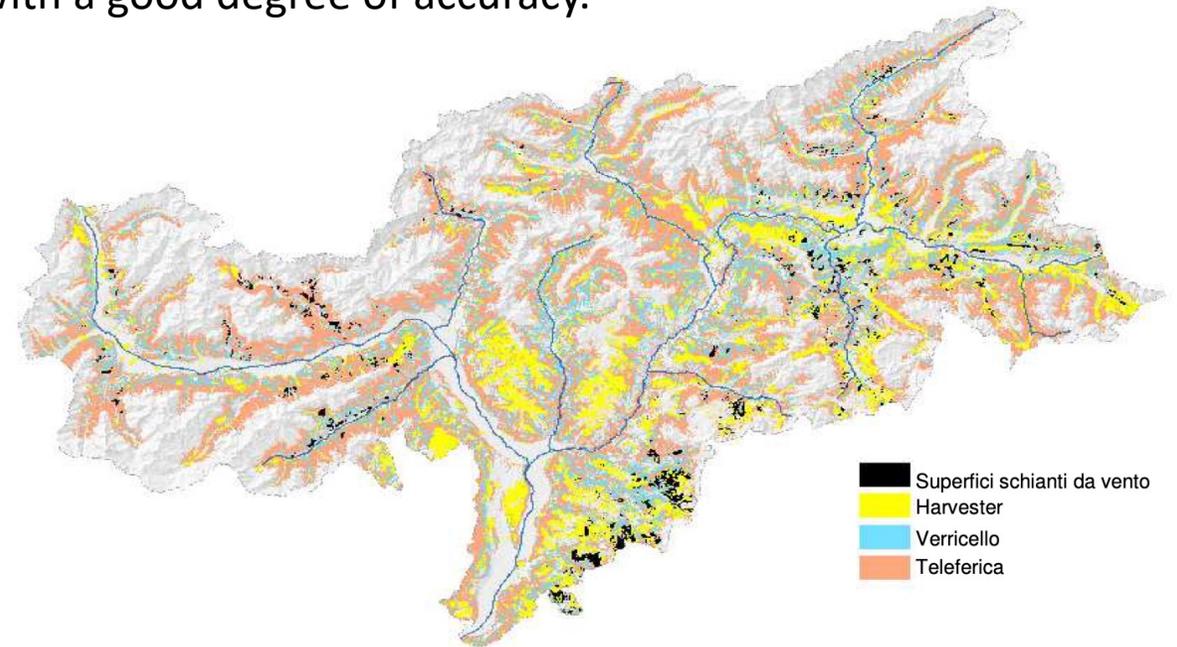
9 storage places have been built

In the months of February to April, up to 25 articulated lorries per day were loaded, which corresponds to a timber volume of over 800 m<sup>3</sup> per day.

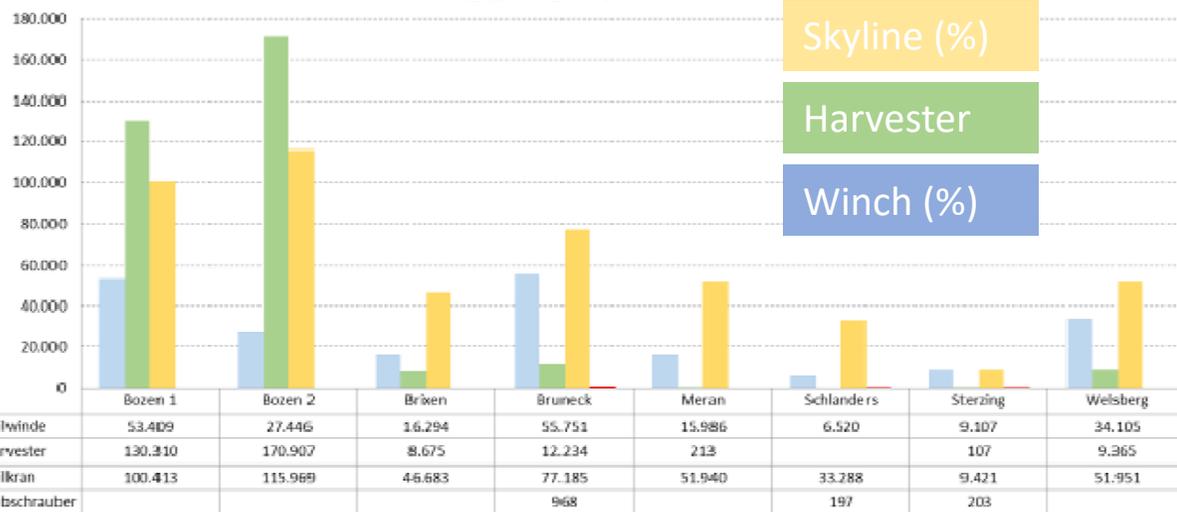
# Which kind of management strategy was adopted?

Ispettorato Forestale	Harvester (%)	Winch (%)	Skyline (%)
Bolzano I	55	23	22
Bolzano II	62	25	13
Bressanone	31	29	40
Brunico	28	35	36
Merano	9	20	71
Silandro	8	31	61
Vipiteno	29	30	41
Monguelfo	44	29	27
<b>TOTALE</b>	<b>37</b>	<b>27</b>	<b>36</b>

On the basis of the modelling of deforestation types developed a few years ago by Techno Innovation South Tyrol, it was possible to estimate the different logging methods with a good degree of accuracy.

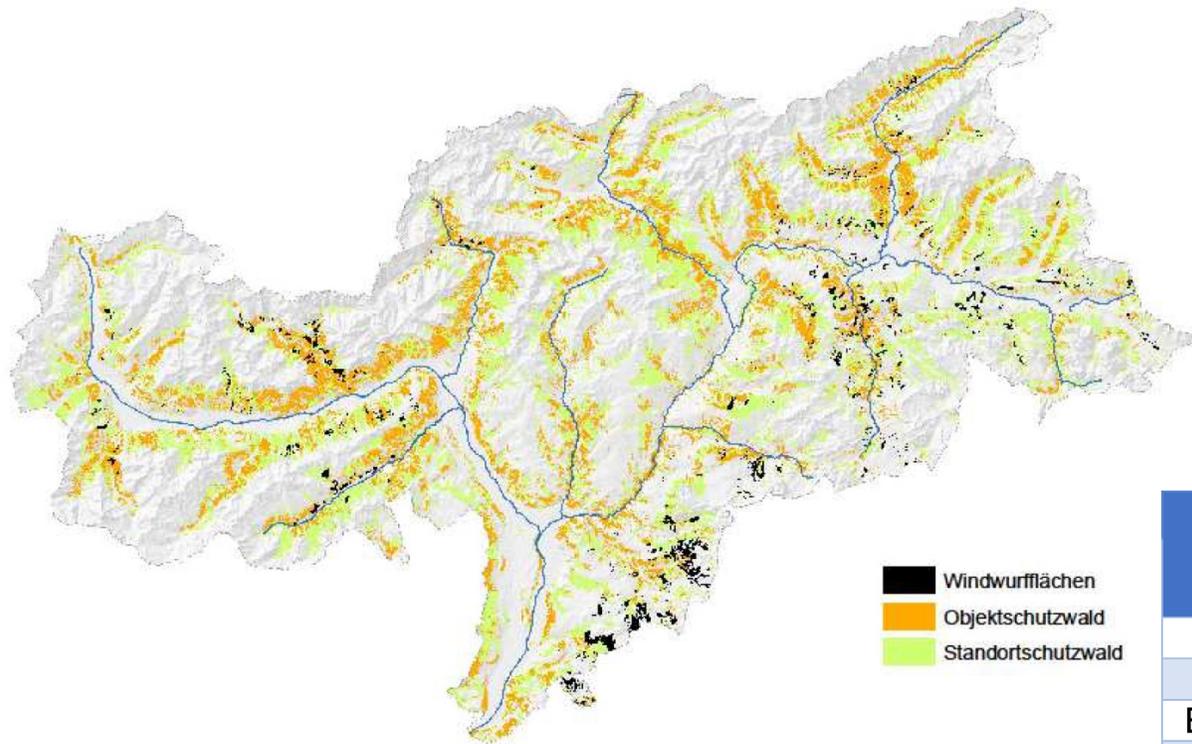


Logging approach



The clearing of the wood mass was mainly done with skyline (47% of the total mass) and harvesters (32%). Only 21% of the mass was removed with a winch.

# How much of the damage concerns protection forests?

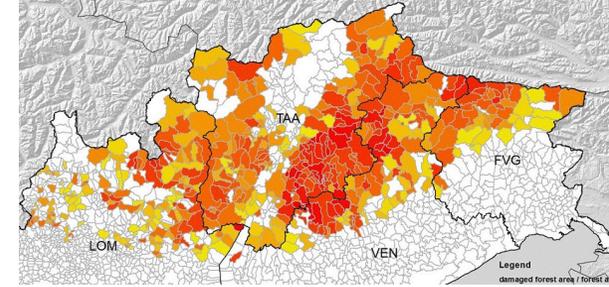


Priorities for implementing the measures

- Approximately 1,000 ha of heteroprotective forest - (technical measures and afforestation)
- Approximately 1,000 ha of autoprotective forest - (afforestation)
- Remaining area with "*sensu lato*" protective function is essentially left to natural regeneration and monitored; any additional reforestation deemed necessary is planned on a case-by-case basis.

Ispettorato Forestale	Damaged protection forests (ha)	Heteroprotective	Autoprotective
Bolzano I	374	25	75
Bolzano II	186	54	46
Bressanone	244	31	69
Brunico	613	54	46
Merano	796	74	26
Silandro	221	37	63
Vipiteno	16	67	33
Monguelfo	204	24	76
<b>TOTALE</b>	<b>2.655</b>	<b>50</b>	<b>50</b>

# Interregional monitoring plan



Friuli Venezia Giulia, Veneto, Lombardia, Trentino, Alto-Adige

- the timing of soil cover with a vegetation cover referring to the initial initial successional stages;
- the timing of the establishment of regeneration with species from the final successional stages
- the effect of logging activities, especially in situations where the use of heavy vehicles in sub-optimal weather conditions resulted in soil compaction and risk of erosion.
- the influence on the regeneration of biotic disturbances (especially ungulates);
- the influence of distance from the edge of the residual stand;
- the effect of logging strategy on the timing of regeneration;
- the effect of stand characteristics on the timing of regeneration establishment (pH, altitude, exposure, slope, forest type, etc.).

# Interregional monitoring plan

PLOT 80 CODICE ADS: 8202.HL DATA RILIEVO: 20/7/2021

Rinnovazione 20-150 cm piante >150

N	Specie	Diámetro	Altezza	Origine Pre/Vala(SN)	Altezza
1	1321				
2	1321				
3	1321				
4	1321				
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

Rilievo Legno morto

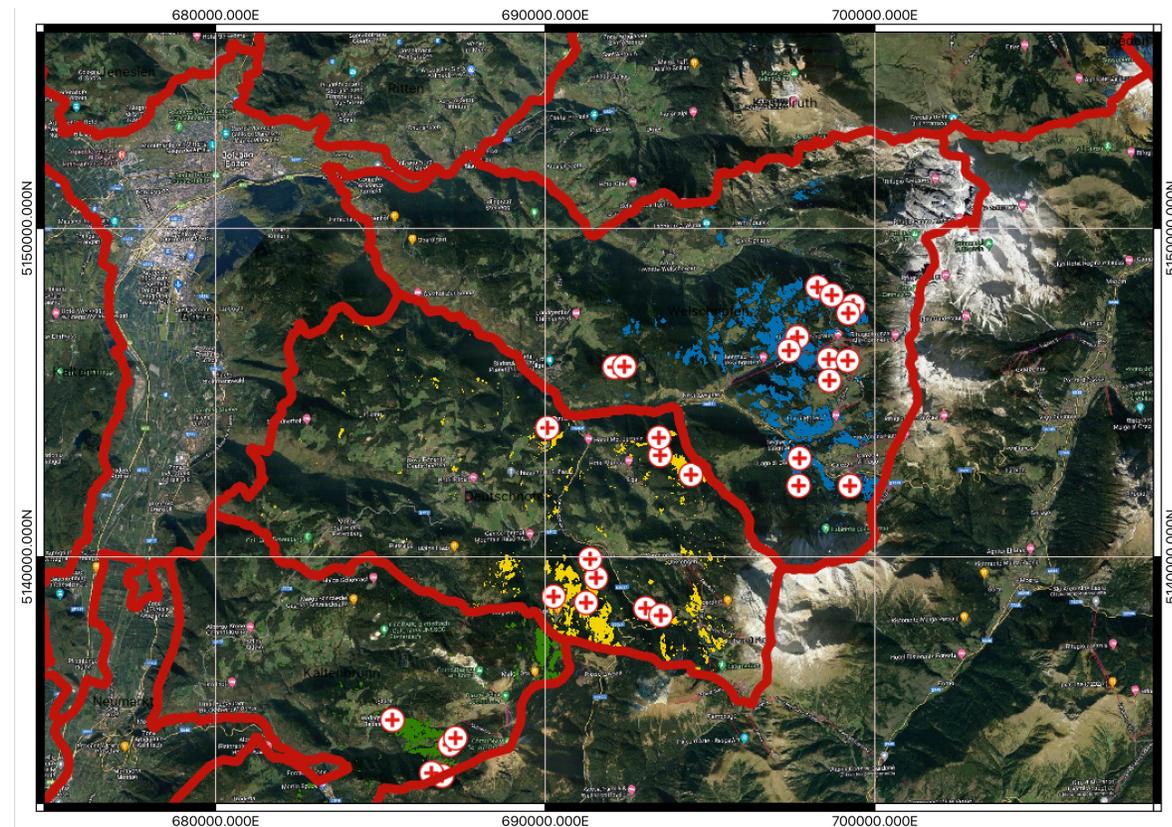
N	Tipo (C/L)	Tipologia DW (ST, SS, L/G, SK)	Diam. (cm)	lung. (m)	Degradato (1, 2, 3)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
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20					
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23					
24					
25					
26					
27					
28					
29					
30					

Subplot rinn. <20cm

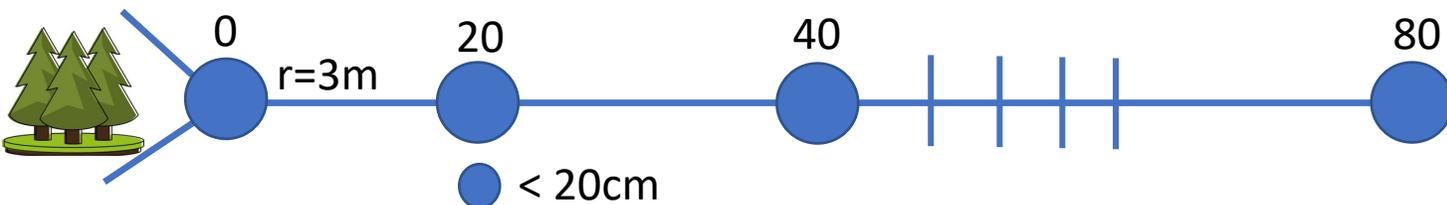
Specie	Pre Vala (SN)	Substrato (S/L)	N	conteggio
20	N	S	3	-

Spessore orizzonte organico del suolo (cm): 30 Profondità di campionamento (se <30cm): 30

Data e ora foto plot 0 (PLO): 20/7/2021 PL80 12:54  
Rilevatori: Mattia Cöschke, Sabine Schweitzer



20-150cm , >150cm

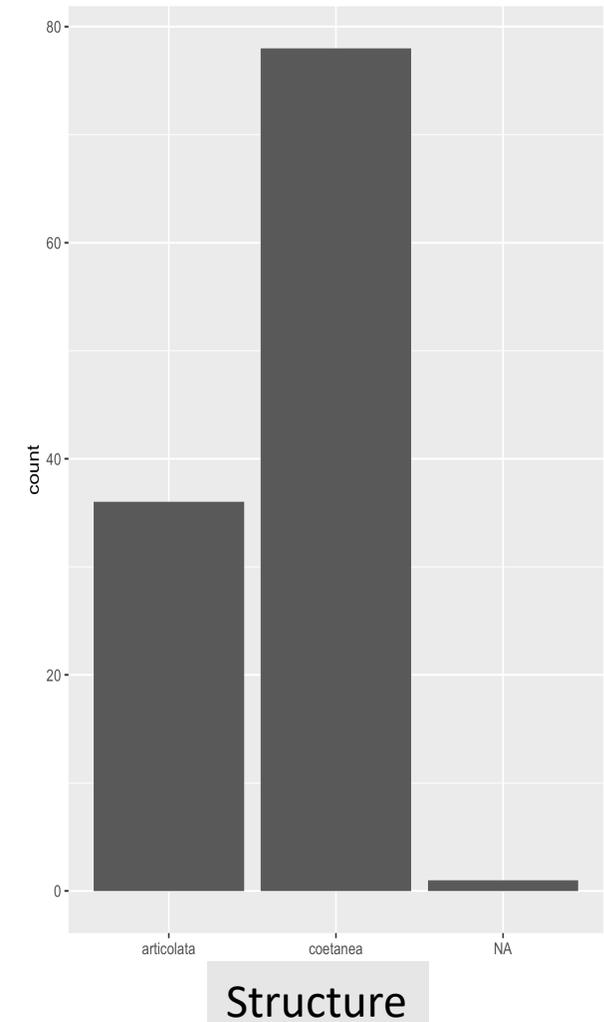
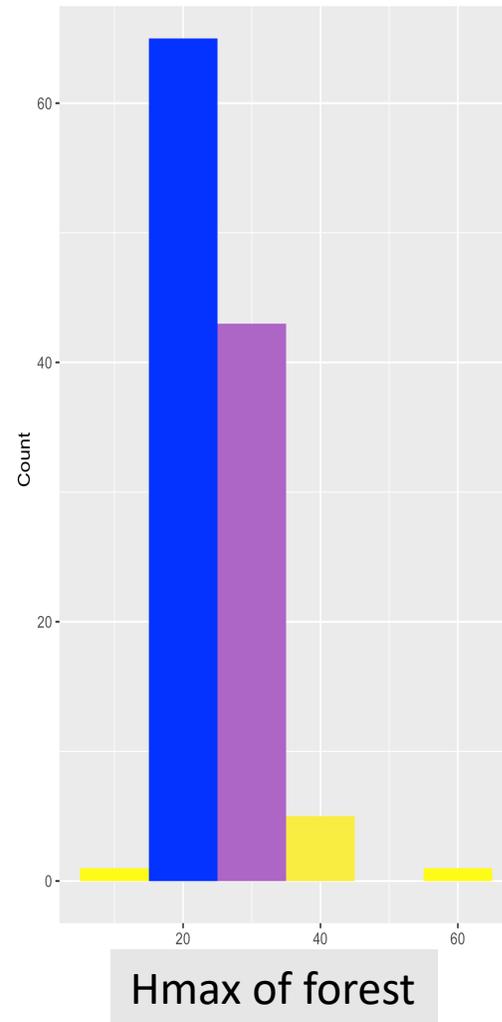
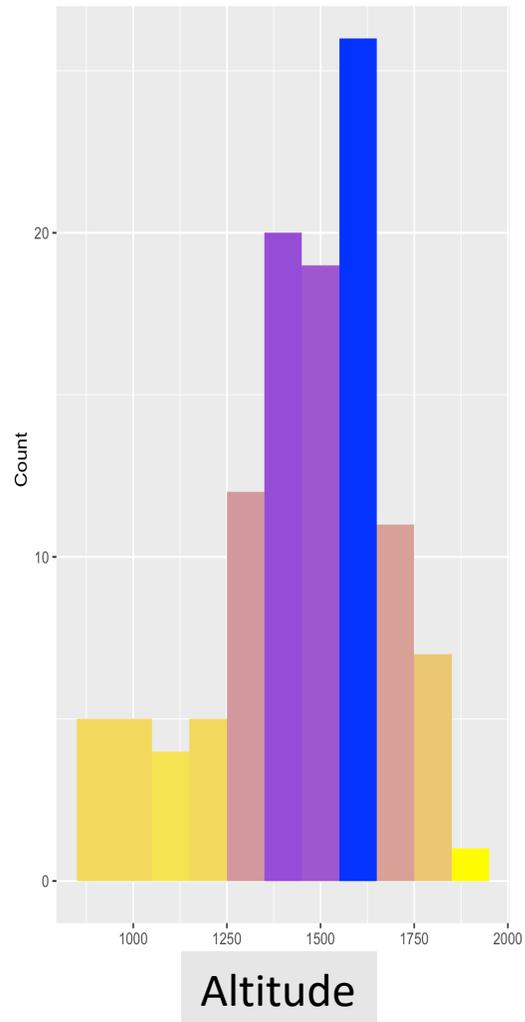
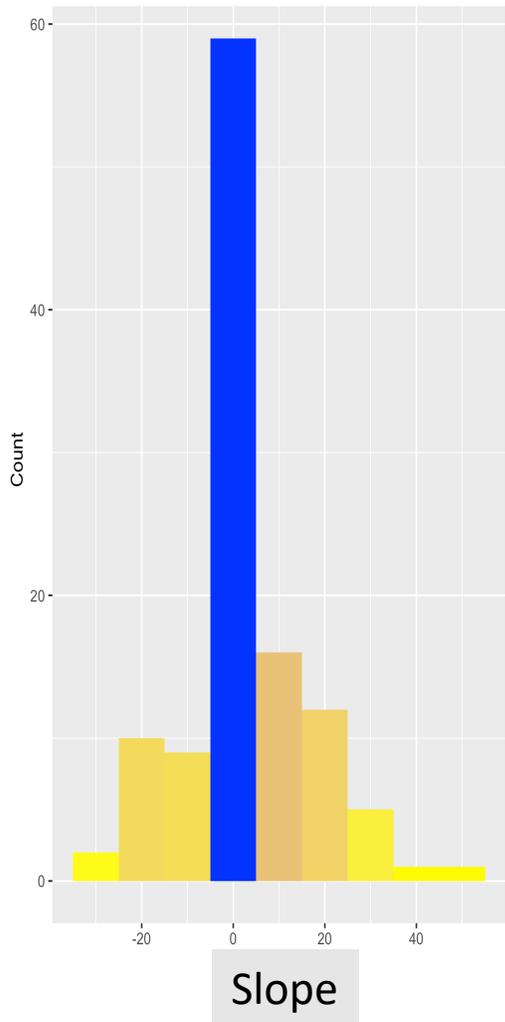


Minimum area of windthrow: 4 ha

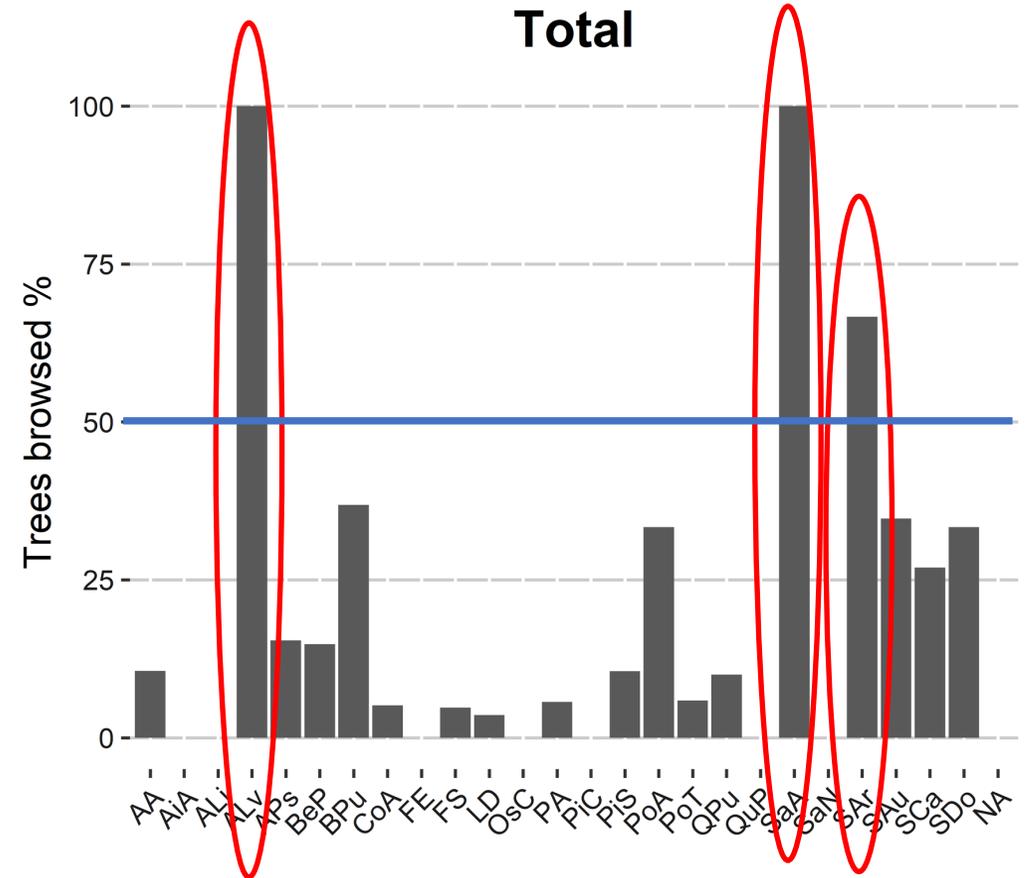
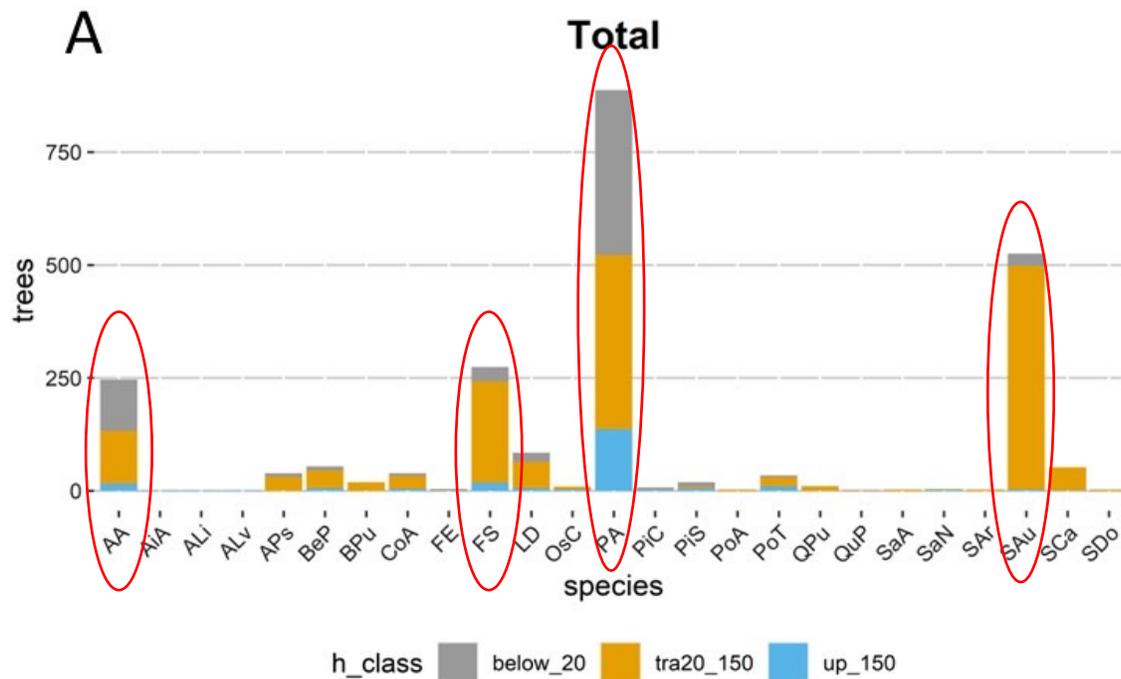
110 Transects and 440 plots

Activity funded by Ministry of Agricultural, Food and Forestry Policies

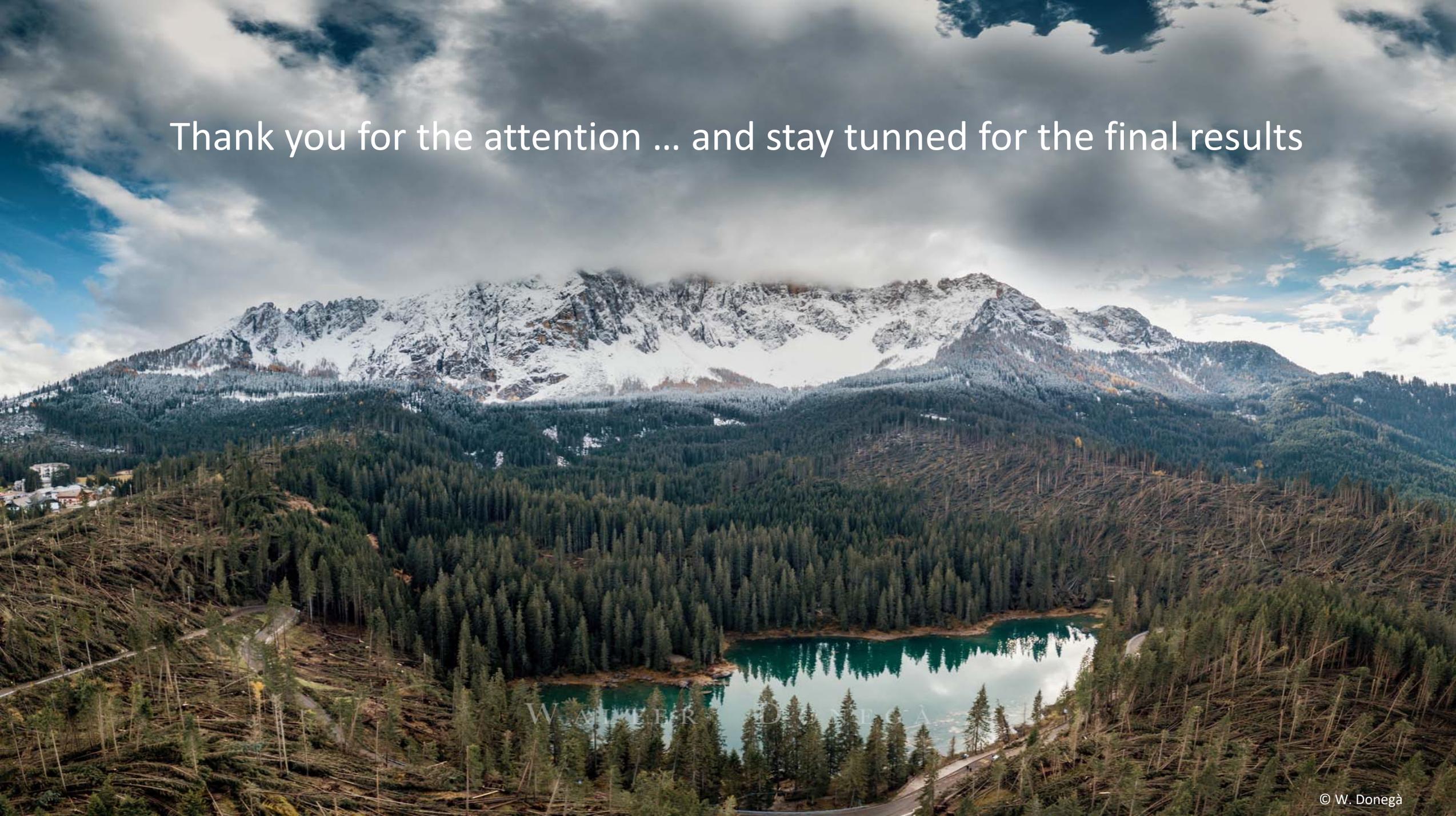
# Interregional monitoring plan: first results



# Interregional monitoring plan: first results



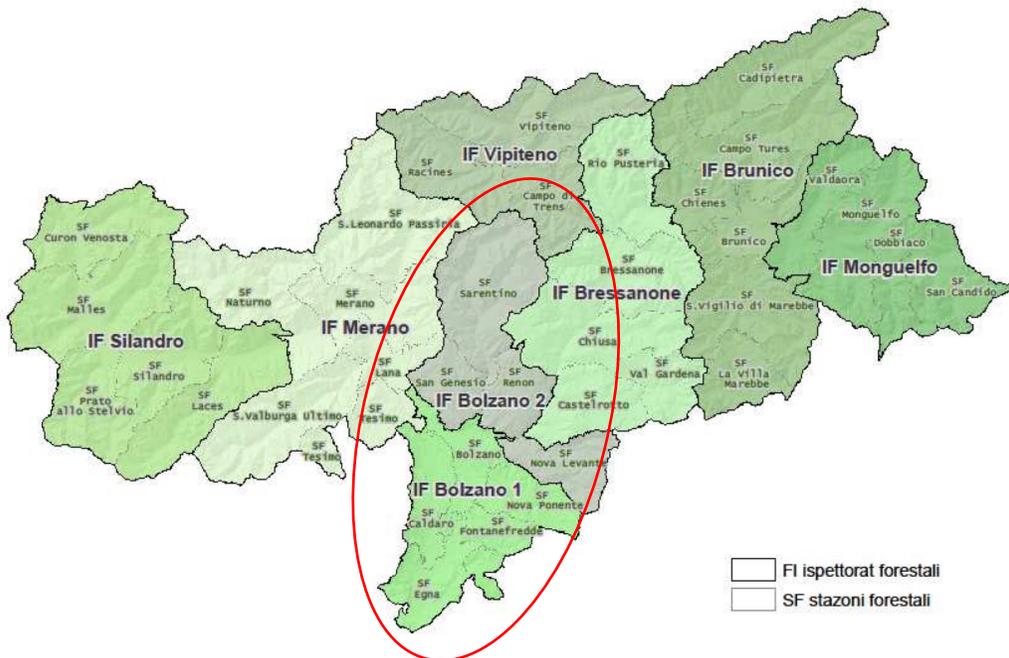
Thank you for the attention ... and stay tuned for the final results



WALTER DONEGA

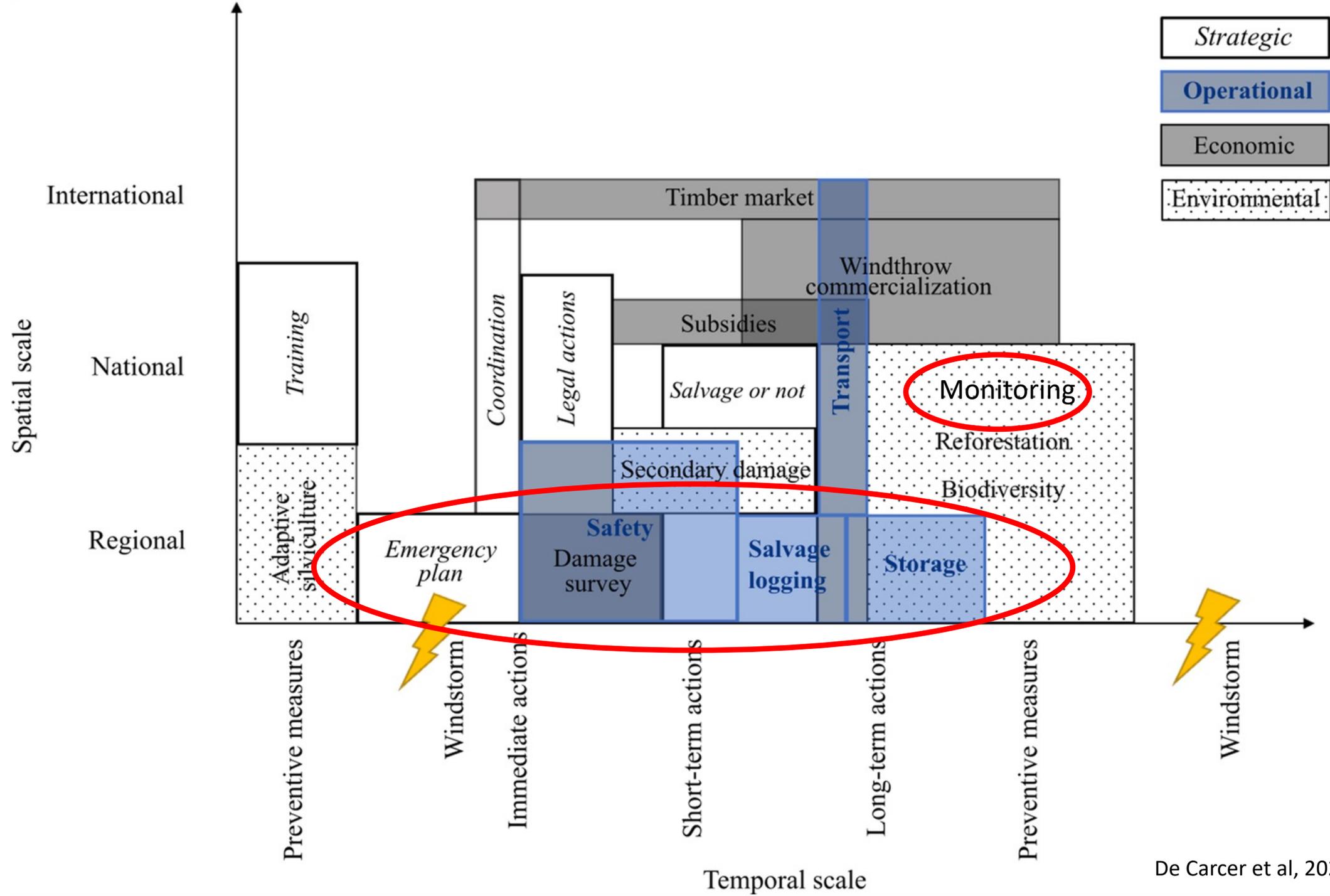
# Damages for forest district in South Tyrol

The timber clearing work began in the first month after the weather event. By the end of November 2020, i.e. approximately two years after the event, a timber mass of 1.63 million gross cubic metres had been cleared. On average, this quantity corresponds to the utilisations of almost 2.5 years for the whole of South Tyrol.



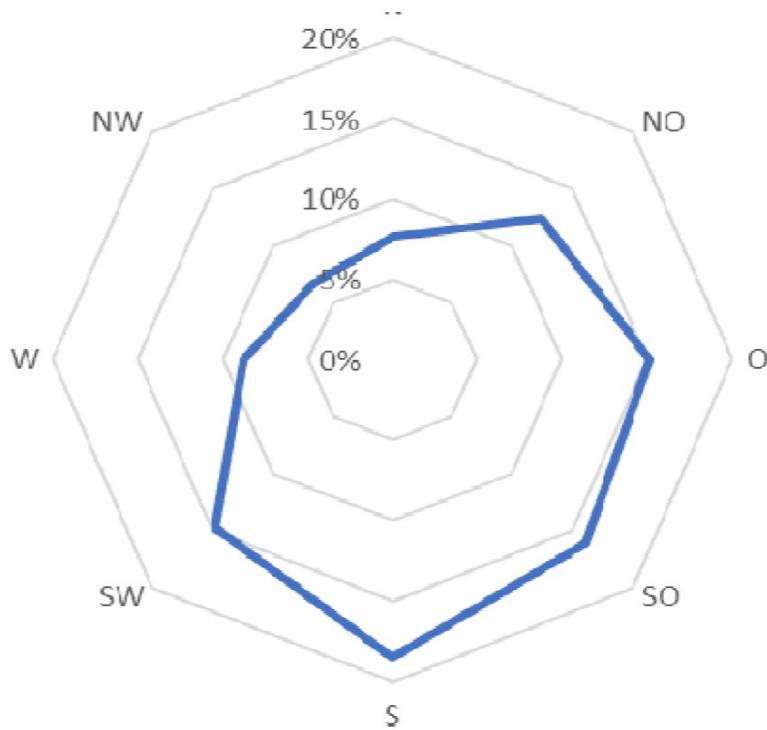
Ispettorato Forestale	Superficie catastale (ha)	Superficie forestale (ha) secondo l'inventario Forestale Nazionale (anno di riferimento 2015)	Indice di boscosità (%)	Superficie schiantata (ha)	Superficie schiantata in rapporto con la superficie forestale (%)
Bolzano I	58.276	36.311	62	1.385	3,8
Bolzano II	65.306	43.286	66	820	1,9
Bressanone	100.021	55.403	55	440	0,8
Brunico	124.130	53.607	43	1.250	2,3
Merano	131.606	52.867	40	1.014	1,9
Silandro	123.064	39.468	32	320	0,8
Sipiteno	65.564	28.630	44	22	0,1
Monguelfo	71.978	39.322	55	667	1,7
<b>TOTALE</b>	<b>739.945</b>	<b>348.893</b>	<b>47</b>	<b>5.918</b>	<b>1,7</b>

Ispettorato Forestale	Schianti stimati (mc) <sup>2</sup>	Ripresa annuale <sup>1</sup> (mc/anno) (anno di riferimento 2015)	Massa schiantata rispetto alla ripresa (%)	Massa legnosa sgomberata al 30/11/2020 (mc)	Massa legnosa lavorata rispetto alla massa stimata (%)	Massa legnosa lavorata rispetto alla ripresa annuale (%)
Bolzano I <sup>6</sup>	482.300	63.000	766	441.306	92	700
Bolzano II <sup>3</sup>	437.884	70.000	625	390.176	89	557
Brunico	225.000	111.000	203	253.961	113	229
Merano	76.050	116.900	65	137.333	181	117
Monguelfo	66.700	80.400	83	129.050	193	161
Bressanone <sup>4</sup>	97.260	94.000	103	107.851	111	115
Demanio <sup>5</sup>	93.150	9.900	941	90.600	97	915
Silandro	40.000	52.100	77	56.157	140	108
Vipiteno	18.000	47.700	38	21.438	119	45
<b>TOTALE</b>	<b>1.536.344</b>	<b>645.000</b>	<b>238</b>	<b>1.627.872*</b>	<b>106</b>	<b>252</b>



# Damage and topography of damages in South Tyrol

Wind felled areas, aspect



Wind felled areas, altitude

