Assessment of the environmental impacts of a project or measure

Assessment of the environmental impacts of a project or measure

Once the costs of project implementation have been calculated, it is often necessary to estimate the environmental impacts of the project. But how should an economic assessment be carried out on the environmental benefits and damages, which are, by definition, difficult to estimate in monetary terms? What value can be assigned to environmental assets or to the services rendered by the environment? What methods are available to carry out these assessments? At what point during the WFD cycle or during SBMP implementation should they be run?

Defining and assessing the various impacts of a project

For an SBMP or the WFD, it may be necessary to assess the environmental impacts of a project or measure. This consists of identifying the environmental benefits and damages incurred by the project or measure. The point of the assessment of these impacts is to inform on the economic, social and environmental effects caused by the project or measure. For example, the ecological consequences of a project may be defined as the impact of the project on the balance or the functioning of the environment or the ecological system. The consequences are thus all the effects of the project on ecosystem services, on environmental regulation (climate, soil formation, water cycle), on services provided by species (pollination, balance between fauna and flora), and on biodiversity and the gene pool.

The social effects of an environmental project reflect the consequences of the project on cultural, recreational, scientific and educational habits, as well as the benefits for human health and quality of living provided by the environment.

To determine the economic impact of an environmental project, it is necessary to assess all the economic consequences of the project in terms of jobs, the production of market natural goods and, more generally, the effects of the project on local development.

The approach to the impacts of a project will differ depending on the type of benefits and damages that must be quantified. Depending on the specific analysis selected, the value assigned to the consequences of a project (and the final assessment of the project) may vary considerably. **This variation in the assessment of impacts is not a problem as long as the evaluation criteria are clearly presented with the results.**

Some of the impacts listed in Table 10 are easy to quantify and can be translated into monetary terms and financial totals. That is notably the case for the economic impacts. On the other hand, it is much more difficult to set a price for ecological impacts, e.g. the “value of flagship species”.

Tableau 10 *An example of impact assessment on the Sainte-Victoire site (Source: Credoc, 2008).*

Type of impact	Notable elements	Quantification and valuation
Economic impacts	Jobs created by the local board and by its partners in the economic sectors stimulated by environmental protection. Creation of skills in forest management (prevention of forest fires) and sustainable management of natural areas. Economic benefits for: - the forestry industry - agrosylvopastoralism - hunting - the wine-growing sector - real estate Potential benefits via specific labels for tourism businesses. Benefits derived from cooperation with farmers and hunters.	Number of full-time equivalent jobs: direct jobs, indirect jobs, derived jobs. Number of work days (calculated using the average price for consulting businesses) put into creating a methods guide on fire-prevention projects, a guide on development work in natural areas, etc. Revenues from sale of wood from the site. Revenues of business units on the site. Average price for one hectare of a reference hunting ground, multiplied by the number of hectares set aside for hunting on the site. Change in revenues of the cooperative following granting of the Sainte-Victoire label. Calculation (hedonic-pricing method) of the impact of the “proximity to and/or view of the Sainte-Victoire mountain” criterion on real-estate prices. Increase in the average price of a rental in a rural vacation apartment benefiting from the “Grand Site” label. Subsidies received by hunting associations for the development of cover crops (for game animals). Territorial agro-environmental subsidies received by farmers.
Ecological impacts	Oxygen supply and carbon sequestering by biomass. Prevention of fires. Value of flagship species.	Market value per ton of carbon per hectare of forest on the site. Avoidance cost calculated using the average cost of fire per hectare on the site (using the 1989 fire as the reference value) or Replacement cost based on the cost of fighting a fire if one occurs. Average willingness to pay to preserve site flagship species (further information required).
Social impacts	Value of the Cézanne heritage. Value of the vernacular historical heritage, of the palaeontological heritage and of the site landscape. Value of recreational uses (climbing, paragliding, hiking). Value of the local living conditions. Creation of a collective transportation system around the site.	Approach via willingness to pay for all aspects of the social value of the site or Approach specifically targeting the Cézanne heritage (the value of the Cézanne paintings showing the Sainte-Victoire mountain). Approach via willingness to pay for all aspects of the social value of the site or Value of a set of dinosaur eggs (based on the market value of dinosaur eggs). Approach via willingness to pay for all aspects of the social value of the site or Average cost accepted by individuals to access the site (cost of travel). Approach via willingness to pay for all aspects of the social value of the site. Annual gas savings achieved by inhabitants using the shuttles.

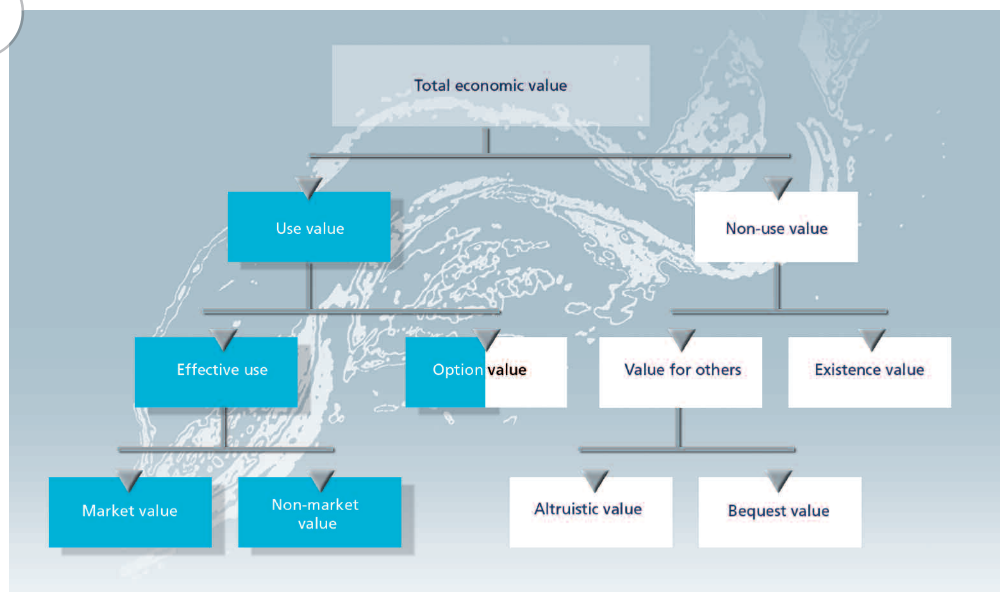
Total economic value (TEV)

How can the value of an environmental asset be assessed? What is meant by the value of an environmental good or service? To answer these questions, it is first necessary to define the notion of total economic value.

In environmental economics, the total economic value (TEV) is a theoretical concept used to define the value of an environmental good or service. TEV is made up, on the one hand, of the use value, and on the other, of the non-use value, as shown in Figure 20.

The use value of an environmental good corresponds to its effective and real use, e.g. a visit to a nature park,

Figure 20



The components of total economic value. Source: The theory of total economic value.

or to its planned and possible use, e.g. a planned visit to a nature park. The use value may or may not be set by an existing market. For example, use of water as drinking water has a price, i.e. the price paid by the user of the service. In this sense, the value of the water use is determined by a market. On the other hand, a walk in a wetland area to observe the fauna and flora is a use whose value is not set by a market (no market price).

In cases where a use is possible (option value), it is deemed to be offset to the future. The option value is therefore a type of use value, but postponed to a later time.

Non-use value corresponds to the value assigned by people to an environmental good or service that they do not effectively use, that they in fact cannot use or that it would be impossible to use. In most assessments, this value is declared by the persons questioned and is highly subjective.

The existence value represents the value a person assigns to an environmental good that the person does not use and does not intend for use, either by himself or herself or by other persons. This could be the case, for example, of the value assigned to saving a wetland even if the person has no intention of using the environmental good.

The altruistic value corresponds to the desire to preserve an environmental good for the present generation, whereas the bequest value represents the desire to preserve an environmental good for future generations.

It must be said, however, that these distinctions remain relatively theoretical. Practically speaking, it is difficult to distinguish the various types of values, particularly given that a single person may have many reasons to assign value to an environmental good or service.

Different economic methods may be used to roughly calculate one or more of the above values simultaneously. However, the methods must be correctly selected for the type of value to be determined.

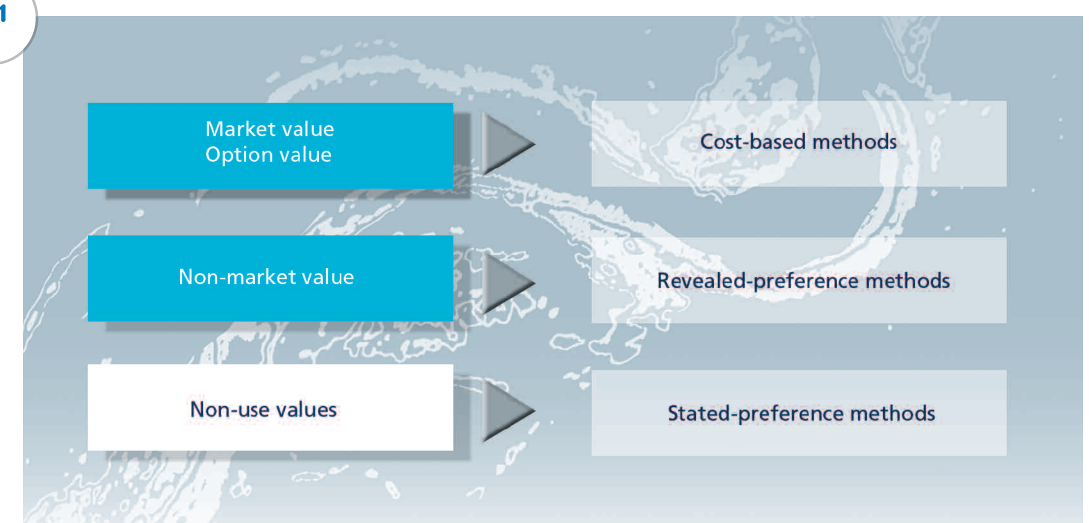
Methods to assess the impact of a project or measure

An economic assessment indicating the value of an environmental good is based primarily on methods **linking a value expressed in monetary terms** (euros, dollars, etc.) **with changes in the environmental status.** The process of monetising does not mean that the environmental good, the aquatic environment, becomes a marketable item that can be freely purchased or exploited. It **provides a quantified assessment that can then be compared to economic values** more commonly used in analysis such as costs and budgets.

Different methods for the economic assessment of environmental goods have been developed and are currently used. Each provides a particular type of information. Distinctions are generally made between three types of methods depending on the type of value to be determined.

For example, to determine market or option values, cost-based methods are employed. To calculate non market-related use values, revealed-preference methods are used. Finally, non-use values can be measured by stated-preference methods.

Figure 21



Assessment methods for the various values.

Cost-based methods

Market values and market-based option values are assessed using methods based on observed costs, e.g. the avoided-cost method, substitute-cost method, replacement-cost method. This type of method is relatively easy to use. In general, the objective is to determine the value of certain environmental goods or services by estimating the costs that would be incurred if the goods or services were no longer available or if their quality were damaged.

For example, the loss of a wetland or damage to it would lead to:
- an increase in flood risks, because wetlands absorb flood waters and thus avoid flood damage (avoided costs);
- a reduction in the self-cleansing of wastewater by the natural environment. The disappearance of the wetland would require the construction of additional wastewater-treatment plants or the resizing of existing plants, which would represent considerable additional costs (substitution costs);
- a reduction in biodiversity which would require, for example, the reintroduction of the species removed from the environment to "re-establish "the quality of the damaged ecosystem (replacement costs).

For a study on Alsatian groundwater during the preparation of the WFD programmes of measures, the avoided-cost method revealed that if the regulatory thresholds for sodium chloride (salt) were reached by 2015 in Alsatian groundwater bodies, investment and water-treatment costs of between 5.7 and 6.8 million euros could be avoided.

Table 11 presents the results of assessments using cost methods to determine the economic impacts of pollution in water resources for consumers of drinking water.

Tableau 11 *Use of cost-based methods to assess the economic impacts of water pollution.*

Treatment costs for water resources intended for drinking water	Minimum unit price	Maximum unit price	Study site	Sources
Treatment for eutrophication (abstraction from a river)	0.13 €/m3	0.21€/m3	Loire-Bretagne basin	Loire-Bretagne water agency
Treatment for nitrates (abstraction from a river)	0.22€/m3		Seine-Normandie basin	Seine-Normandie water agency
Treatment for pesticides (abstraction from a river)	0.06€/m3		Seine-Normandie basin	Seine-Normandie water agency
Treatment for nitrates	0.4€/m3	0.6€/m3		Ecology ministry (CGDD)
Treatment for pesticides	0.06€/m3	0.2€/m3		Ecology ministry (CGDD)

(Sources: Water agencies and CGDD, E&D no. 52, http://www.developpement-durable.gouv.fr/Couts-des-principales-pollutions.html).

Revealed-preference methods

To calculate non market-related use values, revealed-preference methods may be implemented. They consist of estimating the value of, for example, bathing by referring to an existing and relevant market, for example, the real-estate market.

The objective is to deduce the value of environmental goods and services on the basis of decisions effectively made by individuals. The basic technique used by these methods is to observe the behaviour of environmental users (fishermen, walkers, industrial companies using water as a raw material, etc.), on the assumption that their behaviour indicates their preferences and thus the value that they assign to the environment.

In other words, these methods "reveal" the value of the environmental good or service via an estimation using an existing market.

■ Method based on market prices

This method deduces the value of environmental goods and services on the basis of their market price. For example, if problems involving water pollution lead to the closing of a fish-canning factory, the loss of revenue caused by the closing and the possible impacts of increases in fish prices on markets for consumers may be used to calculate the benefits of a return to high-quality water.

■ Method based on productivity

This method is used when an environmental good (water, wood, etc.) enters into the production of another object sold on a market. For example, water quality influences the productivity of irrigated crops or the treatment costs of services providing drinking water. The economic benefits drawn from higher quality water may be roughly calculated by measuring the increase in revenue due to greater agricultural productivity or to a drop in costs to provide drinking water.

■ Hedonic-pricing method

This method assesses the value of an ecosystem or of an environmental service based on its direct influence on the price of certain objects. It is based on the idea that the price of some objects, e.g. housing, depends on many characteristics, some of which may be environmental. In general, economists study the variations in real-estate prices assumed to indicate an implicit value of the environmental component, for example, proximity to a nature park.

■ Travel-cost method

The travel-cost method estimates the economic value of a recreational site on the basis of the costs accepted by site users to travel to the site. The travel costs incurred by the visitors are interpreted as the expression of their willingness to pay to visit the site.

Stated-preference methods

Many of the services provided by an ecosystem, for example a walk in the woods or the pleasure of fishing, cannot be purchased or sold on a market. It is also impossible to roughly calculate their value based on existing market sales of other goods or services, as is the case for the revealed-preferences methods (travel-cost method, hedonic-pricing method). In order to determine the non-use value of an environmental good or service, stated-preference methods are used, e.g. the contingent-valuation and joint-evaluation methods.

■ Contingent-valuation method

This method uses **declarative questionnaires and surveys on the population concerned by a project to assess how much households would be willing to pay for a given improvement in the environment.** This willingness to pay for an improvement in environmental quality is then used to calculate the monetary value of the environment (see Figure 23).

Figure 23

AN EXAMPLE OF CONTINGENT VALUATION ON THE LOWER GARDON RIVER

METHOD

- Telephone survey
- Travel-cost method
- Contingent-valuation method to estimate the advantages of restoring the Gardon River to good status
- Cost-benefit analysis to determine the degree to which good status is reached

OBJECTIVES

- **Assess** the value of recreational activities on the lower Gardon River
- **Quantify** the benefits in order to compare them to the costs of measures required to reach good ecological status of the river
- The **analysis** serves as a decision-aid tool

RESULTS

- The value assigned to their recreational activity was estimated on the basis of the maximum entry fee that they would be willing to pay to continue that activity (travel-cost method):

  19.30 euros for walkers, 12.80 for fishermen, 12.60 for kayakers, 12.00 for bathers (values per visit and per person).

- The total amounted to 45 million euros per year.
- These data were then extrapolated to calculate the advantage derived from restoring good status in the lower Gardon River. The result was 2.8 million euros.
- This analysis showed that the benefits to be drawn from restoring the river were higher than the costs (net sum resulting from revenues minus the costs of measures).

Source: Espaces naturels, revue des professionnels de la nature, no. 30, April 2010.

In general, contingent-valuation analysis comprises three main steps.

First, it is necessary to structure the survey questionnaire. The elements that must be determined are the population to be surveyed and the type of questions (telephone survey, postal survey). It is necessary to define the hypothetical scenario studied during the survey and the payment systems targeted by the questionnaire (income taxes, sales taxes, entry fees, etc.). It is also necessary to select the social-economic parameters used to differentiate the surveyed population (age, income, profession, etc.).

The second step consists of selecting the method used to have people declare their preferences. There are a number of possibilities:

- using an auction system (the proposed values increase throughout the questionnaire);
- using an open question (no proposed values, answers are totally open);
- using a bank card (semi-open question with a proposed value);
- using a closed question (only one value proposed).

Finally, in the third step, the collected data is analysed. This step comprises a descriptive phase and an explicative phase:

- via statistical analysis, the descriptive phase indicates user willingness to pay;
- via econometric analysis, the explicative phase identifies the key variables determining user willingness to pay.

Joint-evaluation method

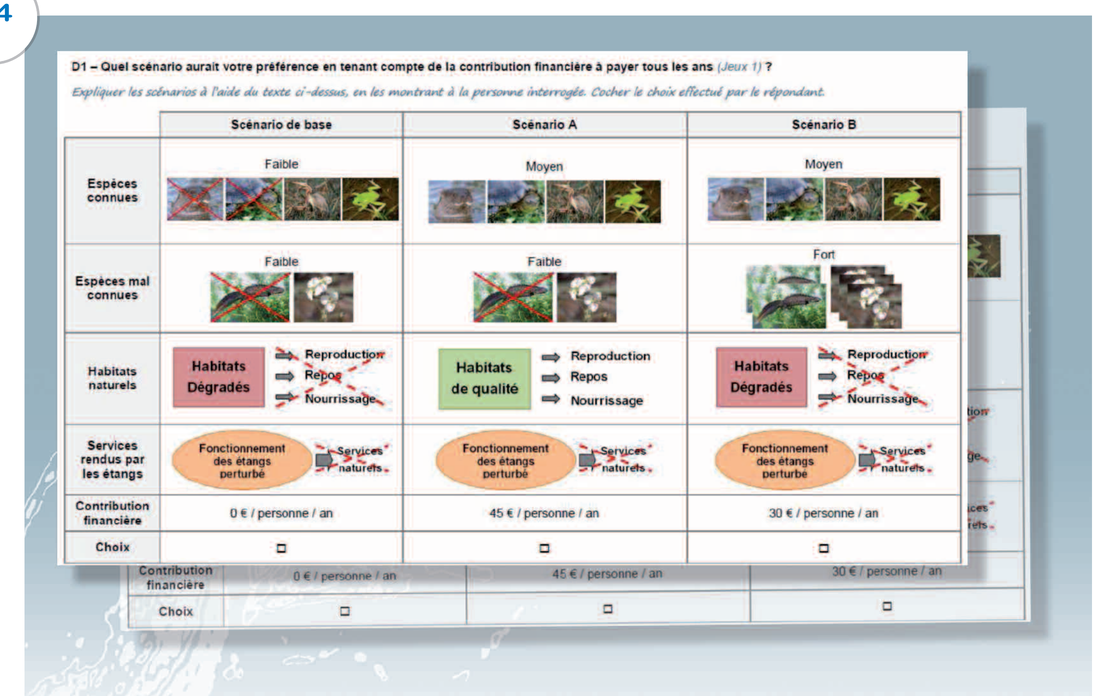
Similar to contingent valuation, joint evaluation is a stated-preference method used to estimate both use and non-use values assigned to an environmental good. The joint-evaluation method, also called the experimental-choice or the contingent-choice method, is used to determine the **value of an ecosystem or a service provided by the environment based on a choice between virtual situations.**

The persons interviewed must make choices and set priorities among different characteristics of the ecosystem and/or the services it provides. Each choice is linked to a cost or to other monetary/economic attributes. It is on the basis of the choices made by the interviewed persons that the value attributed to the ecosystem can be determined.

To encourage the interviewed persons to make choices between the various scenarios presented, the environmental good to be evaluated is geographically situated. The good is presented in its current and future (hypothetical) state and the restoration possibilities of the good are listed (following the hypothetical degradation).

An example of the joint-evaluation method used for the Brenne ponds is presented in Figure 24.

Figure 24



D1 – Quel scénario aurait votre préférence en tenant compte de la contribution financière à payer tous les ans (Jeux 1) ?

Expliquer les scénarios à l'aide du texte ci-dessus, en les montrant à la personne interrogée. Cocher le choix effectué par le répondant.

	Scénario de base	Scénario A	Scénario B
Espèces connues	Faible	Moyen	Moyen
Espèces mal connues	Faible	Faible	Fort
Habitats naturels	Habitats Dégradés → ~~Reproduction~~ → ~~Repos~~ → ~~Nourrissage~~	Habitats de qualité → Reproduction → Repos → Nourrissage	Habitats Dégradés → ~~Reproduction~~ → ~~Repos~~ → ~~Nourrissage~~
Services rendus par les étangs	Fonctionnement des étangs perturbé → ~~Services naturels~~	Fonctionnement des étangs perturbé → ~~Services naturels~~	Fonctionnement des étangs perturbé → ~~Services naturels~~
Contribution financière	0 € / personne / an	45 € / personne / an	30 € / personne / an
Choix	☐	☐	☐

Study on the "improvement of knowledge of wetlands on eight sites in the Loire-Bretagne basin", Actéon, 2010, page 67.

Joint-evaluation method used for the Brenne ponds. The available choices comprise three scenarios incorporating different biodiversity characteristics. Each scenario also includes different financial contributions.

Operational implementation of the assessment on the environmental benefits and damages incurred by a project or measure

Implementation of an assessment method is not the only element in the procedure. Beforehand, it is necessary to determine whether it is a good idea to take existing values obtained from other studies and use them for the assessment.

After the assessment, the results must be extrapolated to the entire population concerned by the given ecosystem and the services it provides. The time factor must also be taken into account (using the discount rate) because the benefits drawn from the services provided by the environment are not limited to a single year. Implementation of economic-assessment methods for environmental goods therefore requires particular care in ensuring that the monetary values obtained are robust, relevant and can be used at some later time.

Benefit transfer and aggregation of data for entire areas

Benefit transfer means that the results of a prior study on a given site are transferred to another site. In this manner, the costs that would be incurred by launching a new study can be avoided. The transfer may also be the first step in a more extensive study on the new site.

To date, transfer methods remain fairly rudimentary. The simplest and most common method is to use unit values expressed per cubic metre of water, per household, per hectare, etc., drawn from previous studies. Consequently, a change in the status of an environment can be linked to a unit value corresponding to the non-market benefits that may be expected following the change.

Three types of transfer have been identified, in increasing order of precision and difficulty:

- **simple-value transfer.** The average unit value drawn from an existing study is taken without adjustment and used "as is" for the new site;
- **adjusted-value transfer.** The average unit value drawn from an existing study is adjusted taking into account the differences between the sites, e.g. the differences in income between inhabitants living on the two sites;
- **value-function transfer.** Some methods call on statistical models to describe the relationship between the unit value and explanatory variables such as the age of the population, income levels, etc. Value-function transfer consists of transferring the explanatory model linked to the unit value produced by the prior study to the new site.

To determine the total value of an environmental good, it is necessary to aggregate the transferred unit values. The precision of the unit-value aggregation is enhanced by clearly identifying and determining the population concerned by the study, i.e. the persons potentially affected by a change in the quality of the environment. It is then necessary to select the sample group that, given its social-economic characteristics and behaviour, is as representative as possible of the identified population.

Once the sample group has been selected, aggregation consists of extrapolating the value found for the sample to the population as a whole. The result is the estimated total value of the environmental good. In some cases, it may be necessary to modify the sample group in order to improve its representativeness.

Procedure to estimate the value of an environmental good or service

■ Determine the unit values

Most methods proceed by **first determining unit values corresponding to a marginal change in certain environmental goods or services,** e.g. the value of an environmental change calculated per cubic metre of water, per household, per protected hectare, etc.

Unit values may be calculated using a three-step process recommended by the Ecology ministry.

Figure 25

THREE-STEP PROCESS FOR UNIT VALUES

1

First, carry out a **qualitative assessment of the uses** concerned by a change in the natural environment (see chapter one of this book).

2

Secondly, **use unit values from prior studies** to roughly calculate financial volumes that are imprecise, but sufficient to provide a general idea of the amounts in play. Reference unit values are available on the economie.eaufrance.fr site for the water sector or on the EVRI database site (see box below) for environmental assessments in general. The database contains a number of environmental-valuation studies and may be consulted on-line.

3

Finally, to obtain reference unit values better suited to the actual case, **it may be necessary to use on site a method specifically adapted to the context** and to the environmental impact studied.

Unit values may be determined in three successive steps.

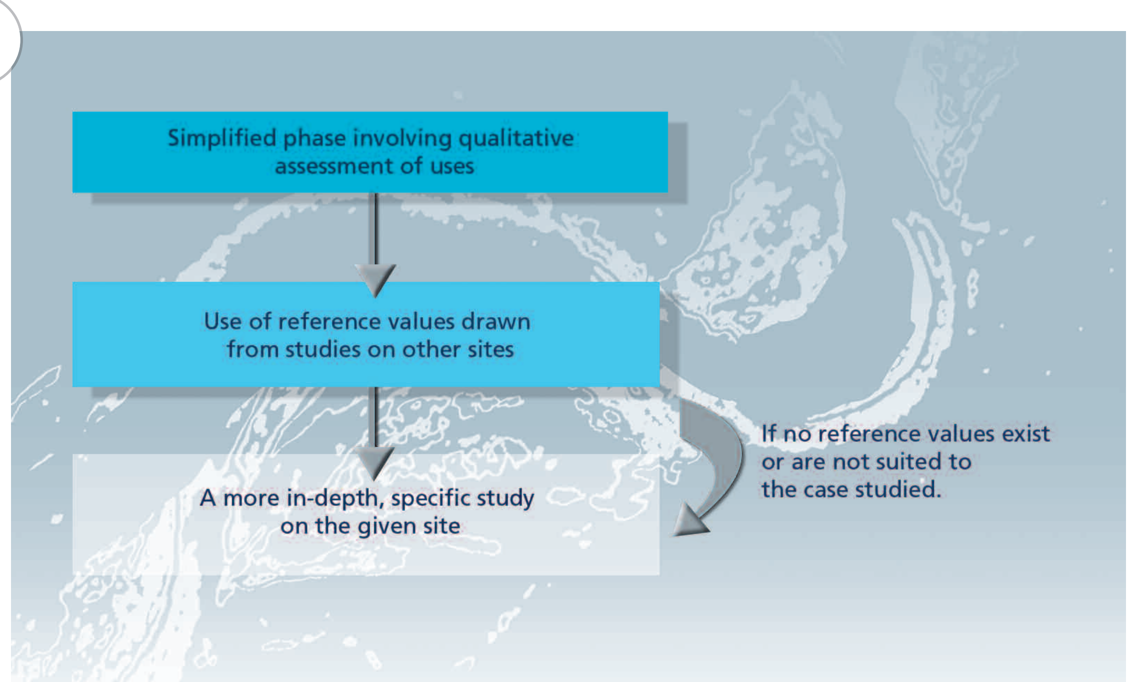
The EVRI database for the development of benefit transfer

The EVRI (Environmental Valuation Reference Inventory) database is a storehouse of environmental valuation studies.

It was developed in the beginning of the 1990s by the Canadian and U.S. environmental agencies (Environment Canada and the Environmental Protection Agency), primarily to identity alternate solutions for on-site environmental-assessment studies because the latter are often long and costly. The main goal of the EVRI database is to encourage benefit transfer. It has continued to be developed in the form of an internet site (www.evri.ca). In 2011, the site held almost 3 500 studies, including 50% from North America and 30% from Europe. Most of the studies stored in the database concern water or fauna. Since October 2002, France has been a member country with Canada, the United Kingdom, the United States and Australia.

The agreement signed between France and Environment Canada means that all French citizens may freely access the database. A registration is required prior to obtaining access.

Figure 26

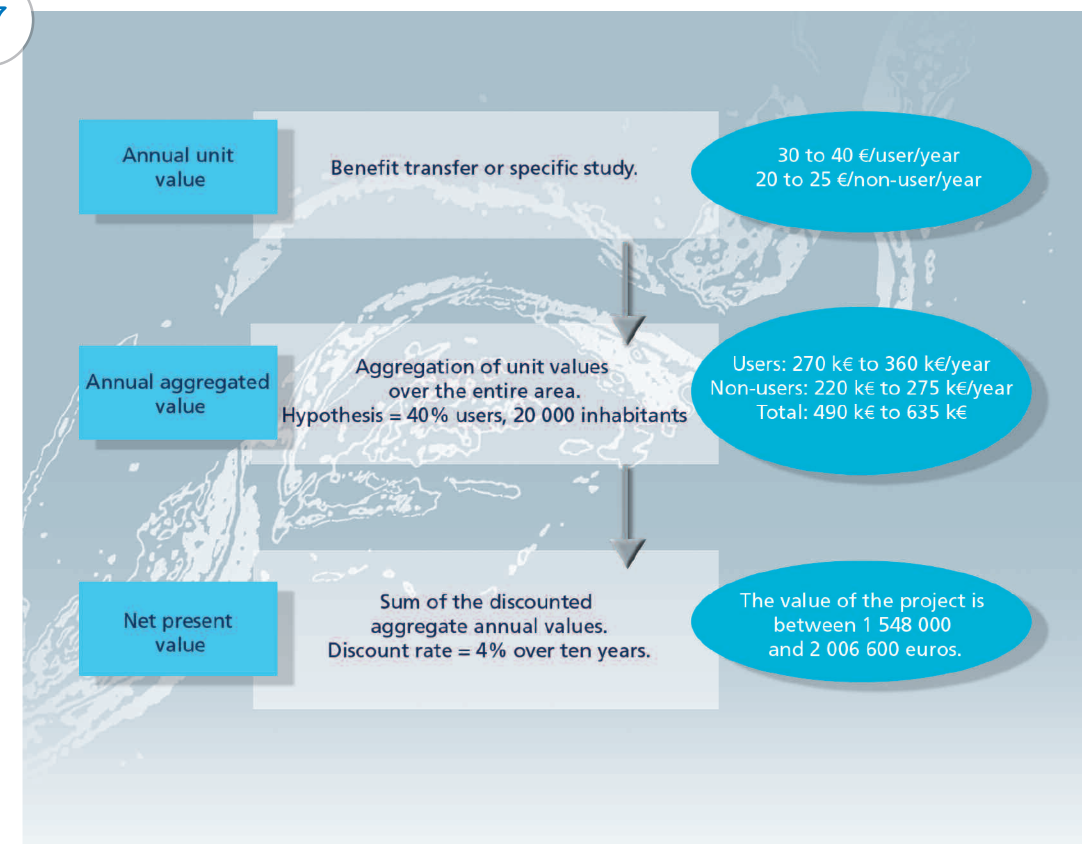


Position of on-site assessment in the overall procedure.
Source: the Water agencies.

Aggregation of the unit values

Once the **unit values have been determined,** it is necessary to proceed with their **aggregation** over the entire population to learn the total benefits produced by conserving or restoring environmental quality. **Calculation of the distribution of benefits over time** also requires particular care and the use of a discount rate. Figure 27 recapitulates the steps involved in the aggregation of unit values.

Figure 27



Steps leading to an estimate of the total value of an environmental good, based on unit values.
Source: the Water agencies.

Example of an assessment of the environmental services rendered by wetlands

An environmental economic assessment of wetlands is based on assigning a market value to the functions and services provided by these environments (see the Zones humides journal, no. 66, fourth quarter 2009). However, this type of valuation requires that the services rendered concern a use and/or are of use to users. For this reason, the assessment is anthropocentric, i.e. a service that does not concern a use and/or is not of use to users would have no value or a negligible value.

In French studies, a number of methods have been implemented to determine these values, notably direct market assessment based on prices, the avoided-cost method, the travel-cost method and contingent-valuation methods (see Table 12).

Tableau 12 *Value in euros[2008]/hectare/year of the main services provided by wetlands as indicated by the various methods.*

	Average economic value found by 15 French studies	Average economic value found by the meta-analysis by Brander *et al.* (2003) on the basis of 89 sites
Water purification	15 – 11300 (4)	272
Supply of water during low-flow periods	45 – 150 (3)	42
Flood control	37 – 617 (6)	438
Recreational activities		
Fishing	80 – 120 (2)	353
Hunting	230 – 330 (2)	116
Navigation / boating	15 (1)	not assessed
Canoeing/kayaking	28 (1)	not assessed
Social value	200 – 1600 (7)	392
Total services provided (€[2008]/ha/year)	650 – 1416 * 907 – 3132 **	1613

CGDD. E&D no. 23 (June 2010, http://www.developpement-durable.gouv.fr/Evaluation-economique-des-services.html) and LPS no. 62 (September 2010, http://www.developpement-durable.gouv.fr/L-evaluation-economique-des.html).

() The number in parentheses indicates the number of studies on which the data is based.
** These values represent the total services provided by the wetland.*
*** Given the great variability in the water-purification service, the value was replaced by the average (272 €) produced by the meta-analysis undertaken by Brander et al.*

The report titled “Approche économique de la biodiversité et des services liés aux écosystèmes : contribution possible à la décision publique” (B. Chevassus-au-Louis, J.M. Salles and J.L. Pujol, 2009) analyses the methods used to assess the economic value of biodiversity and ecosystem services (see Figure 28). The authors also test the reference values used for social-economic assessments of public investment. In France, some work has used the willingness-to-pay approach. The results of the studies are presented in Tables 13 and 14.

Tableau 13 *Assessment of the willingness to pay to preserve wetlands.*

Site	Methods used	Willingness to pay per year x households (average willingness to pay)	Size of population concerned by measure	Surface area of the studied wetland	Willingness to pay / ha / year
Der Lake	Contingent valuation	30-33 €	117 000 inhabitants, i.e. 46 600 households	4 800 ha	291-320 €
Orne estuary	Contingent valuation	30-66 €	13 500 inhabitants, i.e. 5 400 households	900 ha	179-394 €
Erdre marshes	Choice experiments	34 €	56 000 inhabitants, i.e. 22 555 households	2 500 ha	307 €
Seine estuary	Choice experiments	18-46 €	1.17 million inhabitants, i.e. 500 000 households	14 000 ha	659-1 652 €

Figure 28

© F. Weingertner - Onema

Example of a wetland.

Tableau 14 *Assessment of the services rendered by wetlands.*

In euros	Cotentin and Bessin		Bassée		Oise	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Regulatory services						
Absorption of flood waters			210	3840	110	370
Groundwater recharging	190	370	35	70	35	35
Water purification	830	890	475	1420	315	560
Climate regulation	1800	1800	1800	1800		
Productive services						
Agriculture	585	750	285	305	285	305
Shell fishing	120	120				
Forestry			75	270	75	270
Cultural services						
Hunting	170	340	100	155	60	80
Recreational fishing	165	230	130	160	80	90
Educative and scientific value	10	15	490	540		
Aesthetic and recreational value	290	1170	Negligible	Negligible	Negligible	Negligible
Total use value	2100	3500	900	4300	700	1200
Biodiversity (non-use)	225	870	470	2360	440	2230
Total economic value	2400	4400	1300	6700	1200	3400

CGDD, Economic assessment of services rendered by wetlands, in Études & documents no. 49, September 2011.

Recommendations for studies to assess an environmental good or service

Figure 29 lists the steps for an assessment of an environmental good or service For each step, practical recommendations are provided.

Figure 29

Step	Recommendations
Set up a steering committee	Do not attempt to carry out an assessment alone. It is necessary to set up a steering committee including economists, organisations having already participated in this type of assessment and people who are intimately familiar with the area and with local activities.
List all items of value	Draw up a list of the potential economic effects of the environment to be restored (using the value typology), identify existing sources of information. This step may be filled out with in-depth studies.
Write up the technical specifications	For each item of value, draft a written plan for the study or survey intended to assess the item.
Select a competent study partner	Selection of the entity carrying out the study depends on the cost, but also on the quality of the proposal. Make sure that the subject and issues at hand are correctly understood, that the person/company is familiar with the field and can produce relevant references. Contingent-valuation analysis, for example, requires very particular skills.
Monitor and accompany the study	Study monitoring includes checks on the work done at certain key steps agreed upon with the study partner, notably the targets of the study (who, when and where), the type and content of questionnaires (telephone, face to face), etc., all of which must have first been tested. It is indispensable to visit the area with the persons who will carry out the study and to explain the issues involved. Finally, do not forget to inform beforehand the persons to be surveyed and to thank them for their time.
Inform on the study results	It is best to organise a meeting for the management organisation, the elected officials and economic participants. The results presented should be understandable and appropriate for a public of non-economists.

The steps for an assessment of an environmental good or service.
Source: the Water agencies.

In addition to the recommendations listed above, Table 15 recapitulates the various assessment methods that can be used, depending on the values and types of impacts to be assessed.

Tableau 15 *Methods to assess different values on a site.*

Type of value	Components of the value to be assessed	Available analysis methods
Economic value	Jobs Production Local development Skills	Budgetary analysis* Input/output analysis** Activity-systems analysis***
Ecological services	Environmental services Services provided by species Protection against hazards Biodiversity, genetic heritage	Avoided costs Replacement costs Opportunity costs
Social value	Value of heritage Scientific and educational uses Recreational uses Health and quality of life	Joint evaluation Contingent valuation Travel costs Hedonic pricing

** Budgetary analysis consists of an accounting examination of the revenue and expenses of the environmental-management organisation.*

*** Input/output analysis requires highly detailed territorial statistics. It attempts to model the economic functioning of the territory and particularly the flows of wealth transiting from one economic compartment to another.*

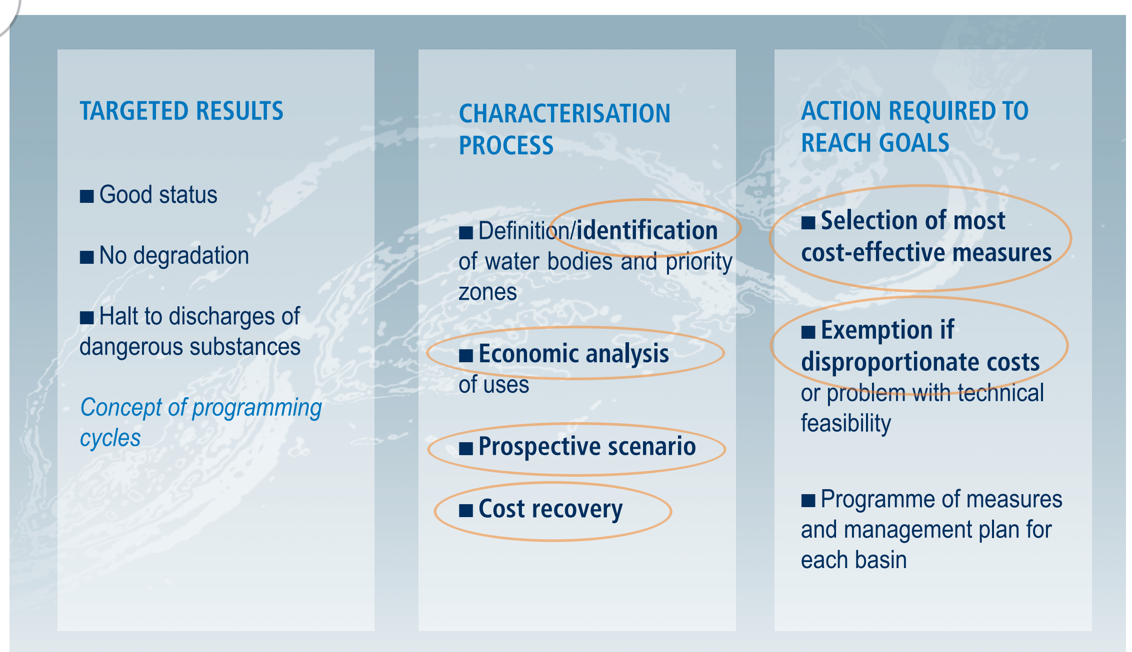
**** Activity-systems analysis measures the positive impact on the economy (improved productivity, quality) of the availability of goods produced by ecosystems (wood, fresh water, etc.).*

When should the environmental impacts of a project or measure be assessed?

Assessment of environmental impacts in the WFD programming cycle

In the process of implementing the WFD, economic analyses are carried out at a number of key steps during the preparatory cycle for the management plans of each river basin, as is shown in Figure 30.

Figure 30 *Economic analysis during the key phases of WFD implementation.*



Source: Maria Salvetti.

For the WFD characterisation process, the economics of water uses and cost recovery of water services must be analysed.

Economic analysis is also required during the process of identifying the heavily modified and artificial water bodies.

Finally, during formulation of the programmes of measures, cost-effectiveness and cost-benefit analyses should be carried out.

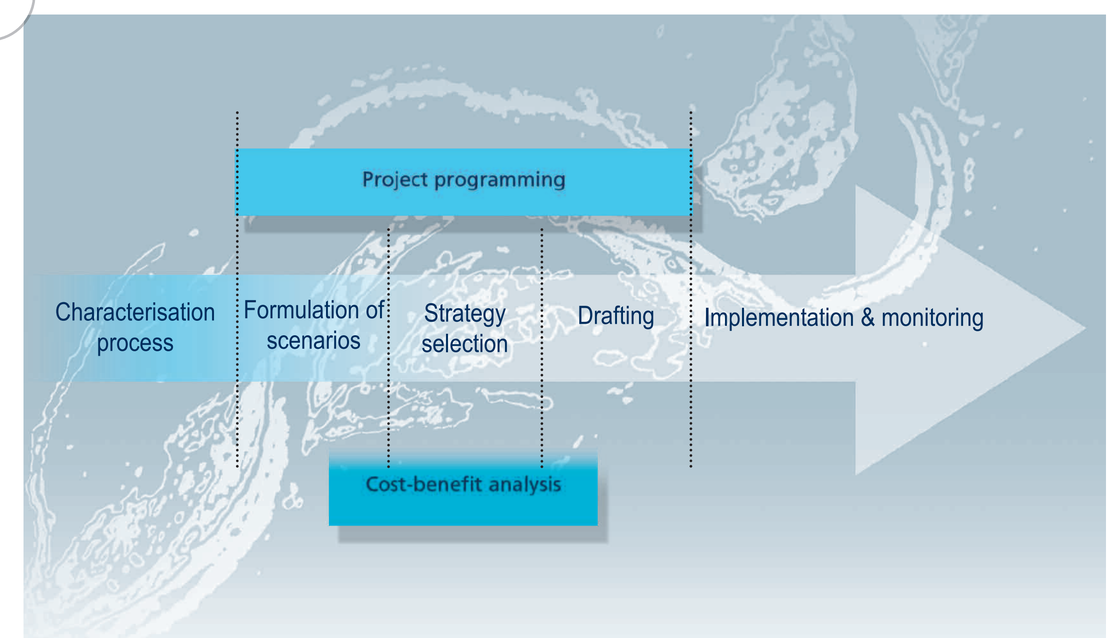
The assessment of environmental benefits and damage is carried out primarily during the phase in which the programmes of measures are drafted. This is because it is during this phase that the disproportionate-cost analyses are done (see the chapter titled “Disproportionate costs - a special type of assessment”) in view of justifying exemptions from WFD requirements. The disproportionate-cost analyses include cost-benefit analyses during which the benefits and damages incurred by the various measures are studied and quantified.

It should be noted, however, that the environmental benefit and damage assessments can also be carried out during the identification of the heavily modified and artificial water bodies.

Assessment of environmental impacts during SBMP preparation

For an SBMP, assessment of environmental impacts occurs essentially during the strategy-selection phase (see Figure 31). Collection and processing of the data required for this phase are however closely linked to the characterisation phase.

Figure 31 *Assessment of environmental impacts during SBMP preparation.*



Source: the Water agencies.

Tableau 16 *Experience feedback on environmental benefits and damage assessment during SBMP preparation (Source: the Water agencies).*

Issue	Difficulties to be avoided (negative feedback)	Needs expressed	Advantages expressed
Integration of analysis in SBMP procedure	Poor integration of analysis in overall SBMP planning. Economic analyses carried out separately, in parallel.	Need to simplify procedures (accelerate SBMP preparation). Run the analysis when project participants are ready (i.e. the political decisions concerning the project have been made).	
Data acquisition and processing	Benefits unknown or difficult to quantify (margin of error, no reference points). Difficulty in determining the effectiveness of measures and consequently in calculating the avoided costs. Links between water and the area as a whole may be too technical.	Improve access to data. Improve knowledge on effectiveness of measures. Improve links between perception of the territory and the issues.	
Analysis scale	Open-ended possible advantages (where does the analysis stop?). Less populated, less touristic SBMP area. Benefits depend on other measures that fall well outside the scope of the SBMP.	Focus analyses on issues and on each area. A "collectively ready" project, i.e. advantages identified for the area, beneficiaries identified, contributors identified, political guidelines set (plan for area).	Shed light on underlying economic issues. Highlight the economic value for the area.
Debates	Difficulty in perceiving the collective objective.	Need for a forward-looking debate with the local stakeholders. Support for political decisions. Enhance definition of projects in the economic analysis.	Provide an alternative to the existing debate. Clarify the advantages and the costs. Confirm or contradict the economic analyses presented by each stakeholder. Clarify the underlying economic issues, justify the option to be debated for the SBMP.
Objectives	Confusion between assessment and budget. Numerous misunderstandings and difficulty in grasping concepts.	Send a message to the local water commission.	Strengthen SBMP legitimacy.

Conclusion

As a conclusion, Table 17 recapitulates the resources required to implement the main methods used to assess environmental impacts, each with their specific advantages and disadvantages.

Tableau 17 *Methods to assess the environmental impacts of a project or measure (Source: the Water agencies).*

Method	Type of information used	Cost	Skills required	Advantages	Disadvantages
Avoided costs	Technical information	+	Economist Technical expert	Intuitive method, easy to understand.	Provides no information on non-use values.
Contingent valuation	Sample group of people must be interviewed (if postal or telephone survey)	+++	Ecologist Sociologist Statistician Economist	Provides information on non-use values. Can be used to assess all types of goods and services.	Based on answers and hypothetical situations. Higher cost than other methods.
Hedonic pricing	Data on real-estate sales	++	Economist Person with knowledge on real-estate sales Statistician	Suited to assessing changes in environmental quality. Based on choices and real situations.	Provides no information on non-use values. Difficulty in finding suitable real-estate data. Caution concerning effects of inflation.
Travel costs	Sample group of people must be interviewed (if postal or telephone survey) Data on frequency of visits to studied site, on travel costs (bus tickets, etc.)	+++	Statistician Economist	Suited to assessing the recreational value of a site. Based on choices and real situations.	Provides no information on non-use values. The existence of substitute sites and multiple-purpose visits complicates the assessment.