APPLICATION of "POLLUTER-PAYS-PRINCIPLE" and ENVIRONMENTAL LIABILITY ISSUES

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APAT

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The application of "Polluter-Pays-Principle" according to European Union Regulation

1. The "Polluter-Pays-Principle" and the Role of Economic Valuation
2. The Basic Strategy: The Need for a Multidisciplinary Approach
3. Evaluation Methods: Economic Theory
4. Evaluation Methods: Law Suggestions

The "Polluter-Pays-Principle" and the Role of the Economic Valuation

Environmental policy aims at protecting and avoiding damage to the environment, as well as establishing directives containing emission norms, quality standards, obligations regarding assessment of environmental effects of projects, and requirements for operation of certain industry and other sectors. This entails **ex-ante regulation** and is based on command-control regimes.

Unfortunately, despite these acts, pollution incidents and other harmful events can never be entirely prevented. As a consequence, damage to the environment will occur. Environmental policy therefore also establishes a legal framework to regulate actual damages. This includes implementation of a variety of environmental liability regimes. In particular, the policy that regulates actual damages is named **ex-post regulation** and based on **environmental liability regimes.**

Environmental Liability and Polluter Pays Principle

- **Environmental liability** is the term used for the process through which responsibility for the cost of damaging the environment is transferred back to those who caused the damage. The principle under which environmental liability operates is called the '**Polluter Pays Principle.**' Its ultimate objective is to reduce damage to the environment.

- The **Polluter Pays Principle** is a principle in international environmental law where the polluting party pays for the damage done to the natural environment.

- Thus, the Polluter Pays Principle supplies the **framework** to implement environmental liability regimes.

- The **Key** to the operation of **environmental liability** is assigning a charge for **environmental** damage to provide compensation.

- To date, most policy has tended to charge polluters for the cost of cleaning up pollution, for the economic cost that pollution causes to other property, and/or for the purchase of permission to discharge pollution.

- The environment is generally regarded as a ‘public good,’ so it is not priced in a conventional market place. As a result, economic actors typically do not take responsibility for damaging it, and charges for rectifying **environmental** damage may not reflect its true **environmental** cost.

- Because of this:

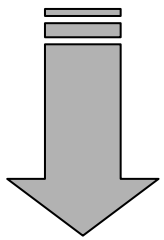
  1. a standardization of valuation methods is necessary;

  2. reducing uncertainty in valuation is an important tool for effective ex-post regulation

The Basic Strategy: the need for a multidisciplinary approach

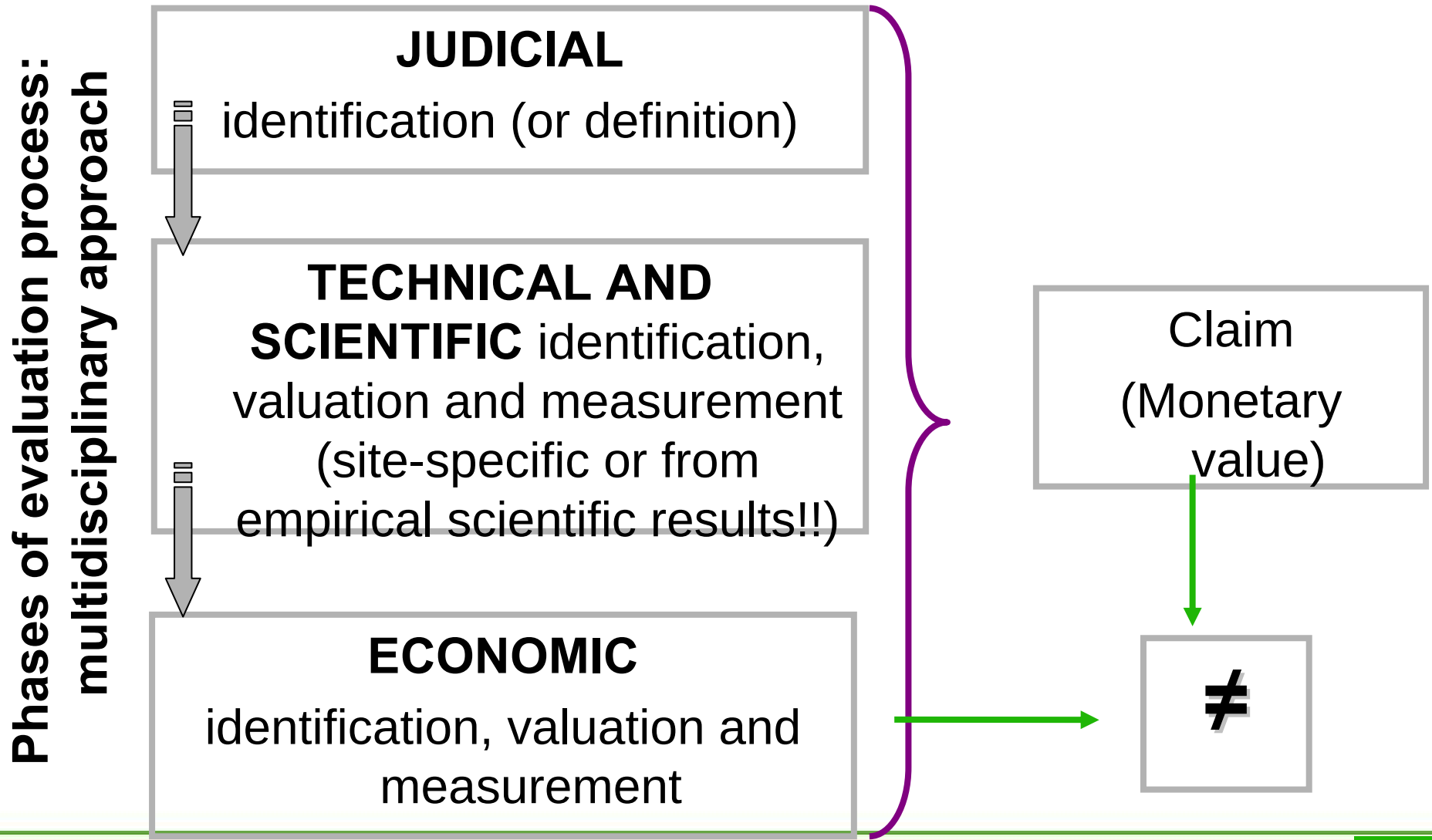
ENVIRONMENTAL DAMAGES: ECONOMIC VALUATION

It is the outcome of a process. The process consists of sharing information, data, methods and models among different skill and knowledge bases (engineers, economists, biologists, *etc*.)



MULTIDISCIPLINARY APPROACH

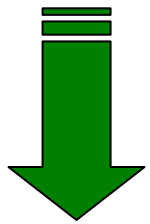
ENVIRONMENTAL DAMAGES: the EVALUATION PROCESS



From the Economic Definition ...
...to the Judicial Definition

Relationship between human activity and natural resources

Any human activity
(both production and consumption)
determines **IMPACTS** on natural resources



Natural resource changes due to human (and not natural) factors

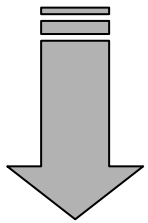
Economic definition: negative externalities

if natural resource changes due to human (and not natural) factors are:

NEGATIVE

+

and polluters do not have to bear these changes because they are **NOT INTERNAL COSTS**



Then negative natural resource changes are named:

External costs, or negative externalities

SOME DEFINITIONS …

- **INTERNAL COSTS =** PRODUCTION OR CONSUMPTION COSTS (BOTH FIXED AND VARIABLE) THAT FIRMS AND CONSUMERS BEAR

- **EXTERNAL COSTS =** PRODUCTION OR CONSUMPTION COSTS (BOTH FIXED AND VARIABLE) THAT FIRMS AND CONSUMERS **DO NOT** PAY, BUT RATHER ARE BORNE BY A DIFFERENT ENTITY, SUCH AS A COMMUNITY

- ***IMPORTANT***! USING THE TERM 'COST' DOESN'T NECESSARILY IMPLY THAT A MONETARY MEASURE EXISTS FOR THIS COST!!!

Diagramma di flusso: bilancio dei materiali - APAT, 2006 - Ripreso e modificato da Kneese et al. 1970

- Production and consumption processes do not create or destroy goods. They transform utility; that is, they add or remove utility (Georgescu-Roegen, 1971 and 1985).

- If the relationship between an economic system and the natural environment reduces the capability of the environment to provide utility to consumers and firms, then environmental pollution is said to occur.

ENVIRONMENTAL DAMAGE: the Economic Definition

ENVIRONMENTAL EXTERNAL COSTS

=

ENVIRONMENTAL NEGATIVE EXTERNALITIES

=

ENVIRONMENTAL DAMAGE

THEORETICAL-ECONOMIC APPROACH...

...BUT IN IMPLEMENTATION, WHAT HAPPENS?

THEORETICAL-ECONOMIC APPROACH...

Natural resource damages as externalities define damage as a loss of collective welfare due to the operation of single entities.

...BUT IN IMPLEMENTATION, WHAT HAPPENS?

measurement of economic damage allows one to internalize this welfare loss by charging it to the polluter. If this internalization is missing, it is a *market failure*.

- the economic definition of natural resource damages suggests the economic approach to evaluation, but it does not provide effective implementation.

- effective implementation is possible only after a technical-scientific identification, evaluation and measurement of environmental externalities.

- thus, to be useful in practice, the economic definition of natural resource damage needs to be combined with data, information, and model results from a technical-scientific point of view

… also without a judicial definition of natural resource damages, a multidisciplinary approach is necessary!!!

IMPORTANT DEDUCTIONS
(not always clear)

- It is always possible to estimate the economic effects of natural resource damages also out of the judicial definition of natural resource damage.

- A scenario will have to be defined, of course. The scenario will bound the scope of the estimation—the object to evaluate—but it's always possible.

- One can differ on the "completeness" of any actual estimate, but the general viability of computing estimates is unarguable.

BRIEF BUT USEFUL DIGRESSION...

WHY DO WE NEED ECONOMIC ESTIMATION IF IT IS NOT USEFUL IN THE COURTS?

- Economic estimation is useful for many reasons (luckily!). Most broadly, it provides tools to help define the economic policy of a country or region (such as Europe, USA, etc..)

- In the case of natural resource damage, estimation can support a *policy-maker's* decision to employ other policy tools or to make decisions under present policy tools on relevant natural resource damages that are not included in the present law (in Italy ex art. 18 L.349/86 or, currently, D.lgs. 152/2006).

NATURAL RESOURCE DAMAGE (theoretical-economic approach)

- any human activity (both production and consumption) determines natural resource changes
- if the natural resource changes are negative and polluters do not bear the costs, they are negative externalities that need compensation (otherwise market failures occur)
- in economic terms, externalities and market failures justify a regulatory system

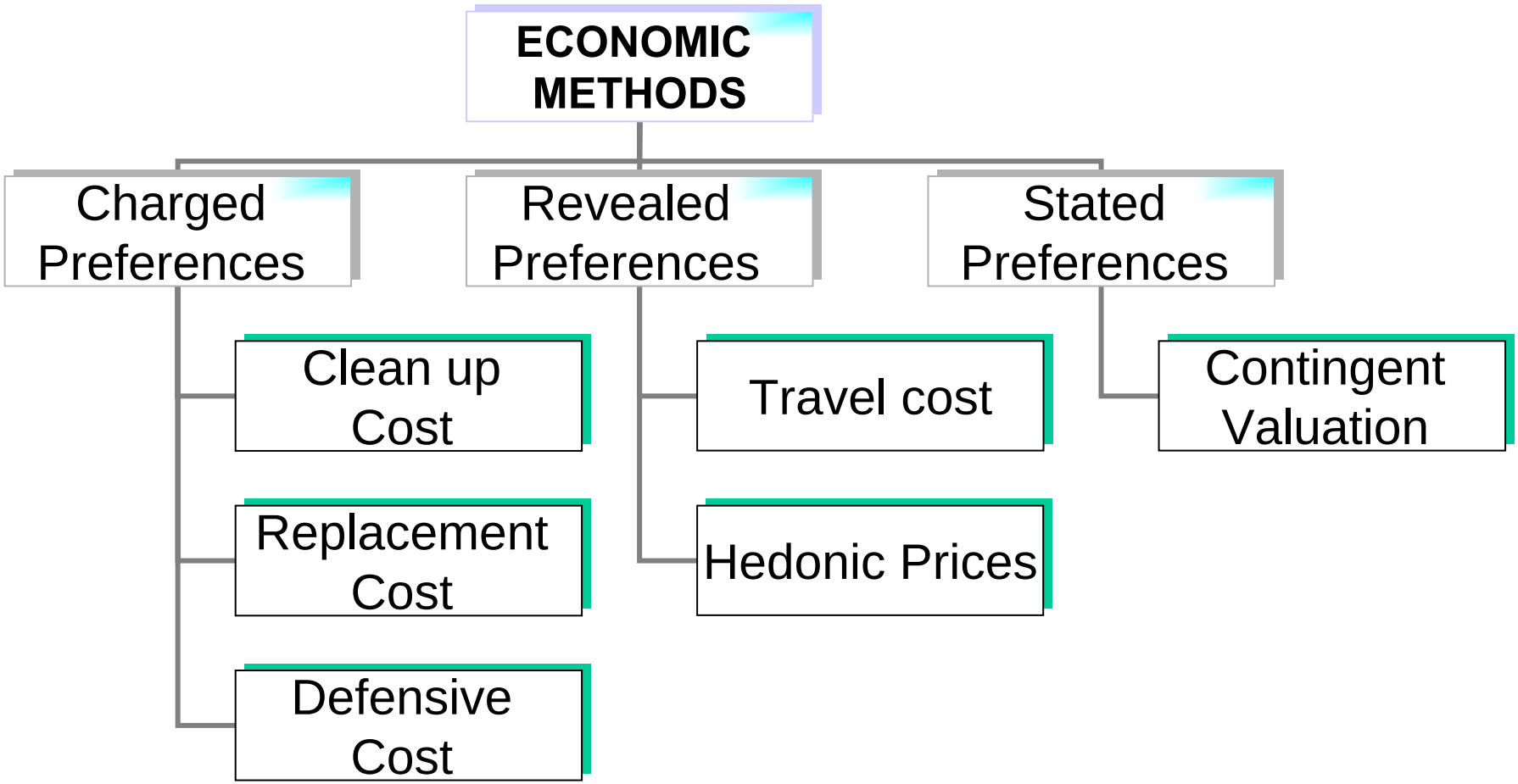
NATURAL RESOURCE DAMAGE (economic-judicial approach)

- Not all negative externalities are regulated. Any regulatory system provides threshold criteria that identify the cases when negative externalities have to be charged to polluters, under the Polluter Pays Principle.

⇒ **Repayable Natural Resource Damage**

Evaluation Methods: the Economic Theory

ESTIMATION METHOD CLASSIFICATION (ONE OF)



CHARGED PREFERENCES
- market-oriented methods (explicit and existing market) -

- These are based on the following equivalency:

Welfare Loss
=
Repair cost

Damage Value
=
Willingness to pay to repair natural resource damage
(Touaty & Gié, 2004)

Main advantage:

- Inexpensive to estimate because the benchmarks are market prices

Main disadvantage:

- Available as aggregate estimates and often underestimated

CHARGED PREFERENCES METHODS

- **CLEAN-UP COST**: computation and/or estimation of the necessary expenditure to bring back natural resources and services to baseline level (baseline is the situation before the damage)
- **REPLACEMENT (or substitution) COST**: computation and/or estimation of the necessary expenditure to substitute for the natural resources and services with alternatives that provide the same utility (Di Cocco, 1960; Michieli & Michieli, 2002)
- **DEFENSIVE COST**: willingness to pay (i) to bring back natural resources and services to baseline level; (ii) to limit the occurred loss. Included costs are first interventions costs and safety interventions (Boyd, 2000), as well as assessment costs (Ofiara, 2002)

OTHER METHODS
(implicitly included in the previous ones)

- SHADOW PROJECT COST: computation and/or estimation of the necessary expenditure to construct an alternative project that is able to substitute for the damaged environment (discussion on environmental effects, any way it has relevance in evaluation)
- RELOCATION COST: computation and/or estimation of the necessary expenditure to relocate economic activity developed on the damaged environment because of reduced environmental quality (as the previous one discussion on environmental effects, any way it has relevance in evaluation)

REVEALED PREFERENCES
- market-oriented methods (implicit market) -

- These are based on the following idea:

  Estimates of the costs of natural resource damages can be obtained indirectly. This needs to start from agent behavior in real markets.

- **The value of some goods depends on the environment where they are located. If damages occur in the environment, their value changes.**

- **This is because economic goods have a mix of features that collectively determine their market value (Lancaster, 1971).**

- **The components of this mix of features cannot be sold separately; that is, the components do not trade separately in the real market. For example, a house cannot be sold without its location**

Main advantage :

- Provide better estimates than the charged preference approach

Main disadvantage:

- Requires higher costs and more time for evaluation. In addition, the value of only some goods can be estimated with this method

Revealed preferences: Hedonic price method

- A direct relationship has to exist between a market good and environmental quality (complementarity between natural resource and market good).
- → COMPLEMENTARY VALUE: the value of a good depends on the value of the natural environment where the good is located (Di Cocco, 1960)
- The market has to be able to recognize the quality changes of the environment to capture these changes in market prices.
- Thus, the market has to work such that prices include exactly the willingness to pay for each separate feature of the good

Revealed preferences: travel cost method

- Developed by Hotelling (1931) and Clawson (1959) and applied in recreational activities.
- Based on possibility of knowing the demand function of environmental public goods (X), starting from consumer behavior with respect to the necessary costs to secure the good for consumption.
- Consumer demand depends on all features included in the price (P)
- The consumer pays added costs (access costs, C) such as travel cost, congestion, time, etc.
- Then $X=f(P,C)$

- if:

  X= number of visits to a recreational site and

  P=0 (price of visiting is negligible)

  C>0 (relevant access costs)

  if $\Delta C \Rightarrow \nabla X$

  then, X=f(C): relationship between number of visits in a recreational site and the unit access cost

- Different approaches and econometric models exist to estimate it

EXAMPLE….

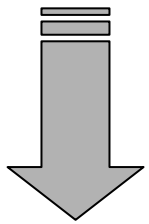
discussion...

- DEFENSIVE COSTS: estimation of the costs that would avoid or limit natural resource damage

- Is there a relationship between defensive costs and polluter profit?

STATED PREFERENCES
- survey-oriented method – hypothetical market -

- The previously considered methods suppose that natural resource changes in quality and/or quantity imply an individual behavior change. This change results in welfare losses…
- …but what methods can be used if this behavior change doesn't happen?



survey oriented method:

contingent valuation

CONTINGENT VALUATION

After the Exxon Valdez oil spill case in the US, NOAA (National Oceanic and Atmospheric Administration) commissioned an economic working-group, guided by Kenneth Arrow, to examine the reliability of contingent valuation (Arrow *et al*., 1993; Carson *et al*., 1996a & 1996b).

This method requires interviews of people to estimate the TOTAL ECONOMIC VALUE (TEV) of the natural resource.

These approaches are more expensive than previous ones (in costs and in time) but they are the only ones that can be used to estimate non-use values of a natural resource (Commissione Europea, 1996; Amigues *et al*., 2003; Bonnieux & Rainelli, 2002; Cummings & Harrison, 1992 & 1995).

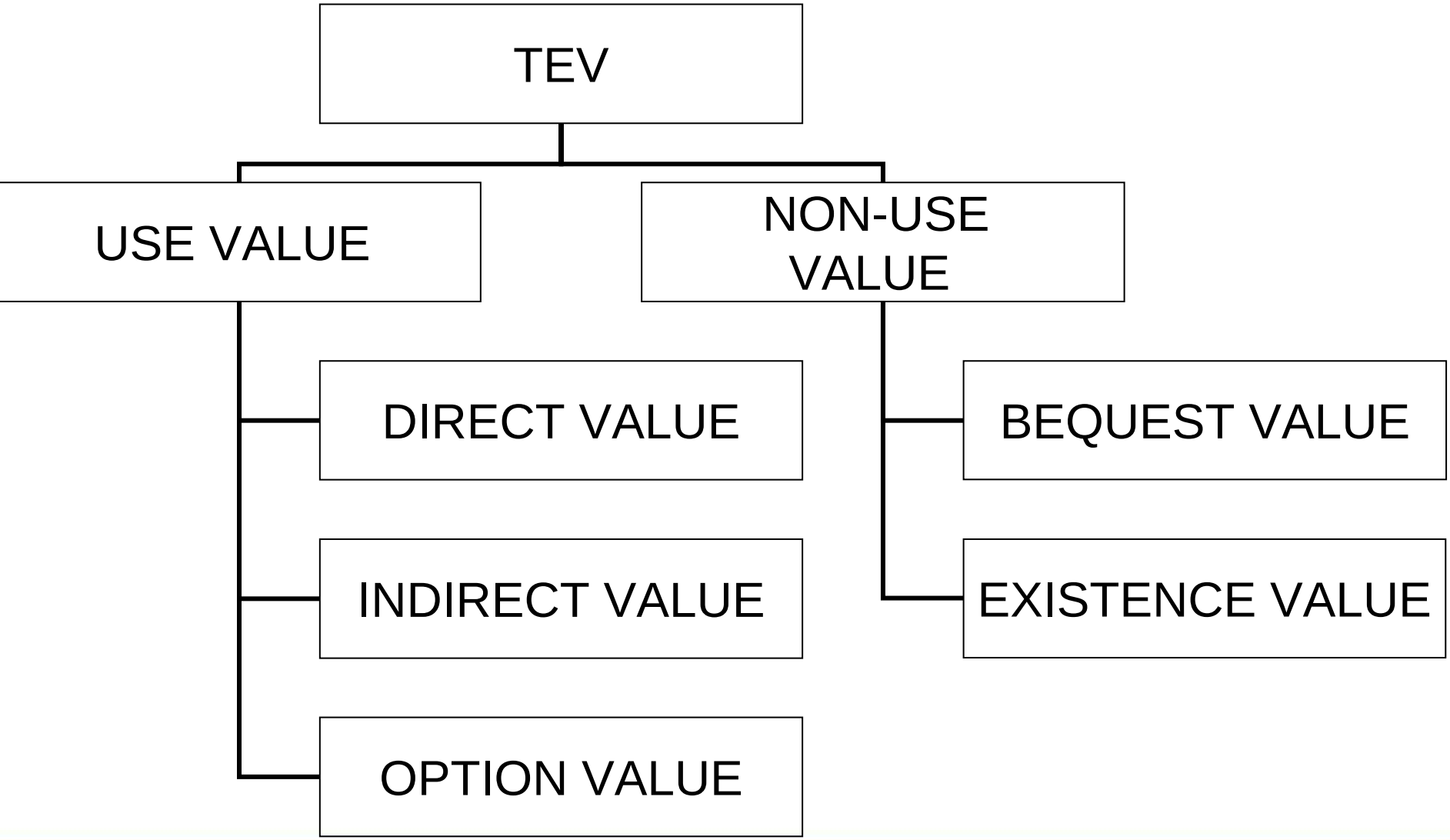
OBSERVATION and BENEFIT TRANSFER METHOD

- The international literature has numerous contingent valuation studies (for example, Carson *et al.*, 2003; Flores & Thatcher, 2002; Boyle *et al*., 1999; Carson *et al*., 1994).
- But in Italy, and in Europe in general, this method is just a subsidiary method to estimate environmental damage.
- In Europe and elsewhere there is a diffusion of a practice known as **benefit transfer**: adjustment and application of previous valuation estimates to a current case with similar natural resource damages (Desvousges *et al.*, 1998; Rosenberger & Loomis, 2001).
- Benefit transfer is a second best solution that should be used only if there is no alternative.

IMPLEMENTATION METHODS IN SUM

EVALUATION METHODS	IMPLEMENTATION
CLEAN UP COST	• full clean up is possible • suggested method by law
REPLACEMENT COST	• just partial clean up is possible • damage to goods and services that lack market, but which can be replaced by private resources (*e.g.*, recreational service) • interim losses
DEFENSIVE COST	• just partial clean up is possible • suggested method by law
HEDONIC PRICE	• complementary values exist
TRAVEL COST	• available data on recreational service
CONTINGENT VALUATION	• (relevant) non-use value estimation

NATURAL RESOURCE TEV

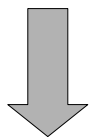


EVALUATION METHODS: WHAT THE LAW SUGGESTS

FROM THEORETICAL METHODS TO MEASUREMENT IN THE COURTS

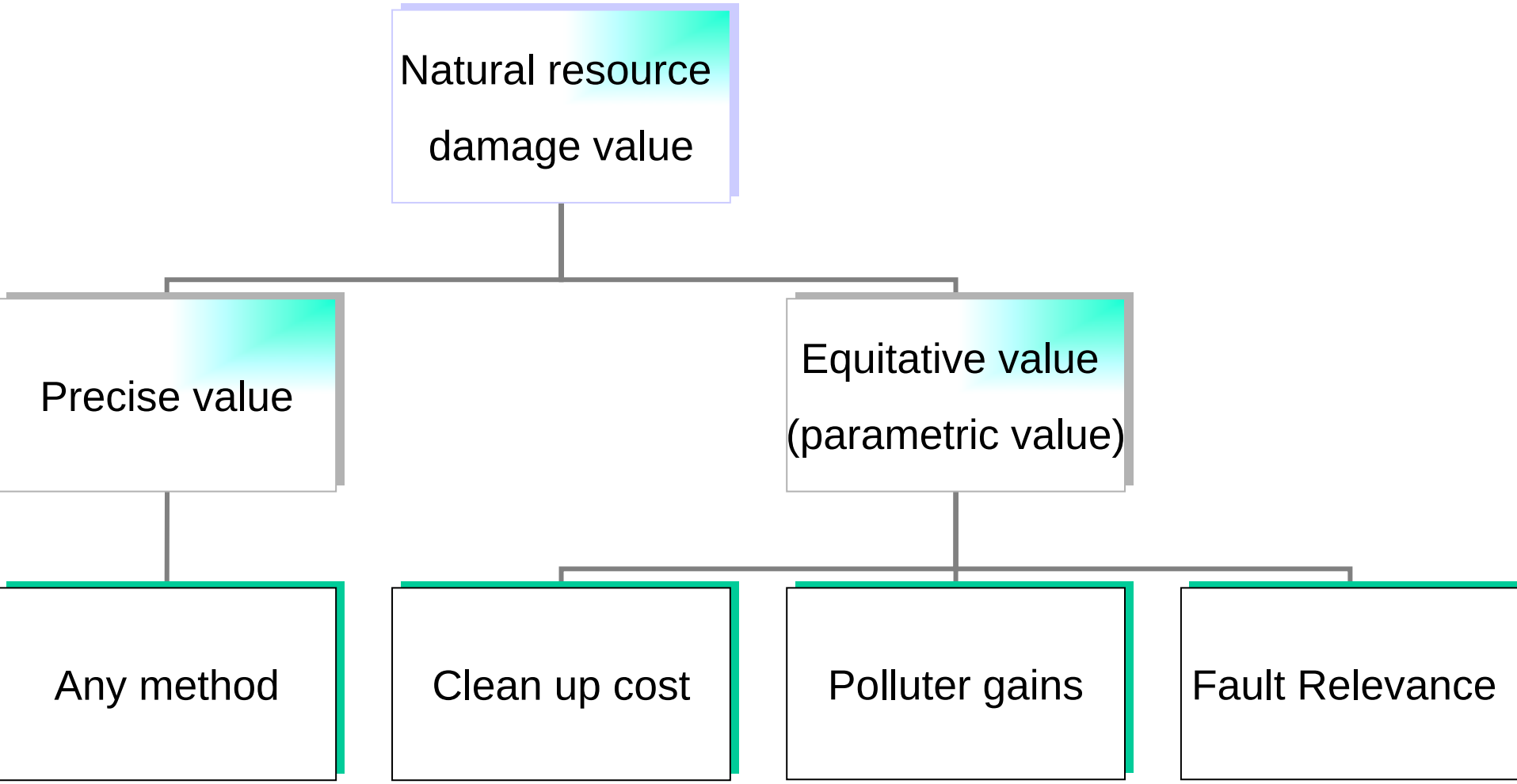
What valuation methods does the law suggest for measuring environmental damage?

- First law (art.18 L.349/86)
- New law (Dlgs 152/06)



We'll just consider the interesting part about evaluation

First law (art.18 L.349/86)



New law (Dlgs 152/06)

From the evaluation point-of-view, the new law in Italy gives an order of priority for valuation methods

1. Clean up cost
2. Any method suggested by economic literature
3. Parametric method

Factors to compensate for environmental damage

- Primary restoration
- Complementary restoration
- Interim losses

Natural Resource Damage AND Evaluation Methods in Italy

Evaluation method	Damage effects					
	Interventions			Benefit losses		
				Interim	Permanent	
	Defensive	Clean up	replacement	Use value	Use value	No-use value
Defensive cost	X			x	x	
Clean up cost		X		x’	x’	
Replacement cost			X	x	x	
Hedonic price				x/X	x/X	
Travel cost				x/X	x/X	
Contingent cost				x	x	X

Where:
X = *first best solution*
x = *second best solution*
x/X = the best solution depends on resources and services damaged
x’= proposed solution by law

Uncertainty of the methods to evaluate environmental damage

Except for the clean up cost approach, no method is identified by law. What does this mean? Is any method OK?

- on one hand, the lack of a legal identification of the required method allows the economist to choose for each specific site the preferred method.

- on the other hand, in court proceedings it would be better to have a standardized method.

Problems in valuation, some evidence – discussion 1

• in some case the precise amount of damage and also the cost of cleanup is very difficult to estimate (*e.g.*,. air emissions, changes in biodiversity, water pollution, etc.).

• if more than one polluter contributes to the contamination, it's no easy apportion the liability (in some case it is impossible).

• when the amount of estimated damage is huge, there is the judgment proof problem.

Problems in valuation, some evidence – discussion 2

- Ceteris paribus, is there a difference between damage caused to precious land and damage caused to less-precious land?

- If pollution occurs to previously contaminated land, what does this mean for valuation?

- Is health damage a part of environmental damage?