



POLITECNICO  
DI TORINO

# Honors thesis

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COURSE OF

Territorial, Urban, Environmental and Landscape Planning

*Abstract*

**THE EVALUATION OF FOREST ECOSYSTEM  
SERVICES. Method and directions for territorial  
planning through Valle Tanaro's case study**

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Ecosystem services (ES), defined by Millenium Ecosystem Assessment (MA) in 2003 as “the multiple benefits given by nature to human beings”, has assumed a relevant role in the actual environmental issue. They are fundamental for the environmental, socioeconomic stability, and for humans’ well-being (figure 1). However, this importance has not been always acknowledged, that has contributed to an unsustainable exploitation of natural resources. Therefore, current international policies and initiatives, as those about climate and sustainable development, start acknowledging the necessity to explicit both biophysical and economic value of ES in order to take decision knowingly.

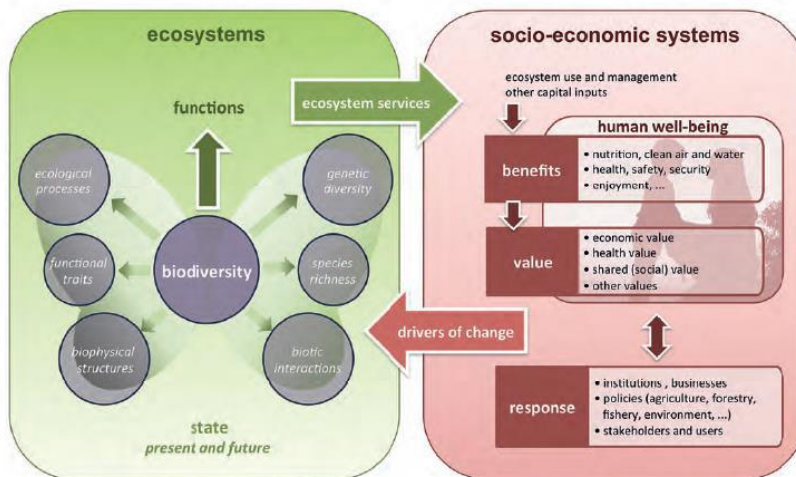


Figura 1: Scheme about the relations between ecosystem and socioeconomic system.

Source: Maes et al, 2013:17.

This thesis is focused on economic evaluation of ES, applied on ecosystem services of Valle Tanaro’ forests, work done during the internship in Piedmont Region. The aim is to show how the evaluation system can be useful for territorial planning. It has been used a method basing on previous works, enriched by an elaboration of results through an experimental approach. The principal reference has been the project Advanced Forest Fire Fighting (AF3), basing on which biophysical and economic indicators have been identified and associated to forest ecosystem services. These have been selected according to the international classification CICES, (Haines-Young & Potschin, 2009), figure 2. Biophysical values are translated into the economic ones thanks to the indicators calculated using Gis and based on environmental evaluation techniques and other processes described by the European project Life+ MNG. Since the work is Gis-based it has been possible to map the results, making them communicative visually too.

Funzione ecosistemica	Servizio Ecosistemico	Indicatore Biofisico	Indicatore Economico	DATI
<b>Regolativa climatica</b>	Sequestro di carbonio	Quantità assorbita dalle categorie forestali [t/ha/anno]	Valore delle quote CO <sub>2</sub> [€/t/anno]	INFC (2005); asta GSE; PFT.
	Assorbimento di PM <sub>10</sub>	Quantità assorbita dalle foreste [kg/ha/anno]	Valore esternalità negative, costi sociali [€/t/anno]	CLC; PFT; Life+MNG
<b>Regolativa protettiva</b>	Protezione da dissesto franoso	Estensione aree protette [ha]	Costo di surrogazione [€/ha/anno]	PFT; Life+ MNG; localizzazione frane (Geoportale).
	Protezione da dissesto valanghivo	Estensione aree protette [ha]	Costo di surrogazione [€/ha/anno]	PFT; Life+ MNG; localizzazione valanghe (Geoportale).
	Protezione dall'erosione del suolo	Volume erosione evitata[m <sup>3</sup> ]	Costo di surrogazione [€/m <sup>3</sup> /anno]	PFT; Life+ MNG; Carta sull'erosione del suolo; carta pendenze
	Protezione idrologica	Volume piogge trattenute [m <sup>3</sup> ]	Costo di surrogazione [€/m <sup>3</sup> /anno]	PFT; Life+ MNG;
<b>Approvvigionamento</b>	Produzione di legname (uso energetico, per lavoro, legna da ardere)	Volumi prelevabili [m <sup>3</sup> /ha/anno]	Prezzo di mercato [€/m <sup>3</sup> /anno]	PFT; SIFOR; ISTAT e indagini di mercato
	Produzioni di prodotti non legnosi (funghi, castagne)	Volumi prelevabili [kg/ha/anno]	Prezzo di mercato [€/kg/anno]	PFT; Life+MNG; ISTAT e indagini di mercato
<b>Culturale</b>	Affluenza turistica	Numero visitatori ai siti protetti boscati	Costo del biglietto [€/persona]	Intervista ai gestori dei siti; siti web delle aree protette.

Figura 2: Table showing the forest ecosystem services selected and the relative indicators calculated.

The following step has been to elaborate the way to use the results in the territorial planning sector, focusing on two approaches, whose one is experimental. The first consists of summing ES' values in a Totale Economic Value, though the problem regarding trade-offs remains still open. These are the conflicts that can raise between ecosystem services, as those provided by the forest alive (climate and protective services) and those provided by a cut forest (productive services). Seeking to overcome this limit, it has been experimented the second approach, that of Cluster Analysis, a statistic method of multivariate analysis from which a reclassification of forests has been obtained, based not on the forest classes but on economic values of ecosystem services. The use of cluster analysis presents advantages and disadvantages for territorial planning that are analysed in the thesis. However, it emerges that the two approaches can be used in a complementary way.

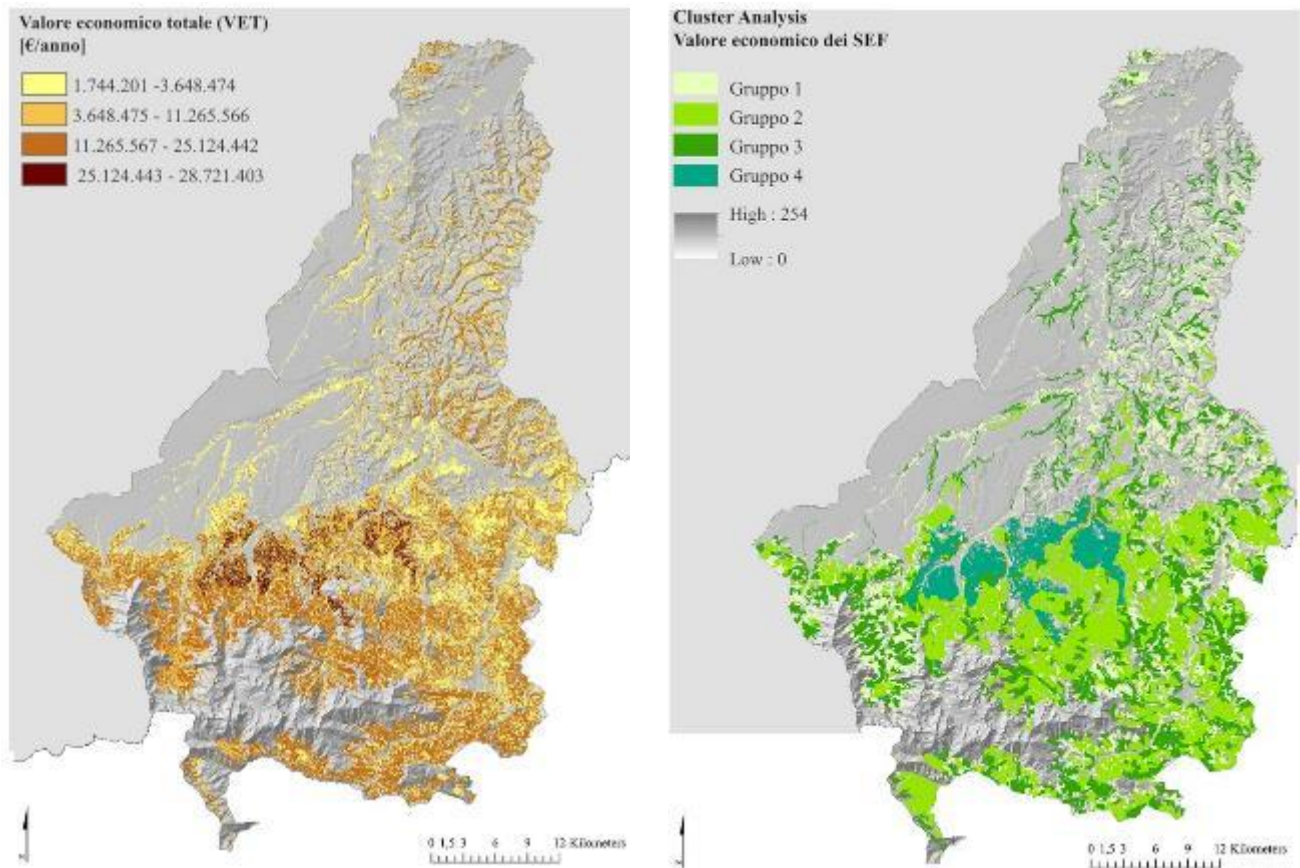


Figura 3: Maps of the results. TEV approach (on the left) and Cluster analysis one (on the right).

Reminding that identifying economic values of ecosystem services aims to let their importance emerge, consequently to intervene with a sustainable management, the directions that the method can give to planning system are identified. The results of the evaluation can improve the knowledge of forest ecosystem, helping territorial planning to take decisions regarding environment knowingly. Being aware of ES value is useful to define PES (Payment for ecosystem services), based on the principle of “paying for the benefits used”. According to this, who need ecosystem services should intervene investing for their protection paying who work for their management. Finally, evaluating forest ecosystem services can influence also the contents of territorial plans, driving them to consider the forest as a dynamic reality that needs to be valorised for its multifunctional role.