

Workshop

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

29-31 March 2016
ECRAN 61725

Resource Cost

Theory and methodology



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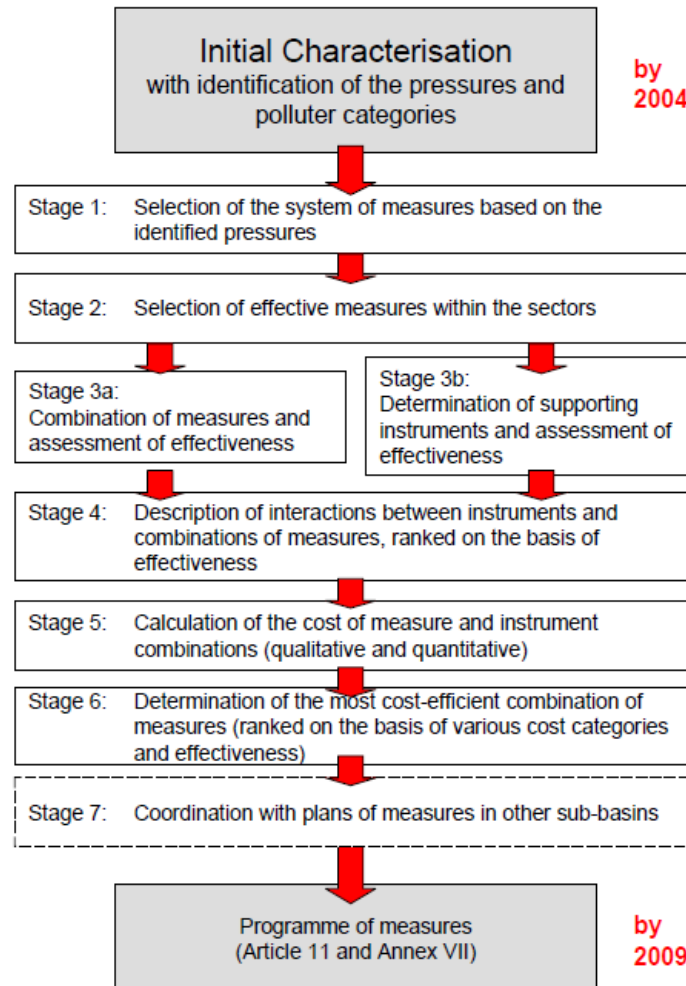
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Structure of the presentation

- Determination of costs of measures
- WFD references
- Legal basis of Resource Cost calculation
- Where we can use the RC
- Estimation of RC
- Example from Spain



Approach for determining the most cost-effective combination of measures



What we know from the WFD (1)

- *Article 5* of the WFD requires Member States to undertake an economic analysis of water uses according to the specifications of *Annex III*.
- *Article 13* and *Annex VII* require Member States to send summary reports of the analyses required under *Article 5* and *Annex II* as part of the first RBMP.
- *Annex III* of the WFD stipulates that the economic analysis of water uses should contain enough information in sufficient detail (taking account of the costs associated with collection of relevant data) in order to:
 - Make the relevant calculations necessary for taking into account the principle of recovery of the costs of water services under Article 9, taking into account long term forecasts of supply and demand for water in the RBD and where necessary:
 - Make estimates of the volume, prices and costs associated with water services.
 - Make estimates of the relevant investment including forecasts of such investments
 - Make judgments about the most cost-effective combination of measures with respect to water uses to be included in the PoMs under Article 11, based on estimates of the potential costs of such measures.



What we know from the WFD (2)

Article 9:

- Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs, having regard to the economic analysis conducted according to *Annex III*, and in accordance in particular with the polluter pays principle.
- Member States shall ensure by 2010 that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive, an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services, based on the economic analysis conducted according to *Annex III* and taking account of the polluter pays principle.
- Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected.



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Legal basis

WATECO Guidance document, 2004

Information Sheet on the “Assessment of Environmental and Resource Costs in the Water Framework Directive” prepared by the Drafting Group ECO2 of Working Group 2B of the Common Implementation Strategy (CIS), 2004

A guidance for assessing the recovery of Environmental and Resource Costs in the context of the WFD, 2015



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RESOURCE COSTS – Definitions (1)

Resource costs represent the **costs of foregone opportunities** that other uses suffer due to the depletion of the resource beyond its natural rate of recharge or recovery (e.g. costs related to groundwater over-abstraction). These measure the value of lost opportunities which are withheld from other users because a resource is being exploited to excess (i.e. above the rate of regeneration).

These users can be either those of today, or those of tomorrow, who will also suffer if water resources are depleted in the future.

Total economic value of an environmental resource:

i) use values

- a) direct use value
- b) indirect use values
- c) option values

ii) nonuse values

- a) altruistic,
- b) existence values
- c) bequest values.



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RESOURCE COSTS – Definitions (2)

The resource costs are defined as the **difference between the net benefits (= total benefits minus total costs) of present or future water resource use and the net benefits of alternative water resource use** (including – if relevant and significant - environmental costs)

2015: Resource costs are the costs of foregone opportunities which other water employments suffer due to the depletion of the resource beyond its natural rate of recharge or recovery (e.g. linked to the over-abstraction of groundwater).

They depend on:

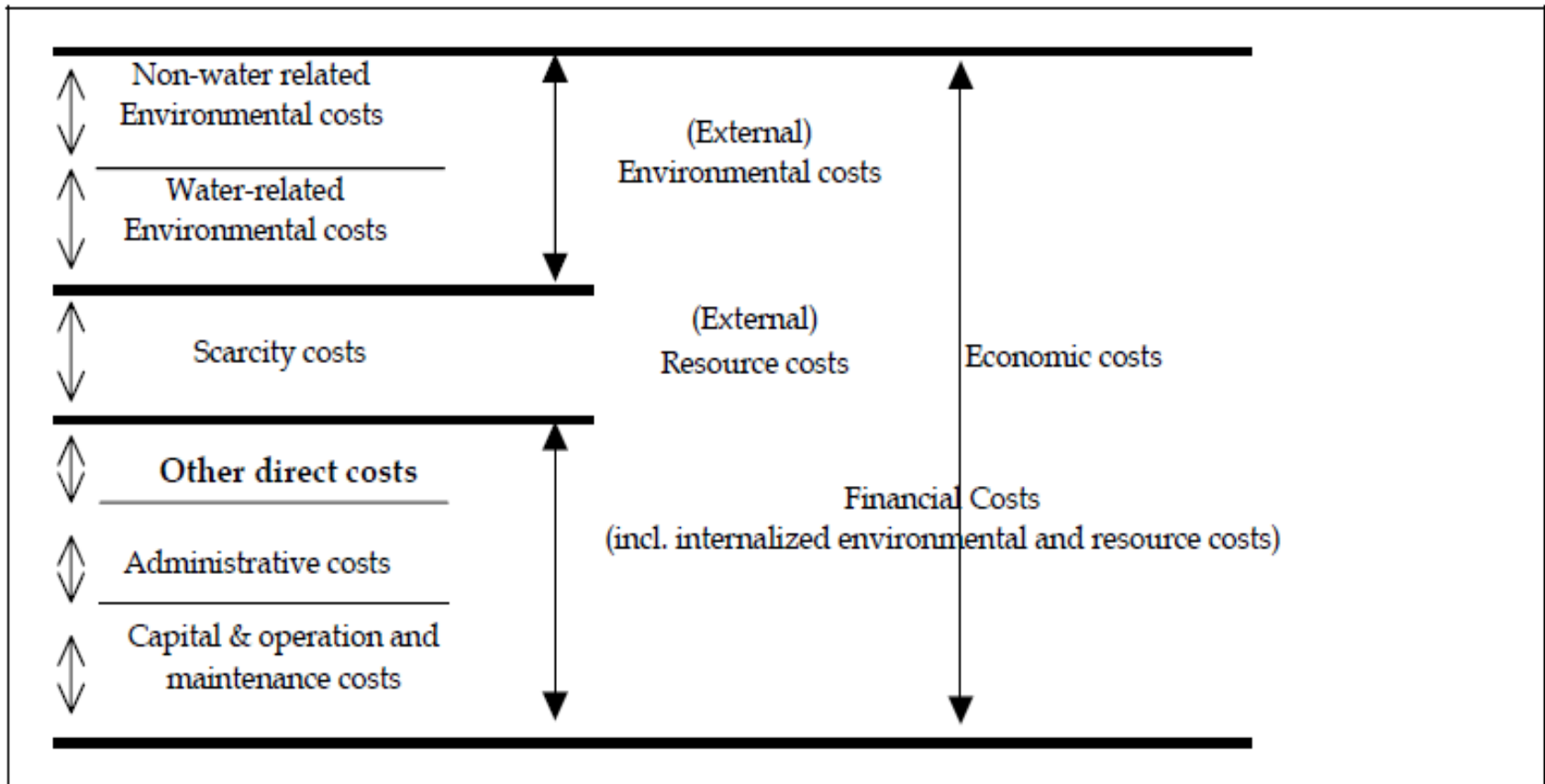
- the water availability in the territory and in the time
- current and future needs
- reproducibility of the resource (including its quantity)
- the allocation distribution
- the economic, social and environmental effects on the alternative use and no-use.

The resource costs are “scarcity costs” and they can occur for inefficiency causes or natural conditions.

Therefore, **they could exist also if environmental costs do not exist**. In these cases alternative water uses could generate higher net economic value.



Category of costs in the WFD



Where we can make use of the RC (1)

- Cost Recovery as a Source of Funding for the Programme of Measures
- Cost recovery (including internalization of environmental & resource costs of water use)
- The assessment of the degree of cost recovery can provide information on the extent to which the polluter-pays-principle is applied
- Economic incentives for rational water use
- Selecting the most cost-effective set of measures to reach the environmental objectives (selection of the most cost-effective combinations of measures under Article 11 and Annex III of the WFD)
- Support the designation of HMWB (Heavily Modified Water Bodies)



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Where we can make use of the RC (2)

- Application of derogations under Article 4 of the WFD, providing a possible economic justification for such derogations
- Pricing water security may contribute in particular to the EU Climate Change Adaptation Strategy and EU Action on Drought and Water Scarcity
- Article 9 of the WFD - where pricing water security can be interpreted as a means to advance towards the recovery of the resource costs of water. In this case resource costs are the equivalent to the cost of restoring a sustainable flow of water provisioning services
- Article 9: take account of the cost recovery of water services, including environmental and resource costs.
- Article 9: Member States shall ensure by 2010 that water pricing policies provide adequate incentives for water users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive.



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Where we can make use of the RC (3)

Cost recovery principle applies to:

- **the financial costs** for the provision of a water service, including the creation, operation, maintenance and replacement of water infrastructure
- the costs of negative environmental effects associated with the water service (environmental costs) and forgone opportunities of alternative water uses (**resource costs**) which must all be taken into account.

WFD:

- MS: "should take account of the principle of recovery of the costs of water services including environmental and resource costs, having regard to the economic analysis conducted according to Annex III, and in accordance in particular with the polluter pays principle" (Article 9 WFD).
- MS: should also ensure "an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, **to the recovery of the costs of water services**, based on the economic analysis conducted according to Annex III of the WFD and taking account of the polluter pays principle."



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Estimation of Resource Cost

- **Direct costs** are payable for the implementation of specific measures, such as the cost of structural measures in water protection, or administrative costs for collection of taxes.
- **Indirect or economic costs** are incurred by measures and instruments in the sense that the measures restrict or change the uses of a water body, or necessitate adaptation measures. In contrast to direct costs, a significant proportion of economic costs are comprised of lost revenue.
- **Representation of costs:**
 - Overall costs, e.g. in the form of the cash value of project costs
 - Specific costs:
 - per inhabitant
 - per household
 - per river kilometer
 - in relation to real net output in the river basin
 - in the form of annual costs.



Estimation of Resource Cost – example (1)

There are no well-established methods for estimating resource costs!!!

Two users (City A and City B) are competing for the use of the same water.

It is possible to estimate the demand curve for each of them.

If there is sufficient water available to satisfy both demands, there is no scarcity and the resource cost of water is zero

If there is scarcity - only a limited amount of water available - (supply with scarcity), there will be a resource cost, which can be calculated by finding the price for which total demand is exactly to the supply with scarcity.

The difference between that price and the normal price is the resource cost.

The resource costs arise as a result of an inefficient allocation (in economic terms) of water and/or pollution over time and across different water users, because an alternative water use generates a higher net economic value.

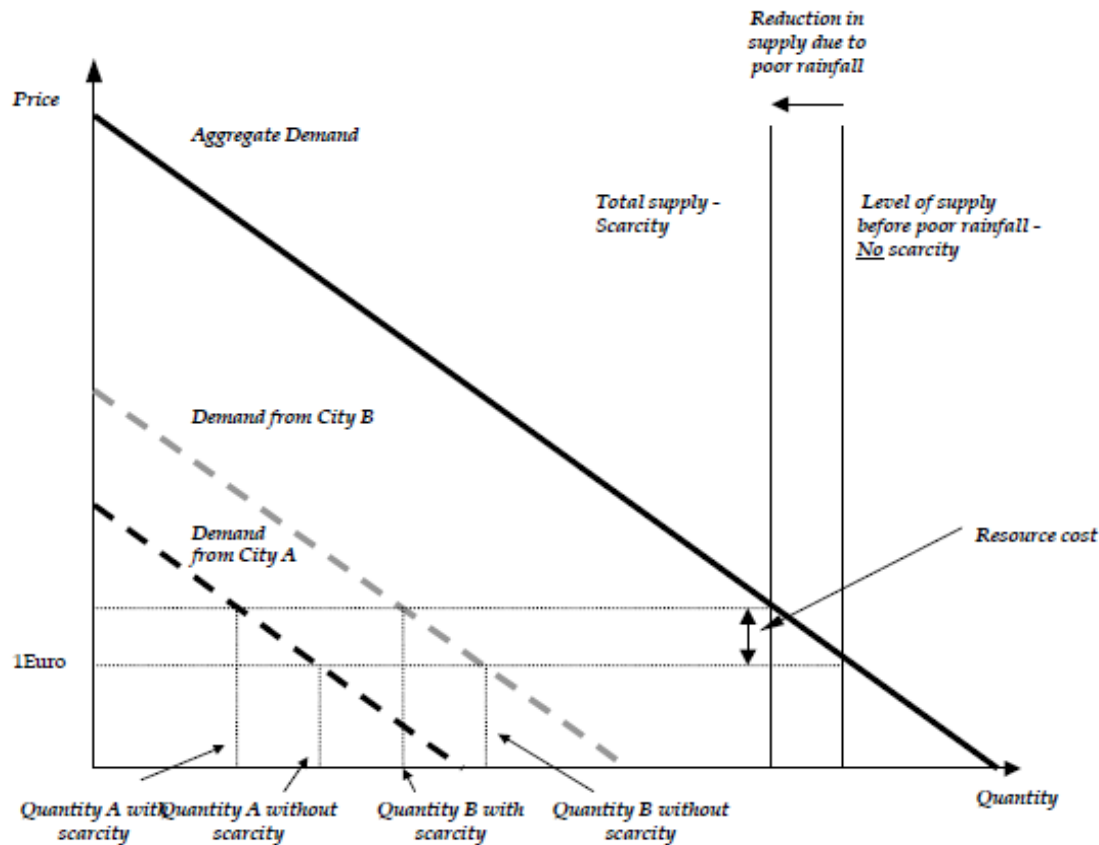


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Estimation of Resource Cost – example (2)



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Steps for assessing Resource costs

- To get a deep knowledge and control of the existing administrative water concession procedures including complete information on water licences and actual consumption rates.
- To verify the cost-benefit ratio for each water use and between different allocation schemes using a benchmark analysis (e.g. optimal *pro capite* households water budget, crop surface to water volume ratio, etc.)
- To identify causes of imbalances;
- To establish limits to the abstraction (water licences) to support a hydrologic regime coherent with GES achievement (ecological flow), at the right cost.

Solution: an efficient water use (optimal allocation) bringing near zero resource costs implementing first administrative measures under WFD annex VI Part B ii) (supplementary measures).



Types of resource costs

Resource costs resulting from current water shortage

The resource costs arising due to foregone benefits from “not delivering” water quantities to given consumers. These resource costs are based on the concept that the value of the resource equals the value of the water that is “not delivered”. Hence, a possible way to quantify them is to calculate the lost profit originating from the “missed consumption” by multiplying the “not delivered quantities” by their value, a proxy for which can either be water prices or water taxes.

Resource costs for future water shortage

The resource costs for future water shortage are based on an assessment of the security of the water consumption as a result of climate change and deterioration in water quality. The cost estimation is based on “conditional” water shortages compared to a baseline scenario for the respective RB. The estimation of these costs is based on Water Exploitation Index+ (WEI+), calculated according to the following formula in compliance with EEA 2012 State of Water Assessment.



Approach used to assess Resource costs in Spain (1)

A pilot methodology was applied in Jucar PRB by the Spanish Environment Ministry

- *Conjunctive modeling of surface and groundwater.* In systems in which the groundwater component is important, the model should be able to simulate both surface and groundwater systems and their interaction. Otherwise, externalities due to separate actions would be ignored.
- *Incorporation of water productivity functions in the water uses and marginal unit costs of the water supply system.* The demand of the different types of users are represented by “economic value functions”, which express the relation between water supply and its marginal value for the different types of users in a specific year.



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Approach used to assess Resource costs in Spain (2)

The calculation of resource costs is based on simulation and optimisation models. The use of an *optimization approach* allows to calculate an upper bound of the economic value of water at a certain location with the system being operated in an economically optimal way.

The *simulation approach* allows to determine the economic value resulting from a set of a priori established operating and allocating rules.

Comparison of the optimization and simulation results provides insight in the resource cost.

The gap between the economic value of an economically optimal water use and the current water allocation system allows to assess the “distance” between the optimum and any management regime analyzed.

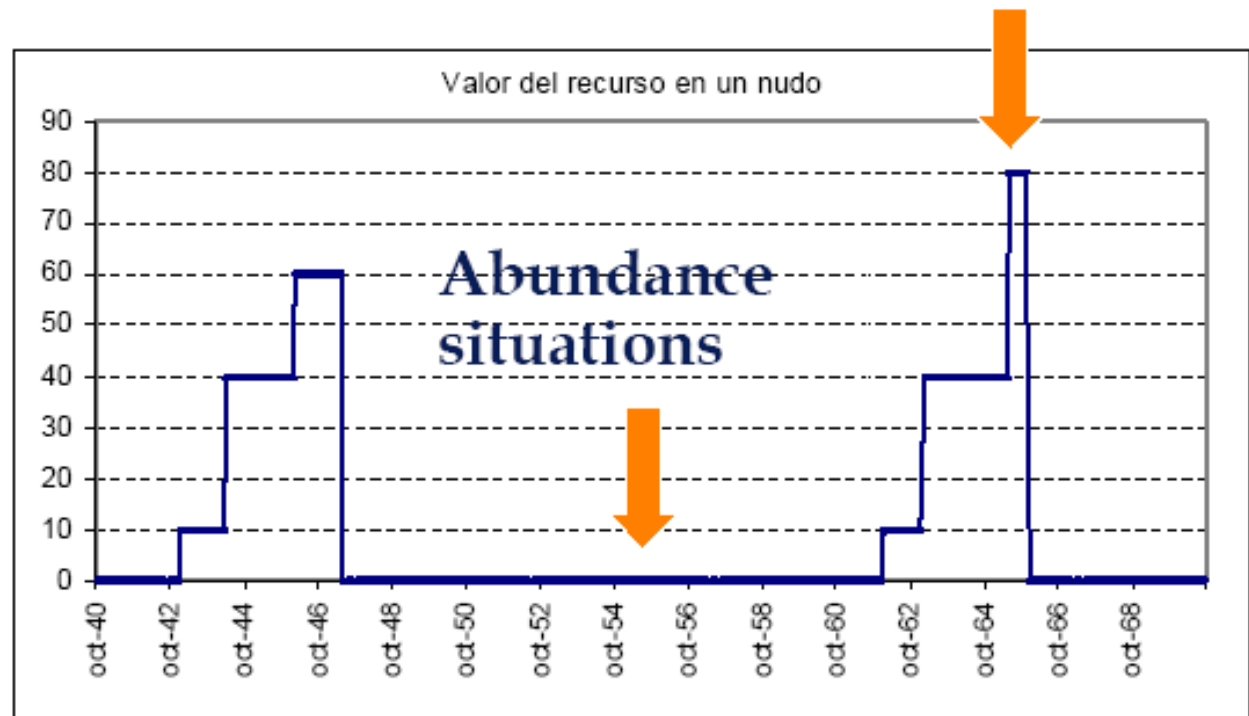
The results of the optimization model provides insight in possible operating rules or strategies with which to improve the economic results in the system, whereas the benefits of any modification in the management criteria, such as modifications to achieve the quality standards required by the WFD, can be assessed by the simulation model.



Approach used to assess Resource costs in Spain (3)

Opportunity cost of the resource is higher in scarcity situations and lower in abundance situations.
Opportunity costs are modified in time if there is the possibility of storing water in a reservoir.

Scarcity situations



Relevance for Drina PoM

The “resource costs” relevant for:

- water balances and
- ecological flows.

Resource costs refer to competing and/or conflicting human water use, primarily as a result of its limited quantitative availability in time and space.



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Thank you!



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