Economic Valuation of Wetlands: an Important Component of Wetland Management Strategies at the River Basin Scale

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Economic valuation can be defined as the attempt to assign quantitative and monetary values to goods and services provided by environmental resources or systems, whether or not market prices are available to assist us. When market prices are not available (e.g., for flood control services, for disaster mitigation services, for erosion avoidance…), the value is established by *the willingness to pay* for the good or service, whether or not we actually make any payment. A major problem in assessing the value of ecosystems arises when the services provided, such as climate change regulation or biodiversity conservation, benefit the global community. However, this short introduction will not deal with valuation of ecosystems global services.

Why estimate ecosystem value?

Environmentalists sometimes question the need to always put a price tag on nature and assert that nature has an intrinsic value, that it is our long-term life support system and that this is reason enough to protect it. They are of course totally right but the reality of life on this planet unfortunately shows that many people do not share this view. Especially (but not only) those who suffer from hunger and understandably try to get the most out of wetlands in the short term. If they are hungry today, they will not care about what happens tomorrow - even less in 20 years from now! But people in developing countries do not have the privilege of this short-term approach. People in developed countries often also have restricted vision and prefer to maximize their immediate benefits rather than to secure them for the long term.

This being a realistic view of life on Earth, we have to work with it. We therefore think that when one cannot reasonably expect to change a situation in the short term, it is better to try to make the best of it and exert influence to mitigate its negative effects on the environment.

There are at least two good reasons for evaluating wetland services and goods:

1. In difficult financial times, it is not easy for government decision makers to spend taxpayers' money on environmental activities, especially if there is no broad support from the public. Wetland valuation is a way to estimate ecosystem benefits to people and allows financial experts to carry out a Cost-Benefit activity which might be in favour of environmental investment. Cost-Benefit analysis compares the benefits and costs to society of policies, programmes, or actions to protect or restore an ecosystem. It is therefore an important tool for environmental managers and decision makers to justify public spending on conservation activities and wetland management[1].

[1] Barbier, Acrerman and Knowler, in Economic Valuation of Wetlands: A Guide for Policy makers and planners, Ramsar Convention Bureau publication, 1997.

2. The other good reason is that people are not always aware of the values of wetlands. Many think that they are no more than mosquito breeding areas! By giving objective evidence to skeptical managers and the public of the monetary and non-monetary benefits of wetlands, environmentalists will gain their support. Most people only care about what they love or what brings economic benefit to them. By helping people to improve their living conditions by using and selling wetland goods and services, we will gain strong supporters for our cause!

Economic valuation is but one of many ways to define and measure values. Other types of value (religious, social, cultural, global, intrinsic…) are also important but the economic value is the most important in most countries when decision makers have to make difficult choices about allocation of scarce government resources.

Economic valuation is not an easy and non-conflictive exercise. It often depends on human preferences. In other words, it depends on what people perceive as the (positive or negative) impact wetlands have on their wellbeing. In theory, the economic value of any good or service is measured in terms of what we are willing to pay for the commodity less what it costs to supply it. But often, because they are perceived as common good (market failure), we do not have to pay for wetland products and services. In this case, the value is provided by the estimation of the *willingness to pay*, whether or not we actually make any payment.

The relationship between ecology and economics

In all regions of the world, human populations are suffering social, economic and environmental hardship resulting from the destruction and mismanagement of their natural resources, notably including their wetlands and water resources. This destruction, which is continuing at alarming rates in many countries, is contributing to escalating poverty and water supply and food security problems, as well as robbing the planet of the biological diversity with which wetlands are endowed. Its causes are multiple – from local actions and national policies to global issues.

Although wetlands are amongst the richest life-supporting ecosystems on Earth, they are amongst the most threatened and destroyed. Why do human beings destroy what are essential elements of their ecosystems? The answer is relatively simple: because they do not value wetland goods and services in economic and monetary terms. Sacred wetlands are an exception and are often well conserved because their religious value is recognized by local people.

The reason why people do not value wetland goods and services is more complex and is probably linked to the fact that most of us are not aware of wetland characteristics (biological, chemical and physical) which enable the development and maintenance of their structure, which in turn is key to the provision of wetland goods and services. Ecosystem functions are the result of interactions amongst characteristics, structure and processes[2]. Because of the complexities of the natural interactions, ecological assessment of these ecosystem functions is best served by a river basin approach. These functions, values and attributes can only be maintained if the ecological processes of wetlands are allowed to continue functioning. But the river basin approach is beyond the extent of direct personal interest of many wetland

[2] R.K. Turner et al. In Ecological Economics 35 (2000) pp 7-23

beneficiaries. An ecological characterization is therefore an indispensable step before carrying out an economic valuation.

In economic valuation exercises, the scale of work is very important in that the attempt to value ecosystems separately, despite the fact that they are highly interdependent, may result in paradoxical results of unwise substitutions of "lesser valued wetland ecosystems" with "higher valued artificial (human made) wetlands". Although the Ramsar Convention recognizes the value of artificial wetlands, the fragmentation of the whole wetland system (river basin) into a series of smaller wetland units may lead to an economic over or under valuation of one separate unit against the whole system.

This is the main reason why the Convention on Wetlands is promoting the river basin scale as the framework for wetland management and is therefore also suggesting using it for wetland economic valuation exercises[3]. Some questions remain about the problem of the exact size of the management unit and many wonder how much of a river watershed should be considered wetland?[4] In this case, a pragmatic approach would perfectly well complement the theoretical river basin approach!

In April 2003, during the first Steering Committee meeting of two French MBA research studies aimed at promoting the sustainable trade of wetland products, led by the *Tour du Valat* and the *Pôles Relais Lagunes Méditerranéennes*[5], lowland producers from the lagoons and coastal wetlands had difficulty accepting that up-river products with no apparent relationship to wetlands (apples, grapes, …) would be included in the research and should benefit from the research and commercial promotion and marketing work.

This rather common attitude introduces another element of complication: because the value of a product is often determined by its rarity, the producers want to give a specific image of uniqueness and rareness to their ecosystem and therefore tend to limit the scale of work to a very limited area. In other words, they try to convince people of the high value of their products by selling the idea that they come from a very small, rare, unique and pure ecosystem. All of which are elements which contribute to high prices … Marketing theories therefore plead for a division of the basin into several small units. On the other hand, although the production systems on the upper river bank and on the slopes of the watershed very strongly influence the quality of the lowland ecosystems, the upper-land producers are often not perceived as part of the wetland ecosystem and therefore do not benefit from any economic and financial incentives for limiting agriculture inputs or water consumption which, in turn, would benefit the lowland wetland.

The risk is therefore that, without incentives to do so, the upper river producers will not use their lands as wisely as expected (limiting inputs, avoiding erosion…) and will therefore contribute to the deterioration of the lowland ecosystem (quality image) and failure of the marketing strategy!

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[3] Integrating Wetland Management and Wise Use into River Basin Management. Ramsar Handbook N°4, Publication of the Ramsar Convention Bureau.

[4] Tore Söderqvist and others. In Valuation of wetlands in a landscape and institutional perspective. Ecological Economics 35 (2000) pp1-6

[5] The two researches are entitled: (1) "Valuing Langedoc-Rousillon's lagoons products" and (2) "Valuing French wetland's products".

What are wetland values?

Wetlands, as defined by the Ramsar Convention, cover a wide variety of habitat types, including rivers and lakes, coastal lagoons, mangroves, peatlands, and even coral reefs. In addition, there are human-made wetlands such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms, and canals.

Wetlands are among the world's most productive environments. They are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals depend for survival. They support high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species. Of the 20,000 species of fish in the world, more than 40% live in fresh water. Wetlands are also important storehouses of plant genetic material. Rice, for example, which is a common wetland plant, is the staple diet of more than half of humanity.

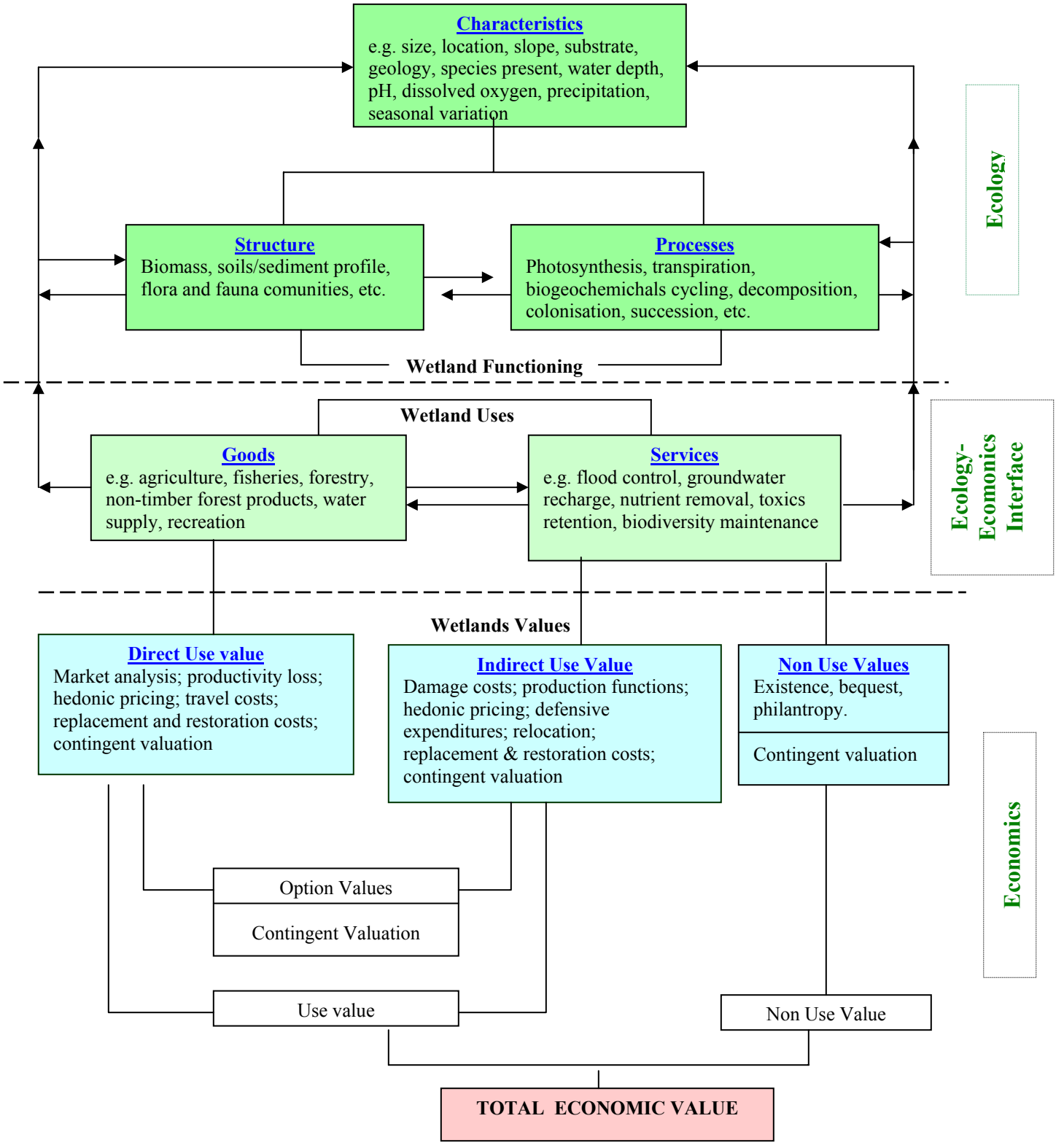
The interactions of physical, biological and chemical components of a wetland, such as soils, water, plants and animals, enable the wetland to perform many vital functions, for example: water storage; storm protection and flood mitigation; shoreline stabilization and erosion control; groundwater recharge (the movement of water from the wetland down into the underground aquifer); groundwater discharge (the movement of water upward to become surface water in a wetland); water purification through retention of nutrients, sediments, and pollutants; and stabilization of local climate conditions, particularly rainfall and temperature.

Wetlands provide tremendous economic benefits, for example: water supply (quantity and quality); fisheries (over two thirds of the world's fish harvest is linked to the health of coastal and inland wetland areas); agriculture, through the maintenance of water tables and nutrient retention in floodplains; timber production; energy resources, such as peat and plant matter; wildlife resources; transport; and recreation and tourism opportunities.

Translating these many values into economic terms is of primary importance if we are to convince of the importance of these ecosystems as life-supporting systems. This is a relatively new science but promising progress is being made.

Figure 1 below taken from R.K. Turner et al., *Ecological Economics 35 – 2000*, p.12, very well summarizes the complex relationship between the different levels of intervention.

Fig. 1 CONNECTIONS AMONG WETLAND FUNCTIONS, USES AND VALUES



The total economic value (TEV) of wetlands is defined as the total amount of resources that individuals would be willing to forego for increased amount of wetland services. The TEV is divided into different kinds of components:

A. The Use Values

1. The Direct Use Values (DUV) are the benefits derived from fish, agriculture, fuel wood, recreation, transport, wildlife harvesting, peat/energy, vegetable oils, dyes, fruits, …
2. The Indirect Use Value (IUV) are the indirect benefits derived from the wetlands functions like nutrient retention, flood control, storm protection, groundwater recharge, external ecosystem support, micro-climatic stabilization, shoreline stabilization, etc.
3. The Option Value (OV) in which an individual derives benefits from ensuring that a resource will be available for future use.

B. The Non-Use values

1. The Non-Use Value (NUV) is derived from the knowledge that a resource (biodiversity, cultural heritage, religious site, and bequest) is maintained. This value is strongly advocated by environmentalists who support the concept of the pure intrinsic value of nature.

How to quantify wetland values?

The next question is how to adequately put a monetary value on wetland products or services. The idea behind the evaluation of wetland products and services is to show that, in some cases, maintaining the natural functions of the ecosystem as untouched as possible can be economically valuable and generate profit. Of course, to adequately do so, one has to compare the price of the wetland product originating from a well preserved wetland with the price of producing similar goods or services in an environmentally less friendly way: building dykes or irrigation schemes, promoting input-intensive agriculture, transforming lands into grazing fields… The key to this exercise is to internalize cost externalities[6]. Most of the products and services produced on Earth are subsidized, frequently without the consumer's knowledge. The fact that the fruit producer using chemical fertilizers does not have to pay the cost of water treatment needed to take out the excess of nitrates caused by his use of fertilizers to provide clean drinking water does not reflect the real price of the product. The fact that the farmer who intensively irrigates his field does not have to pay for the damage (erosion, pollution) caused by the running of the water he is using on watershed slopes and finally increasing river water turbidity does not reflect the real price of the cubic meter of water he is using. In these cases, both chemical fertilizers and water are being heavily subsidized. This kind of subsidy leads to little consideration being given to environmental protection. And of course, someone has to pay for the damage caused. Who pays? The whole community, as taxpayers, pays for unwise use of common goods by private individuals.

[6] Internalising simply means including. Cost externalities are all those "external" elements which contribute to the real cost of any item but which, for political reasons or for market failure reasons, are not reflected in the real price and which are therefore paid for by the community. For example, one externality of the cost of fertilisers is the cost of water treatment.

Because decision makers and politicians want to see convincing figures before they make decisions that might affect their popularity, a series of methods have been developed to try to quantify the monetary values of wetland services and goods.

The easiest way to do this would be to apply the market price method (the law of supply and demand) but this is unfortunately not always possible because for some wetland products there is simply no market or because some wetland values are intrinsically non-marketable. These market failures occur when markets do not reflect the full social cost or benefit of a good. Market failures related to ecosystems include the fact that many wetlands (1) provide services that are public goods, (2) many wetlands services are affected by externalities and (3) property rights related to ecosystems and their services are often not clearly defined.

Another limitation of the market price method is that it does not always and automatically reflect the real value of a good. There are many cases where the actual willingness to pay is much higher than what the customer actually pays.

However, several (non perfect) methods have been devised to help quantify or give an order of magnitude for specific wetland values.

The Table below gives an idea of the most common quantitative evaluation methods used, their constraints and limitations.

Method	**Applicable to…**	**Description and Importance**	**Constraints and limitations**
Market Price Method	Direct Use values, especially wetland products.	The value is estimated from the price in commercial markets (law of supply and demand)	Market imperfections (subsidies, lack of transparency) and policy distort the market price.
Damage Cost Avoided, Replacement Cost or Substitute Cost Method	Indirect Use Values: coastal protection, avoided erosion, pollution control, water retention…	The value of organic pollutant or any other pollutant's removal can be estimated from the cost of building and running a water treatment plant (substitute cost). The value of flood control can be estimated from the damage if flooding would occur (damage cost avoided).	It is assumed that the cost of avoided damage or substitutes match the original benefit. But many external circumstances may change the value of the original expected benefit and the method may therefore lead to under- or over-estimates. Insurance companies are very interested in this method.
Travel Cost Method	Recreation and Tourism	The recreational value of a site is estimated from the amount of money that people spend on reaching the site.	This method only gives an estimate. Over-estimates are easily made as the site may not be the only reason for traveling to that area. This method also requires a lot of quantitative data.
Hedonic Pricing Method	Some aspects of Indirect Use, Future Use and Non-Use Values	This method is used when wetland values influence the price of marketed goods. Clean air, large surface of water or aesthetic views will increase the price of houses or land.	This method only captures people's *willingness to* pay for perceived benefits. If people are not aware of the link between the environment attribute and the benefits to themselves, the value will not be reflected in the price. This method is very data intensive.

Method	Applicable to…	Description and Importance	Constraints and limitations
Contingent Valuation Method	Tourism and Non-Use values	This method asks people directly how much they would be willing to pay for specific environmental services. It is often the only way to estimate the Non-Use values. It is also referred to as a "stated preference method".	There are various sources of possible bias in the interview techniques. There is also controversy over whether people would actually pay the amounts stated in the interviews. It is the most controversial of the non-market valuation methods but is one of the only ways to assign monetary values to non-use values of ecosystems that do not involve market purchases.
Contingent Choice Method	For all wetland goods and services	Estimate values based on asking people to make tradeoffs among sets of ecosystem or environmental services	Does not directly ask for willingness to pay as this is inferred from tradeoffs that include cost attribute. This is a very good method to help decision makers to rank policy options.
Benefit Transfer Method	For ecosystem services in general and recreational uses in particular	Estimates economic values by transferring existing benefit estimates from studies already completed for another location or context.	Often used when it is too expensive to conduct a new full economic valuation for a specific site. Can only be as accurate as the initial study. Extrapolation can only be done for sites with the same gross characteristics.
Productivity Method	For specific wetland goods and services: water, soils, humidity in the air…	Estimates the economic values for wetland products or services that contribute to the production of commercially marketed goods	The methodology is straightforward and data requirements are limited but the method only works for some goods or services.

Adapted from Barbier, E.B., M. Acreman and D. Knowler (1996) Economic Valuation of Wetlands: A guide for Policy Makers and Planners. Ramsar Convention on Wetlands; King D. and Mazzota (1999) Ecosystem valuation website (www.ecosystemvaluation.org); Struip,M.A.M., Baker, C.J. and Oosterberg,W. 2002. The Socio-economics of Wetlands, Wetlands International and Riza, The Netherlands.

Using these methods might seem complicated or very exhaustive for most economic neophytes. But behind the apparent complication there is ample room for the application of common sense.

Economic and financial valuation is not a *panacea.* There are cases where:

(1) It should not be carried out. If the ecosystem we are dealing with is, for example, a Ramsar site with a very rare and highly threatened endemic species and with little potential economic benefit to local people, it is evident that the environmental valuation shall take precedence over any economic valuation. The cost of the loss of endemic species is much higher than the benefit derived from the collection of, say, a few bird eggs for a short period of time before the bird eventually becomes extinct. The same logic can be applied to religious values. In some countries, they are above all economic values.

(2) It should not be done in an exhaustive way. In most countries it will be difficult to find qualified economists to carry out an in-depth economic valuation exercise but some of the methods proposed above can be used by non-economists. Sometimes, the economic benefits are so important to so many people that a rapid economic assessment would be enough to allow decision makers to take decisions. Protecting a rich costal ecosystem in which a large

number of fisherman make a living against the destruction of mangroves for the construction of a road might not require an extensive evaluation.

A partial or rapid economic valuation might be enough to show trends or give an overview of the situation and be a valuable input to the decision-making process. Of course if decision makers do not care about their people, there is nothing an evaluation or the absence of an evaluation can do!

Cost-Benefit Analysis: a tool for decision makers

The section above explained how to answer the question: What does this product cost or what are the monetary benefits of a particular wetland service or good?
Once we have the answer to this basic question, we have to compare the value of a product or service coming from a well preserved and managed wetland with the value of a product coming from a poorly or unwisely managed wetland. This exercise must be done between comparable products or services and of course only makes sense if all externalities are internalized in all costs.

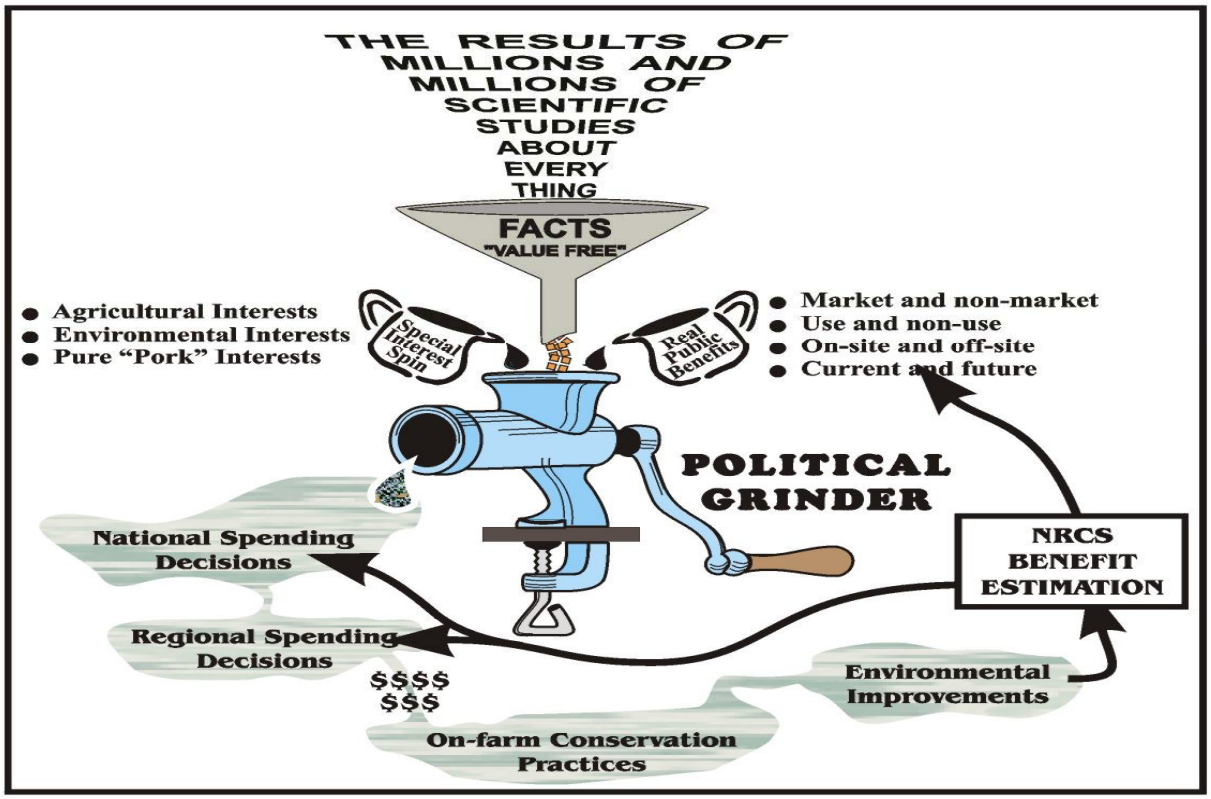
Decision makers cannot take decisions based on intuition alone. They need facts and values but they are also confronted with three very different kinds of input to feed the decision-making process:

1. Environmentalists, NGOs and other interest groups (farmers, tourism industries…) often voice their views strongly and try to influence decision makers. They are supposed to represent the diversity of public views and opinions but they do not always do so in a coherent way! As the basic constituency of decision makers, they are more or less influential.

2. Scientists provide decision makers with supposedly neutral scientific information and facts about the hydrological cycle, the ecosystem functioning etc. Their views are key for decision makers to understand the context in which they work and help them avoid making seriously damaging or irreparable decisions regarding ecosystems management.

3. Environmental economists combine the feelings of environmentalists about the intrinsic value of nature (sentimental approach), the understanding of ecosystem functioning as explained by scientists (scientific approach) and the pragmatism that decision makers need to do their job (real life approach). They provide objective benefit estimations and values.

All these inputs enter into the political grinder as shown on the drawing below, taken from King D., and Mazzota M. (www.ecosystemvaluation.org) which is a very explicit illustration of the forces at stake and the challenges for decision makers.



Conclusions

Valuing wetlands is not limited to valuing the economic and monetary benefits wetland ecosystems can bring to humans. It is about attributing a value to all kinds of benefit to humans and/or to nature, including religious values, social values, environmental values (biodiversity, climate change, intrinsic value …), aesthetic values, economic values and any other...
All values are good. The challenge is to set priorities according to local realities and for the benefit of both humans and nature. It requires an *ad hoc* approach.

In developing countries, where life is not always easy for most people, the economic value tends to overstate the others. This has to be taken carefully into consideration to make sure there is a strong poverty alleviation component in any wetland management plan. In developed countries, economic valuation may be less relevant, especially if the economic benefits are marginal as compared to aesthetic or recreational values.

Economic valuation methods are not perfect yet and some are even controversial but they are certainly good enough to be used to give valuable information that people often do not perceive. The production of goods and services is closely linked to the functioning of the ecosystems (hydrology, soil, water quality…) and the economic valuation has to take this reality into consideration at every stage.