
VALUING NATURAL RESOURCES
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Main addressed issues
✓The off-market value of a natural resource
✓The money-value of a resource and why pricing it?
✓Monetary assessment methods

Total Economic Value (TEV) break down into different parts

Use Value:

- direct (e.g. woodland recreation)
- indirect (e.g. watching television show about a forest)

Non-use values (passive):

- option (value placed on future known uses e.g. carbon sequestration)
- quasi option (value placed on future unknown uses, e.g. species having medical benefits.)
- bequest
- existence (intrinsic)

Different type of values are relevant depending from

- ✓Process irreversibility
- ✓Uncertainty on future availability
- ✓How 'unique' is the good under valuation

FROM A PRATICAL POINT OF VIEW:

	Total economic value components			
Type of good	Use	Option	Existence	Bequest
Can Substitute	yes	no	*	no
Can't substitute				
Can Surrogate	yes	**	*/**	**
Can't surrogate	yes	yes	yes	yes

* Depending on ethical issues

** depending on how can be surrogated

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TOTAL ECONOMIC VALUE
The maximum value a person places on a good or environmental quality
i.e.
How much money he or she is 'willing to pay' to obtain that good or level of environmental quality


PRIVATE COMPONENTS: Market price
OFF-MARKET (PUBLIC) COMPONENTS:
We do not directly observe market transactions in which people pays and sells these goods
Non excludability from use may cause free riding
This makes it difficult to infer these values


WHY MONEY-VALUE PUBLIC COMPONENTS OF A NATURAL RESOURCE?
Helping public decisions (benefit-cost analysis)
Environmental damage compensation


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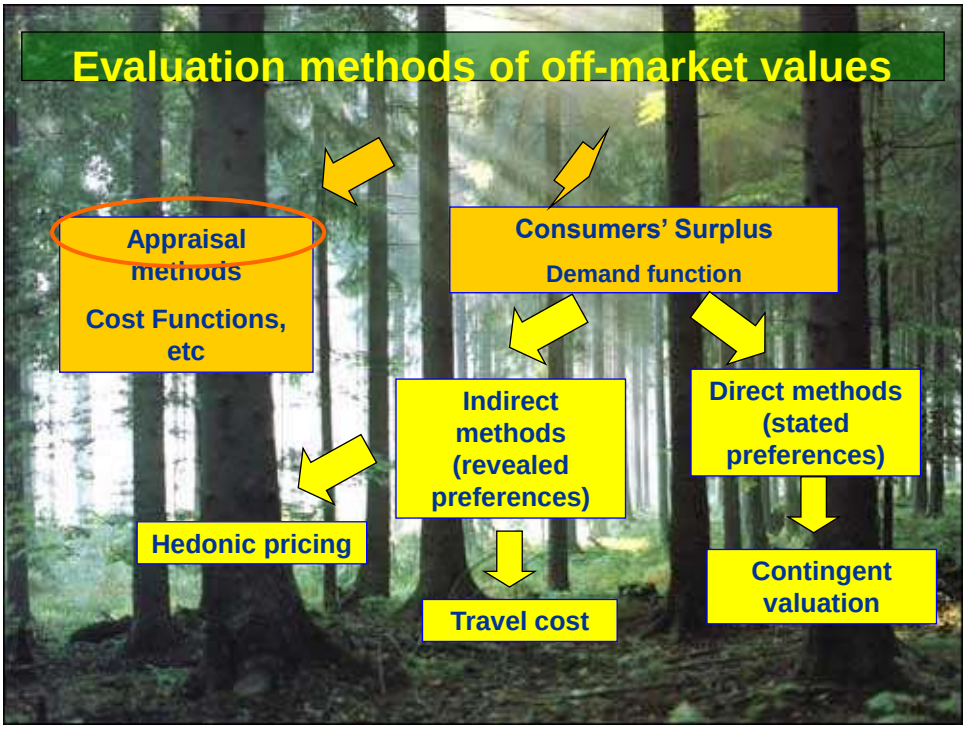
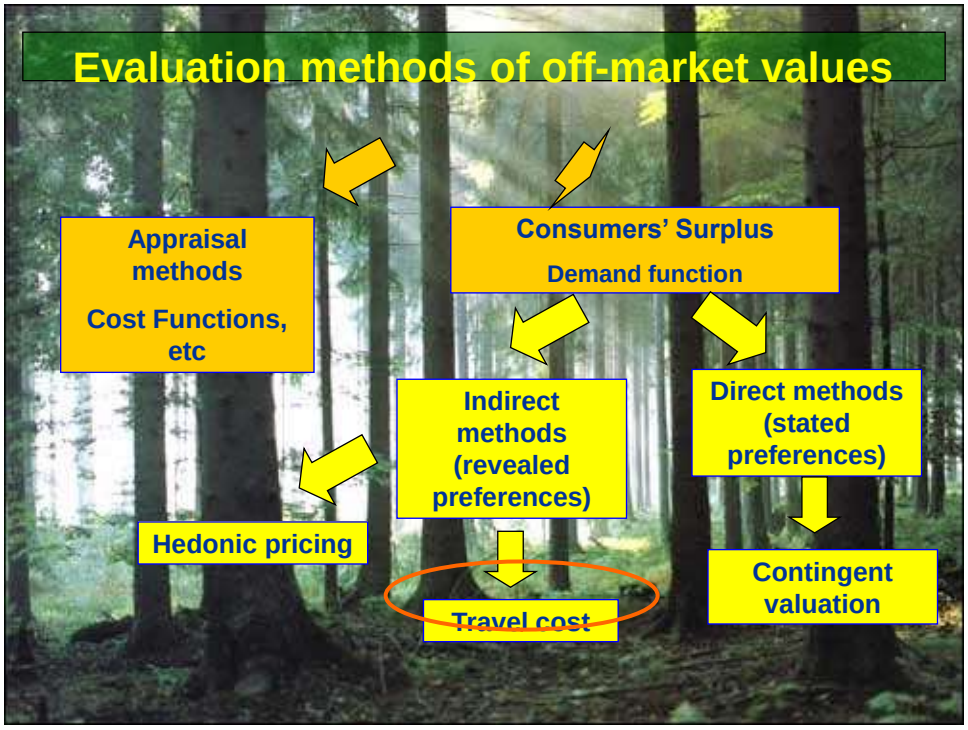

Evaluation methods of off-market values
Appraisal methods
Cost Functions, etc
Consumers' Surplus
Demand function
Indirect methods (revealed preferences)
Direct methods (stated preferences)
Hedonic pricing
Travel cost
Contingent valuation


Appraisal Approach of off-market values
Use market values as a proxy
Production/avoided cost such as:
Restoration cost (e.g. a damaged ecosystem by pollution)
Replacement cost (e.g. a fire-damaged forest)
Substituting cost (e.g. lost local species replaced by non-endogenous ones)
Market price (e.g. mushroom picking permits price, forest 's wild fruits market price)

Pros and cons

- Estimates based on real market
- 'Robust' estimates
- Well known methodologies: easy to implement
- Reasonable evaluation cost and time needed
- Partial approaches and difficult to adopt when passive values are involved

Evaluation methods of off-market values



TRAVEL COST Method

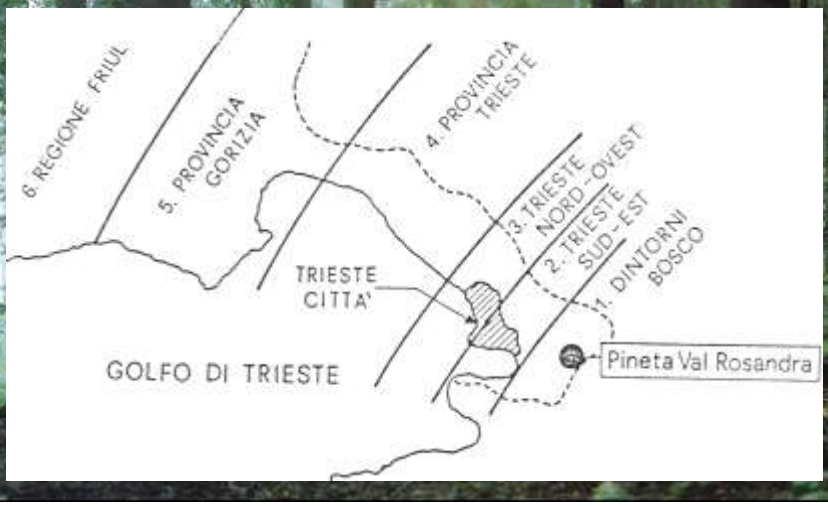
ASSUMPTION: If people spend time and money visiting a site or resource, the value of the resource is at least equal to travel cost (plus the value of time). In other words time and travel cost measure the 'access price' to the resource

THREE DIFFERENT APPROACHES:

- **Zonal Travel cost (mainly secondary data are needed and a simple data collection from visitors)**
- **Individual Travel cost (detailed survey is needed)**
- **Random Utility Approach (detailed survey, other data and more complicated statistical techniques)**

EXAMPLE OF ZONAL TRAVEL COST: Val Rosandra Forest (210 ha, 1980)

Recreational use value estimate



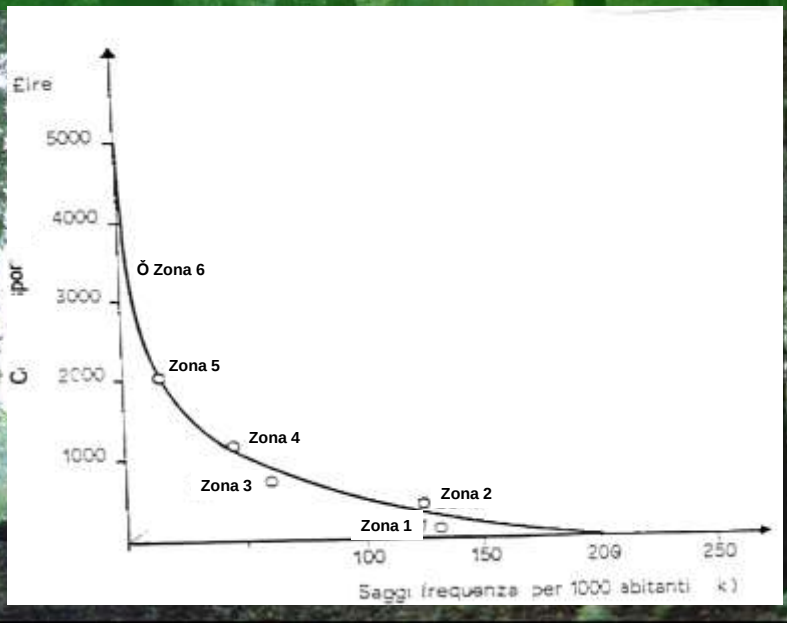
2. Survey: yearly number of visitors per zone and estimation of the % of visitors over population

Zone	Visitors	Population	Visitors/PoPX1000 K
1 Close to the forest	1051	8000	131,4
2 TS south east	16230	130000	124,6
3 TS north-west	7840	130000	60,3
4 Other TS	863	20000	43,1

3. Average travel cost per visit estimation (including opportunity-cost of time if traveling can be considered a cost and not part of recreational activity)

Zone	Cost per visit (Euro 2006)	Visits/PoPX1000 K
1 Close to the forest	0,22	131,4
2 TS sud est	0,87	124,6
3 TS nord ovest	1,53	60,3

4. Estimation of function relating unit cost to K and other variables



5. Estimation of a 'new' number of visitors assuming a progressively increasing 'hypothetical entry fee'

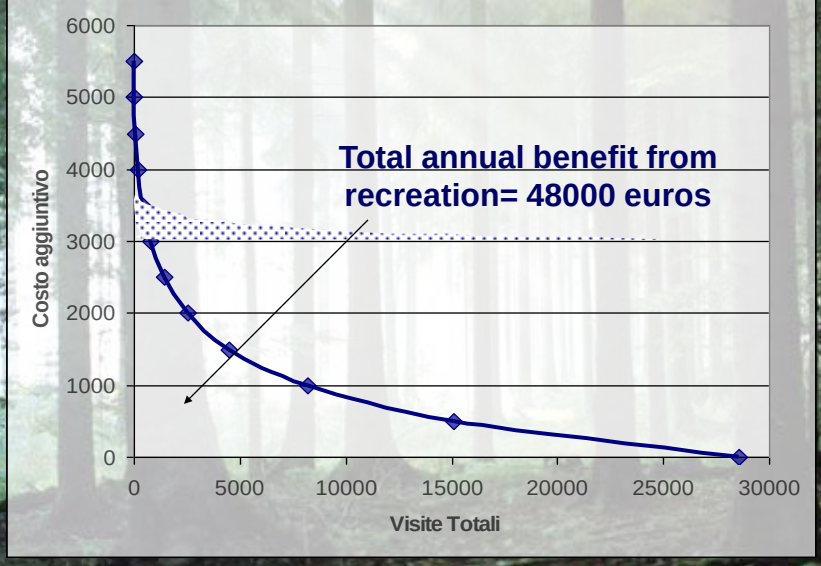
Zona	K if cost increase 1,09 euros	Visite
1 Dintorni	88,2	706
2 TS sud est	57,8	7519
3 TS nord ovest	38,9	5053
4 Resto prov.TS	22,2	445
5 Prov. GO	8,4	1081
6 Friuli Orient	2,1	314

….progressively increasing the ‘entry fee’ a demand function can be estimated:

Entry fee	Visits
0	28589
1,09	15118
2,18	8228
3,27	4476
4,36	2514

Entry fee	Visits
6,54	788
7,63	409
8,72	189
9,80	44
10,89	1
11,98	0

6. The area under the estimated demand function is the annual recreational surplus of the area



INDIVIDUAL TRAVEL COST

Provides for accurate estimates being based on observed behaviour of a random sample of individuals visiting the area:

- ✓Location of visitors' home, time and money spent
- ✓Number of annual visits of each individual
- ✓Socio-economic characteristics of the visitors
- ✓Only site-visit trip or multi-purposes
- ✓Visitors' opinions on the quality of the site
- ✓Substitute sites exists?

DEMAND FOR RECREATION OF THE 'AVERAGE' VISITOR

Regression model explaining the NUMBER OF YEARLY VISITS OF AN INDIVIDUAL in terms of travel expenses and other relevant factors characterizing the individual and its behaviour

'Area under the estimated demand curve' is the TOTAL RECREATIONAL BENEFIT OF THE 'MEAN VISITOR'

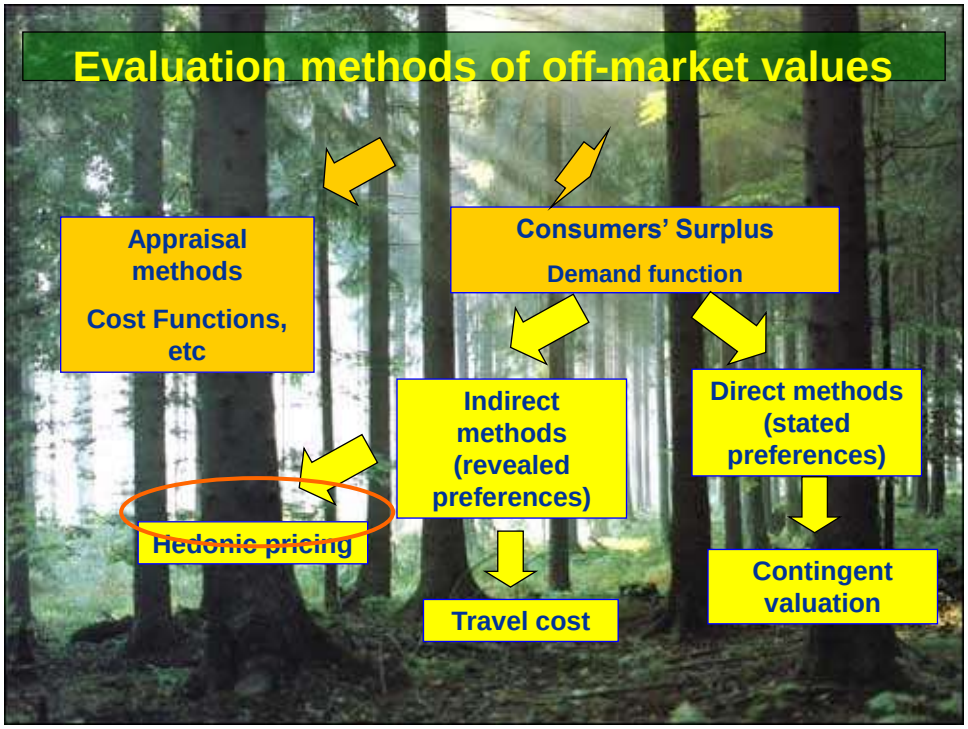
By multiplying this value and the number of visitors the TOTAL RECREATIONAL BENEFIT PER YEAR FROM THE SITE is obtained

PROS OF TRAVEL COST

- ✓Largely used and accepted method based on real world prices
- ✓It is based on observed behaviours and not on simulated markets
- ✓Easy to implement and relatively low-cost survey is needed
- ✓On-site interviews or off-site large scale telephone surveys
- ✓Easy to understand and easy to communicate results
- ✓Suited for amenities like fishing or hunting sites, sites with historical significance, etc.

CONS OF TRAVEL COST

- ✓It measures only Use values expressed by actual visitors
- ✓Unable to measure on-site values that are not perceived by visitors
- ✓Unable to measure off-site recreational values (indirect use values)
- ✓Difficult to implement in case of multi-purpose trips
- ✓Opportunity-cost of time is a questionable issue
- ✓Site's value depends on the availability of alternative sites
- ✓Not useful in case no travel (urban parks)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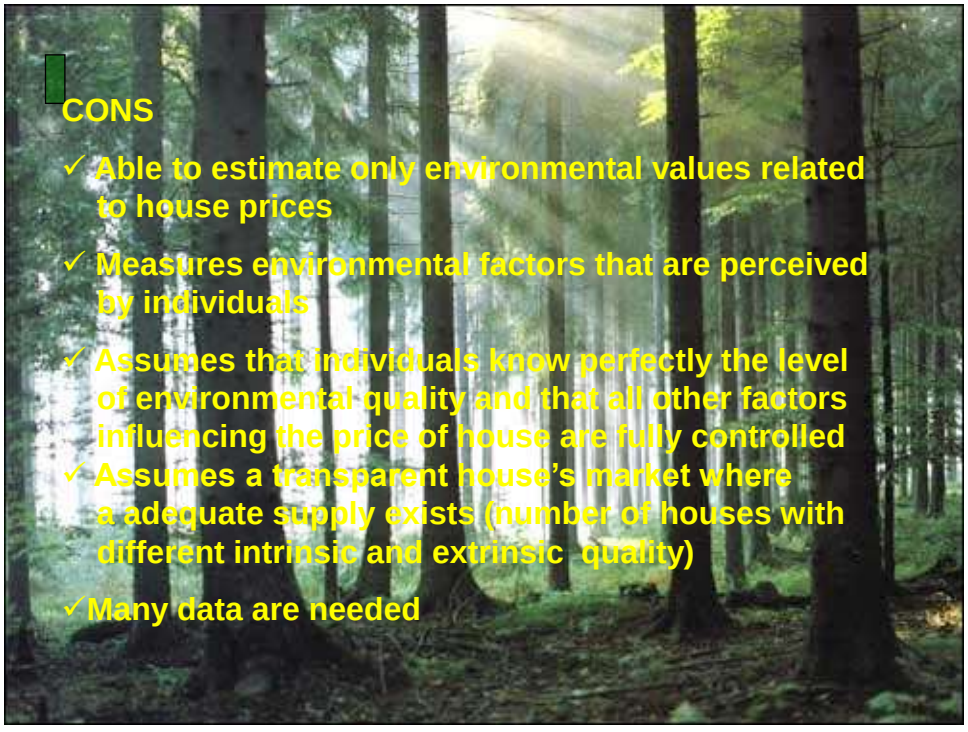
HEDONIC PRICING
Based on observing how environmental quality (landscape, etc.) is incorporated into the price of a good such as a house
Houses prices related to:
✓Intrinsic characteristics
✓Environmental characteristics such as Environmental quality (air pollution, traffic noise, etc.), Landscape
Regression model analysis
P=f(Xi, Yj) where:
Xi intrinsic characteristics indicators
Yj environmental indicators characteristics


The estimated effect of an environmental characteristic on the house's price indirectly help estimating the monetary value of this characteristic
PROS
✓ Valuation based on observed market prices
✓ Houses markets are generally able to signal values in an efficient way when adequate supply exists
✓ Relatively easy to implement approach under certain circumstances
✓ Results are easy to understand and to communicate


CONS
✓ Able to estimate only environmental values related to house prices
✓ Measures environmental factors that are perceived by individuals
✓ Assumes that individuals know perfectly the level of environmental quality and that all other factors influencing the price of house are fully controlled
✓ Assumes a transparent house's market where a adequate supply exists (number of houses with different intrinsic and extrinsic quality)
✓ Many data are needed

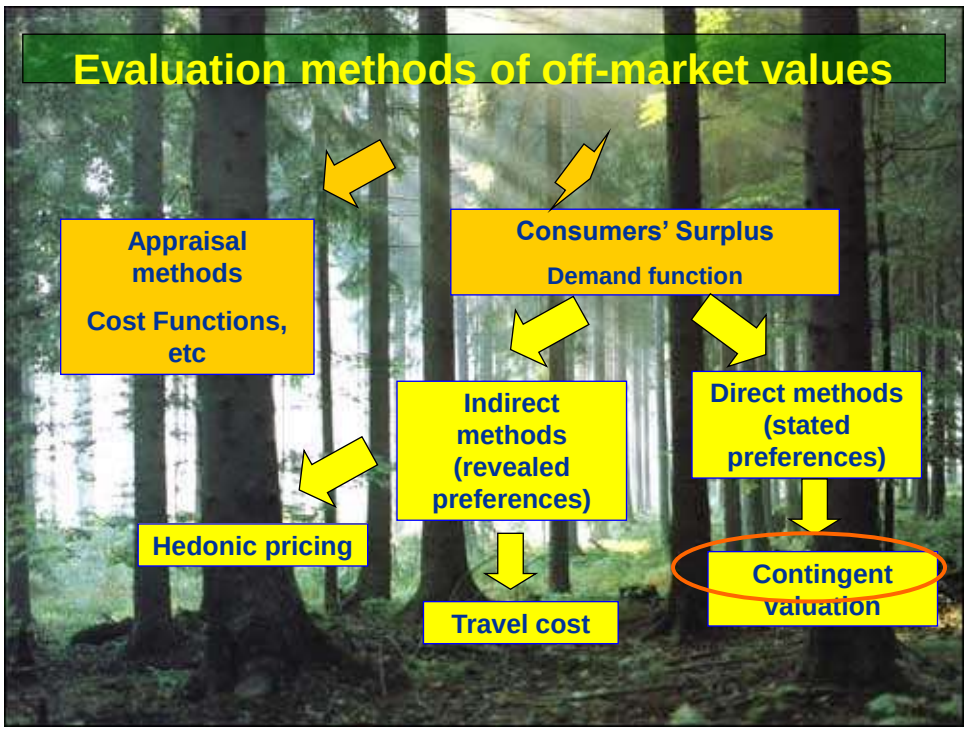
Example: Environmental value of an historical urban park of Padova: Treves Park (Jappelli 1829-36; 11000sqm 80000 visitors per year

Area	Total sqm	Houses price premium per sqm (%)
In front of Park	9500	30%
Close to the park	9500	15%
Not far from	4000	5%

Total houses' park-related value: 3,3 millions Euro (2006 prices)

Source: Merlo, 1986-97

Evaluation methods of off-market values



CONTINGENT VALUATION (Davis 1963)

Directly asks individuals to report their willingness to pay (WTP) or willingness to accept (WTA) for a good or resource within a simulated hypothetical market

Stated preferences method: it relies on people stating how much they would to pay to obtain a hypothetical good or scenario, rather than observing people's actual behaviour. 'contingent' on a scenario.

Can be used to value both private goods (e.g. reducing risk of becoming ill) and public goods: both use and passive values (e.g. protecting an endangered specie)

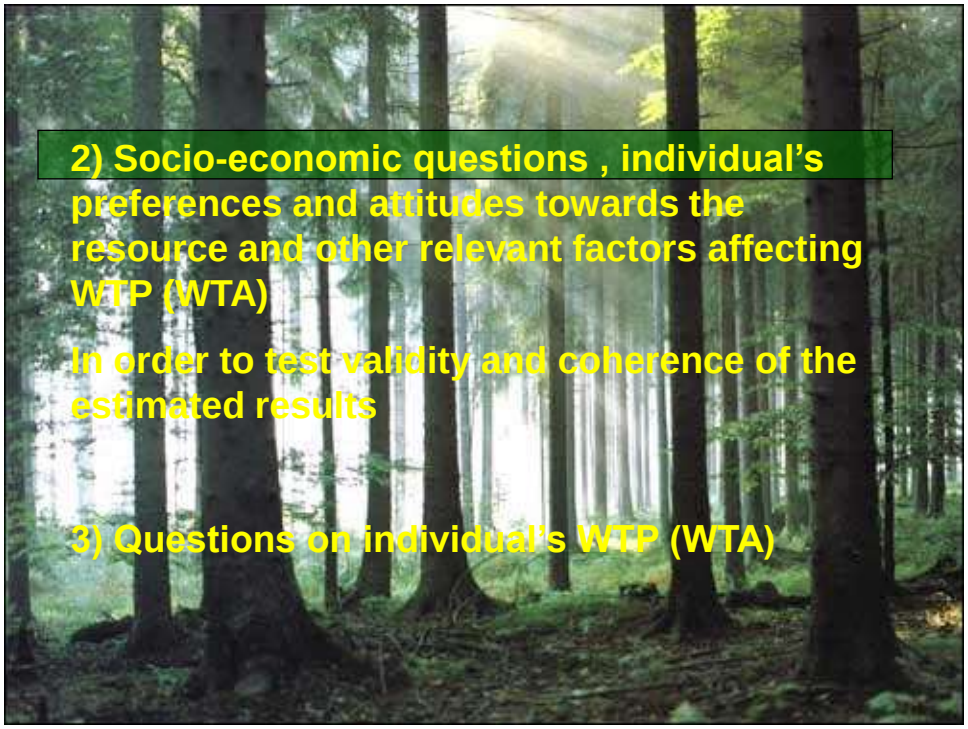
NOAA panel guidelines (1993)

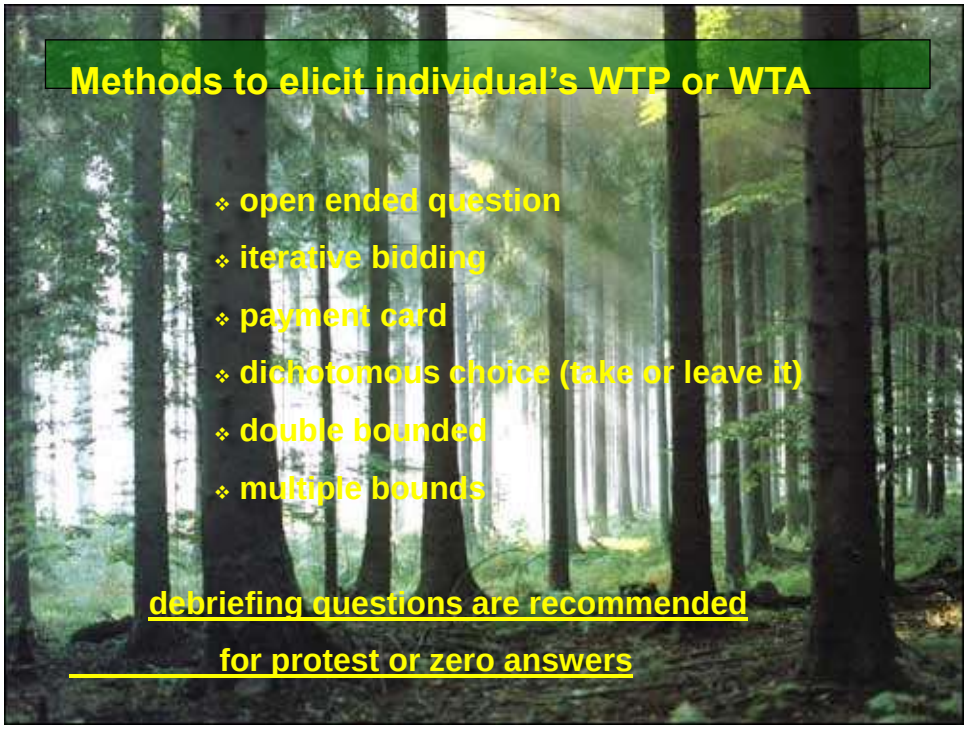
Bishop, McCollum, (1996) reccomandations

Questionnaire-based individuals survey

1) Detailed description of: the good under evaluation, the hypothetical scenario, the hypotetical payment method (entry fee local tax, general taxation, etc.)

- ✓It is needed to be realistic and clear but it has to be emphasysed the hypothetical situation in order to avoid strategic answers, refusals to answer and protest ones
- ✓Focus Group
- ✓Pretest


2) Socio-economic questions , individual's preferences and attitudes towards the resource and other relevant factors affecting WTP (WTA)
In order to test validity and coherence of the estimated results
3) Questions on individual's WTP (WTA)


Methods to elicit individual's WTP or WTA
open ended question
iterative bidding
payment card
dichotomous choice (take or leave it)
double bounded
multiple bounds
debriefing questions are recommended
for protest or zero answers

ITERATIVE BIDDING: WTP CASE

Ask individual his WTP a certain amount X (X changes among individuals and it is randomly selected)

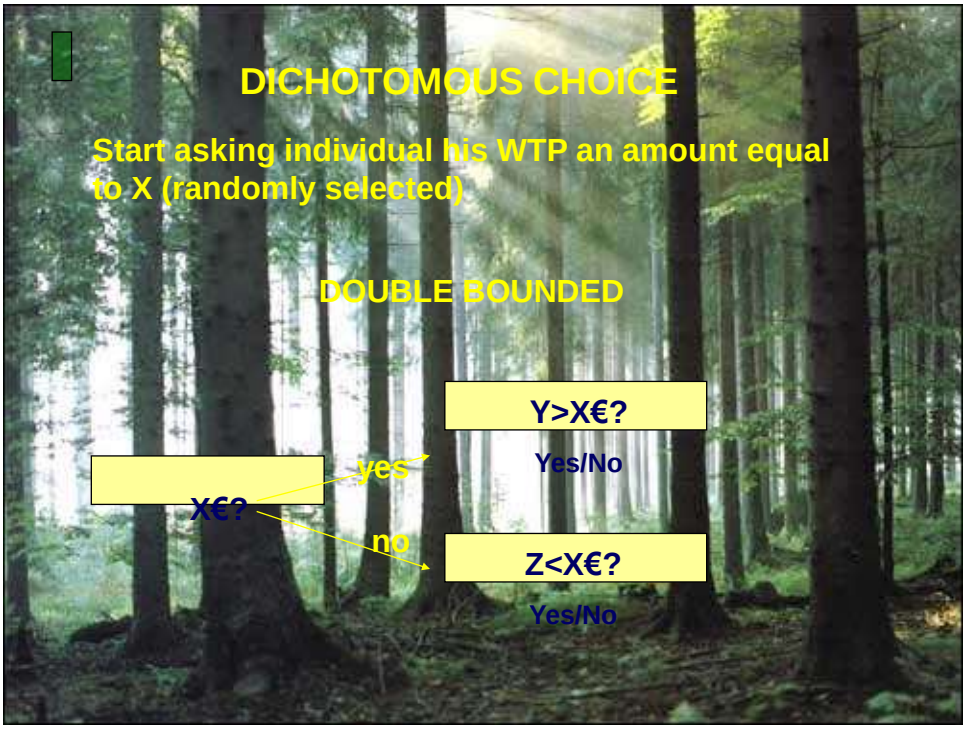
IF YES: propose progressively increasing amounts. At the first NO, ask lower amounts, when reached a new YES: STOP.

IF NO: propose progressively lower amounts. At the first YES, ask increasingly amounts, when reached a new NO, STOP.

PAYMENT CARD

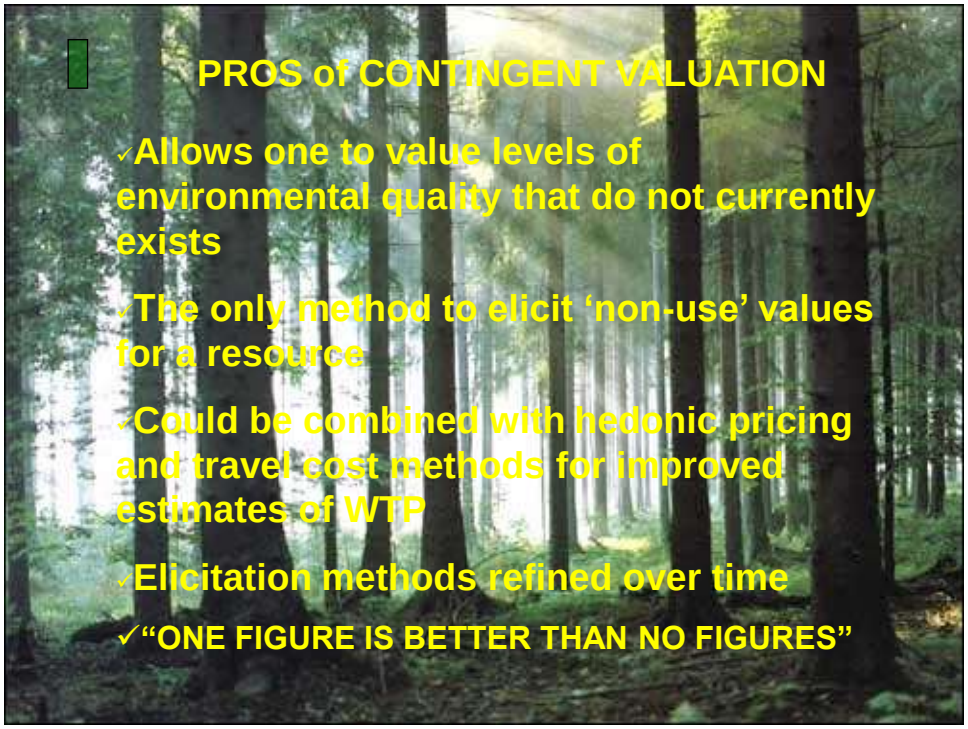
Ask each individual to select his/her WTP among a proposed list

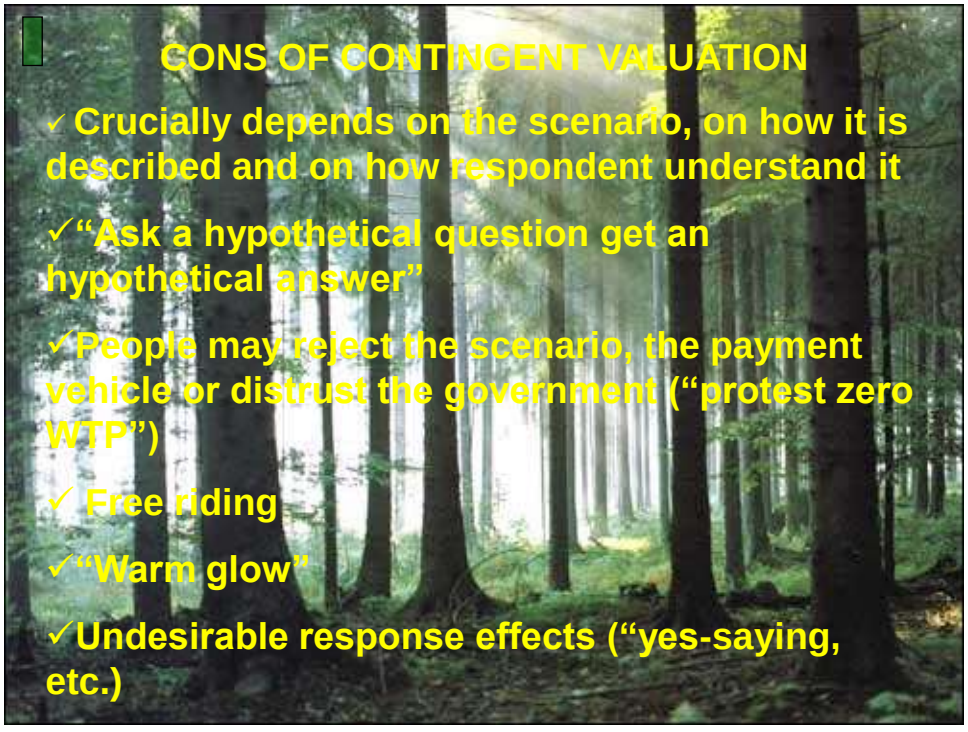
€ 0	€ 5	€ 12
€ 0,25	€ 6	€ 13
€ 0,50	€ 7	€ 14
€ 1	€ 8	€ 15
€ 2	€ 9	€ 16
€ 3	€ 10	€ 17
€ 4	€ 11	€ 18

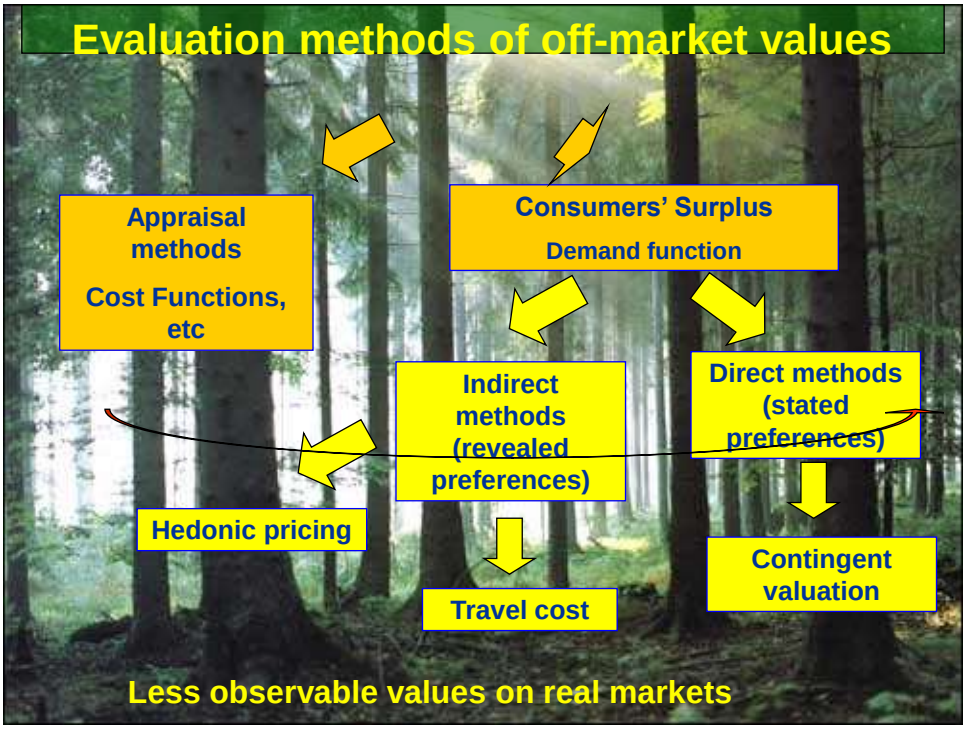


		WTP ($)	
Author	Good	Dichotomous	Open Ended
Bishop et al. (94)	Hunting	37	32
Boyle et al (93)	Hunting	701	484
Loomis et al (93)	Forestry off-market services	224	100
Kealy-Turner (93)	Acid rains	18	8
Desvouges et al (92)	Oil spills pollution	240	129

Source: Gios, Notaro, 2001


PROS of CONTINGENT VALUATION
✓Allows one to value levels of environmental quality that do not currently exists
✓The only method to elicit 'non-use' values for a resource
✓Could be combined with hedonic pricing and travel cost methods for improved estimates of WTP
✓Elicitation methods refined over time
✓"ONE FIGURE IS BETTER THAN NO FIGURES"


CONS OF CONTINGENT VALUATION
✓ Crucially depends on the scenario, on how it is described and on how respondent understand it
✓"Ask a hypothetical question get an hypothetical answer"
✓People may reject the scenario, the payment vehicle or distrust the government ("protest zero WTP")
✓ Free riding
✓"Warm glow"
✓Undesirable response effects ("yes-saying, etc.)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Less observable values on real markets


CONCLUSIONS
✓THE BEST method does not exists
✓WHEN POSSIBLE
▪adopt methods referring to observable markets
▪Use more than one method
✓TAKE INTO ACCOUNT THE SURVEY COSTS