THE ECONOMIC EVALUATION OF LANDSCAPE

A proposal of indicators

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UNISCAPE European Network of Universities for the implementation of the European Landscape Convention

Structure

- Introduction
- Landscape as an Economic Resource
- Landscape: Externalities, Public Goods
- Components of landscape demand
- The value of landscape
- The economic landscape evaluation methods
- Economic landscape indicators: a synthesis

European Landscape Convention

CHAPTER I – GENERAL PROVISIONS

Article 1 – Definitions

For the purposes of the Convention:

a "Landscape" means an area, **as perceived by people**, whose character is the result of the action and interaction of natural and/or human factors.

Is landscape an economic resource?

- We **spend money** to admire a beautiful landscape
- Higher value of **real estate** because of the beautiful landscaping
- Precious landscapes contribute greatly towards **tourism**
- Landscape produces benefits which we attribute an economic value, **but not necessarily "buying it" directly**

Landscape as an economic good

- Good = everything satisfying a human need or want
- Unlike other animals, humans have a dynamic concept of good, as it is filtered through technology and culture.
- Humans stored some necessary information to their achievements and survival into their cultural heritage.

Landscape as an economic good

- The economic theory **has not formulated a definition** to describe landscape.
- The landscape is an **externality** and functions as a (pure) **public good.**

Externalities

Externalities are usually defined as

unintentional side-effects of production and consumption that affect a third party either positively or negatively

Competitive markets will not ensure efficiency

Type of Externalities

A **NEGATIVE** externality occurs when a decision causes costs to third party not involved in a given economic transaction without compensation

- For example, farming that causes landscape degradation imposes costs on others

A **POSITIVE** externality results when part of the benefit of producing a good or service accrues to firms or stakeholders other than that which produces it, without compensation

- For example, maintenance of beautiful hill landscape from farmers

Public Goods

A private good has two essential characteristics

- It is **excludable**

  A good is excludable if the seller can exclude non-buyers from its consumption

- It is **rival**

  A good is rival if, in transferring the good to one purchaser, the quantity the seller has available for sale is reduced

NO → **PURE PUBLIC GOODS**

↓

MARKET FAILURE

Landscape as public good

	NON-RIVAL	Congestible	RIVAL
NON EXCLUDABLE	**PURE PUBBLIC GOODS Landscape (non use value)**	Open access resources **Landscape (use value by visitors)**	Open access resources
Benefits involve only a small jurisdiction such as municipality	Local pure public goods *Relational goods* **Landscape (use value by residents)**		
Excludable only to outsiders of a community		Common property resources	Common property resources **Landscape (use value by visitors if exclusione can be made)**
EXCLUDABLE	*Toll goods*	Club goods	**PRIVATE GOODS**

OCSE, 2001, 2003 and 2005

How markets use priced and unpriced (environmental) resources

- As it is a **(pure) public good** and an **externality**, landscape commonly can neither have a **price** nor be **produced** by private citizens.
- As **positive externality** of an economic activity, its quality in a market economy would be always **lower** than the socially optimal level.

How markets use priced and unpriced (environmental) resources

- It calls for **government intervention** to correct market failure.
- To implement these policies the institutional decision maker has to be able **to estimate the landscape**
- Before estimation it is necessary to identify the **benefits** deriving from landscape

Components

To understand which features make attractive a landscape, it is necessary to distinguish among

1. The **biological** components
2. The **cultural** components
3. And the ones connected to the **experience**

1 – The biological component

An environment that seems to be able to satisfy the biological needs becomes more attractive both for man and other animals.

(Appleton, 1975)

The landscapes seem to be preferred, if they have some **features** (Kaplan, 1979):

- legibility
- mystery
- refuge

1 – The biological component

We prefer the so called
"*Savanna like landscape*"

VALUE SYSTEM SHARED BY SEVERAL PERSONS, WHICH IS SLIGHTLY AFFECTED BY SOCIAL FEATURES

2 - The cultural component

It is linked to first phases of education and first environmental experiences (usually mediated by adults)

We acquire the preferences of adults and educators

PREFERENCES RELATED TO CULTURE AND TRADITION OF A POPULATION OR A TERRITORY ARE SUBJECT TO TRANSFORMATION

3 - The component related to experience

We prefer the landscapes that contain historical-cultural components and/or wild elements, or landscapes that are functional to human activities (productive, recreational ones, etc.)

PREFERENCES QUITE CONSTANT IN THE COURSE OF TIME, AS THEY ARE DEFINED BY "CULTURED" MINORITIES, WHOSE VALUES WOULD BE HANDED DOWN THROUGH EDUCATION OR LINKED TO VARIOUS ACTIVITIES

The value of landscape

The value of landscape depends on its ability to **satisfy some needs** (or **demands**)

- Historical-cultural and identity demand
- Tourism-recreational demand

Two value components derive from it:

- Historical-cultural component
- Aesthetic and perceptive component

The value of landscape

The aesthetic and historical-cultural values could be estimated using:

- **NON MONETARY METHODS**
- **MONETARY METHODS**

According to the decisional process in which the estimation has been engaged.

Economic Landscape Evaluation Methods

- Landscape economic evaluation doesn't necessarily mean monetary evaluation
- With the exception of nominal scale any scale of measurement can be used but ratio data should be preferred
- Economic landscape indicators are a measure (monetary or not) of the aesthetic and historical benefits becoming from a landscape
- They can be estimated using several methods

An attempt to classify economic landscape evaluation methods

Landscape evaluators	Approach			Kind of value		Object of the evaluation
				Aesthetic	Historical	
General public	non monetary			reliable	non reliable	single components whole landscape
	monetary	supply based (costs)	opportunity cost	reliable	non reliable	whole landscape
			defensive expenditures	reliable	non reliable	single components
		demand based (benefits)	*revealed preferences*			
			- single site travel cost	reliable	non reliable	whole landscape
			- multisite travel cost	reliable	non reliable	single components
			- hedonic pricing	reliable	non reliable	single components
			stated preferences			
			- contingent valuation	reliable	non reliable	whole landscape
			Conjoint choice experiment	reliable	non reliable	single components
	mixed	multiobjective analysis	opportunity cost	reliable	non reliable	whole landscape
Experts	non monetary			non reliable	reliable	single components whole landscape
	monetary	supply (costs)	opportunity cost	non reliable	reliable	whole landscape
			defensive expenditures	non reliable	reliable	single components

A - General public
A1) Non monetary aesthetic methods

- Scenic beauty is in part "*in the eye of the beholde*r" but it also depends on the specific features of the landscape being viewed (Friedeldey, 1995)
- All humans share some innate preferences for certain types of natural landscapes
- The cultural basis of landscape appreciation is similar among a community

A

B

C

D

A = 10 B = 7

C = 4 D = 3

The biological and cultural landscape appreciation

Some experimental evidence in the North-east of Italy

Study area	Udine province hill and plain	Venice lagoon basin plain	Veneto east plain	Euganei Hills Natural Park (PD)	Veneto west plain	Veneto plain (computer imaging)
Geographic Area	hill and plain	plain	plain	hill and plain	plain	plain
Land use	Arable crops, vineyards, meadows, woods, poplars, hedges	Arable crops, meadows, poplars, hedges, set-aside, vineyards, horticultural field crops	Arable crops, poplars, hedges, vineyards	Arable crops, meadows, woods, hedges, uncultivated land, vineyards, horticultural field crops	Arable crops, vineyards, meadows, orchards, hedges	Arable crops, meadows, pasture, woods, hedges, scattered trees, tree rows
Cultural and historical elements	mulberries-vines rows, hilly surface laying out	enclosed fields	"Cavini" historical fields laying out	hilly surface laying out		
Sites num.	24	18	n.d.	20	8	n.d.
Slides num.	134	126	117	179	101	40
Interviewees num.	203	225	113	171	67	137
Interviewees composition	General public	Students	Students	General public	General public	Students

Land use and cultural-historical elements	Euganei Hills Natural Park (PD)	Venice lagoon basin plain	Udine province hill and plain	Veneto east plain	Veneto west plain	Veneto plain (computer imaging)
Horticultural field crops %	-0,069	-0,044	-0,035			
uncultivated land %	-0,018	-0,032				
arable crops %	-0,019	-0,017	-0,021	-0,014		
meadows %	0,018	0,017	0,014		0,019	0,025
cow pasture %						0,031
alfa-alfa %					0,028	
orchards (young trees) %					-0,020	
Hedges %	0,060	0,024	0,028	0,050	0,015	0,066
Hedges heigth > 6 m (*)					1,144	
Hedges heigt from 3 to 6 m (*)					0,607	
wood %	0,006		0,036			0,041
scattederd oilve trees (*)	1,069					
ditches, streams (*)	0,619	1,482		2,318		
scattered trees (*)	0,732	1,455	0,942		0,644	0,181
tree rows (*)	1,225				0,941	0,643
paths (*)	3,717	1,322				
high voltage pylons (*)	-2,346			-2,478	-2,638	
sprinkler (*)					-1,022	
modern buildings (*)	-0,709					
non visible morphology(*)	-1,417					
historical laying out of fields	0,375					
uncultivated land (herbaceous) (*)	0,831					
vineyard %			-0,014	0,059		
tree rows (*)		0,032				
asphalt road (*)		-1,809				
pylons, urban buidlings, etc. (*)		-0,850	-0,926			
mulberries rows (*)			0,132			
hills (*)			0,704			
photograph quality (*)			0,736			
constant	5,542	4,380	5,780	5,159	4,630	3,452
r squared correct	0,43	0,62	0,63	0,25	0,75	0,26

Elements that reduce the aesthetic value

- All the experiments confirm the hypothesis of the presence of different ways of landscape perception (biological and cultural)
- All the elements of the so called “savanna like landscape” improve the aesthetic appreciation
- If visible, also cultural elements can play an important role
- These results are consistent with the international literature

A2) Mixed methods

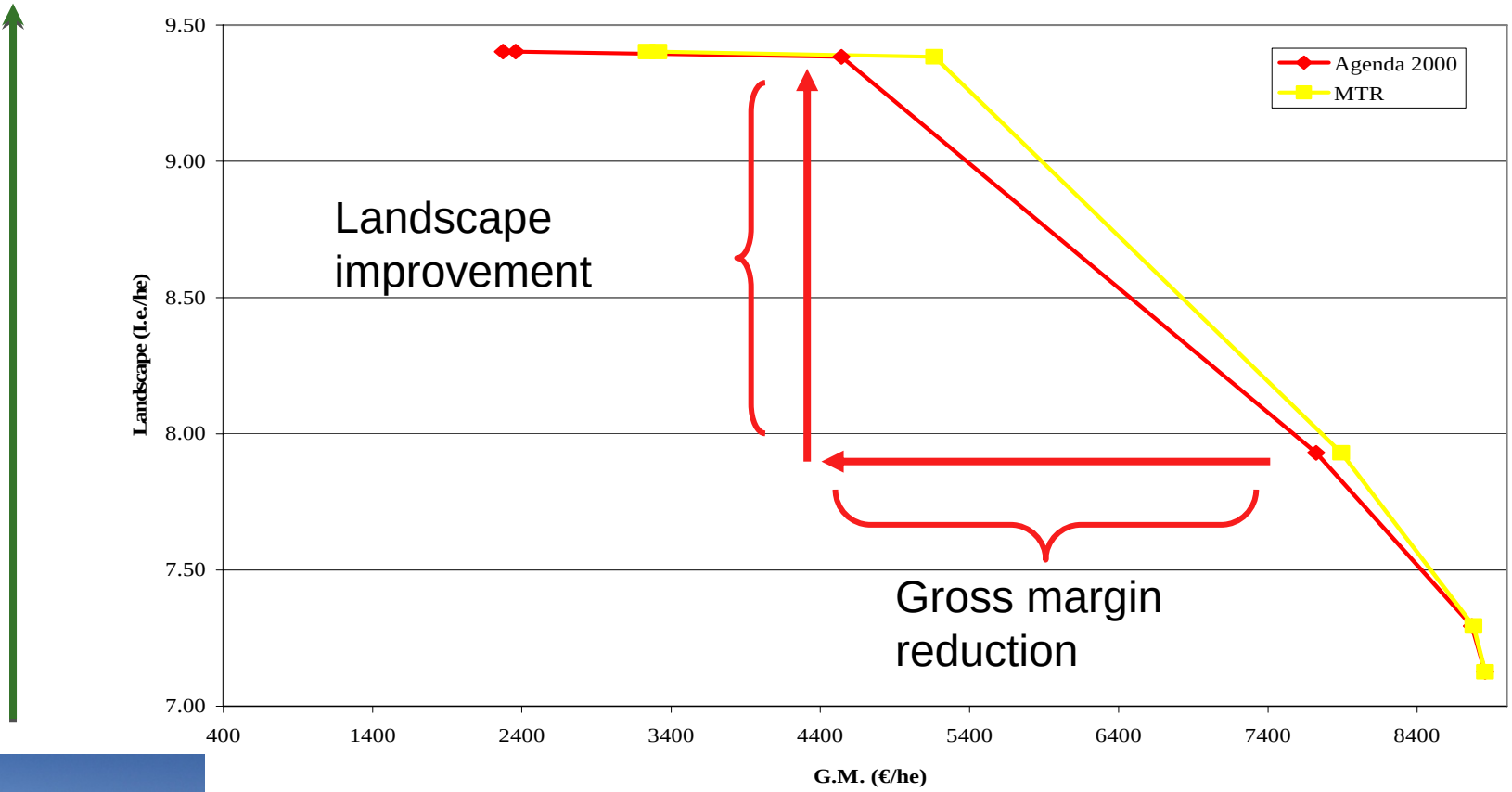
From scores to money – the opportunity cost of landscape improvement or preservation

- Multiobjective analysis allows to estimate the opportunity cost of landscape improvement
- It is an evolution of linear programming
- the optimal compromise solution between farm income and landscape aesthetic quality can be find

Opportunity cost of landscape improvement under Agenda 2000 and Mid Term Review Scenario

Livestock farm

Figure 1 - Efficiency frontier livestock farm: comparing Agenda 2000 and Mid Term Review scenario



A3a) Monetary – supply-based methods
The defensive expenditures

DEFENSIVE EXPENDITURES

the money that the citizens or the public administration spent in order to preserve the landscape, the cultural heritage, the environment, etc.

Landscape Farms defensive expenditures Three Italian researches

Area	Schio - Tretto (VI) municipality	Colli Euganei Natural Park (PD)	Udine Province Plain
Geographic area	Pre Alpine mountain	Hill	Plain
Year	1990	1991	1993
Farms number	19	21	13
Defensive expenditures (euro per hectare - constant price 2004)	**179,1**	**132,1**	**48,2**
Percent of yearly revenue	16,3	2,5	1,8

A3b) Monetary – demand-based methods

Stated preferences: contingent valuation (CV)

- **Contingent Valuation** is a survey-based economic technique for the valuation of non-market resources, such as landscape preservation.
- People are directly asked to state how much they would be willing to pay (or accept a compensation) for a specific environmental service
- People state their willingness to pay (or to accept) contingent on a specific hypothetical scenario
- The willingness to pay and the willingness to accept are measures of the consumer surplus (benefits)

The basic structure of the hypothetical market

What are you **Willing To Pay (WTP)** in order **to improve** the landscape?

What are you **Willing To Accept** (**WTA**) in order **to renounce** to the landscape improvement?

What are you **Willing To Pay (WTP)** in order **to prevent** the landscape degradation?

What are you **Willing To Accept** (**WTA**) as a **compensation** for the landscape degradation?

CVM landscape evaluation around the world

	before 1987	from 1987 to 1991	from 1992 to 1996	from 1997 to 2001	from 2002 to 2006	total
Italy			**2**	**3**	**6**	**11**
Great Britain		3	5	1		9
USA	2	2	1	1		6
Others		2	4	1	6	13
Total	**2**	**7**	**12**	**6**	**12**	**39**

Authors and year	Area	Aim of the evaluation	Benefits estimation (current prices)
Tempesta, 1997	Plan between Isonzo and Tagliamento rivers (Udine)	Landscape conservation	WTP average =14,9 € per family / year
Marangon e Tempesta, 2001	Hills of Friuli Venezia Giulia Region	Landscape conservation	WTA median = 375,0 € per family / year
Marangon e Tempesta, 2001	Hill of the Collio Area (Friuli Venezia Giulia Region)	Landscape conservation	WTA median = 72,3 € per family / year
Marangon e Tempesta, 2001	Western Hills (Friuli Venezia Giulia Region)	Landscape conservation	WTA median = 112,7 € per family / year
Cicia e Scarpa, 1999	Cilento National Park	Landscape conservation	WTP average = 18,0 € per person / year
Tempesta e Thiene, 2004	Cortina d'Ampezzo Valley - Dolomites (Belluno)	Landscape conservation	WTP average = 27,4 € per family more years
Signorello et al., 2001	Etna Volcan area (Catania)	Landscape conservation	WTP average = 51,6 € one shot per family
Marazzi e Tempesta, 2005	Italy	High voltage lines under grounding (improvement)	WTP median = 156 € per family / year
Marazzi e Tempesta, 2005	Italy	High voltage lines under grounding (improvement)	WTA median = 389 € per family / year
Tempesta, 2006	Plain of the Venice Municipality	Landscape improvement	WTP median = 20,1 € per person / year
Torquati et al., 2006	Umbria Region hills and mountains	Landscape conservation	WTP average = 47 € per family/year
Idda et al., 2006	Sardegna - Thiesi hills area (Sassari)	Landscape conservation	WTP average = 56,4 € per family / year
Idda et al., 2006	Sardegna - Thiesi hills area (Sassari)	Landscape conservation	WTP median = 27,6 € per person / year
Signorello et al., 2005	Viola coast (Reggio Calabria)	Landscape conservation	WTP average = 183,7 € one shot per family
Antonelli et al., 2006	Marche Region - hills and mountains	Landscape conservation	WTP median = 74,3 € per person / year

Landscape conservation benefits in Italy:

€ 1.290 millions per year

Whole CAP agri-environmental measures expenditure in Italy:

about € 830 millions per year

The way ahead: Conjoint Choice Experiments

- Conjoint analysis is a method usually employed in market researches
- Recently it has been used in the environmental evaluation
- Only few studies estimated landscape value using conjoint choice experiments (Sayadi et al., 2002; Hanley et al., 1998; Campbell et al., 2005)

How conjoint choice experiments work: valuing alternatives hypothesis of landscape improvement in the plain near Venice

B. SCENARIO 1

Choose the most preferred option

			
	A	**B**	**C**
Wood	75%	100%	-
Arable crops	25%	-	100%
Meadows	-	-	-
Hedges	yes	no	no
Cows pasture	yes	no	no
Small lake	yes	no	no
Cost	€ 7	€ 10	€ 0
	❑	❑	❑

Cost = tax increase per family per year during the next 10 years

How conjoint choice experiments work: valuing alternatives hypothesis of landscape improvement in the plain near Venice

Marginal effects

WTP for one percent wood increase	0,15
WTP for one percent arable crops increase	-4,40
WTP for one percent meadows increase	17,64
WTP for cows presence	10,18
WTP for small lake presence	14,20

WTP estimates for different percentage of wooded land

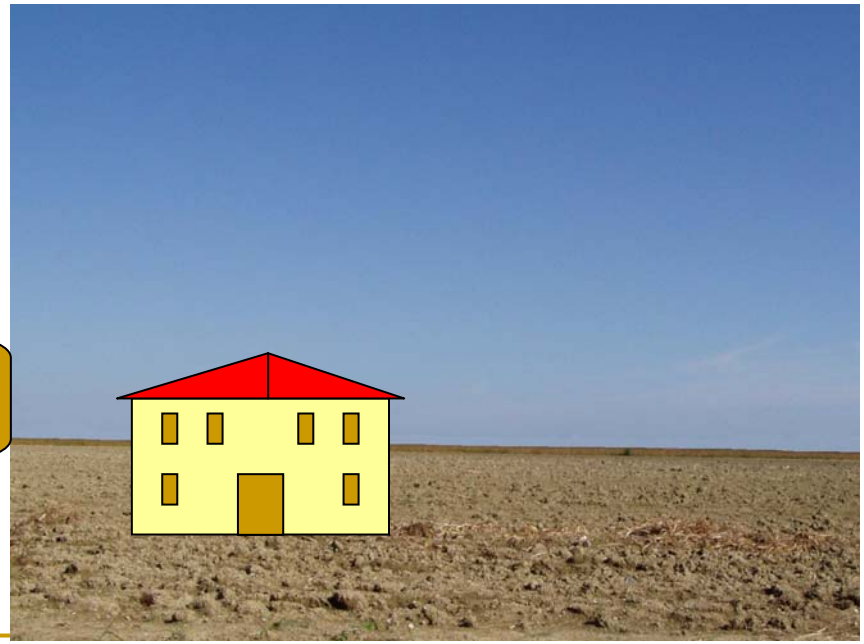
Surface coverage	1%	25%	50%	75%	100%
WTP (€ per year per family)	**0,16**	**3,87**	**7,74**	**11,63**	**15,48**

Also the monetary evaluation confirms the preference for the ***savanna like landscape***

A3b) Monetary – demand methods revealed preferences

The hedonic pricing method

2.200 €/mq



800 €/mq

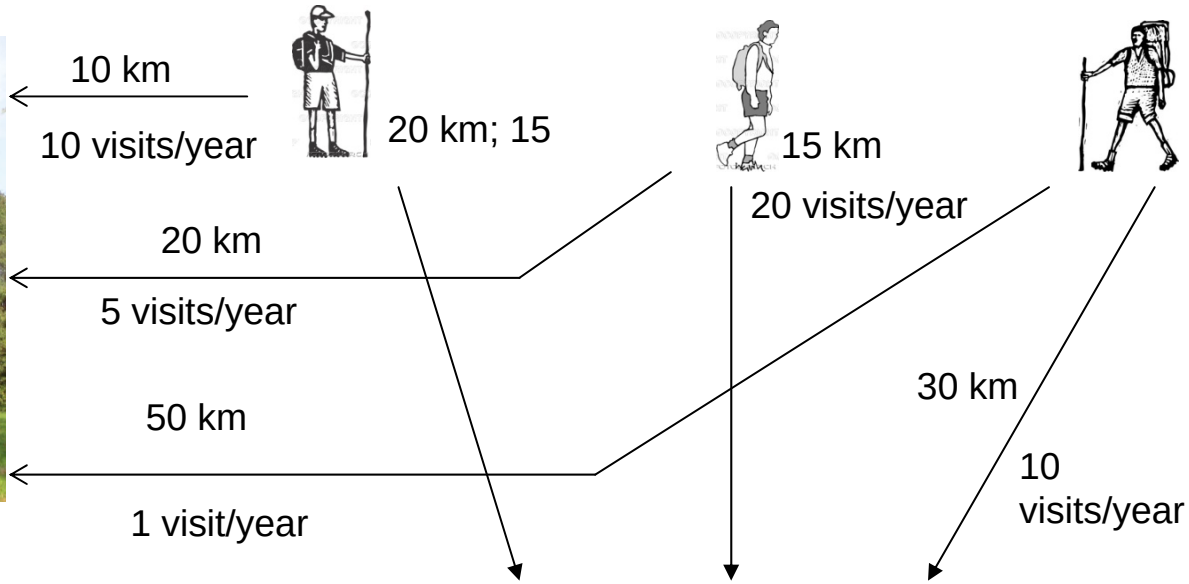
The hedonic pricing method

Empirical results

- Some elements of the landscape can affect the value of housing
- This influence tend to decrease rapidly with distance
- These effects vary widely depending on the nation, the town, the type of property and the visibility of landscape
- The method is relatively complex to implement and interpret

A3b) Monetary – demand methods revealed preferences

The travel cost method



Single site travel cost

Multiple site travel cost

The travel cost method

The **single site** travel cost method can estimates landscape value if and only if:

- The performed activities are landscape oriented (hiking, sightseeing, etc.)
- Only one landscape is visited

The **multisite** travel cost can overcome the second restriction

It' s possible to calculate the value of each landscape element

A3b) Monetary – demand methods revealed preferences

The travel cost method

An example: The Change of the recreational benefits caused by a 1% reduction of the forest surface in the forest districts of Friuli Venezia Giulia (Marangon et al, 2002)

Benefits change (euro per hectare)

Variazione benefici per ettaro (€)

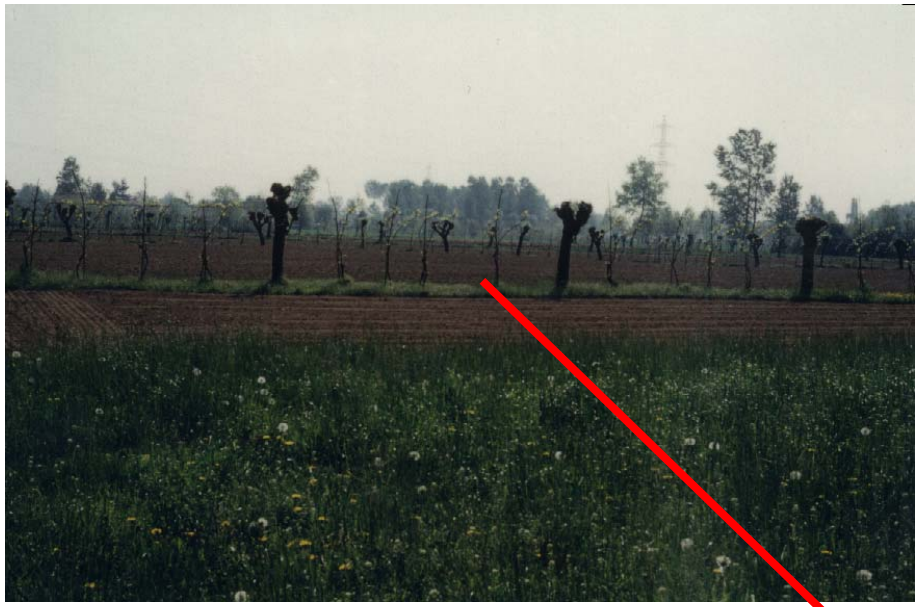
Districts	Ostrio-leccete, orno-ostrieti, corileti, alnete	Carpineti, castagneti, saliceti, robinieti, aceri-frassineti	Faggete	Piceo-faggeti	Abieti-piceo-faggeti, pecceti, lariceti
1.Valcanale	-212,32	-106,74	-148,18	-461,80	-187,82
2.Canal del Ferro	-23,15	-11,64	-16,14	-50,99	-20,55
3.Carnia	-37,83	-19,03	-26,37	-83,24	-33,53
4.Dolomiti friulane	-55,91	-28,11	-38,92	-122,87	-49,64
5.Prealpi giulie	-42,28	-21,28	-29,45	0,00	-37,65
6.Prealpi carniche	-28,72	-14,45	-20,03	-63,48	-25,58
7.Prealpi pordenonesi	-36,79	-18,52	-25,70	0,00	-32,77
8.Prealpi giulie meridionali	-107,20	-53,71	-75,03	0,00	0,00
9.Colline moreniche	-105,38	-52,94	0,00	0,00	0,00
10.Colli Orientali e Collio	-68,21	-34,27	-47,73	0,00	0,00
11.Carso GO e TS	-143,83	-72,97	0,00	0,00	0,00
Totale	-84,27	-41,60	-32,74	-264,26	-72,12

Experts evaluations

The Historical value - Landscape as a cultural good

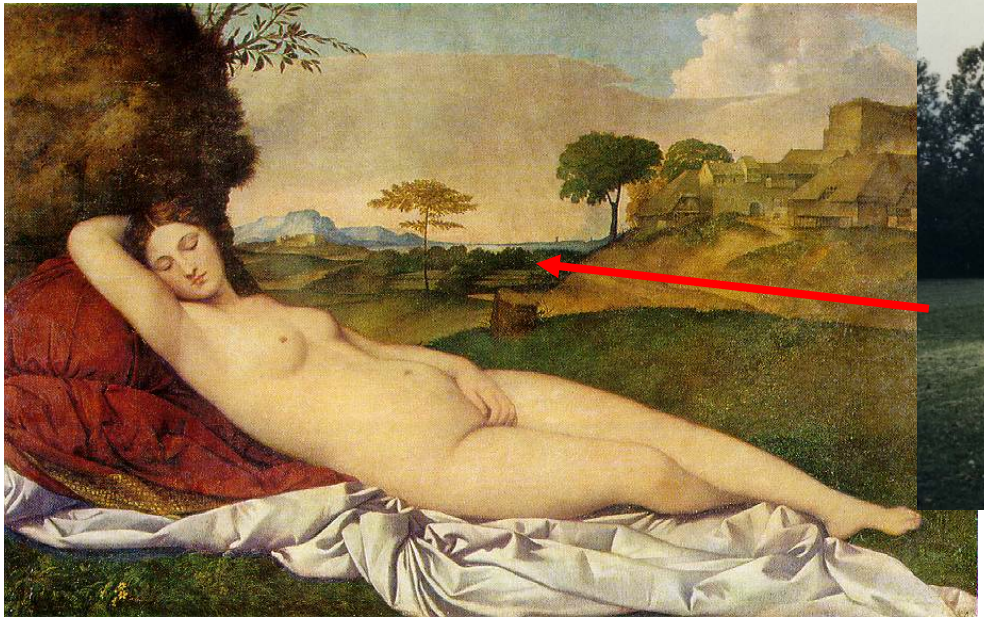
Experts analyzing historical maps, cadastres, pictures etc. can find the presence of:

- Ancient structures and infrastructures (roads, irrigation and reclamation ditches and channels, etc.)
- Historical buildings (houses, cowshed, etc.)
- Irriguous and hydraulic land settlements, dry stones walls etc.
- Cultivations (row of mulberries-vines; hedges; enclosed fields; historical woods; grasslands; water-meadows; trees with traditional pruning; etc.)



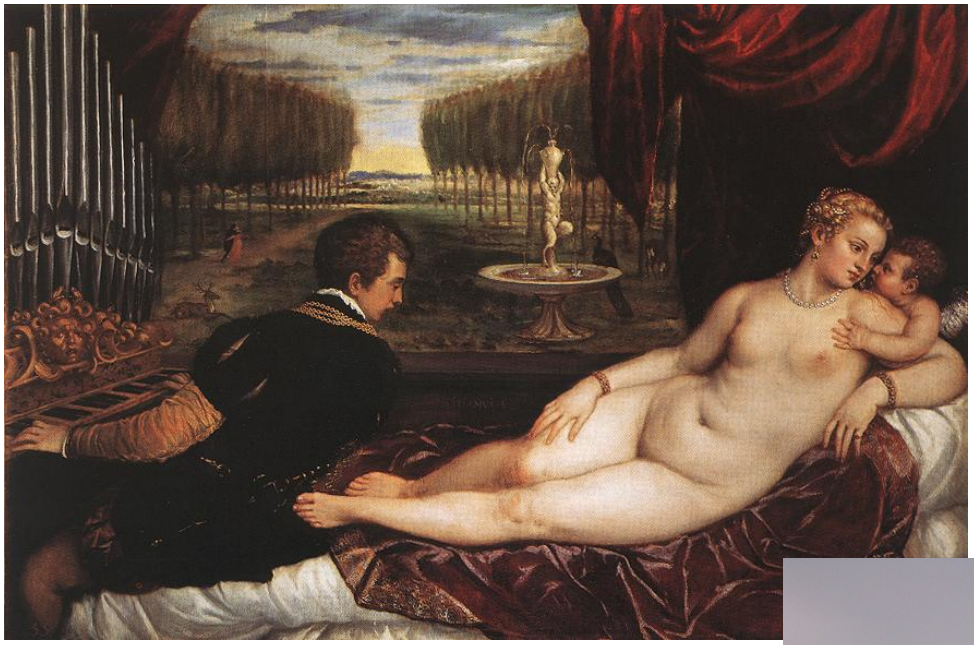
Row of mulberries and vines

Giovanni Bellini (1426 - 1516)



Giorgione (1477 – 1510)

Enclosed fields in the plain



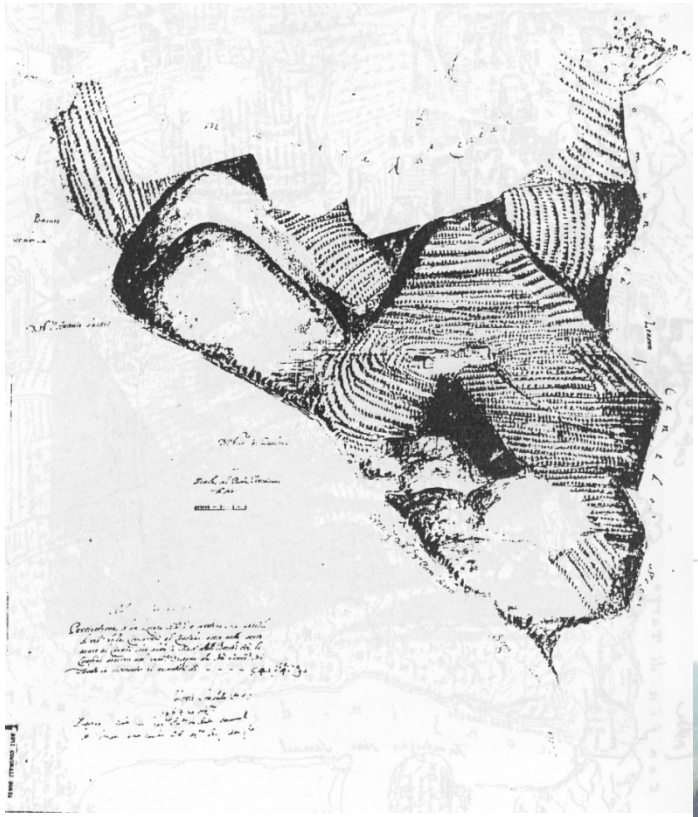
Venetian Villas Landscape

Tiziano (1490 – 1576)

Enclosed fields in the hills of Veneto

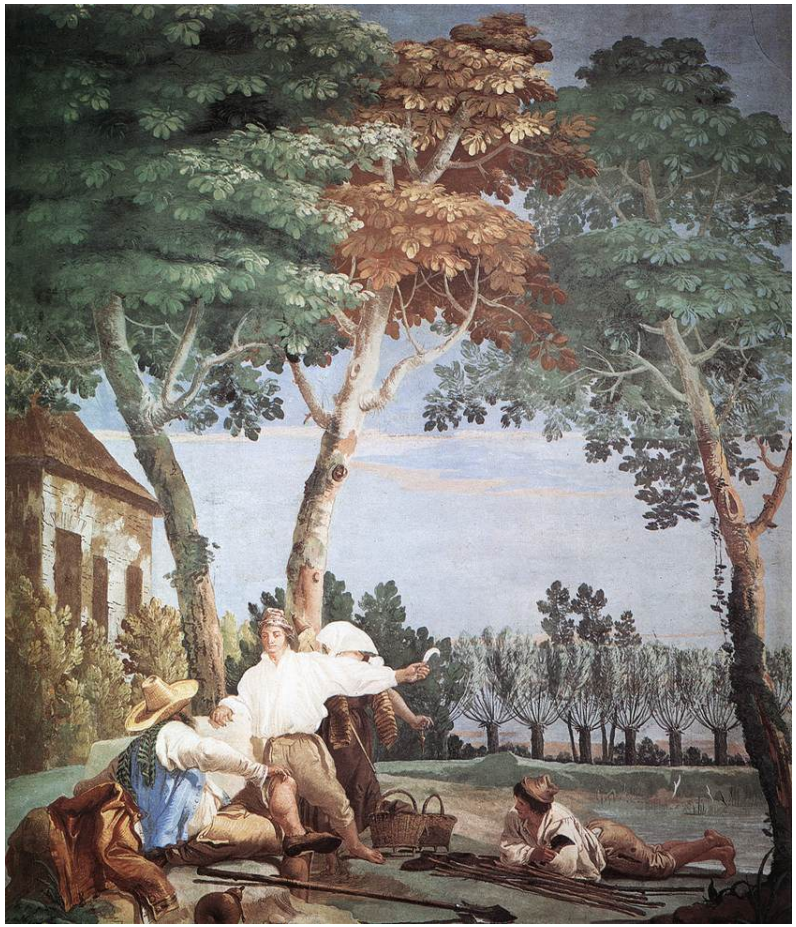
Cima da Conegliano (1459 – 1518)

Historical Vineyard landscape of Prosecco di Conegliano – Valdobbiadene (Veneto)



Ancient venetian map (bird flight vision)

Second half of the XVII century



Willows trees traditional pruning

Giandomenico Tiepolo (1727 – 1784)

Economic landscape indicators: a synthesis

Landscape evaluators	Approach			Economic landscape indicators
General public	non monetary			average whole landscape score
				single elements score
	monetary	supply (costs)	opportunity cost	lost income per hectare
			defensive expenditures	cost of whole/single elements landscape maintenance
		demand (benefits)	revealed preferences	
			- single site travel cost	recreational benefits per hectare
			- multisite travel cost	recreational benefits per hectare, recreational benefits per hectare per single element change
			- hedonic pricing	houses price change per squared meter referred to the whole landscape quality or to the visibility of a single landscape element
			stated preferences	
			- Contingent valuation	willingness to pay per hectare of preserved/improved landscape
			- Conjoint choice experiment	willingness to pay per hectare or per single element
	mixed	multiobjective analysis	opportunity cost	income reduction per hectare per unit of landscape aesthetic improvement
Experts	non monetary			ad hoc scale
	monetary	supply (costs)	opportunity cost	lost income per hectare
			defensive expenditures	cost of whole/single elements landscape maintenance


Thank you for
your attention