

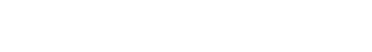


"Gestione sostenibile dei boschi cedui: indicazioni

per il futuro dall'eredità di prove sperimentali"

Arezzo, 22 Marzo, 2019





CLImate-Smart Forestry in MOuntain Regions

CO2



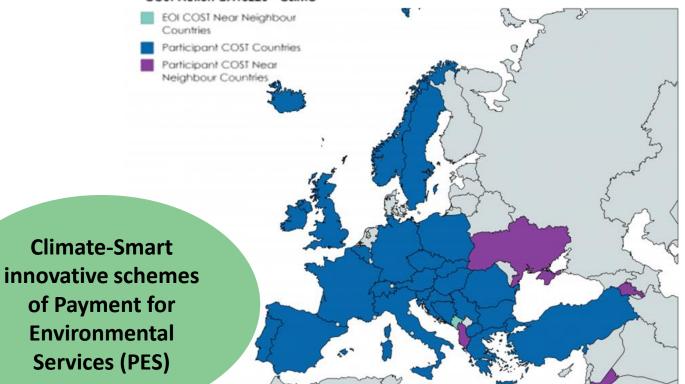
# Sustainable Forest Management and *smart forests*: COST Action CLIMO

**Giovanni Santopuoli** 



CLImate-Smart Forestry in MOuntain Regions

COST Action CA15226 - CLIMO



Approaches and Definitions of Climate Smart Forestry (CSF)

> European Smart FOrests NETwork

Development of a future cybernetic web of experimental structures 27 partners

Oct. 2016 Oct. 2020

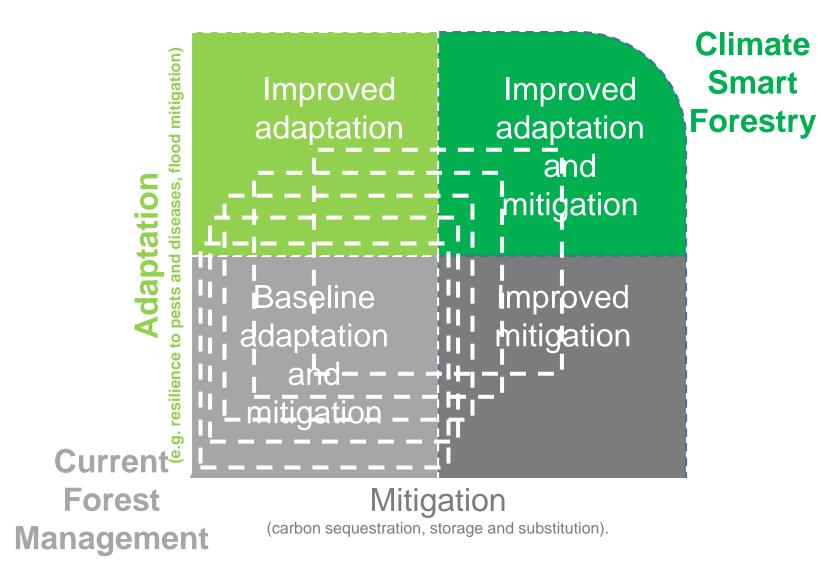
http://climo.unimol.it/

High forest, Inverness (Scotland) 2018

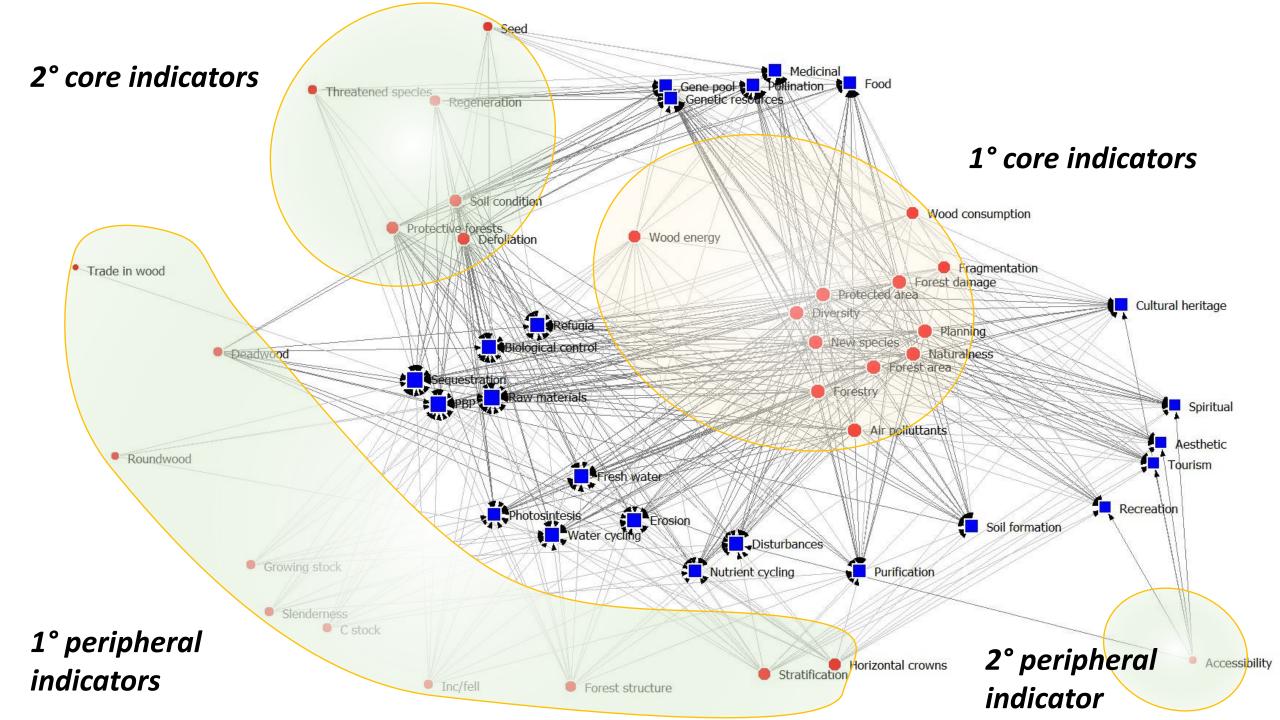
Ladace and the state of the later of the

Coppice forest, Italy 2010

# **Climate Smart Forestry**

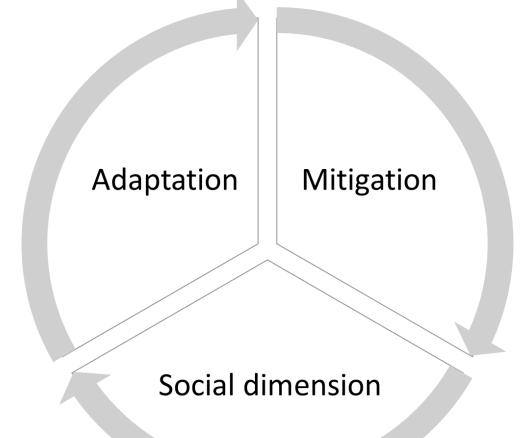


A h	В	С	D	Е	F	G	Н	1	J	K	L	М	N	DF	Q	R	S	Т	U	V	W	Х	Y	Z	AA	AB
4	Ecosystem services INDICATORS	Adaptanion=A	Mit igat ion=M	both Adaptation & Mitigation=AM	ary biomass production	uction of atmospheric oxygen	ormation and retention	ent cycling	Water cycling	Maintenance of genetic diversity	Habitats for species	Food	Timber, fuel, fibre	Fresh water	Pharmaceuticals and bio-chemicals etic resources	Purification of water and air	tration ar	leration of natural disturbances, e.g. flood alleviation	ion prevention and maintenance of soil health	Pollination	Biological control	reation and mental and physical health	Tourism	thetic appreciation and inspiration for culture, art and design	iritual experience and sense of place	Protection of cultural heritage
n 👻		-	-	-	-	-	-	-	-	-	•	Ŧ	• •			-	-	<b>_</b>	-	•	-	-	-	-	-	-
1.4	Carbon stock		х	1	М	М		м	М		М		MIN	N			М	м			М					
2.1	Deposition of air pollutants	x	х	2	AM	AM	AM	AM	AM	AM	A	AM /	AM AI	M A	AM	AM	AM	Α	Α	AM	AM	Α	Α	Α	Α	Α
2.2	Soil condition	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM.	AM	AM	AM	AM	AM					
2.3	Defoliation	x	х	2	AM	AM	AM	AM	AM	AM	AM	A	AM AI	M A	MA N	AM	AM	AM	AM	AM	AM					
2.4	Forest damage	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM I	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
4.3	Naturalness	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /		M A	MA N	AM.	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
4.5	Deadwood	x	х	2	AM		AM	AM		AM	AM	1	AM		AM	1	AM	AM	AM		AM	nd	nd	nd	nd	nd
4.6	Genetic resources	x		1	Α					Α	Α	Α	Α	4	A		Α			Α	Α	nd	nd	nd	nd	A
4.7	Landscape pattern	x		1			Α	Α	Α	Α	Α	Α	AA	A A	A	Α	Α	Α	А	Α	Α	Α	Α	Α	Α	A ta
4.8	Threatened forest species	х		1	Α					Α	Α		Α	4	A		Α			Α	Α					
4.9	Protected forests	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM I	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
5.1	Protective forests - soil, water and other ecosystem functions, and infrastruct	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM	AM	AM	AM	AM	AM	nd	nd	nd	nd	nd ta
1.1	Forest area	х	х	2	AM	AM	AM	AM	AM	AM	Α	A	AM AI	M A	AM	M	AM	м	М	М	AM	Α	Α	Α	Α	AM :a
1.2	Growing stock		х	1	М	М			М				MI	и			М	M	М		М					
; 1.3	Age structure and/or diameter distribution	x		1	Α	Α	Α	Α	Α		Α		A A	4		Α	Α	Α	Α	Α	Α	nd	nd	nd	nd	A
1.5	Management system	x	x	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	AM	AM	AM	AM	AM	Α	AM	Α	Α	Α	Α	Α
2.5	Slenderness coefficient	x		1	Α				Α		Α		AA	4		Α	Α		Α		Α	nd	nd	nd		
3.1	Increment and fellings	x		1	Α	Α			Α				AA	4		Α	Α	Α	А		Α					
3.2	Roundwood		х	1	М				М				м				М									
3.5	Forests under management plans	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
4.1	Tree species composition	x	х	2	AM	AM	AM	AM	AM	AM	AM	AM /	AM AI	M A	MA N	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
4.2	Regeneration	x	х	2	AM	AM	nd	nd	nd	AM	AM	AM /	AM AI	M A	AM	nd	AM		nd	AM	AM	nd	nd	nd	nd	A
1 1	Introduced tree species		v	2	AM	AM	AM	AM	۸M	A.M.	AM	AM	AM A	M A	A	AM	۸M	A.M.	۸M	A.M.	ΛM	ΛM	AM	A.M.	A.M.	AM



## **Definition of CSF**

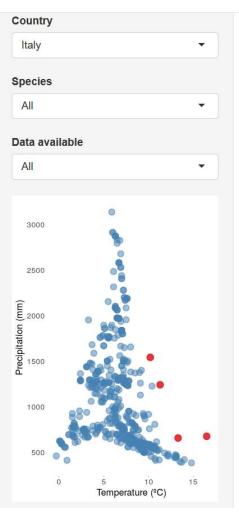
Climate-smar management ar potential of fc change. The a functions an ecosystem gc impact of clim being ar

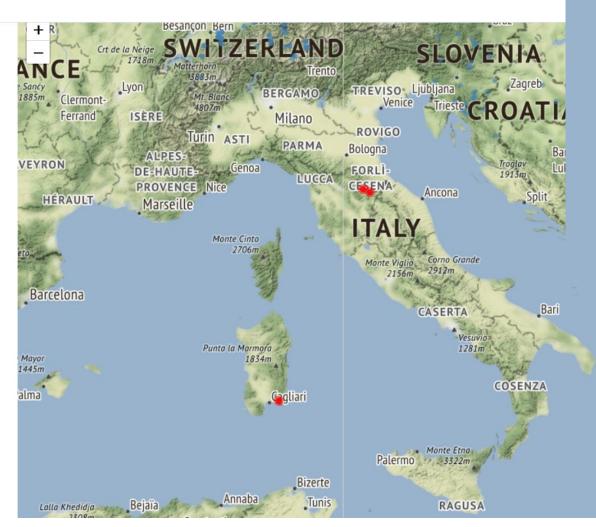


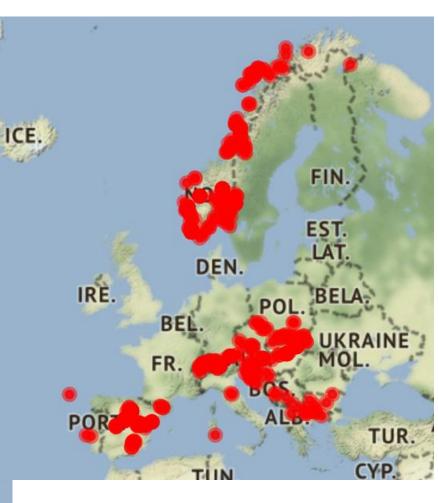
The *social dimension* of forestry holds many aspects, from the involvement of stakeholders from local communities, and their conflicts over land use or for the access to skills and technology, to global forest governance challenges. Climate change may jeopardize forest ecosystem functioning and brings social and economic consequences for people, which may modify priorities of ecosystem services at various scales. Assessment for ecosystem services could be a tool making this process more efficient with respect to indicators relevant for governance regime and actors involved.

Euan Bowditch; Giovanni Santopuoli; Franz Binder; Miren del Rio; Nicola La Porta; Tatiana Kluvankova; Jerzy Lesinski; Renzo Motta; Maciej Pach; Pietro Panzacchi; Hans Pretzsch; Christian Temperli, Giustino Tonon; Violeta Velikova; Melanie Smith; Andrew Weatherall; Roberto Tognetti

### **European Smart Forest Network (ESFONET)**







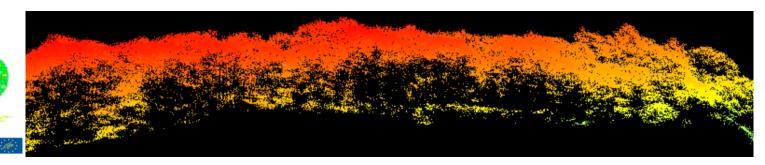
Testing Indicators in the field

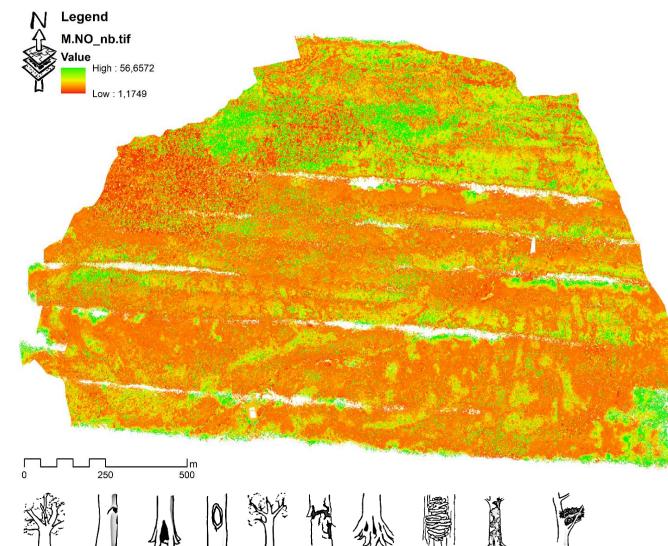
#### Short-Term Scientific Missions

https://climoproject.shinyapps.io/CLIMO\_dataset/

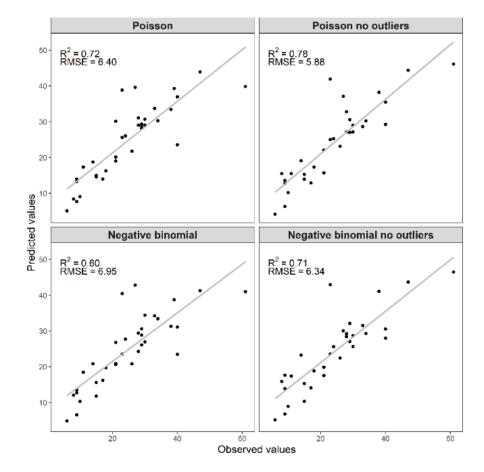
## **TREMS**

## 4 ENVITIOO Remote sensing to support SFM and smart forestry





#### Integrate monitoring of forest biodiversity with management practices



# THANKYOU!!!