



Transferability and Replicability plan

ACTION C8

Consiglio Nazionale delle Ricerche-
Istituto per i Sistemi Agricoli e Forestali del
Mediterraneo

(CNR-ISAFO)



LIFE16 CCM/ES/000065

CLIMARK

Forest management pro-
motion for climate change
mitigation through the
design of a local market
of climatic credits

DELIVERABLE

13

Table of Contents

1	Brief summary of contents	4
2	Objectives of Action C8.....	5
3	Assessment of Indicators and Testing of Climatic Credits	5
3.1	Carbon stock and Sink	7
3.2	Water Cycle Regulation.....	8
3.3	Biodiversity	8
4	Preliminary results on indicators	8
5	Approach and Contacts with local carbon market.....	9
5.1	Replicability of Climark approach in Regione del Veneto	10
5.2	Planned Activities	11
6	Transferability through dissemination	11

1 Brief summary of contents

Action C8 deals replicability and transferability of the LIFE CLIMARK project in other socio-economic and environmental conditions. The Action C8 objectives are to: 1) define and test the climatic credit using indicators on Sustainable forest management (SFM) and 2) to replicate the implementation actions in Italy. In the deliverable, preliminary results on SFM indicators are reported. Moreover, planned activities for transferability and replicability in Veneto Region were reported.

2 Objectives of Action C8

The LIFE CLIMARK project replicability and transferability (Action C8) strategy is essential in the project. This action will be implemented in Catalonia and in the Veneto Region, which has a credit market created during the project CARBOMARK (LIFE07 ENV/IT/000388), with the coordination of CNR partner.

The main objectives of the action C8 is to: 1) define and test the climatic credit concept as developed in CLIMARK project using data/indicators on Sustainable forest management (SFM) collected during the project ManFor C.BD. (LIFE09 ENV/IT/000078) and 2) to replicate the implementation actions in Italy

3 Assessment of Indicators and Testing of Climatic Credits

The first part of the action is devoted to check, after 5 to 7 years the ecosystem responses to different silvicultural treatments in the 2 ManFor C.BD. sites located in Veneto Region (fig.1) and to define and test the climatic credit.



Figure 1: Location of *Lorenzago di Cadore* and *Bosco del Cansiglio* test sites

The two forests, one beech (fig.2) and one mixed conifer stands (fig.3), have been selected as representative of the Region and offer an opportunity to replicate the CLIMARK approach in different European forest contexts.

In the site of Cansiglio, traditional and innovative techniques were compared, plus the no-intervention or delayed-intervention thesis. In Lorenzago di Cadore, the site lies in a mixed, uneven-aged coniferous forest (silver fir 51%, Norway spruce 46%, European larch 2%, beech 1%) traditionally managed according to the selection system. Innovative silvicultural treatment consists the contemporary harvesting of a few mature trees and thinning of intermediate-sized trees all of them being arranged into small groups, make possible a minimum degree of mechanized harvesting. Such demonstrative/innovative practice has been implemented by the opening of strip clear-cuttings 60 m long (1½ top height) and 20 m wide (½ top height).

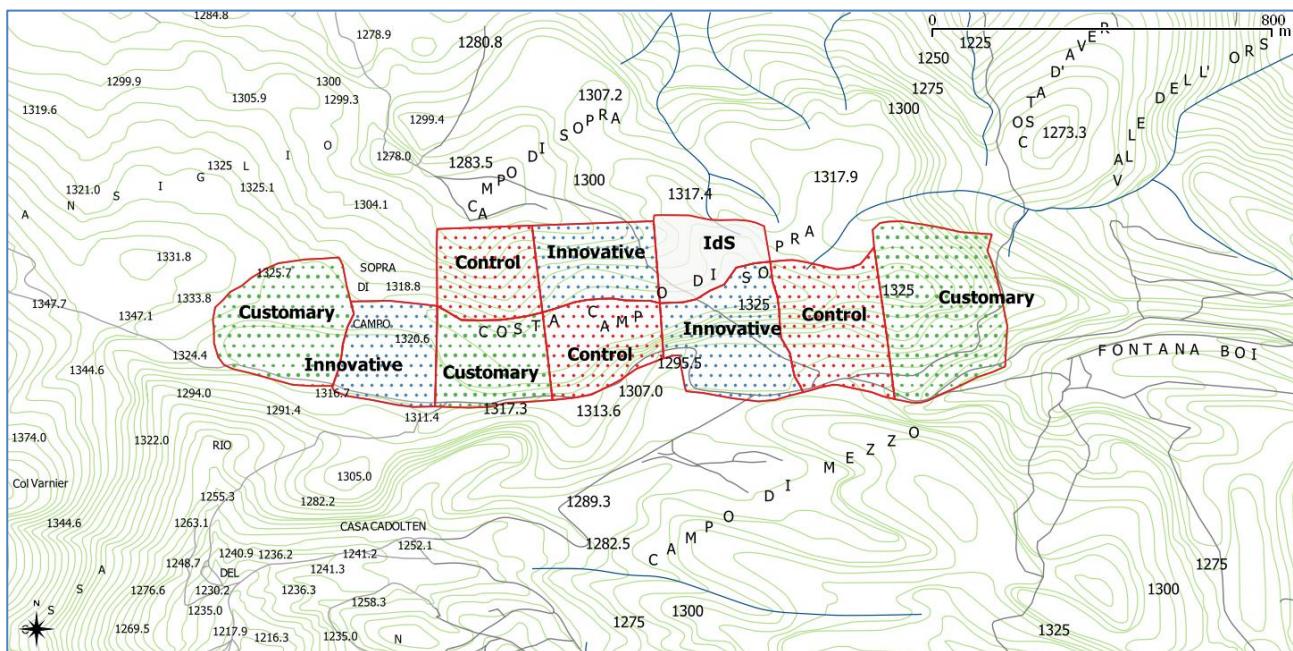


Figure 2: Cansiglio test site, where: in green dotted areas the traditional forest management was applied, in blue dotted areas a management approach to improve the multifunctional role of forest was proposed by LIFE+ ManFor C.BD., and red dotted areas were the control without silvicultural treatment.

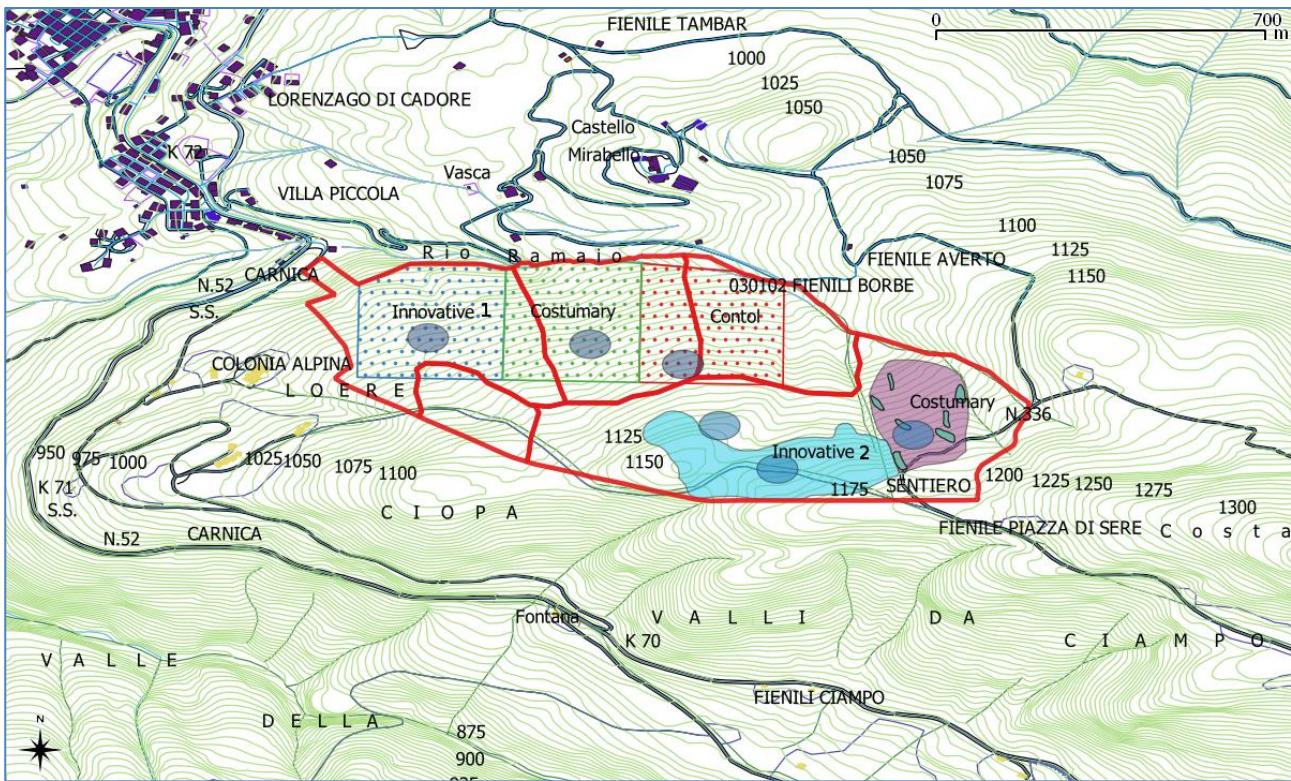


Figure 3: Lorenzago di Cadore test site, where: in blue areas (Innovative 1 and 2) management approaches to improve the multifunctional role of forest were proposed by LIFE+ ManFor C.BD, in green dotted and violet areas the traditional forest management was applied, in red dotted area no silvicultural treatment was applied.

3.1 Carbon stock and Sink

In each management option available at these sites (2-3 per site) and in a reference area, Climate regulation (Ecosystem Service targeted 1) will be assessed through the following indicators:

1. Aerial Carbon stock, after 5-7 years of selvicultural treatments in the permanent ManFor C.BD. plots (for a total of 32 permanent sampling areas);
2. Soil organic carbon and litter carbon pools, to estimate the variation of carbon in soil and litter (81 plot in Cansiglio and 54 in Lorenzago), comparing the results with data of ManFor C.BD. project.
3. Carbon Sink capacity, assessed throughout tree growth in the last 10 years (5 cores per plot, for a total of 75 cores);
4. Carbon Stock in products (substitution effect), analysis of trees quality to foresee the woody products of the stand to evaluate the potential of C pools in timber and firewood.

3.2 Water Cycle Regulation

The component of climatic credit, related to the water interaction between forest and atmosphere (Ecosystem Service targeted 2, - Water cycle regulation), will be evaluated by the intrinsic water use efficiency (iWUE). This ecophysiological parameter will be analysed using the isotopic ratio of cellulose (or whole wood if we found the same signal) of tree rings. Using this method iWUE will be analysed in relation to growth and forest management. In each site, codominant trees will be selected per thesis and control to analyse the isotope ratio (27 cores in Cansiglio and 18 cores in Lorenzago, at least the last 15 years, for a total of 675 samples).

3.3 Biodiversity

The effect of the different management options on biodiversity (Ecosystem Service targeted 3), performed in each site, will be assessed using the Index of Potential Biodiversity (IPBB), which considers forest structural features suitable for biodiversity conservation (e.g. habitat trees, deadwood).

The protocol has been translated into Italian for easiest use and to transfer the approach to Italian site managers (annex 1)

All these measurements will be useful to define and test “climatic credit” and set the model ORGEST to Italian situation. After the analyses, guidelines to realize mitigation project and to calculate climatic credit will be developed.

4 Preliminary results on indicators

In the section, preliminary results on indicators assessment, deriving from ManFor C.BD., will be briefly presented. The indicators (Aerial Carbon stock, Soil organic carbon and litter carbon pools, carbon Stock in products, IPBB), have been combined through both normalization and standardization to assess the overall effect of the different management options. Preliminary results show how innovative management in both sites (INN_Can, INN_1_Lor, INN_2_Lor) have a positive effect compared to the no practice (NO PRACT_Can, NO PRACT_Lor) and traditional management (TRAD_Can, TRAD_Lor). In the Cansiglio site the traditional cut, considering the indicators mentioned above, is equivalent to a non-intervention.

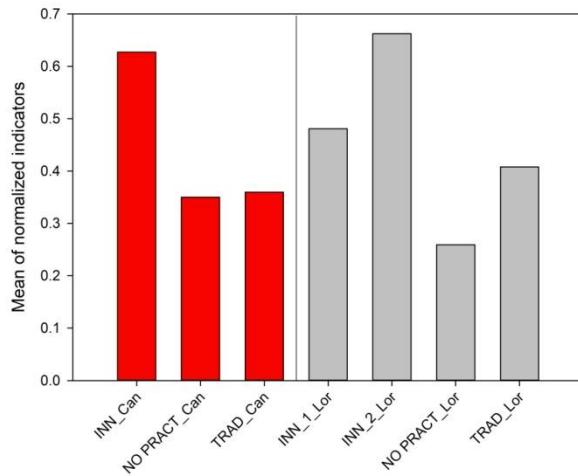


Figure 4: Mean of the normalized indicators (Aerial Carbon stock, Soil organic carbon and litter carbon pools, carbon Stock in products, IPBB) with values ranging from 0 to 1.

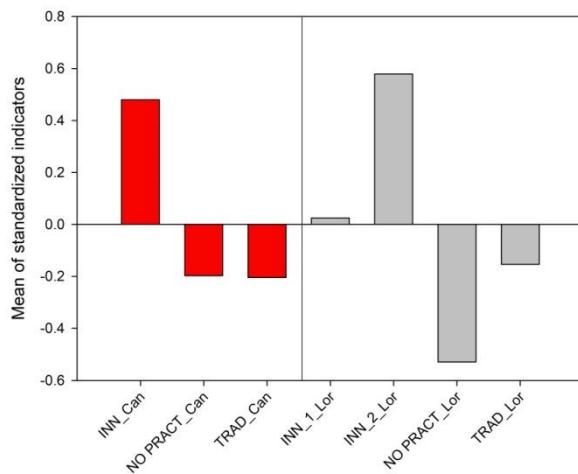


Figure 5: Mean of the standardized indicators (Aerial Carbon stock, Soil organic carbon and litter carbon pools, carbon Stock in products, IPBB).

5 Approach and Contacts with local carbon market

At the same time, an existing Carbon market in Italy will be contacted to propose the climatic credit scheme.

The CLIMARK approach will be applied in 2 pilot projects in which companies will be found to use and pay credits deriving from forest management and afforestation according to the project guidelines.

In Italy, implementation actions will be related only to forest management and to afforestation, because the "*Legge-quadro in materia di incendi boschivi, 353 del 2000*" does

not allow any activities funded by public money on the burned area before ten years from the fire event.

Implementation actions for mature stands and afforestation will be carried out in Veneto where a forest carbon credit market is active, Carbomark created by LIFE07 ENV/IT/000388. In this market, there are 21 private companies (buyers) and 27 forest owner (sellers).

5.1 Replicability of Climark approach in Regione del Veneto

Transferability and replicability of CLIMARK project and especially the climatic credit need to consider Analysis, modification and definition of Legal Aspects.

The work will include:

- (i) Analysis of legal documents (regional and international) that affect the new market and adaptation / modification of those aspects necessary for the integration of climate credits in the CARBOMARK market
- (ii) Definition / Adaptation of the requirements to be met by the different stakeholders involved (e.g. law of access to the purchase / sale of credits, form of the promoting legal entity, etc.).

Contacts with the forest manager of Cansiglio and Lorenzago di Cadore have been established for performing the activities to verify the ecosystem responses to different silvicultural treatments after 5 to 7 years. Moreover, Veneto Region, manager of CARBOMARK, has been contacted to begin the process of integration of climatic credit in its market. In addition meetings will be organised with the buyers and the sellers in each area where management will be performed.

5.2 Planned Activities

Planned activities for Action C8 are reported below.

Activities	Period
Sampling for definition of Climatic credit in Italy (Soil, and tree cores)	September 2019
Collected Samples analysis	November 2019 - February 2020
Report with the list and methodology for the development of forest mitigation projects	May 2020
First advisory meeting in the Veneto Region	June 2020
Meeting with sellers and buyers of CARBOMARK	December 2020
Legal aspects in the application of the climatic credit in Veneto carbon market	December 2020
Computer tool for calculating climate credits	December 2020
Contract of sale of climatic credits in the Veneto Region	June 2021

6 Transferability through dissemination

Replicability and transferability of CLIMARK activities are closely related to dissemination of the project. In Italy, dissemination will consist in the translation of the main documents and the digital application produced in the project.

At the moment, CLIMARK dissemination activities were performed in the following event:

Date	Location	Organizer	Event	Activities
18/12/2018	Rome	CREA-Centro Politiche e Bio-Economia	Il mercato dei crediti di Carbonio forestali: uno strumento di lotta al cambiamento climatico e un'opportunità per il settore forestale	Leaflet distribution
08/02/2019	Belluno (Veneto)	SISEF	La Tempesta VAIA. Disastro o opportunità per le foreste del Nord-Est	Leaflet distribution
01/06/2019	Villavallelonga (AQ)	Condotta forestala	Final workshop of the project Forestenergia	Oral presentation
11/10/2019	Cansiglio (Veneto)	CNR- National Research Council of Italy	Field trip in Cansiglio forest of a Turkish delegation of forestry ministry	Project presentation in the test site

Furthermore, the project will be presented to national and international conferences, and a list of potential events are listed below.

Date	Location	Event	Activities
12-15/11/2019	Palermo (Italy)	XII Congresso Nazionale della Società Italiana di Selvicoltura ed Ecologia Forestale (SISEF)	Leaflet distribution
26-28/02/2020	Bonn (Germany)	Governing and managing forests for multiple ecosystem services across the globe	Poster/ Oral presentation
2020	-	TRACE, (Tree Rings in Archaeology, Climatology and Ecology)	Poster/ Oral presentation
2021	-	TRACE, (Tree Rings in Archaeology, Climatology and Ecology)	Poster/ Oral presentation
2022	-	TRACE, (Tree Rings in Archaeology, Climatology and Ecology)	Poster/ Oral presentation
2021	-	XIII Congresso Nazionale della Società Italiana di Selvicoltura ed Ecologia Forestale (SISEF)	Poster/ Oral presentation
2020		Annual conference -EuroDendro	Poster/ Oral presentation
2021		Annual conference -EuroDendro	Poster/ Oral presentation
2022		Annual conference -EuroDendro	Poster/ Oral presentation
3-8/05/2020	Vienna (Austria)	EGU General Assembly 2020	Poster/ Oral presentation
2021	Vienna (Austria)	EGU General Assembly	Poster/ Oral presentation
2022	Vienna (Austria)	EGU General Assembly	Poster/ Oral presentation

Moreover, a manuscript on CLIMARK project will be submitted to “Sherwood”, the most diffuse forestry journal for professionals in Italy, before the end of 2019.

Considering the experience of all the project partners, surely CLIMARK project will be presented in many local workshop about forest management and ecology, and climate change mitigation.

ANNEX1

SCHEDA DI CAMPO PER L'IBPC			 																																																									
DATI GENERALI																																																												
LOCALIZZAZIONE																																																												
Unità gestionale(nome foresta):		Coordinate:		Campionamento: Transetto lineare*																																																								
Comune e Provincia:		Superficie soprassuolo (ha):		Long (m):																																																								
Dati e rilevatori:		Formazione forestale:		Dist. visibilitat à(m):																																																								
				Sup. campionata (ha)																																																								
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IBPC-CONTEXT																																																												
1. Struttura dello spazio (valutazione del paesaggio nei dintorni di 1 km)			<input type="checkbox"/> Antropizzato: abbondanza di infrastrutture di origine umana. 0 <input type="checkbox"/> Continuo: aree forestali continue. 2 <input type="checkbox"/> Mosaico: alternando spazi aperti, prati, pascoli, campi, ecc. 5																																																									
2. Rilievo e orografia (valutazione del paesaggio nei dintorni di 1 km)			<input type="checkbox"/> Piano e omogeneo: senza variazioni altitudinali e di esposizione. 0 <input type="checkbox"/> Eterogeneità ridotta: con alcuni cambiamenti altitudinali e di esposizione. 2 <input type="checkbox"/> Eterogeneità elevata: con molti cambiamenti altitudinali e di esposizione. 5																																																									
3. Continuità temporale del bosco			<input type="checkbox"/> Foresta recente: dopo il 1956-57. 0 <input type="checkbox"/> Foresta del primo Novecento. 2 <input type="checkbox"/> Foresta del XIX secolo. 5																																																									
4. Elementi acuatici (nell'entroterra o al confine con il bosco)			<input type="checkbox"/> Assenza di questi elementi 0 <input type="checkbox"/> Presenza di un elemento. 2 <input type="checkbox"/> Presenza di 2 o più elementi. 5																																																									
5. Elementi rocciosi (all'interno o al confine del bosco con una superficie accumulata dall'elemento>20m ²)			<input type="checkbox"/> Lastre, grotte e caverne 0 <input type="checkbox"/> Affioramenti puntuali di roccia 0 <input type="checkbox"/> Accumulo naturale di pietre 2 <input type="checkbox"/> Rocce grandi 5 <input type="checkbox"/> Muretti a secco (>20m) 5																																																									
IBPC-GESTIÓ																																																												
6. Struttura verticale della vegetazione: per considerare uno strato come presente deve avere una copertura ≥20% (in caso di disturbo ≥10%)			<input type="checkbox"/> Strati esistenti: Vol superiore Uno strato 0 <input type="checkbox"/> Subvolume Due strati. 2 <input type="checkbox"/> Strato arbustivo Tre strati. 5																																																									
7. Spazi aperti (radure all'interno della metropolitana (boschi, sculture rigenerate, ecc.) E bordi ecotonici (margini raschiati o con scrub)			<input type="checkbox"/> Inesistente. 0 <input type="checkbox"/> Sup. Clarianes (ha): Occupano meno dell'1% o più del 5% della superficie della foresta 0 <input type="checkbox"/> Long. ecotons vora (km): x2 Sup. (ha): 0 % rodal: ##### Occupano tra l'1% e il 5% della superficie della foresta 2 <input type="checkbox"/> Presenza di 2 o più elementi. 5																																																									
8. Composizione e diversità degli strati			<input type="checkbox"/> Specie presenti: Bosco puro o presenza di specie aliene invasive. 0 <input type="checkbox"/> Specie con frutti carnosì: Bosco misto o puro con 2 specie di alberi di accompagnamento. 2 <input type="checkbox"/> Specie esotiche invasive Presenza di 5 o più specie arboree; la situazione precedente con presenza significativa di specie arboree o arbustive che producono frutti carnosì. 5																																																									
9. Alberi portatori di microhabitat (MH) (fino a 2 MH / ha per ogni tipologia)			<input type="checkbox"/> <table border="1"> <thead> <tr> <th></th> <th>Num. Total</th> <th>MH/ha</th> <th></th> <th>Num. Total</th> <th>MH/ha</th> <th></th> </tr> </thead> <tbody> <tr> <td>Cavità degli uccelli (>4 cm)</td> <td>#DIV/0!</td> <td>Lastre o corteccia frantumata per rifugi</td> <td>#DIV/0!</td> <td>Inferiore a 1 MH/ha.</td> <td>0</td> <td></td> </tr> <tr> <td>Cavità dei contrafforti delle radici (>10cm)</td> <td>#DIV/0!</td> <td>Funghi (>10cm)</td> <td>#DIV/0!</td> <td>tra 1 e 5 MH/ha.</td> <td>2</td> <td></td> </tr> <tr> <td>Legno senza corteccia (senza decomposizione) (> 600 cm²)</td> <td>#DIV/0!</td> <td>Flusso di linfa fresco (senza resina)</td> <td>#DIV/0!</td> <td>6 MH/ha o più.</td> <td>5</td> <td></td> </tr> <tr> <td>Cavità evolutive in tronco o rami (>10cm)</td> <td>#DIV/0!</td> <td>Legno morto (> 20%; D>15cm, L>50cm)</td> <td>#DIV/0!</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dendrofelm: cavità che possono contenere acqua (>15cm)</td> <td>#DIV/0!</td> <td>Nidi (specialmente di grandi uccelli)</td> <td>#DIV/0!</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fulmini o ferite da fuoco</td> <td>#DIV/0!</td> <td>Liane e vischio (>25%)</td> <td>#DIV/0!</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>somma</td> <td>0</td> <td>#DIV/0!</td> <td></td> <td></td> </tr> </tbody> </table>			Num. Total	MH/ha		Num. Total	MH/ha		Cavità degli uccelli (>4 cm)	#DIV/0!	Lastre o corteccia frantumata per rifugi	#DIV/0!	Inferiore a 1 MH/ha.	0		Cavità dei contrafforti delle radici (>10cm)	#DIV/0!	Funghi (>10cm)	#DIV/0!	tra 1 e 5 MH/ha.	2		Legno senza corteccia (senza decomposizione) (> 600 cm ²)	#DIV/0!	Flusso di linfa fresco (senza resina)	#DIV/0!	6 MH/ha o più.	5		Cavità evolutive in tronco o rami (>10cm)	#DIV/0!	Legno morto (> 20%; D>15cm, L>50cm)	#DIV/0!				Dendrofelm: cavità che possono contenere acqua (>15cm)	#DIV/0!	Nidi (specialmente di grandi uccelli)	#DIV/0!				Fulmini o ferite da fuoco	#DIV/0!	Liane e vischio (>25%)	#DIV/0!						somma	0	#DIV/0!		
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