ASSOCIAZIONE ITALIANA PER LA INGEGNERIA NATURALISTICA
Sezione Lombardia

Kingdom of the Netherlands

Holland.

CASA dell'AGRICOLTURA

RUOLO E FUTURO DEI NUOVI BOSCHI E SISTEMI VERDI
DELLA PIANURA E DI FONDOVALLE:
UN CONFRONTO APERTO ITALO-OLANDESE

Giovedì 18 ottobre
CENTRO CONGRESSI, LOCALITÀ CASCINA DARSENA, GIUSSAGO (PV)

Lowland Forests and Ecosystem Services

Enrico Calvo

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

Neighborhood greenspace and health in a large urban center

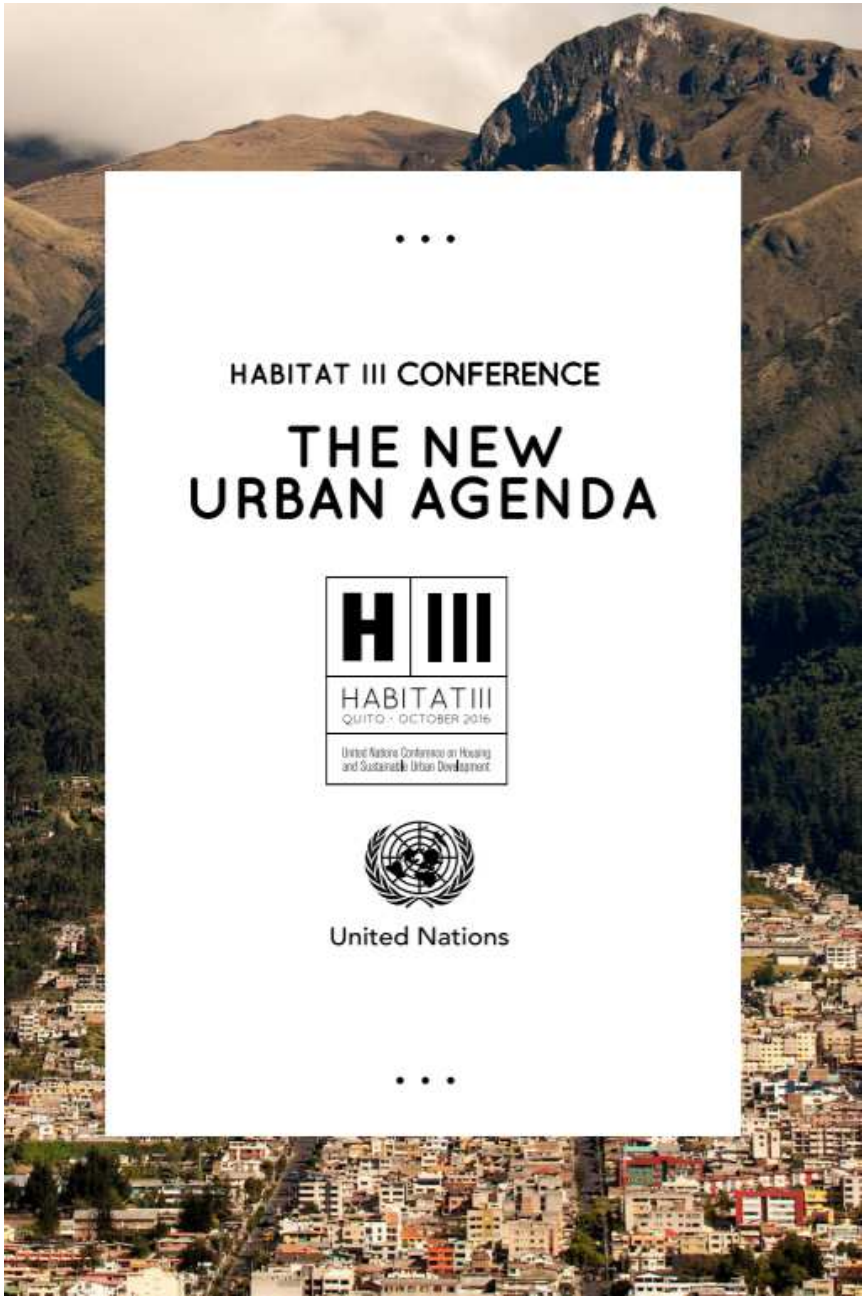
Omid Kardan[1], Peter Gozdyra[2], Bratislav Misic[3], Faisal Moola[4], Lyle J. Palmer[5], Tomáš Paus[6] & Marc G. Berman[1,7]

+10 trees around a neighborhood

- allow people to feel at least 7 years younger
- offer the same well-being perception as you had earn $ 10.000 a year

When trees disapper from an area

- there's an increase of the mortality rate of the inhabitans
- newborns are less strong
- children give less value to thing they don't know



Is this really true?

How do you evaluate these aspects?

- It’s a great challenge that affects the meaning of life

You can see, at least in the western world, how close the forest are to the man, and how the man still depends on them

Perception and communication are two key factors that play an essential role

Content index

1. Preamble
2. The perception
3. Example of estimates and PES
4. Conclusions

1. Preamble

The ecosystem theme
is a very topical subject

GIORNATA MONDIALE DELLE FORESTE

Le foreste in città: un chilometro quadro di verde vale 1 milione

Gli alberi ripuliscono l'aria, assorbono le polveri sottili e mitigano il caldo. Mantova: a f
novembre il primo forum mondiale della Fao sulle foreste urbane

Quanto vale la natura?

Boschi, deserti, oceani e praterie valgono l'astronomica cifra di 145mila miliardi di dollari l'anno; è la stima dei servizi ambientali fondamentali che gli ecosistemi forniscono alla nostra specie. E che stiamo dilapidando.

The New York Times

GRACE NOTES

A Plan for New York City's Forests. Yes, Forests.

Ecco perché i soldi crescono sugli alberi

I dati della conferenza Onu di Quito: le città più verdi risparmiano. Abbattono le spese per l'energia e fanno aumentare i valori immobiliari

Why green is good for you

Being close to green space helps combat depression, a new study has found. No wonder – it's where life happens

The importance of urban forests: wh
money really does grow on trees

In Italia le foreste "valgono" un risparmio di 500 milioni di euro

Il Corpo forestale dello Stato spiega che le aree verdi dello Stivale hanno contribuito al raggiungimento degli obiettivi del Protocollo di Kyoto

Police Move to Clear Treehouse Protest Against Coal Mine in German Forest

State forests in the world

- There's an increase of the value of the enviromental services offer by forests
- The enviromental services offer by forests help achieve UN SDGs 2030 targets
- Invest money is necessary to validate enviromental services' data

EUROPEAN COMMISSION

Brussels, 20.9.2013
COM(2013) 659 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A new EU Forest Strategy: for forests and the forest-based sector

{SWD(2013) 342 final}
{SWD(2013) 343 final}

EU Forest Strategy

(European Commission, (COM(2013) 342 final)

3.3.4 Protecting forests and enhancing ecosystem services

Forests provide ecosystem services on which rural and urban communities depend, and host an enormous variety of biodiversity. Pressures on forests, such as habitat fragmentation, spread of invasive alien species, climate change, water scarcity, fires, storms and pests call for enhanced protection. EU rules cover the movement and trade of certain plants, plant products and objects that can threaten plant health.

Protection efforts should aim to maintain, enhance and restore forest ecosystems' resilience and multi-functionality as a core part of the EU's green infrastructure, providing key environmental services as well as raw materials.

Further emphasis should be put on preventing negative impacts on forests rather than on damage mitigation and restoration. For forests to be able to react to future threats and trends, genetic diversity must be enhanced and endangered genetic resources protected.

Green Infrastructure

(European Commission, (COM(2013) 249 final)

Green Infrastructure is not only good for plants and animals: people too benefit from the recreational opportunities and the many 'unseen' positive effects it offers, such as cleaner air and water, better protection from floods and other natural disasters, and better health and well-being.

Forest Europe

Madrid Ministerial Resolution 1 2016
Forest sector in the center of Green Economy

III. Incorporating the value of forests ecosystem services in a green economy

- 14. Recognise the key role of forest ecosystem services in the contribution of forests to a green economy.
- 15. Promote the exchange of information on methodologies and practices on the valuation of and payments for forest ecosystem services as well as policy approaches to this end.
- 16. Support the development and possible application of common methodologies for the valuation of forest ecosystem services.
- 17. Make further efforts to have the full value of forest ecosystem services better reflected in forest related policies and tools inter alia national forest programmes or equivalents, guidelines, market based instruments and payments for ecosystem services.

Testo unico in materia forestale

D.lgs. 3 aprile 2018, n. 34

Testo unico in materia di foreste e filiere forestali.

ART. 7

8. Le regioni, coerentemente con quanto previsto dalla Strategia forestale dell'Unione europea COM (2013) n. 659 del 20 settembre 2013, promuovono sistemi di pagamento dei servizi ecosistemici ed ambientali (PSE) generati dalle attivita' di gestione forestale sostenibile e dall'assunzione di specifici impegni silvo-ambientali informando e sostenendo i proprietari, i gestori e i beneficiari dei servizi nella definizione, nel monitoraggio e nel controllo degli accordi contrattuali.

I criteri di definizione dei sistemi di remunerazione dei servizi ecosistemici ed ambientali (PSE) risultano essere quelli di cui **all'articolo 70 della legge 28 dicembre 2015, n. 221**, con particolare riguardo ai beneficiari finali del sistema di pagamento indicati alla lettera h) del comma 2 del predetto articolo 70.

9. La promozione di sistemi PSE di cui al comma 8, deve avvenire anche nel rispetto dei seguenti principi e criteri generali:

- a) la volontarieta' dell'accordo, che dovra' definire le modalita' di fornitura e di pagamento del servizio;
- b) l'addizionalita' degli interventi oggetto di PSE rispetto alle condizioni ordinarie di offerta dei servizi;
- c) la permanenza delle diverse funzioni di tutela ambientale presenti prima dell'accordo.

L. 10/2013

I comuni e le province, in base a **sistemi di contabilita‘ ambientale**, da definire previe intese con le regioni, danno annualmente conto, nei rispettivi siti internet, del contenimento o della riduzione delle aree urbanizzate e dell'acquisizione e sistemazione delle aree destinate a verde pubblico dalla strumentazione urbanistica vigente.

Rapporto 2018
sullo stato del Capitale Naturale in Italia

Assegnare ai SE e al CN che li genera un valore in termini monetari ha lo scopo di ampliare l'insieme di informazioni disponibili sulle implicazioni delle diverse opzioni facilitando le scelte e migliorandole dal punto di vista della razionalità economica di lungo periodo, facendo sì che il loro contributo non venga sottovalutato o ignorato nelle decisioni pubbliche e private (Braat & de Groot, 2012; Costanza et al., 1997). In tal senso l'espressione del valore di diverse grandezze fisiche in un solo numerario (l'unità monetaria) consente un processo di aggregazione altrimenti impossibile.

Forest@
Rivista di Selvicoltura ed Ecologia Forestale
Comunicazioni Brevi
doi: 10.3832/efor2861-015
vol. 15, pp. 65-70

Analisi storica della produzione scientifica dei settori scientifico-disciplinari AGR05 e AGR06

Marco Fioravanti [1-2],
Francesca Giannetti [2],
Sara Spinelli [2],
Marco Marchetti [1-3]

Bibliometric analysis of the scientific production in forestry-related scientific fields

On the occasion of the reorganization of disciplinary fields (DF) which is under implementation by the MIUR (Italian Ministry for Research and Education), the scientific production of the Italian forest research in two characterizing disciplines (AGR05 Forest management and Silviculture, and AGR06 Wood technology and Forest Operation) has been qualitatively investigated over the period 2005-2017. Using a text mining software, 2,112 scientific articles indexed in the SCOPUS database were analyzed and the evolution over time of the Italian forest research in the above disciplines was examined. The results indicate that ecosystem functions and services have pushed forest research to overcome the aspects linked to wood production (which still remains an important competence of the two DFs), to tackle topics aiming to understand the functioning and functionality of forest ecosystems, provide tools for monitoring forest dynamics and highlight the contribution of forests and urban green areas in contrasting climate change in terms of adaptation and mitigation. As regards the AGR06 sector, studies on forest operations have been mainly focused on issues related to the forest-energy supply chain, while for wood technology the enhancement of structural uses, the modified wood, and the conservation of Wooden Cultural Heritage have emerged. Therefore, the reorganization of disciplinary fields must certainly take into account the traditional Italian forestry thinking and the aspects related to planning, management and close-to-nature forestry, but also the evolution of forestry research in the past 15 years, which led to an intense scientific activity and production, must be considered. In defining the new declarations, it will therefore be appropriate firstly to consider the peculiarity in the area of Agricultural Science, and then the specificity of skills and research that each one of the two sectors carries forward both jointly and separately, thus ensuring to both sectors an adequate representation in autonomous profiles and domains.

Keywords: Forestry, Wood, Scientometrics, SCOPUS

area (106) biodiversity (104) biomass (124) carbon (238)
change (238) climate (178)
ecosystem (161) effects (130) growth (133) land (110)
landscape (131) management (193)
mediterranean (269)
model (221) plant (112) production (130)
soil (299) spatial (100) structure (156) systems (129)
urban (100) water (100) wood (155)

2018 natural capital

Fig. 42 - Numeri di studi di valutazione economica di CN e SE ripartiti per regione

Stima del valore socio-economico della rete Natura 2000 in Lombardia

Azione A5

Rapporto finale

Azione realizzata da **ERSAF** in collaborazione con **Comunità Ambiente** e **Regione Lombardia** e con:
Università degli Studi di Padova
Dipartimento Territorio e Sistemi Agro-Forestali

TESAF Dipartimento Territorio e Sistemi Agro-Forestali Università di Padova

gestire Natura 2000 in Lombardia

142 studies about the estimates of ecosystem services in Lombardy (or surrounding/similar areas) and in Natura 2000 areas - period 1994-2004

Piani di Indirizzo Forestale

Comuni coperti da Piani di Indirizzo forestale vigenti nel 2017 (in verde scuro) e non (verde chiaro).

<u>Adozione di strumenti per il pagamento dei servizi eco sistemici delle foreste</u>

Il riconoscimento, anche economico, dei servizi eco sistemici garantite dalle foreste costituisce la frontiera delle prossime misure ed attività a livello internazionale.

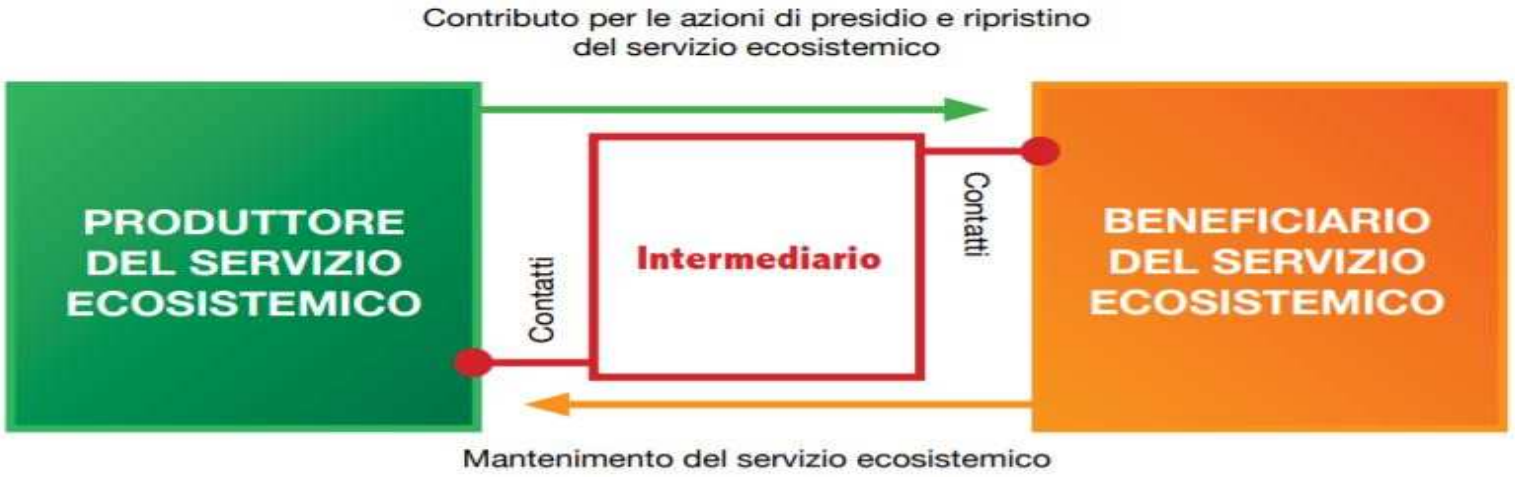
Le recenti comunicazioni europee sulle "Infrastrutture verdi" (maggio 2013) e sulla nuova strategia forestale europea (settembre 2013) evidenziano come la revisione dei sistemi di valutazione delle risorse e l'identificazione dei servizi ecosistemi debbano entrare nel calcolo delle valutazioni economiche delle gestioni, anche con pagamenti degli stessi servizi.

In tale direzione la Città metropolitana, anche in relazione alle dotazioni di conoscenza esistenti ed alle risorse di conoscenze e competenze professionali, potrebbe avviare un percorso di valutazione e verifica dei processi possibili di pagamento dei servizi eco sistemici.

- Great emphasis on ecosystem services
- Awarness of social benefits, but there's no significant return on investments
- It's difficult to define the value of the services, and to find shared tools and methods
- It's not easy to discover who pays the services

What is PES

A volountary transaction
Between users and services
And services providers
That are influenced on a few arranged decisions regarding the management of the environmental resources
Aimed to generate external services
(Wunder, 2015)



2. What people say?

Forests have a social value because they are a resource for everybody

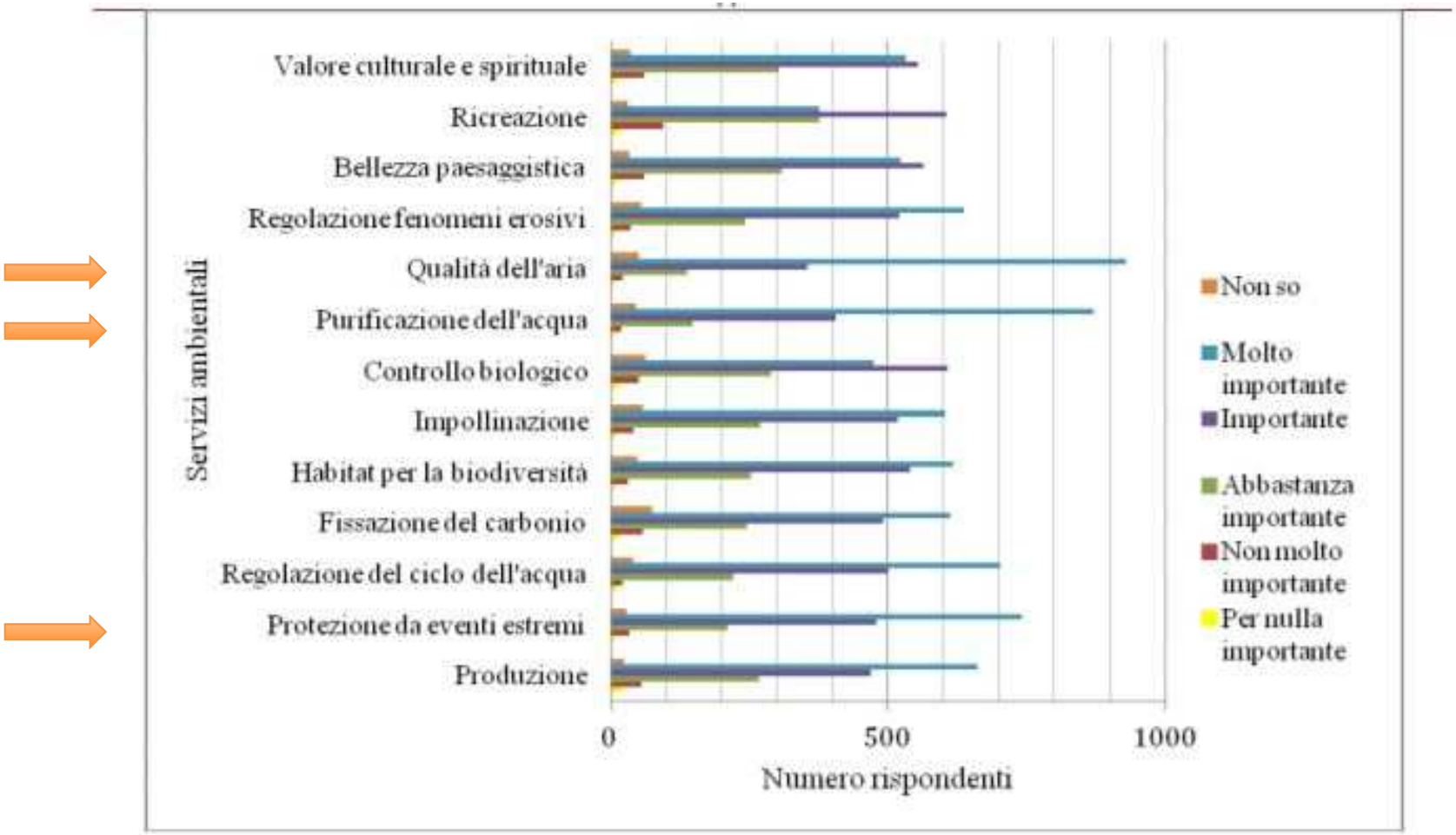
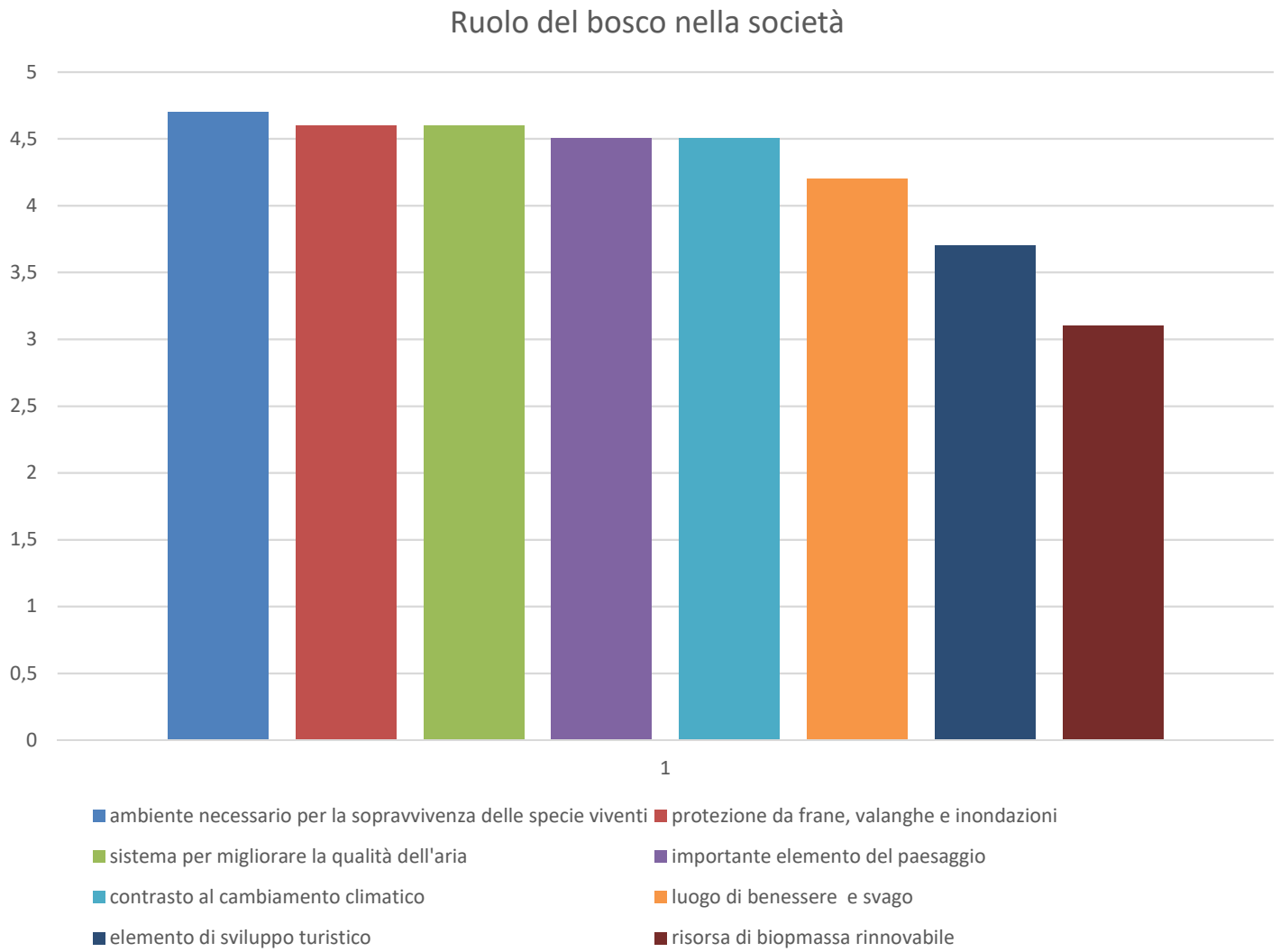
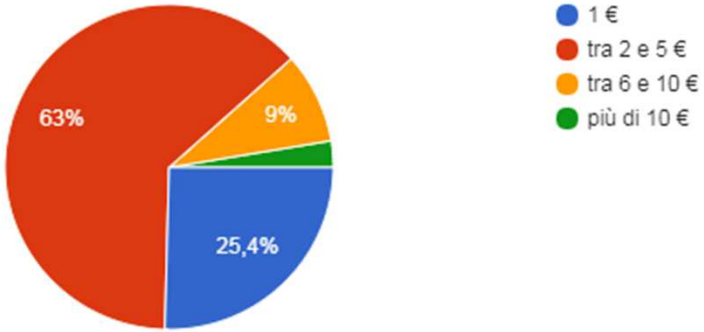


Figura 7.3 – Livelli di importanza dei servizi ecosistemici sul numero dei rispondenti


Ruolo del bosco nella società
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
1
ambiente necessario per la sopravvivenza delle specie viventi
protezione da frane, valanghe e inondazioni
sistema per migliorare la qualità dell'aria
importante elemento del paesaggio
contrasto al cambiamento climatico
luogo di benessere e svago
elemento di sviluppo turistico
risorsa di biopmassa rinnovabile

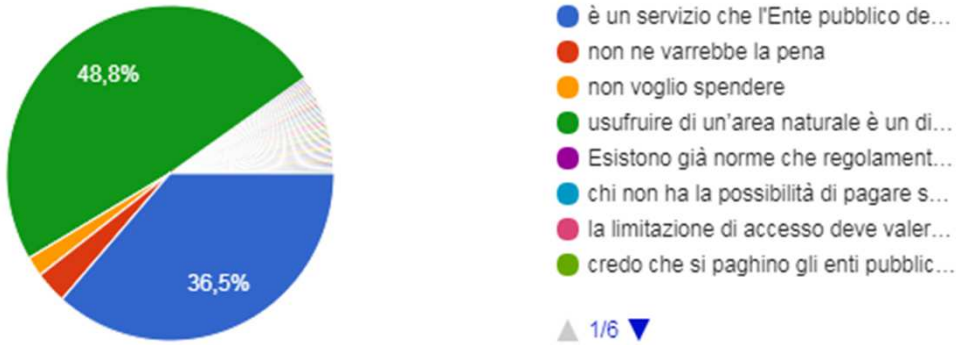
30. Se sì, quanto mediamente saresti disposto a pagare?

610 risposte



29. Se no, quali sono i motivi?

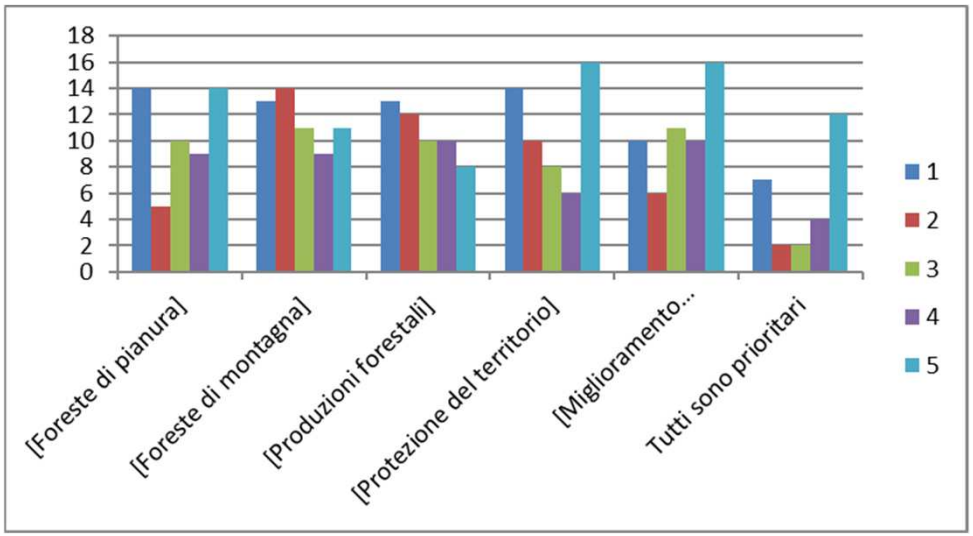
414 risposte



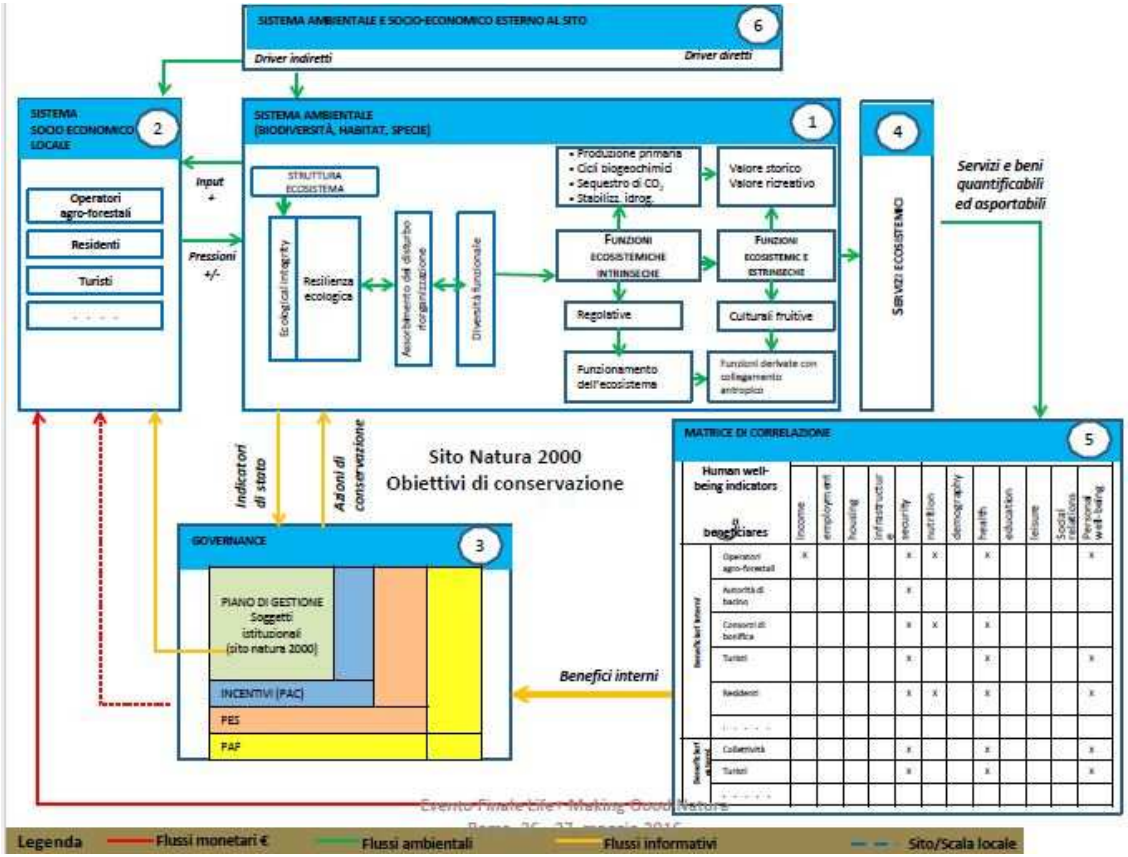
What operetors say?

Politiche Forestali regionali: metti in ordine di preferenza (da 1=più alto a 5=più basso) i seguenti temi:

	Foreste di pianura	Foreste di montagna	Produzioni forestali	Protezione del territorio	Miglioramento ambiente per benessere e turismo	Uguale priorità
Valore medio	3,1	2,9	2,8	3,0	3,3	3,4



3. Example of estimates and PES



Esempi di Stime del valore dei boschi		
Area	**Autori**	**VET**
Friuli V.G.	Marangon, Gottardo (2001)	373 €/ha/anno
Trentino	Gios, Goio (2003)	166 €/ha/anno
Italia	Merlo, Croitoru (2005)	254 €/ha/anno
Area Mediterranea	(Merlo e Croitoru, 2005)	133 €/ha/anno
Lombardia	IReR (2008)	254-655 €/ha
Parco Adamello	Scolozzi (2012)	108.890.528,17 €/anno
Foreste temperate	Costanza (2014)	3.103 US$/anno
Provincia di Trento	AAVV (2012)	212-285€/ha
Area mediterranea-Prodotto non legnosi	Pettenella et al. (2015)	18,10 €/ha
Valli Grandi Veronesi	InBioWood (2016)	3.995-7.176 3€/ha

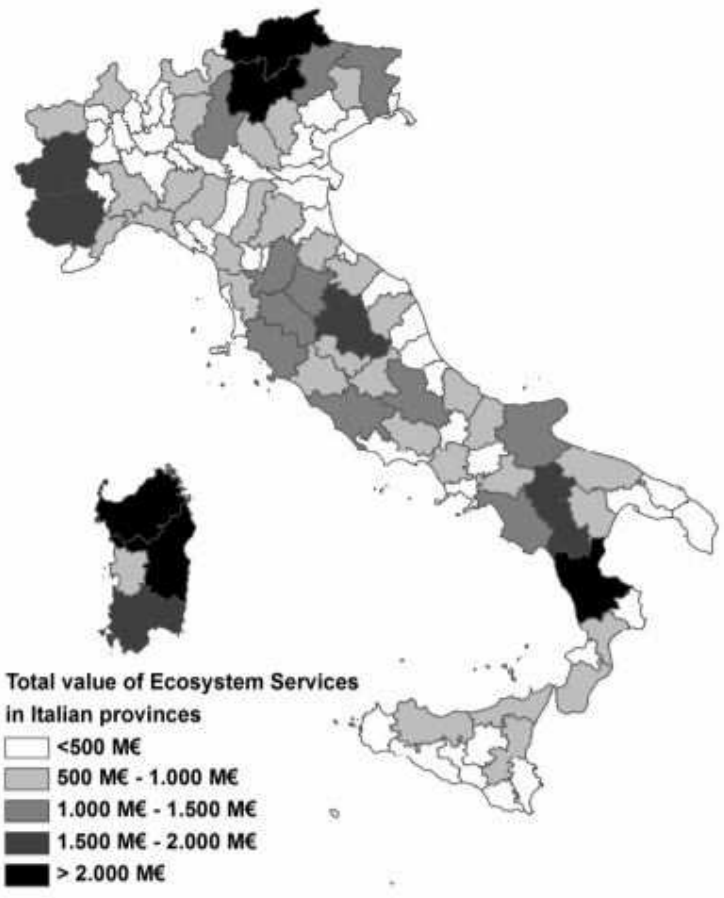


Figura 4. Valore totale (2000) dei Servizi Ecosistemici per provincia.

(Scolozzi et. Al., 2011)

Stima SE con mercato forniti dalla Rete Natura 2000 in Lombardia (M €/anno) (MGN, 2015)

Servizi Ecosistemici	Min	Max	Medio	% sul Tot. Valori Medi
Foraggio	20,84	20,84	20,84	13,5
Legno	6,77	9,77	8,27	5,4
Prodotti non legnosi	0,24	0,48	0,36	0,2
Acqua potabile	100,21	143,30	121,76	79,2
Carbonio	2,14	3,03	2,59	1,7
TOTALE	130,20	177,42	153,81	100

Esempi di Stime del valore di servizi alberi e boschi in contesti urbani		
Area	Autori	Valore
Chicago	Ivancich (2018)	1 M US$/anno
USA		31-89 US$/albero/anno
Romania		4,15 €/albero/anno
Barcellona	Chaparro, Terrades (2009)	1, 2 M US$/anno

Ecosystem services of urban forests

- Decrease of the daily average temperature up to 6° C (Skoulika et al.,2004), and under certain circumstances even up to 10° C (Hiemstra et al.,2017)
- Interception up to 190 l of water/tree in rainy events (Dobbs et al., 2018) assimilate 5,000 liters of water / year
- Capture of 10-70 mgr of particulate matter/cmq of leaf area (Saerbo, 2017), with a reduction potential of 7-24%
- Increase of 2-15% of the real estate value (Wolf,2017)
- Reduction of 7% in energy in real estate (Nowak et al. , in review)

Health

- Doing physical and ricreational activity in a forest improve the health (WHO,2010)
- Activities in the forest reduce stress, depression and mental illness (Taylor and Kuo,2006; Annerstedt et al.,2015)
- Reduction of asthma phenomena (Lovasi et al., 2013)
- Reduction of ADHA phenomena during childhood (Ivancich,2018)
- Increase of immunitary defences (Q.Li, 2010)
- Green areas are an indicator for public health (1 hour within 300 mts– WHO)

Tools

- In VEST - www.naturalcapitalptoject.org
- ARIES – www.ariesonline.org
- SOLVES – www.solves.cr.usgs.gov
- Biome-BGC - http://www.ntsg.umt.edu/project/biome-bgc.php
- i-Tree – www.itreetools.org

i-Tree
Tools for Assessing and Managing
Forests & Community Trees

USGS
science for a changing world

InVEST
integrated valuation of ecosystem services and tradeoffs

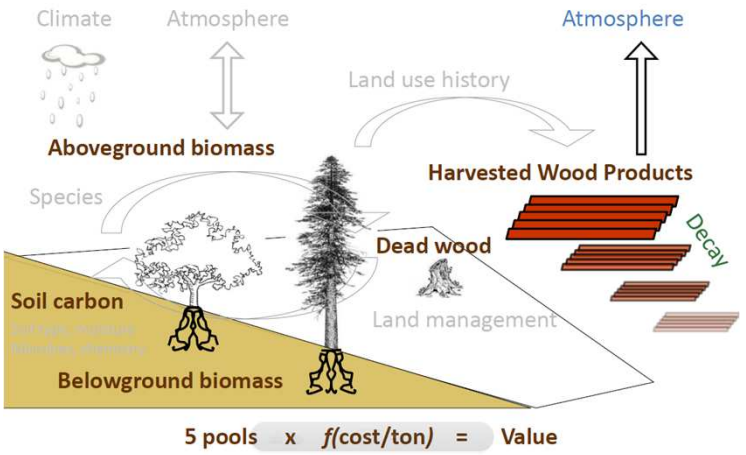


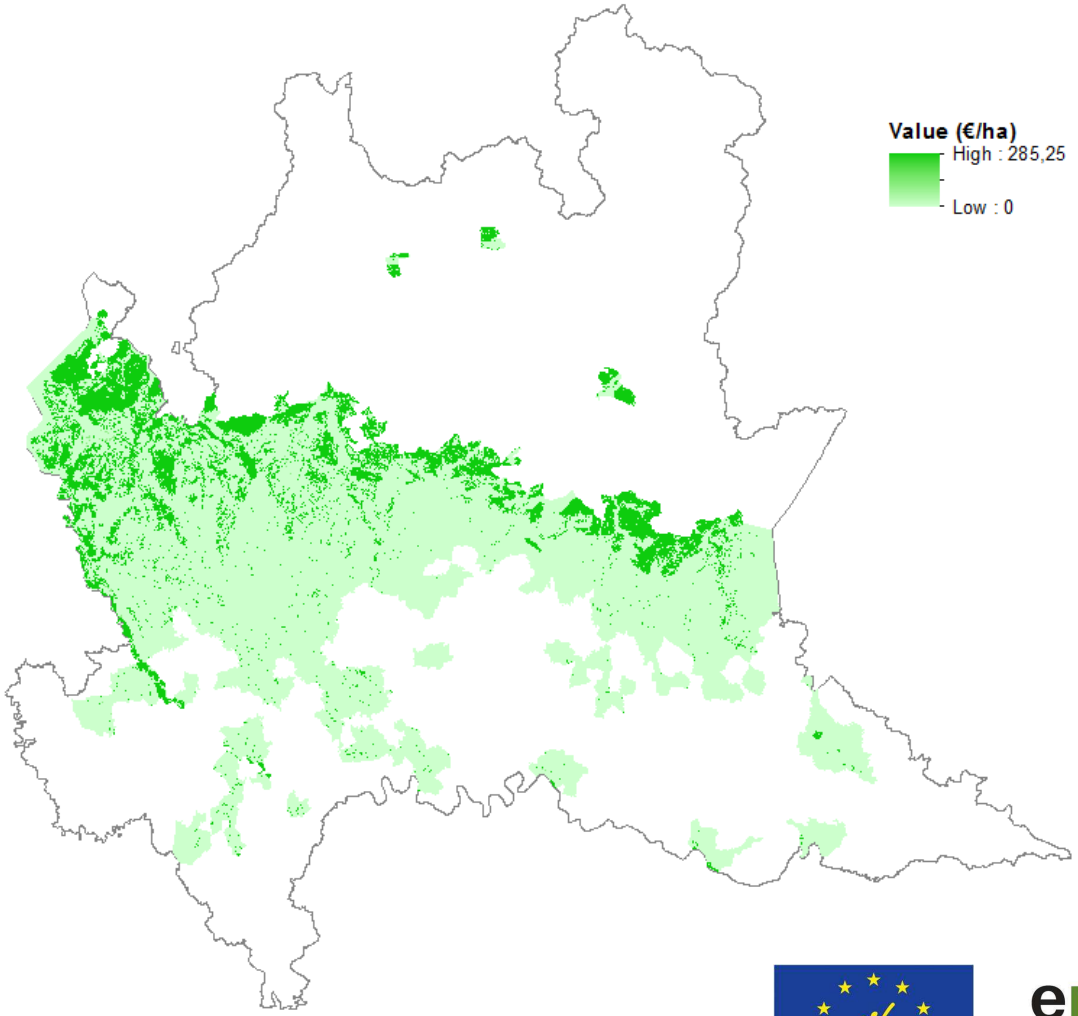
TABLE 1. Benefits and costs of trees currently quantified and in development in i-Tree

Ecosystem effect	Attribute	Quantified	Valued
Atmosphere	Air temperature	○	○
	Avoided emissions	●	●
	Building energy use	●	●
	Carbon sequestration	●	●
	Carbon storage	●	●
	Human comfort	○	
	Pollen	○	
	Pollution removal	●	●
	Transpiration	●	
	Ultraviolet radiation	●	○
	Volatile organic compound emissions	●	
Community/social	Aesthetics/property value	○	○
	Food/medicine	○	
	Health index[1]	○	
	Forest products[2]	○	○
	Underserved areas	●	
Terrestrial	Biodiversity	○	
	Invasive plants	●	
	Nutrient cycling	○	
	Wildlife habitat	●	
Water	Avoided run-off	●	●
	Flooding	○	○
	Rainfall interception	●	
	Water quality	●	○

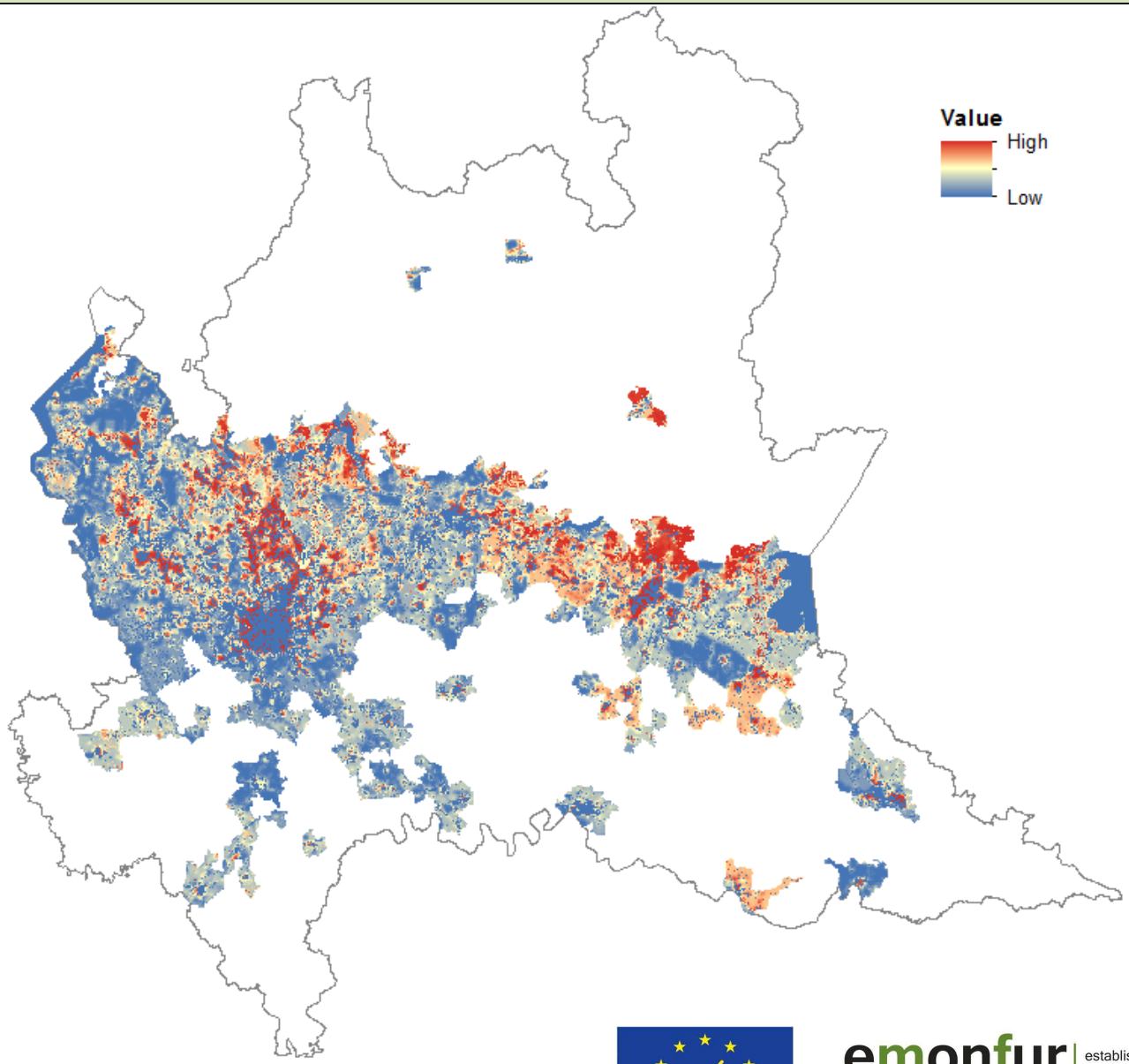
Notes: ● = attribute currently quantified or valued in i-Tree; ○ = attribute in development in i-Tree; 1 = developing a health index based on mapping of green viewing ("forest bathing"); 2 = estimating product potential based on forest structure (e.g. timber, wood pellets, ethanol).

Source: Nowak (2017).

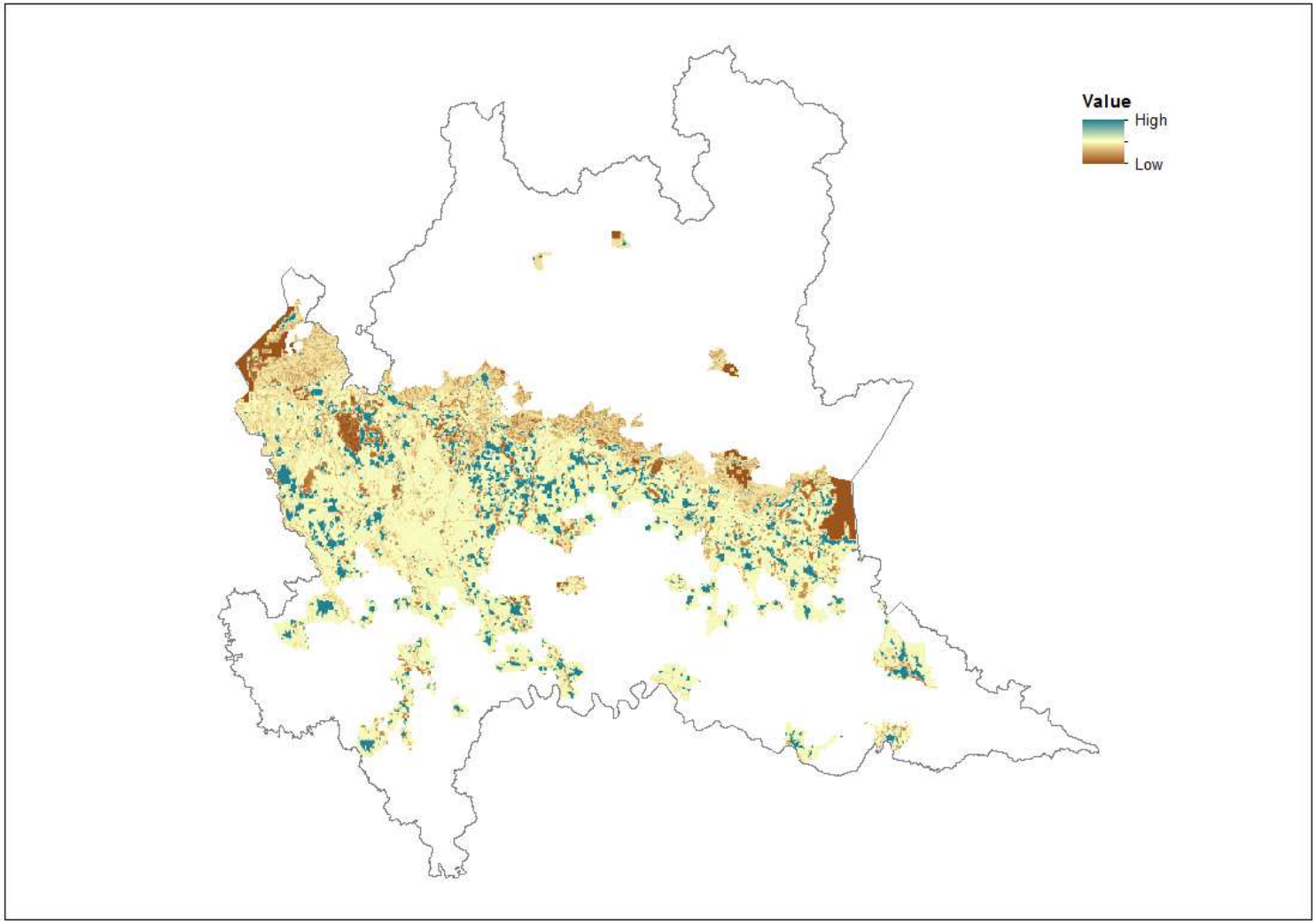
CONTRIBUTO UPF AL VALORE ECONOMICO DELLO STOCK DI C



VULNERABILITÀ DELLA BIODIVERSITÀ DELLE UPF



VALORE RICREATIVO DELLE UPF



InBioWood

TABELLA 3-6: CALCOLO DEL VALORE DEL SERVIZIO DI FITODEPURAZIONE EROGATO DAI BOSCHI DELL'AREA

Codice CLC	Tipo forestale	Superficie (ha)	Capacità di asportazione (kg N/ha*anno)	Azoto asportato (Kg/anno)	Valore Minimo in € (a 4 €/kg)	Valore Massimo in € (a 11€/kg)
3116	**Boschi igrofili**	70,64	330	23.311,20	93.244,80	256.423,20
3112	**Altri boschi caducifogli**	194,14	330	58.242	232.968,00	640.662,00
3119	**Querco-Carpineti**	1,96	330	588	2.352,00	6.468,00
			TOTALE	**82.141,2**	**328.564,80**	**903.553,20**

TABELLA 3-7: CALCOLO DEL VALORE ANNUO DEL SERVIZIO DI HABITAT PER LA BIODIVERSITÀ

Codice CLC	Tipo forestale	Superficie (ha) & (m)	Estensione (metri)	Valore Filare (a 2,42€/m)	Valore bosco/boschetto (a 192 €/ha)	%
3116	**Boschi igrofili**	70,64	--	--	13.562,88	8,22%
3112	**Altri boschi caducifogli**	194,14	--	--	37.274,88	22,60%
3119	**Querco-Carpineti**	1,96	--	--	376,32	0,23%
n.a.	**Piantagioni 3P (pieno campo)**	25	--	--	4800	2,91%
n.a.	**Piantagioni 3P (filari)**	--	45.000	108.900		66,03%
			TOTALE	**164.914,08**		

TABELLA 4-1: VALORI ECONOMICI DEI SERVIZI ECOSISTEMICI DI REGOLAZIONE NELL'AREA DEL PROGETTO INBIOWOOD.

Servizio Ecosistemico	Area di Studio		Piantagioni 3P		TOTALE		Piantagioni 3P (%)
	Valore min (€)	Valore Max (€)	Valore min (€)	Valore Max (€)	Valore min (€)	Valore Max (€)	
R1	24.575	58.622	1.689,09	5.373,37	26.264,34	63.995,59	**6%**
R4	328.564	903.553	92.400	254.100	420.964,80	1.157.653,20	**22%**
R9	51.214,08		113.700		164.914,08		**69%**
TOTALE	**404.354,13**	**1.013.389,50**	**207.789,09**	**373.173,37**	**612.143,22**	**1.386.562,87**	**34%**

Romagna Acque - Diga di Ridracoli

Overgrown with 33 M m3; more than 100 M m3 of drinking water supplied / year = approx. 50% of consumption in Romagna
Two problems: sedimentation and maintenance of high water quality.
The research starts in 1993.

In 2001, the company implemented a payment scheme to encourage forest owners (public and private) to adopt sustainable practices of forest management. The amount of the initial payment was around € 200 / ha (€ 5-600.000 / year), decrease to € 100 / ha after a couple of years, which corresponded to 7% and 3% of the income of water's invoice. Today, almost the entire surface of the area of collection (5,200 ha) is covered by the scheme.

Annual sedimentation (dam underground): 42,600 m3 in 1982, today <30,000 m3

Now: only intervention of ordinary maintenance and environmental education

PES Vittel

Payment of a premium of €200/ha/year to farmers commensurate with income losses and introduction of other benefits negotiated with the 26 local companies (eg free technical assistance in changes in cultivation practices, non-refundable contributions up to € 150,000 / company to improve corporate infrastructures, cancel debts for the purchase of funds or directly purchase the funds then sold under management with thirty-year contracts)

Change of management of agronomic practices (17,000 ha of corn have been converted to other plantation or meadows) - Reduction of nitrates in the stratum and conversion to the biological of numerous farmers.

The multinational has spent, during the first 7 years of implementation of the PES, around € 24.25m (€ 980/ha/year) = €. 0.0154 per bottle produced

Eaux ef foret - SIEM Moise

Event for transporting logs with recovery costs of € 69.000 + production suspension

Creation of an association of forest owners to facilitate the proper management of 150 ha of protection forests (average property: 0.49/ha each) with cost € 25.000/year

Compensation of higher costs and financing a flat rate of € 1.000/ha to support the transformation of woods into irregular mixed forests.

Progetto EcoPay-Connect 202

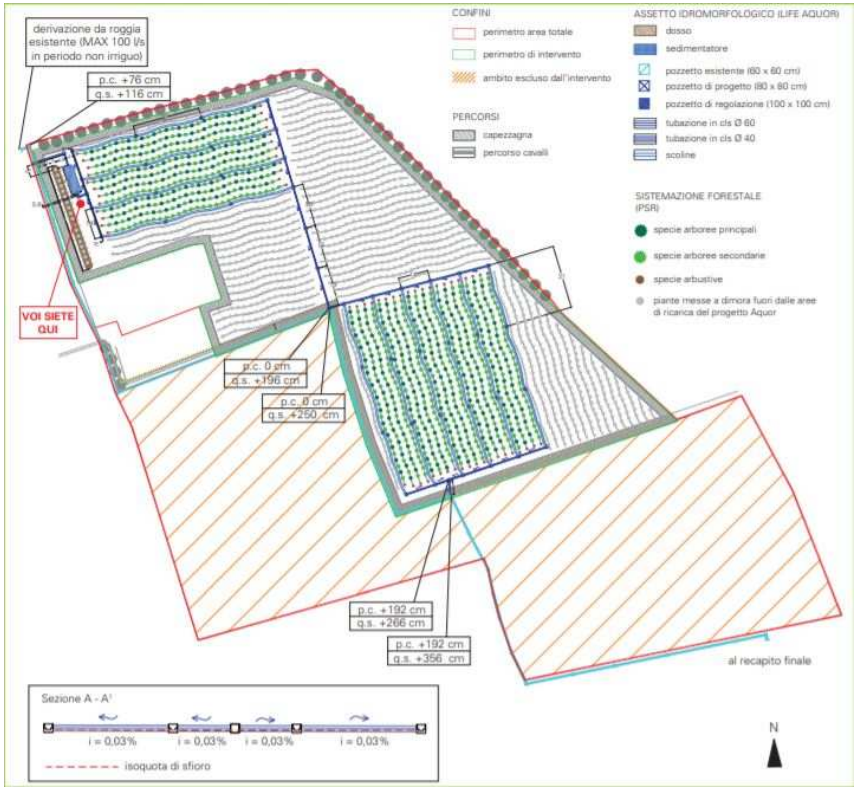
Agreement between farms (FSC certified) for the management of poplar cultivation, and Parco Sud Oglio to carry out specific actions for the conservation of natural areas owned by the Regional Park equal to 10% of the certified area.
Dual advantage:
- the Park minimizes the costs of managing the protected area, keeping its conservation intact;
- the company can meet the requirements of the Standard in line with the characteristics of the surface under management

Progetto Aquor

Implementation of 2.3 ha of plain forest

- Infiltration of 1 M mc water / year
- Fixation of 50 T CO2 / year
- Production of 40 q.ls wood/ year
- 600 visitors / year
- Nesting of 20 species of birds
- Reductions in emissions and consumption from agricultural activity

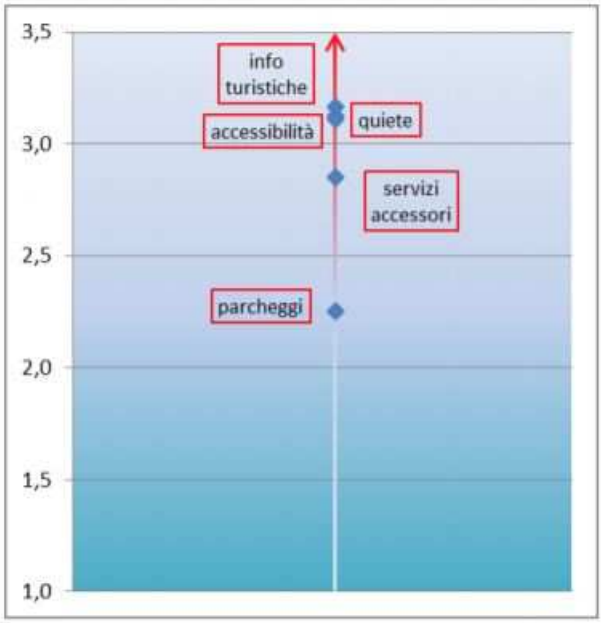
Economic loss of €. 744 / ha / year
compared to the cultivation of mais

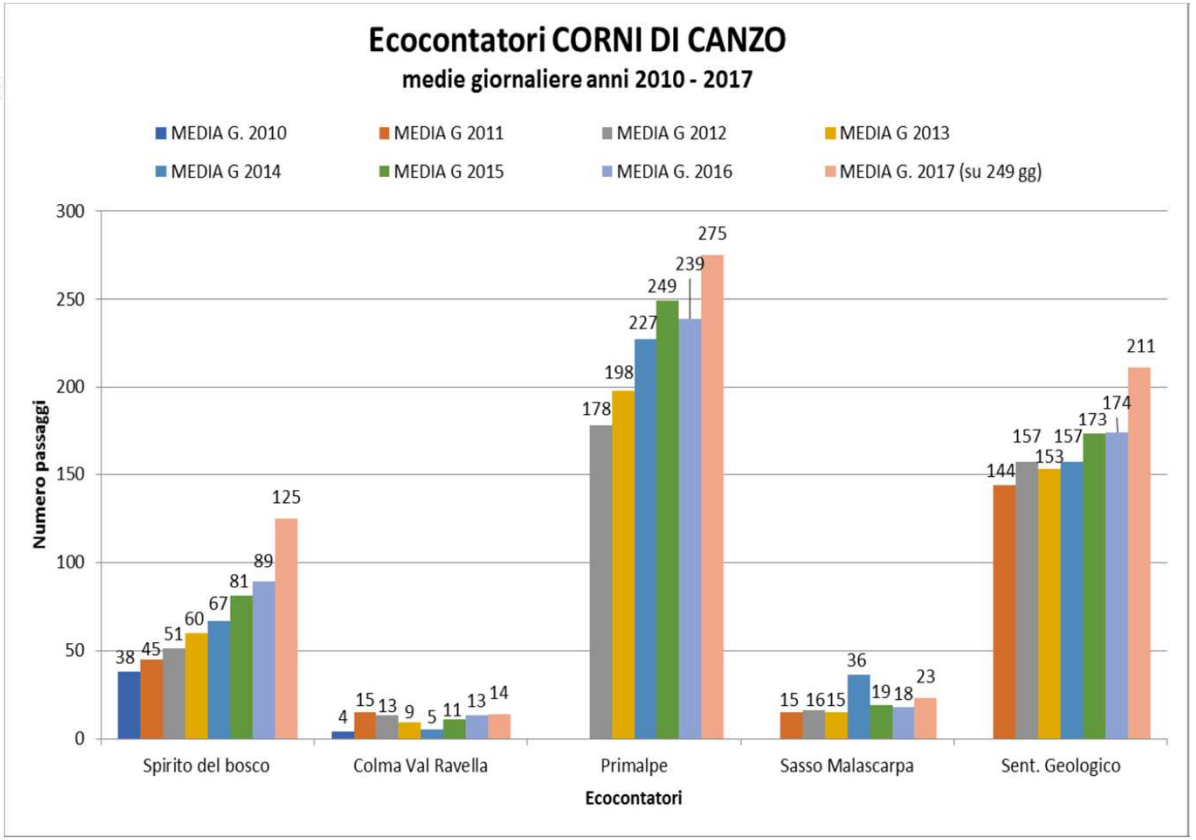


Groundwater Contract

Foreste Lombardia
Stima valore turistico e PES

Figura 3.26: valutazione dei servizi offerti da parte
poco soddisfatto; 4 = molto soddisfatto)





I PES ERSAF – SE C2 VALORE RICREATIVO

MICROPAGAMENTO PER SERVIZI ECOSISTEMICI SMS

CARTELLI INFORMATIVI INIZIO-FINE MIN. 1 SENTIERO/SITO PILOTA

Counter data: average of routes 48.800 (2014)
(Estimated: 50% of the real)

Will to pay = € 2,20

PES evaluation: 20% of the prevision= 8.000

Prevision evaluation: 8.000 x 1€ = €. 8.000

ecososteniamoci

RESULTS

A few hundred euros

From a possible estimate of
48,000 x 2.20 = €. 105,600

A real cash €. 1,000

CONCLUSIONS /1

- Great challenge
- Great opportunity for the forest sistem
- Not just the polluter pays but who produces public services is compensated

But....

- **Goods with public protections,** management limits (restrictions, fragmentation, etc.) ⟹ Complex regulatory framework
- **Non-recognition** of traditionally provided services (customs, acquired rights, etc.)
- **Unbalanced relationship** between those who buy and those who produce, often between strong positions (cities / large companies) and weak positions (small municipalities / individuals)
- **SE for planning:** bridge of language between professions

CONCLUSIONS /2

- **Complex procedure** and long times
- High **transaction costs**
- **Distance** between estimates and PES
- **Difficulty** in understanding and lack of awareness

- Existence of "**ecosystem disservices**"

- **Apply the tools** and experiment with solutions:

- Uncertain instrumentation
- Public-private collaboration and the role of intermediaries
- Role of communication

CHANGING THE NATURE OF CITIES

FORESTS AND SUSTAINABLE CITIES

Let's make our cities greener, healthier, happier places to live!

World Forum on Urban Forests
Mantova 2018

Thanks for your attention

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