

Workshop

“Tools and guidance for assessing resource and environmental cost in the WFD”

29-31 March 2016
ECRAN 61725

Environmental Cost

Theory, methodology, calculation



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Structure of the presentation

- Key issues in economic evaluation
- Definitions
- Estimation of the environmental costs
- Approach used in France
- Approach used in Germany



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Key issues in the economic valuation of water use

- 1) **Water is an economic good** - there is a temporal and spatially defined demand for water of a certain quantity and quality and water can be used in alternative ways, i.e. there is scarcity, the core of any economic analysis
- 2) Water as an economic good **has both an economic value and an opportunity cost**
- 3) **Environmental costs are distinguished separately from the resource costs**-important differences exist in terms of water quantity and water quality management issues
- 4) Environmental costs refer to all physical environmental damage costs related to the chemical and ecological status of a water body or river basin
- 5) Physical environmental damage is measured in practice as the **difference between the baseline state of a water body or river basin and its good ecological status** as defined in the WFD.



Environmental cost: definitions

Environmental costs: **the total economic costs (welfare loss) of the physical environmental damage to a water system (water body or river basin)** as a result of the chemical and/or ecological state of the water system.

The physical environmental damage is measured through the difference between a water body or river basin's current and good chemical and/or ecological state.

The total economic costs include possible benefits foregone (opportunity costs), such as loss of the economic benefits derived from, for example, recreational opportunities or wildlife habitat and biodiversity conservation.

The environmental costs also include the (indirect) impacts of the physical environmental damage on various relevant water uses.

Not all costs are always clearly visible. For example, environmental and resource costs!!!



Other definitions

Environmental costs represent the costs of damage that water uses impose on the environment and ecosystems and those who use the environment.

This loss in welfare may encompass lost production or consumption opportunities as well as non-use values (such as the value produced by contemplating a clean lake at dusk), which are harder to quantify.

Environmental costs generally fall under external costs (cf. WATECO-Guidance).

Damage: Physical deterioration or degradation of the physical environment or detrimental impact of human activities on the environment and those who use the environment.

Damage cost: Welfare loss associated with the deterioration or degradation of the physical environment.

The **monetary value of the damage** incurred to the environment and ecosystems as a result of water use, such as a reduction in the ecological quality of an aquatic ecosystem or the of agricultural land.



Calculation of Environmental cost (1)

Environmental costs are estimated on the basis of the costs of the programme of measures to achieve good water status

Any assessment of environmental costs or benefits starts with and is based upon an environmental impact assessment.

Requirements: information, knowledge, expertise.

Steps in the assessment of the environmental costs associated with water use:

- identify the significant pressure, which causes a water body to change and not reach the set environmental WFD objective(s).
- assess the impact of this pressure (reduction) on the water environment.
- identify and, if possible, quantify the nature and extent of the damage involved, both on the water environment and other water users.

Damage is defined here as the difference between some reference and target situation and the corresponding effect on the provision and quality of the goods and services involved (DPSIR).



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Calculation of Environmental cost (2)

Estimation of the environmental damage (reduction) and the associated welfare losses (gains) in economic terms.

The economic value of environmental costs or benefits is often referred to as environmental values.

It can be measured based on the identification of the goods and services (functions) impaired by the pressure involved (e.g. water used for drinking water production, irrigation, food processing, recreation, wildlife habitat etc.).

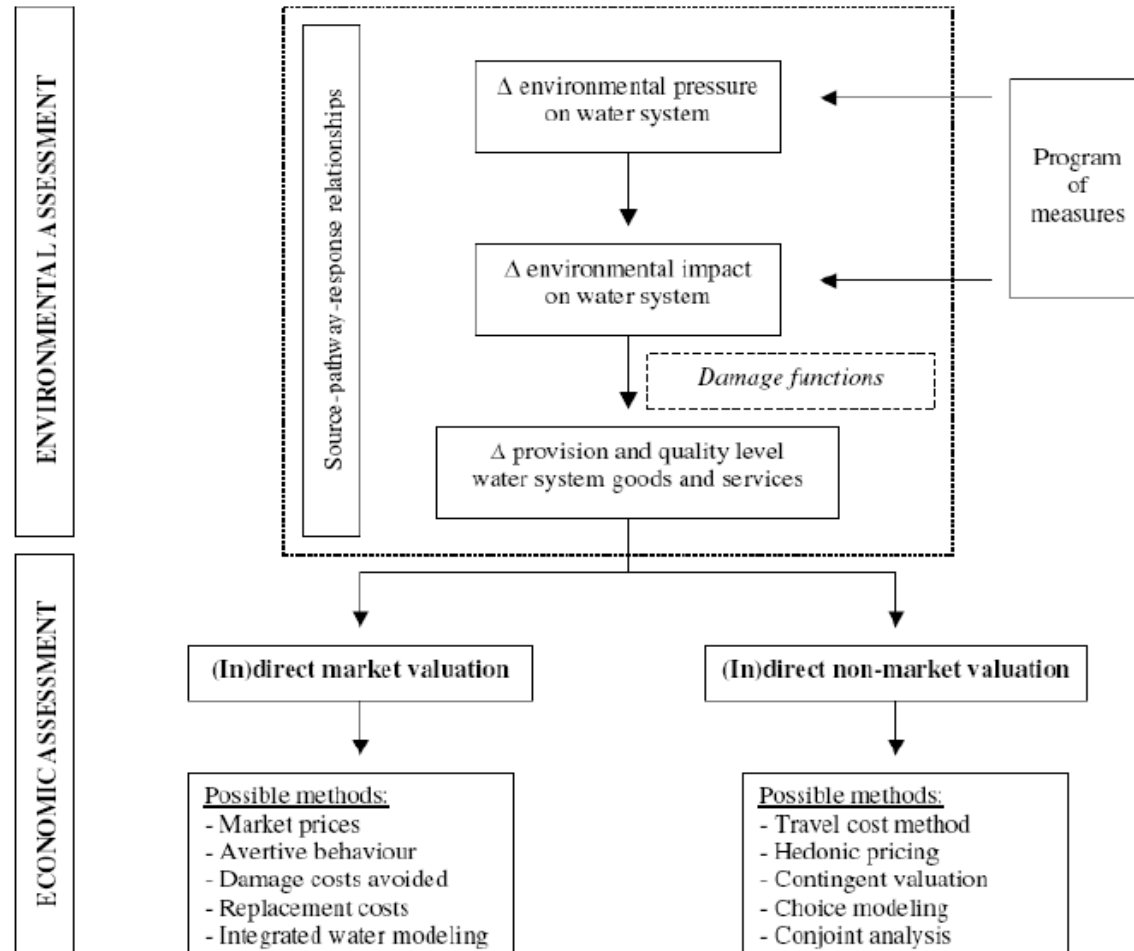
It can be estimated **using direct or indirect market and non-market based valuation techniques.**

Economic values are derived from **existing market prices for inputs** (production values) or outputs (consumption values)

Examples include the economic value of fish, which is sold on a fish market (market analysis) or the costs of replacing impaired environmental riparian functions such as nutrient retention.



Economic valuation of environmental costs and benefits



Situations when we calculate EC

- An important question when estimating environmental costs is what exactly constitutes damage, to the water environment and those who use the water environment.
- Damage arises when there is a discrepancy between some reference and target point or situation. The latter can be measured, for instance, through
- existing environmental norms or standards or the right people attach to a clean environment and the provision of sufficient and clean water. In practice, sometimes also a point in the past, when pollution levels and corresponding damage costs were lower, is taken to represent the target situation.
- An example is the discharge of waste water into a water course at a rate (e.g. tons of N per year), which exceeds some permitted rate (in tons per year) and hence results in a eutrophic water system with negative consequences.
- It is important to point out that this permitted discharge rate is usually not constant and can be determined in a variety of ways, including through expert judgement of good ecological status, public participation or taking into account the incremental costs of reducing damage just below or above the rate .



Approach for assessing environmental costs in Spain

The costs of measures can be used as a proxy or indicator of the *external* environmental costs i.e. the costs of measures aimed at reducing, eliminating or mitigating environmental pressures (through water use or services) on a water body, which have to be internalised somehow in order to reach the desired (target) situation

For the purpose of cost recovery, the steps are:

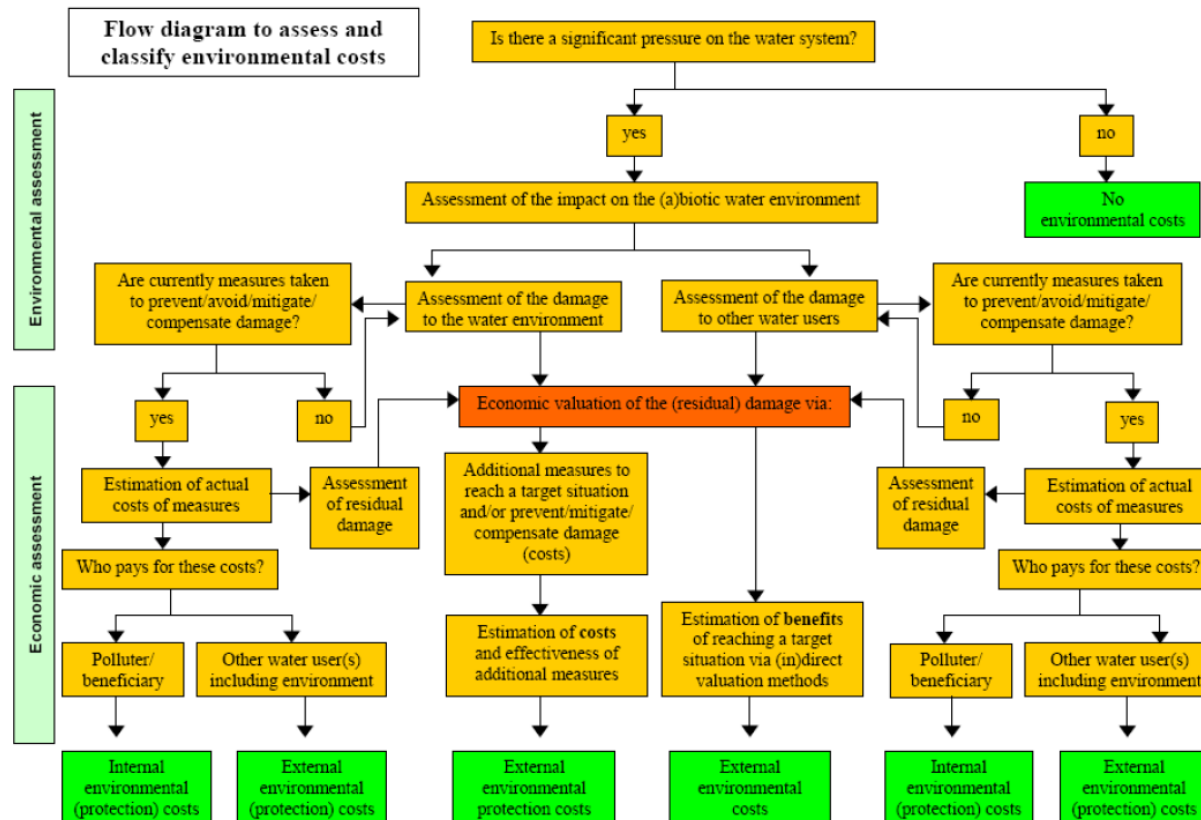
- a) The identification of measures already taken or in place to reduce, eliminate or mitigate the environmental damage caused by a specific pressure.
- b) Analyse the cost of the measures in place to meet the existing environmental standards and analyse the costs expected to be incurred to meet standards in the cases where these have not been met.
- c) Identify how measures are paid for and consider if the costs are passed on to others.

This approach requires:

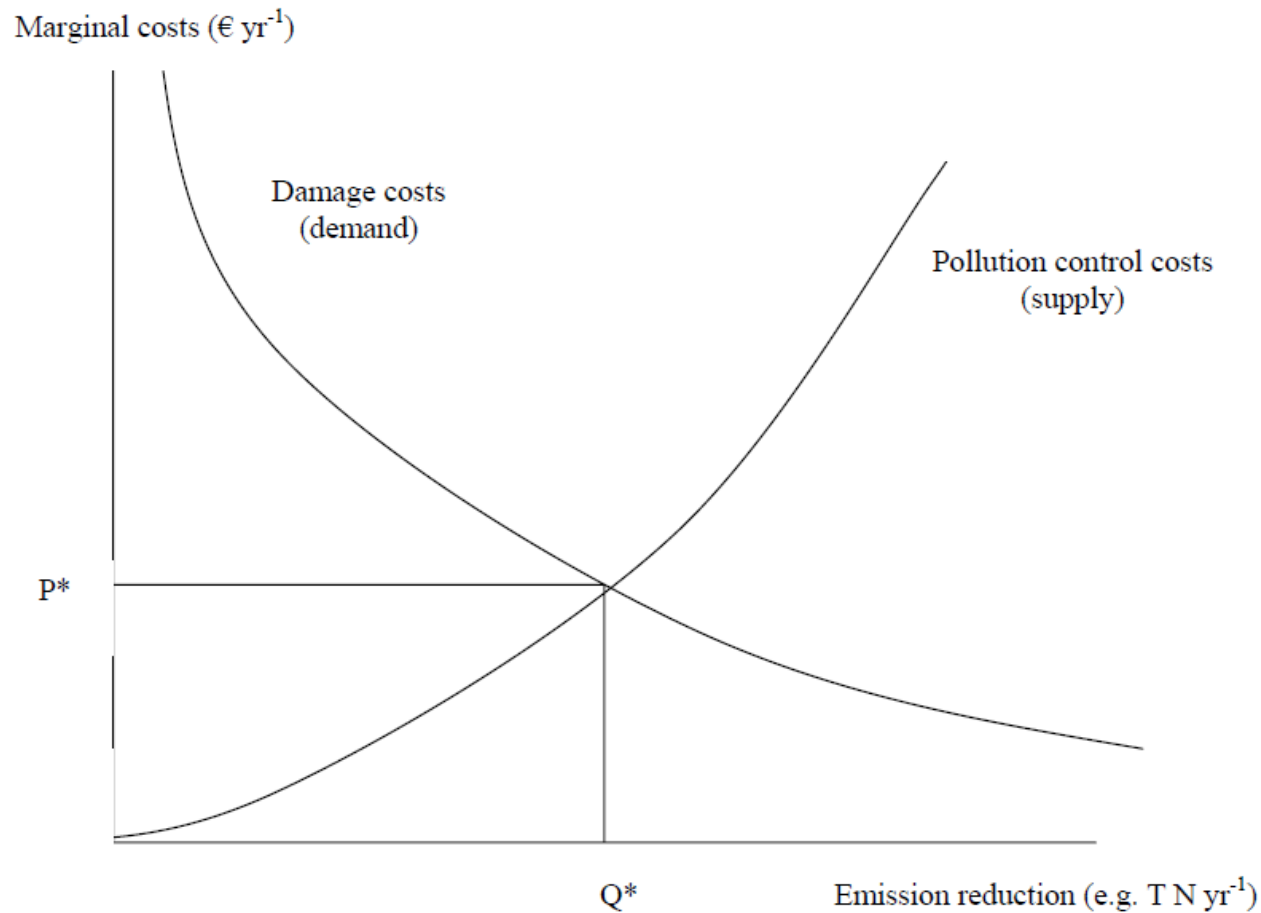
- a) to identify and quantify pressures and their impacts;
- b) identify the gap between the existing situation and the GEQ situation;
- c) apply the available monetary valuations for specific environmental benefit types.



Assessing Environmental cost



Basic economics of pollution control



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Assessment of environmental and resource costs in France

The concept is quite simple: environmental and resource costs of a water service are estimated through the cost of necessary investments and operations, to minimise the impact of services related to the use of water on the environment and users of the environment.

By transposing this thinking into terms of the DPSIR scheme, it means that an extra expense is done to reduce the impact of pressures on the environment.

Therefore, environmental and resource costs can be assimilated to these following costs, ranked according to three categories of pressures:

- Avoidance costs of pressures affecting water quality: cost of treatment
- Cost of avoidance of water user pressure on watercourse hydrology (withdrawals with or without restoration), which can be assimilated to “resource costs”: pressure avoidance cost (refurbishing of drinking water supply networks, better efficiency of irrigation infrastructures, water recycling processes in industry or investments in water retention).
- Cost of avoiding watercourse continuity and morphology impact: It can be the cost of installing fish locks, the cost relative to creating "buffer" areas

Source: French Water Ministry.



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Overview of German water valuation studies

Study	Object	Methodology	Result (examples)
Holm-Müller (1991)	Environmental quality (e.g. drinking water, surface water)	Contingent valuation	Improvement of 1 quality class (€/household*a): 48 (surface water) 24 (drinking water)
Hampicke, Schäfer (1994)	Isar estuary floodplains	Market prices (timber), contingent valuation	500 to 650 €/ha*a
Jung (1996)	Environmental quality (e.g. drinking water)	Contingent valuation	
Schönbäck (1997)	Danube floodplains, national park	Travel costs, Contingent valuation	Value of national park (11.500 ha): 8,3 billion €
Waibel, Fleischer (1999)	Costs and benefits of agricultural pesticides	Market prices (drinking water), Contingent valuation (biodiversity)	Drinking water supply: 65,9 Mio € p.a. for Germany (51% of total external cost)
Muthke (2001)	Quality of water bodies for recreation	Contingent valuation	Improvement of 1 class: 30 – 43 €, 2 classes: 34 – 53 € / household*a
Wronka (to be published)	Biodiversity, drinking water	Contingent valuation	Improvement of drinking water quality: 22 - 75 €/household*a
Meyerhoff, Dehnhardt (2002)	Elbe floodplains (biodiversity, nutrient retention)	Contingent valuation, market prices (nutrients)	Area of 10.000 to 15.000 ha: net present value 850 - 1.080 Mio € (details see below)

Source: German Ministry for the Environment



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Thank you!



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