ONEMA Meeting

Recap

# Economic instruments
## to support water policy in Europe: paving the way for research and future development

Workshop Synthesis
Paris, 9 & 10 December 2009

Pierre Strosser, Verena Mattheiß, Pierre Defrance et Sarah Hernandez

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*The workshop "economic instruments to support water policy in Europe : paving the way for research and future development" organized by the National Agency for Water and Aquatic Environments (Onema) took place in December 9-10, 2009.*

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# Foreword

To address the challenges faced by decision makers, experts and researchers with regard to the design and implementation of economic instruments, and widen the policy debate on economic instruments for water management in Europe, ONEMA and its Department of Scientific and Technical Activities have organised an European workshop entitled **Economic instruments to support water policy in Europe: Paving the way for research and future development.** Positioned at the interface between science and policy, the workshop that took place in Paris, on December 9 & 10, 2009, provided an opportunity for economists, practitioners, policy makers and researchers to dialogue about the design and implementation of (new) economic instruments in the field of water, as a means to identify:

- The **main policy demands** in terms of economic knowledge and expertise
- **Key "success factors"** for the effective implementation of economic instruments
- Pre-conditions for economic instruments to deliver **behavioural changes** and **efficiency** gains, and support **financing** actions for achieving sustainable water management and the ecological objectives of the WFD

The workshop brought together around 120 participants from 11 European countries, the United States and Australia. Combining plenary and working group sessions, the workshop helped to identify policy-related issues that would require **further research** in the field of **economics** and at the **interface between economics and other disciplines** such as ecology, sociology or political sciences.

# Sommaire

# 1 Economic instruments and water management in Europe

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Economic instruments cover a **wide range of policy measures**,which can generally be differentiated as **market-based and non-market based instruments** (Strosser and Speck 2004). The rationale underlying their application in the environment field implies multiple advantages:

- Economic instruments are intended to stimulate voluntary changes in behaviour and decisions in individuals in order to promote the protection of the environment
- Economic instruments are the most cost-effective way for stakeholdersto reduce their level of pollution and use water resources in a sustainable manner
- Economic instruments can mobilise new financial resources for supporting environmentally-friendly environmental practices (**Mattheiss** *et al.* 2009, see also Kraemer *et al.* 2003).

The design of economic instruments cannot be reduced to a quest to achieve economic efficiency. Complex relationships exist between stakeholders and water resources/aquatic ecosystems which need the involvement of other natural and social sciences in order for these instruments to be efficient in achieving the environmental objective. Social science gives an insight into perceptions, cultural and political deadlock and distributional effects in terms of social equity and justice. The legal system and the law provide the guarantees and transparency required for any stakeholders to engage in actions using economic instruments. In particular, tradable permits and rights need an accurate analysis from a legal and institutional perspective in order to clarify the rules of exchange and environmental performances and responsibilities, including sanctions in the event of non-compliance with the environmental objective. Natural science plays an important role in the design process in the sense that it provides indications about the monitoring of the ecological process underpinning these instruments and the assessment of the performance of these instruments in ecological terms.

## 1.1 – Economic instruments: what are they?

The main characteristic of market-based instruments is their reliance on market price mechanisms in order to provide financial incentives to economic stakeholders and to internalise environmental costs and benefits (EEA 2005). Market-based instruments are often chosen in contrast to regulatory or "command-and-control" instruments, as they provide more flexibility in the achievement of the given targets (Kraemer *et al.* 2003, Bernstein 1997). However, a combination of both types of instruments is often advocated as being most effective.

### *The most commonly applied market-based instruments in the field of water*

– **Instruments that use existing markets** and modify the market price of goods and services, so that existing environmental impacts are taken into account in consumers' decisions. These include for example, the application of, or changes in, tariffs for existing services (*e.g.* water pricing); the application of environmental taxes and charges for the degradation/pollution and/or extraction of natural resources (*e.g.* sewerage charges and groundwater taxes); and the application of positive financial incentives (subsidies) for good environmental practice.

– **Instruments creating new markets for environmental goods and services** - a relatively new approach in the European policy context (see box below). This implies creating new institutional and regulatory frameworks or addressing property rights issues for these goods and services, *e.g.* markets for water abstraction permits/rights, pollution or for any goods and services provided by aquatic ecosystems. These markets can function by directly confronting the supply and demand for such goods, or they may involve intermediary structures that facilitate financial transfers between market players.

### *Creating new markets for the environment: innovative experiments from outside Europe*

The Member States' reliance on economic instruments varies widely within the **European Union**. While water tariffs and environmental charges or taxes are applied in the majority of Member States (Kraemer *et al.* 2003), examples of tradable permit markets are rare in Europe.

In the United States, however, water markets and water banking have been developed over the last twenty years as a means of addressing water allocation problems (Macfarlane 2008).

In **Chile**, auctions in water use rights are recognized by the Chilean legislation as an economic and financial instrument for water management. As early as 1981, the existing water right allocation system was replaced by a bidding system among applicants for the same water in situations with insufficient water resources to satisfy all applicants (Andueza 2008).

Other examples of water markets outside Europe can be found in **Australia** and **Mexico** (Landry 2000). Implemented under the right conditions, tradable permit schemes can be environmentally effective, while providing decentralized flexibility, economic efficiency and better control over distributive effects – depending on how the tradable permit scheme is designed (OECD 2001).

## *Economic instruments based on voluntary agreements*

– **These economic instruments based on voluntary agreements, and sometimes using market based instruments** are increasingly applied to the environment field and include:

– Unilateral commitments by individuals/private companies that establish environmental improvement standards and programmes

– Voluntary agreements between two economic operators which agree on rules and practices that are beneficial for both partners and often involve financial compensation for the loss of income which might occur to one partner when implementing the agreed practices

– Public voluntary schemes in which public institutions establish a set of minimum standards of performance to which individual firms can decide to adhere (*e.g.* eco-labelling)

– Voluntary or negotiated agreements where the government interacts with companies to agree on performance targets based on the commitments and/or obligations of both parties

### *Payments for environmental services: The case of Vittel as a voluntary contractual arrangement leading to a decentralized management for water quality.*

The nexus between water resources and rural environments offers great opportunities for private and/or public stakeholders (companies, farmers, local authorities) to engage in voluntary contractual arrangements while keeping on the benefits provided by a common management of ecological services. The outcomes of the setting up of these institutional arrangements produce positive effects in generating more efficient forms of social organisation, responding to the socioeconomic dynamics of the territory.

In France, the first initiative known as a potential "payments for environmental services" has been launched by the water company, Vittel and INRA, developed within the framework of a multidisciplinary research program called "Agriculture, Environnement, Vittel" in 1987. This case study gathered the water company and farmers that decided to commit themselves to keep up the water quality in Vittel's water catchment. Their association, based on voluntary transaction, provides positive externalities that maintain the provision of ecological services. On the one hand, farmers committed themselves to change their agricultural practices using pesticides. On the other hand, Vittel committed himself to pay the farmers a compensation for their efforts in making practices more environmental friendly.

Without any voluntary compensation scheme, Vittel would have seen its profits affected by the bad quality of its source of water and would have lost its label of "mineral natural source of water" which is basis of its economic activity.

Farmers would have been confronted by the same dilemma. They would have been facing financial difficulties due to the high opportunity costs that agricultural changes would have implied. The partnership between Vittel and the farmers has produced a win-win solution to keep up a good water quality (Source: Marc Benoit and Sarah Hernandez. "Système agraire et qualité des eaux: conditions d'extrapolation à la gestion de l'eau et des milieux aquatiques à partir du cas de Vittel". 89ème Astee congess, june 2010).


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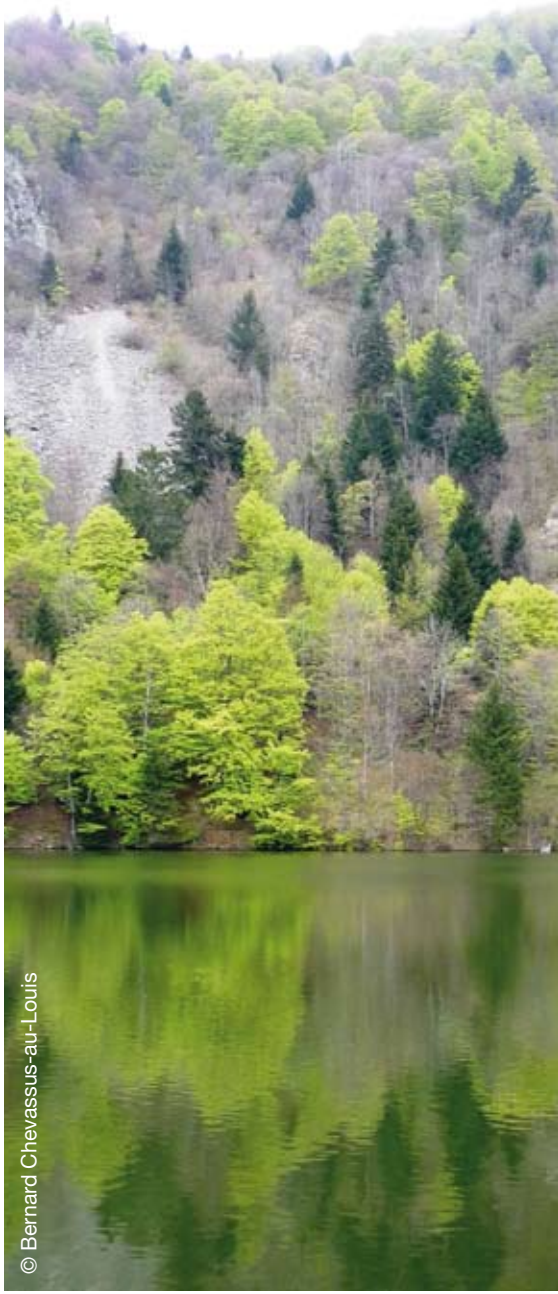
Table 1 presents a range of economic instruments which can be applied to water ecosystems and policy (Mattheiss *et al.* 2009).

**Table 1. Economic instruments for the water sector (adapted from Mattheiss *et al.* 2009)**

| Type of instrument | | | Function/main purpose | Examples |
|---|---|---|---|---|
| Market-based instruments using existing markets | Taxes and charges | Water tariffs | Collect financial resources for the operation of a given water service | Tariffs for drinking water and sewage, tariffs for irrigation water |
| | | Environmental tax | Internalise negative environmental impacts, influence behaviour, and collect financial resources for the central budget | Tax on pollution discharge or abstraction, tax on polluting input (*e.g.* tax on pesticide use) |
| | | Environmental charge | Internalise negative environmental impacts and influence behaviour, and collect financial resources that are allocated to support environmentally friendly practices and projects | Charge on pollution discharge or abstraction, charge on polluting input (*e.g.* charge on pesticide use) |
| | Subsidies | Subsidies on products | Increase the attractiveness of "green" products and production factors that have a limited negative environmental impact/footprint | Subsidies for biological agricultural products |
| | | Subsidies on practices | Promote the application of practices and production processes that limit negative impacts on water resources or produce positive environmental externalities | Subsidies for agri-environment measures in the field of agriculture |
| Market-based instruments creating new markets | Market for environmental goods | Tradable permit for pollution | Ensure an optimum allocation of pollution to the different sectors | Market for pollution permits among polluters of a given river basin |
| | | Tradable permit for abstraction | Ensure an optimum allocation of water quantity to the different sectors (including the natural environment) | Informal water markets in irrigation schemes. Temporary/permanent transfers of water from agriculture to urban areas |
| | | Compensation mechanisms | Establish mechanisms in which environmental degradation leads to financial payment that is allocated to alternative actions intended to compensate for the degradation | Compensation for ecological degradation in the aquatic ecosystem |
| Other market-based instruments | Voluntary agreement (Payments for environmental services) | | To establish contractual agreement between two parties to maintain or to supply an ecological service. This implies voluntary transactions between the beneficiary(ies) and the supplier(s) of the ecological service. | Agreements between water companies and farmers in order to promote good agricultural practices in drinking water protection zones Agreements between municipalities and farmers in order to change practices in river mobility areas |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## 1.2 – Economic instruments for water policy in Europe: what are the main issues?

Many water economists in Europe might have expected a clear interest in the application of economic instruments in water management and policy after the **adoption of the European Water Framework Directive** (WFD) in 2000. As indicated in Box 2, the WFD gives a **specific role to economics** in general and to **economic instruments** in particular (a specific article of the WFD is dedicated to water pricing). And Member States must comply with specific obligations in relation to water pricing when implementing the WFD.

### *Economic instruments and the Water Framework Directive*

The WFD is the first European environmental directive which explicitly refers to the implementation of economic instruments in order to achieve its objectives (Kraemer *et al.* 2003). Article 9 of the WFD states that Member States shall, by 2010, ensure that:

- Water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive.

- Water users (industry, households and agriculture) contribute sufficiently to recovering the costs of water services.

The WFD thus proposes water pricing as an adequate measure for achieving good water status. In addition, it refers to fiscal instruments and negotiated environmental agreements as potential supplementary measures that might prove to be effective. However, a recent review of draft River Basin Management Plans from selected EU countries shows that, so far, changes in water pricing policy and the establishment of new economic instruments for achieving the environmental objectives of the WFD have hardly been considered (Grandmougin *et al.* 2009).

A decade later, the **limited attention given to water pricing** in the context of the WFD implementation is striking. Water pricing has been the focus of many assessments (in particular dealing with cost-recovery issues). But few countries have considered adapting existing economic instruments or proposing new ones as part of their River Basin Management Planning (RBMP) process.

### *Encourage the use of economic instruments within the WFD*

Today, three good reasons might justify the **Member States' renewed interest in Economic instruments**:

Confronted with the significant costs of the Programmes of Measures (PoM) proposed for achieving the WFD environmental objectives, Member States need to identify new sources of financing. This applies in particular to economic sectors and environmental issues that were not at the forefront of previous policies (in particular ecology and river hydro-morphology).

A limited number of Member States are already turning their attention towards **innovative economic instruments in the search for more cost-effective solutions** for the achievement of sustainable water management. Tradable permits are, for example, receiving attention in Southern and Northern Europe for the quantitative and qualitative management of water resources, respectively.

The recent **attention given to ecosystem goods and services in the context of the Millennium Ecosystem Assessment** has created an impetus for identifying new economic instruments for protecting (or creating new) ecosystem services, including those provided by the aquatic environment.

## *Opportunities for the second planning cycle*

With the ending of the first WFD planning process and the recent attention given to ecosystem goods and services, it is the **right time to support the policy debate on economic instruments and financing strategies for water policy**. To inform this debate that


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encompasses a wide range of instruments and decision making scales, a dialogue between scientists and policy-makers is required in order to enhance progressively our knowledge base for critical issues such as: the incentive effect of (innovative) economic instruments; their role in influencing behaviour (of individuals, of economic operators); factors and (pre-) conditions that lead to effectiveness and efficiency, etc.

Although the potential usefulness of economic instruments for a wide range of environmental issues in the water sector is generally acknowledged, choosing the right mechanisms for a given situation or country means answering a series of questions:

– **Which economic instruments for which environmental pressures?** Several economic instruments could be considered in order to tackle a given pressure on water resources (*e.g.* diffuse pollution, morphological alteration, abstraction…). And assessments based on social, economic and environmental criteria need to be made in order to assess the most appropriate instrument(s) for individual environmental pressures.

– **What are the most cost-effective instruments for achieving a given (environmental, economic, financial, social) goal?** While different instruments might be able to achieve the same objective, questions arise concerning their cost-effectiveness, in fragile economic and financial contexts in particular.

– **What are the pre-conditions for economic instruments to be effective or deliver the expected efficiency gains?** The application of certain instruments has produced good results in

terms of providing the right incentives and reducing pressures on water resources. However, the same instruments might not work in other cases. There is therefore a need to examine the technical, hydrological and institutional conditions under which the instrument can operate.

– **Can non-European experiences (*e.g.* from the US, Australia or South-Africa) be transferred to the European context?** This question relates to existing institutions, but also to different economic, social and cultural backgrounds. Are the long-standing European practices and traditions compatible with the goals, principles and rules of new instruments? (*e.g.* will the European society accept a market based allocation of water, which is considered to be an essential good?)

– **Why is it important to address these questions now?** The obligations set out in the WFD drive EU Member States to act now, which has considerable financial implications. Economic instruments can fulfil several functions such as: changing behaviour and reducing pressures on the aquatic environment; complying with the "polluter pays" principle; creating additional funds to finance measures. While it might be too late for Member States to adapt recently adopted PoM and RBMPs, initiating the debate today leaves sufficient time to prepare for the integration of economic instruments in the second river basin management planning cycle.

## *Economic instruments are the most cost-effective option for water policy*

In Europe, different policy initiatives and questions challenge the need for new economic instruments, or for adaptations to existing economic instruments. In particular, the implementation of the **European Water Framework Directive** provides an excellent opportunity to (re)consider the use of economic instruments in water management. Indeed, the WFD gives clear impetus to new water pricing policies and economic instruments in line with the **requirements of its Article 9 in terms of cost-recovery and incentive pricing**. In addition, the role of water pricing has been raised in two parallel policy initiatives in Europe, dealing with **water scarcity and drought and climate change adaptation**. Overall, it is accepted that.

Establishing an accurate pricing system can help to support solutions designed in response to conflicting uses or water scarcity. It can generate **adequate incentives that allow for changes in behaviours, either in production or consumption**. The key element for establishing the right incentive is then to reconcile the interests of individuals (consumers and producers) with the general or collective interest.

The potential for achieving the environmental objectives of the WFD through changes in water prices (price level or price structure) **depends on the characteristics and conditions of given hydrological basins and economic sectors**. In some cases, the use of economic instruments is better suited to achieving the environmental objectives in a more cost-effective and flexible way. In other cases, regulation is needed and can perform better in the short-term. In some cases, an adequate combination of economic instruments and regulation is the favoured approach.



Clearly, the use of economic instruments can go **beyond water pricing, as** referred to in its Article 9 of the WFD. Indeed, more innovative instruments (payments for environmental services, tradable permits, financial tools, etc.) can be considered by Member States when developing their programme of measures, as they might offer **cost-effective solutions for achieving the environmental objectives of the WFD** (a key principle promoted by this Directive).

**Cost-effectiveness** is indeed a key policy driver that can justify the design and implementation of economic instruments, in particular under conditions of financial and economic uncertainty, as experienced today by many countries due to the economic and financial crisis.

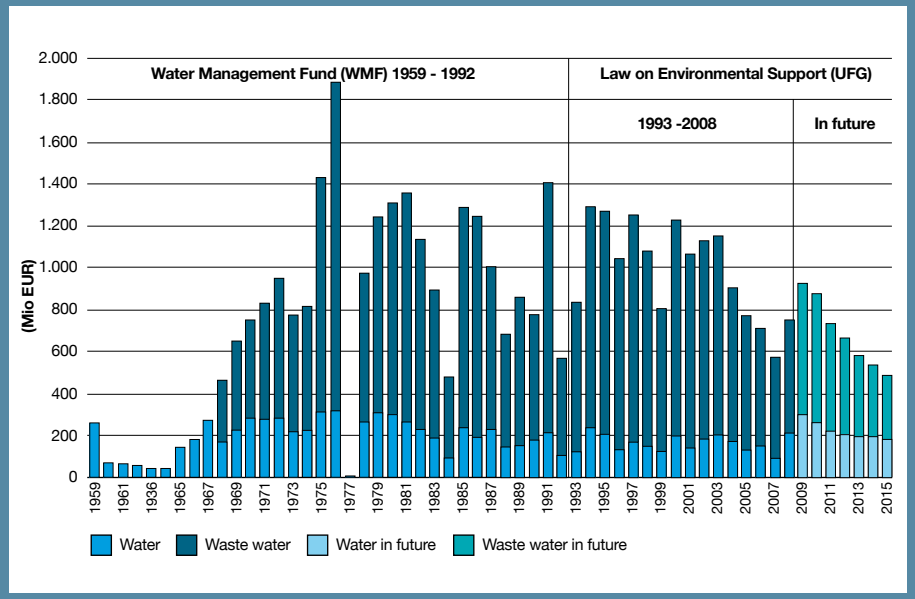
### *Case of establishing a trading system justified by cost-effectiveness*

Cost-effectiveness has been a key element justifying the international nutrient trading scheme currently being considered for the Baltic Sea, for example, as it would facilitate the transfer of financial resources between countries to the most productive (cost-effective) investments. This is achieved by combining regulatory constraints on activities which lead to nutrient loading with economic incentives for implementing abatement measures. This allows for a modelled estimation of the total reduction when permit requirements are implemented. While the cost of the reduction is not known ex ante it can be shown that the abatement measures adopted will always be at the lowest cost. The underlying principle is that the total load must decrease so that the commitment according to a particular reduction target can be fulfilled. The reduction in load results from the discharge caps for individual sources being lower than the existing discharges. The authority sets the discharge caps so that the overall objective for load reduction is achieved, i.e. the target is achieved if no source exceeds its discharge cap. In addition, the international agreement should impose closer monitoring and reporting practices that could, in the long term, help to achieve a more binding and complete international agreement than the current Baltic Sea Action Plan.

## *Using economic instruments is also a way of raising financial resources for the water policy*

The issue of **water management financing** has significantly changed over recent years in many (European and non-European) countries. While most of the attention has in the past focused on investments in water supply and sanitation infrastructure, the financing field has been extended to include overall water resource management, ecological restoration and governance issues (monitoring, planning, administration, etc.). As a result, a broader set of revenue-generating instruments needs to be developed (Figure 1).

**Figure 1. Trends in investments in the water sector in Austria (source: S. Speck's presentation)**






Everyone agrees that that water management and **achieving good ecological status as specified by the WFD is costly**, with many countries facing the challenge of reducing pressures from agriculture and improving river morphology. As a result, **financing has become a clear priority** for many EU Member States. The financial burden imposed by the WFD implementation is expected to be higher for new European member states, as they have to implement several (older) EU directives at the same time. Because of specific obligations for implementing so-called basic measures, for example, the measures considered in RBMPs are not always the most cost-effective ones for achieving good ecological status, which may lead to the over-estimation of costs.

### *What are the costs of implementing the WFD? Some preliminary figures*

Total costs of more than 40 billion Euros have been cited during the workshop as the total WFD implementation costs. In Croatia, achieving set WFD environmental objectives by the year 2038 will cost 7.4 billion Euros.

With regard to the more traditional water supply and sanitation sector, reducing costs and/or increasing revenues may close the **financing gap**. Reducing costs includes measures such as improving operational efficiency and selecting cost-effective interventions. To **increase the revenues**, a clear financing (and regulatory) framework is needed, as this might help to attract private investors which can temporarily "bridge" the financing gap. As the water and sanitation sector is perceived as a

sector with high risks and low returns, different options for "blending" private and public funds, accessing bond markets and attracting private funds can help to bridge the financing gap temporarily. However, more attention needs to be paid to the long-term sustainability of financing, which entails the establishment of institutions at the national level for channelling funds (both public and private) into the sector in order to finance relatively small projects (rather than focusing on a few large transactions at the international level).

Although financing water management is often taken for granted, more attention should be paid to **justifying the benefits (direct and indirect) of financing water management**, in particular with regard to "soft" costs related to monitoring, public participation and governance.

### *Development of water management support scheme in Austria*

Blending consists of combining concessionary finance with repayable finance to support a project or a comprehensive lending programme. Its main purpose is to attract financing that would otherwise not come. Since 1958, Austria has created a water management fund (*'Wasserwirtschaftsfonds'* WWF) in order to support municipalities to finance their investment water and wastewater infrastructures. Firstly managed by the Ministry of Trade and then by a private bank (*Kommunalkredit Austria*), this fund provided soft loans with low interest rates (1-3%) and long pay-back period (50 years). From 1993, the fund has introduced the new rules allowing for the provision of grants instead of loans. The total of the subsidy was based on the investment costs for water and wastewater facilities and progressively, was given based on environmental objectives (ecological restoration). A new support scheme *'Gewässerökologie'*(ecological status of water bodies' – morphology and water flows) started in 2008.
(Source: S. Peck's presentation at the seminar)



Although the costs of these «soft» water management tasks are often mentioned as constraints for their implementation, the most important factor for their successful implementation remains political will.

In the context of the preparation of the RBMPs, economic instruments that have been considered include prices and taxes, licensing of reallocation instruments (environmental standards/ norms, trading/voluntary agreements) and subsidies. However, most Member States' efforts have been limited to studies and assessments. Despite the progress made in using economics in support of the development of river basin management plans, **only a few Member States have considered adapting economic instruments or implementing new instruments for the implementation of the WFD**. Examples include: the new permit-fee system for pollution control proposed and currently tested in Sweden; environmental charges implemented by the Water Agency of Catalonia in response to the requirements of the WFD; new financing instruments to support hydromorphological improvements proposed in Austria in response to the new challenges of the WFD. The main reasons behind this limited consideration of economic instruments by Member States remain, however, unclear. ■

2 In search of innovation and efficiency in water management:

# the use of economic and market-based instruments

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The heterogeneity of the economic instruments and market-based instruments to be used for water policy raises a lot of questions concerning their design, level of implementation and their economic and environmental performance. In any case, these instruments are constrained by the legal, institutional and social context.

The wide range of economic instruments that can play a role in the water sector require an analysis of their effectiveness and efficiency in economic terms but also in terms of their impact and relevance in addressing issues of equity, social justice, social and policy acceptability. We shall address these issues for the traditional economic instruments (tariffs for water services, environmental taxes and charges), and then for the more innovative market-based instruments (payments for Ecosystem Services, tradable pollution permits and water markets).

## 2.1 – Water pricing: to what extent can it provide incentives and change behaviour?

Worldwide, the water sector currently faces two key challenges:

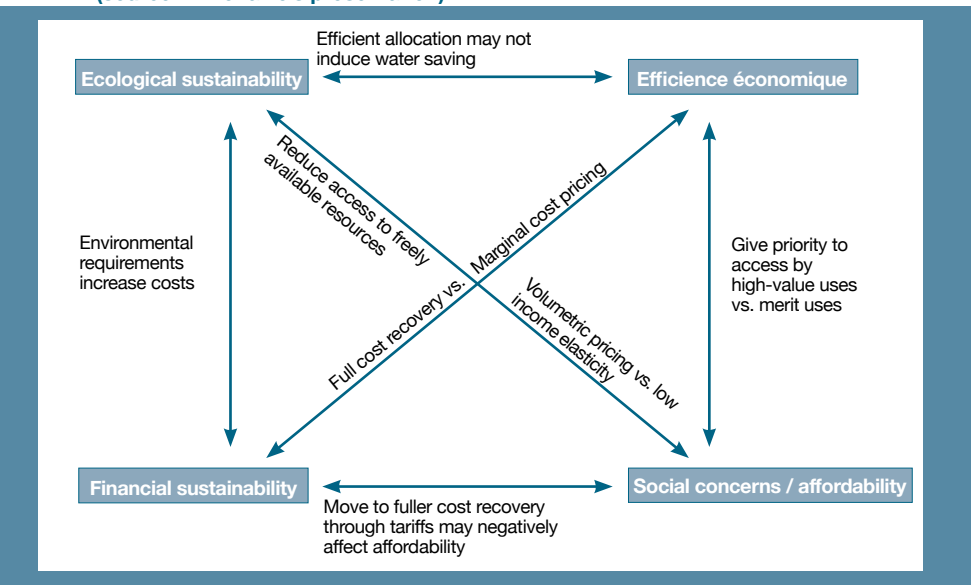
– a) the **increasing competition** between productive uses of water resources for human consumption and the support of ecosystems;

– b) the need to ensure **access to satisfactory, sustainable and affordable water and sanitation services for all**, including poor households.

An adequate **pricing system can help to address both challenges**. However, its design remains a difficult exercise as the different water policy objectives to which water pricing must contribute are potentially conflicting (*e.g.* efficiency, equity and cost recovery) and will not all be equally achieved (Figure 2).

Adapting water pricing requires paying attention to the **tariff level**, the **tariff structure** and the **tariff setting process**. Whereas the tariff level determines how much has to be paid, the tariff structure indicates who has to pay and how payment reflects water use. The tariff setting process should ideally be based on a policy dialogue in which stakeholders develop a shared understanding of water and financing issues and reach a consensus on the objectives of water pricing. **Affordability issues also need to be addressed**, *e.g.* by proposing social tariffs or by putting parallel support mechanisms in place.

**Figure 2. The trade-offs affecting water tariff level and structure (source: X. Leflaive's presentation)**




In theory, the demand for any final or intermediate goods will react to price increases by reducing consumption according to the principle of the price elasticity of the demand. However, this incentive will only work if water prices are established on a volumetric basis. Experiences from Spain suggest that:

– **Significant differences in the elasticity for the agriculture sector** may be observed depending on the relative scarcity of water. In water-abundant areas, price elasticity is found to be high with small increases in water tariffs inducing significant changes in behaviour. In water-scarce areas, elasticity is minimal as water saving technologies have already been widely applied. Finally, no response to price increases can be found in high-value farming (*e.g.* greenhouses), as water accounts for only a small percentage of total production costs.

– Although changes in water tariffs in the residential sector might require a complex design if water savings are to be achieved, it appears to be an **effective instrument in the medium to long term for reducing residential water demand**. Conversely, regulation and restriction are more effective in reducing water demand in the short-term, although they impose high costs on water uses.

A recent study carried out in the Netherlands has shown that there is still room to refine and improve current water pricing systems for greater effectiveness and efficiency. Potential improvements may be made in the water price structure, for example. The **bills for drinking water, sewerage and sewage treatment** – which are currently separated – could be **combined to give a higher price per cubic meter and an additional incentive for saving water**. However, the effect is expected to be limited as current drinking water use is already close to the expected minimum of western standards. Other policy options that could complement current water pricing include: the establishment of **financial incentives for water storage; differentiated water quantity charges in order to abolish hard garden surfaces and direct incentives to create green roofs in order to create additional storage capacity**.

– Even if water pricing can lead to positive results, it **seldom helps to achieve water management objectives on its own**, as mentioned above. A case study in France has shown that a marginal price increase of +50% could reduce the estimated water deficit of a given territory in 2020 by only 10%, stressing the need for **additional short-term measures in order to complement water pricing adaptations**.

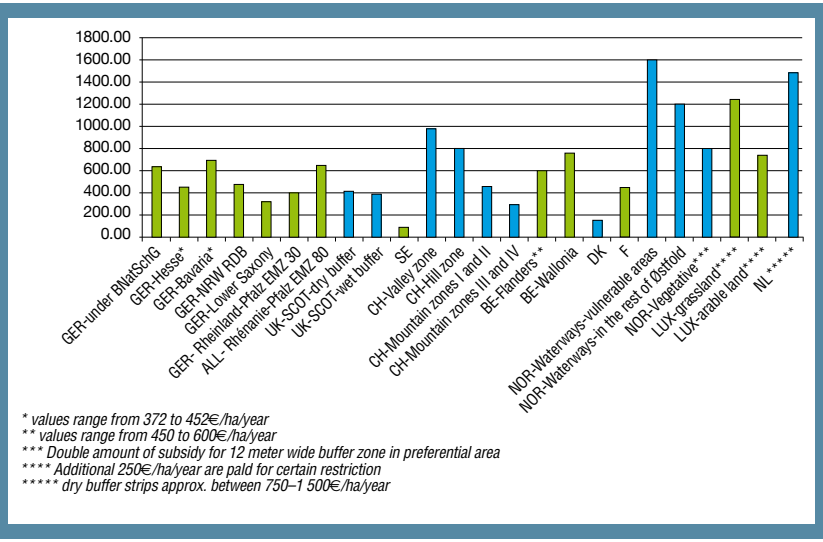



## 2.2 – Payments for environmental services

Since natural capital (and no longer man-made capital) has become the limiting factor, payment systems for ecosystem services can be seen as one of the solutions for investing in nature. To improve their efficiency, their design needs to **mobilise different disciplines (ecology, economics, social sciences, legal and policy concerns) in a common integrated framework**.

The first applications exist in some EU Member States as **mechanisms for fostering environmentally friendly practice and cooperation** for the sustainable management of water resources. This particularly applies to certain institutional arrangements between the agriculture sector and other private and public stakeholders, as illustrated by the cases of Norway and the Netherlands during the workshop (Figure 3).

**Figure 3. Payments for voluntary set up of buffer strips in Europe (source: S. Holen's presentation, taken from Dworak *et al.* 2009)**



But it has received more attention in non-EU countries such as South Africa and the United-States. Its implementation raises a wide range of issues, in particular with regard to the legal, economic and ecological (pre-)conditions for their application.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In the Netherlands, the **potential role of payments for ecosystem services** is currently under investigation, **especially in relation to the introduction of wet buffer strips**. Financially supported, this measure would contribute simultaneously to the ecological functioning of rivers, water storage (flood prevention and dehydration), nature conservation and the improvement of water quality.

Economic incentives for wetland management are being considered in Norway, where payment schemes exist for **converting agricultural land into wet zones** (ponds, artificial wetlands and riparian buffer strips). This conversion is encouraged through **cross-compliance schemes and through payments for environmental services**. If schemes are voluntary, their success depends on the level of the economic incentive, the quality of the land (it is more difficult to convince farmers to set aside good quality land), the effectiveness of information channels and the level of complexity of administrative processes.

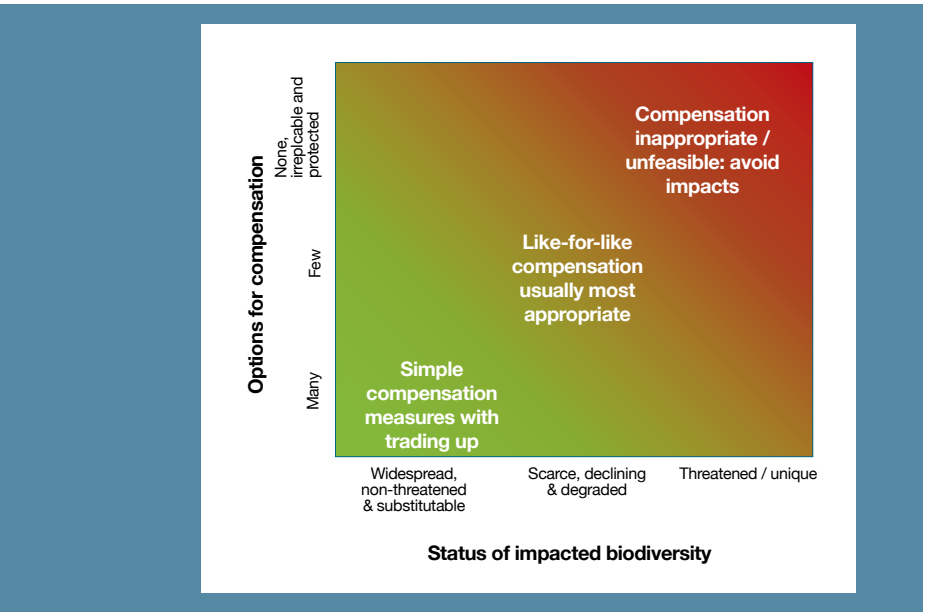
## 2.3 – Compensation based on environmental liability

**Financial compensation for damage and the important contribution of ecological goods and services** to human well-being, are receiving increased attention in water management and policy. Financial compensation for the production of ecological goods and services, for example, does **not constitute a "right to destroy" but is a means of making compensation effective when it is required by the regulations**. More specifically, European regulations impose a **strict hierarchy within interventions to be carried out for addressing the environmental impact**:
1) Firstly, avoid impacts; then 2) Minimize unavoidable impacts; and finally if both of the other options appear unfeasible or disproportionately costly 3) Offset unavoidable residual impacts. Reality shows that compensation is a common practice when it comes to respecting the hierarchy defined by the regulations.

In Europe, despite the existing legal framework for financial compensation, experiences with offsets are very limited. The main principle is to undertake ecological engineering and restore significantly valuable eco-systems, in order to use them as an offset activity to be proposed to developers whose activities impinge on wetlands ecosystems.

These offsets should take place before the damage is done. Wetland mitigation is indeed the main example of this type in the US, promoted by the Clean Water Act. As far as species conservation is concerned, this type of offset mechanism is called "conservation banking", under the Endangered Species Act. Conservation banking allows private landowners to protect endangered species on their own land by receiving economic compensation from developers engaged in offset activities. With regard to **habitat banking**, two key requirements will need to be observed. First, there is a need to create **incentives for long term monitoring**. Second, **flexibility** might exist in the type of compensation (on-site *versus* off-site and in-kind *versus* financial compensation), considering the type of biodiversity resource and the scale of damage and recovery of the ecosystem.

**Figure 4. Offsets options according to the status of biodiversity conservation (Source; Ece Ozdemiroglu "environmental liability, offsets and habitat banking"**






In particular, the offset mechanism might not be relevant for unique and threatened biodiversity while the offset system might be relevant to common and widespread biodiversity in order to minimise the transaction costs attached to its protection.

The **Water Framework Directive gives opportunities to apply this type of economic instrument** by: (1) promoting the use ofmore cost-effective economic instruments and (2) offering Member States the flexibility to achieve the objective of "good status" by adopting an ecosystem services approach that can form part of an offset scheme (Figure 4).

## 2.4 – Tradable pollution permits: in search of optimality?

**Pollution trading schemes** are discussed and experienced in different countries such as t**he USA and also, although more recently, in Europe**. Policy discussions on the potential role for tradable pollution permit schemes are currently being held in Sweden, Denmark and Norway. Other EU Member States have not yet considered this instrument and rely on regulation, often combined with environmental (pollution) taxes or charges. For a successful implementation of tradable pollution permits, different conditions need to be met, including: well **justified targets and caps** (to ensure these instruments contribute to achieving the established environmental goals); clearly identified **goals and credible benefits**; a **simple** and **flexible framework** (in particular for limiting transaction costs); an **institutional enabling environment**; and **transparency, trust** and (political) **courage**!

In the USA, the types of trading schemes that currently exist include: **trading between point sources; trading between non-point sources**; and trading between point and non-point sources (Table 2). The Swedish permit-fee system that is currently being tested also considers point source and non-point source pollutions. In particular, it provides the opportunity to introduce permits based on different crop types (with different leaching of pollution), as this facilitates monitoring and appears to be an effective measure if different soil types are also taken into account.

However the trading scheme is designed, it has to be **consistent with the other existing instruments** as it cannot constitute the sole solution for achieving the environmental goals. Indeed, trading schemes are **part of a comprehensive policy response**. As indicated by the case of Sweden, experiments often combine different instruments including the combination of trading schemes and pollution charges or taxes.

**Table 2. Main Water Quality Trading programmes in selected states of the USA (source: M. Kieser's presentation)**

| State | Description (Program, Permits, Rules, etc.) | PS/PS | PS/NPS | NPS/NPS | Activity (Relative) |
|---|---|---|---|---|---|
| Minnesota | Permits, Draft Rules | • | • | • | High |
| North Carolina | Bubble Permits, programs | • | • | • | Moderate |
| Maryland | Guidelines (draft) | • | • | • | None |
| Florida | Rules (not final) | • | • | • | None |
| Colorado | Rules, watershed programs | | • | | Low |
| Virginia | Rules | • | • | | Low-Mod |
| Connecticut | Legislation | • | | | High |
| Oregon | Guidance | • | • | | Low |
| Pennsylvania | Policy | • | • | | Low |
| California | Permit | • | • | • | Low |
| Idaho | Internal Guidance Doc. | • | • | | None |
| Michigan | Rule | • | • | • | None |
| Wisconsin | Permit | | • | | Low |
| Ohio | Rules, watershed programs | • | • | • | Moderate |

*(Legend: PS/PS = trading between point pollution sources; PS/NPS = trading between point and non-point pollution sources; NPS/NPS = trading between non-point pollution sources)*

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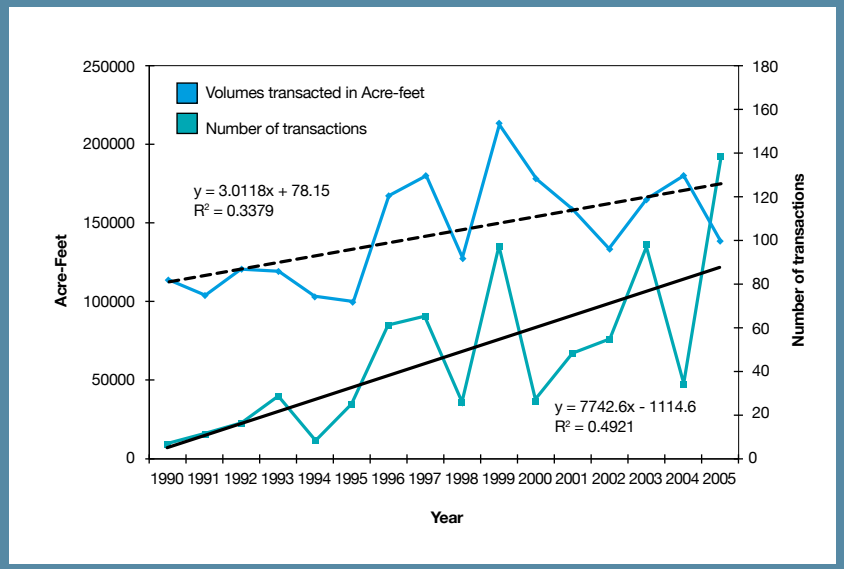
## 2.5 – Facilitating re-allocation through tradable water permits, quotas and rights

**Tradable abstraction permits and tradable water (use) rights** are operational in several countries worldwide (*e.g.* in the US (Figure 5, Table 3), Australia, Chile, etc.) and have been used for several years or decades already. **In Europe**, their application and policy discussions about their potential are **limited to Southern European countries**. There, the main focus is on intra-agricultural and agriculture-to-urban transfers. But water trading is clearly already happening in practice – including for environmental purposes (the environment becoming a user bidding for water).

Water trading is clearly **linked to water scarcity**. This might be exacerbated by climate change, the WFD (imposing new ecological constraints on river flows/regimes) or other socio-economic developments. Depending on their design, trading schemes can deliver improvements, including in terms of equity.

**Figure 5. Time trend of water right sales in 12 Western States of the US (source: R. Howitt's presentation)**




If a country or region decides to use this instrument, it must commit itself to implementing it fully, as it **is not possible to introduce it only partially**. Implementing tradable water permits or water markets requires inter alia: **adequate definition of water rights; assessment of the environmental impact** that is expected from their implementation, in particular how water markets help to achieve environmental policy goals; **proposal of the relevant institutions** to promote, facilitate and regulate the new market (trade conditions, rule of market exchange, roles of stakeholders, information and data collection for monitoring and for measuring environmental performance); **measures to overcome equity concerns** or to **address uncertainty** (be it in the design of water rights or in other institutional arrangements that are proposed).



The analysis of existing experiments in tradable water rights and water markets can help to identify a broader range of preconditions for the success and effectiveness of these types of instruments. To "make it work", several conditions must indeed be satisfied, including: adequate **initial allocation** of licences; **hydrological links between players** in the water market; **adequate regulation** (including for ensuring that transactions comply with environmental regulations) and **simplicity** of the trading scheme.

The debate on the **balance between regulation, collective action and market mechanisms** remains open. Can water markets and collective action be combined or are they mutually exclusive? Or is the relative balance and comparative benefit of a given mechanism just a question of spatial scale?

**Transaction costs** are clearly part of the answer to this question, in particular whether transaction costs for water markets would be lower than for other (command-and-control) arrangements. The link between water pricing and water markets must also to be addressed, in particular whether water markets can promote the efficient use of water if the prices for water services (in particular storage) are "not right" (*i.e. if they do not recover the entire costs of the storage facility*). Whether water markets would be a remedy to this current world food crisis or make it worse remains also an open question. ■

**Table 3. Formal water markets (n° of 5transactions and volumes transacted) in the Tajo, Guadiana and Jucar basins in Spain (source: J. Berbel's presentation)**

| Year | Number | Volume ( $10^6 m^3$ ) |
|---|---|---|
| 2000 to 2005 | 35 | 10.0 |
| 2006 | 6 | 75.4 |
| 2007 | 17 | 102.3 |
| 2008 | 2 | 67.9 |

3 **Enhancing the knowledge base:**

# identifying priority research questions and issues

G. Parfait - Onema

To improve the elaboration, practical implementation and (*ex-ante* and *ex-post*) evaluation of economic instruments, a wide range of research questions need to be addressed, as illustrated in table 4, page 44. Transversal issues, that need due consideration when designing research programmes and projects, include inter alia the following issues.

– **The economic valuation of ecosystem services will need to be pursued, especially in the context of the WFD**. Indeed, these values are the starting point when considering economic and market instruments, in addition to other institutional arrangements, as mechanisms for contributing to the achievement of the WFD's ecological objectives.

– **Economic instruments can clearly not be considered in isolation**. And a policy mix combining economic instruments, collective actions and regulation seems to be the most promising approach to sustainable water management. For given institutional, socio-economic and hydrological conditions, **finding the "right" combination of collective (cooperative) action, water markets and regulation** in order to achieve pre-defined water policy objectives, remains an ongoing challenge for research.

– From the institutional perspective, the **evaluation of the first cycle of river basin** management planning under the WFD should be a source of inspiration in preparing for the second cycle and ensuring that economic instruments play their due role in water management. For example: How could the concept of ecosystem services be further embedded in the WFD implementation? What are the WFD transaction costs?

– With regard to economic and market instruments, the concepts of **uncertainty, integration and multi-disciplinarity** must be central to further research efforts and projects.

– **Uncertainty** has to be taken into account as a fact (due to the complexity of the biophysical and human connections that water management has to deal with): thus, economic instruments need to be flexible in order to account for uncertainty.

– **Integration** of other social sciences will strengthen the understanding of individual perceptions, and increase the attention paid to equity and justice. It will be essential to involve lawyers in the design of transferable water rights. And natural scientists are required to explain to economists how the ecosystem functions so that environmental efficiency and environmental externalities can be assessed in a robust manner.

– Furthermore, **comparative studies** focusing on different instruments already created under different hydrological, institutional, socio-economic and cultural contexts will help us to understand the circumstances in which the implementation of given instruments generates negative, perverse or positive effects.

Finally, active **information, communication and knowledge sharing** will help to build bridges between scientists and policy-makers. Scientists are generating information that should be shared with local, regional and national water managers and decision -makers. In some cases, agreeing on a common terminology (or equivalences between terms) will be required so that terms such as "natural capital" or "payment for ecological services" can be understood by everyone involved in the management of water resources.

Some of these research issues will be **addressed in the context of the forthcoming call for research proposals** launched by the European Commission on the "Evaluation of the effectiveness of economic instruments in integrated water policy". The forthcoming ERA Net & IWRM Net activities will also be instrumental in tackling some of these issues. Additional efforts are required in order to share information and ideas discussed during the workshop with a wider audience of experts, institutions and countries. **Bringing together contributors to the workshop on a regular basis is considered to be essential** in order to continue information sharing and **strengthen the ties between European policy-makers and the scientific community** working on economic instruments for water management.

***Evaluation of the effectiveness of economic instruments in integrated water policy is provided below.***

In the context of the integrated water policy, it is essential to evaluate the effectiveness of economic instruments that could enable the objectives of water policy (water quality and quantity management, flood risk management etc.) to be achieved in a cost-effective way. The purpose is to assess the effectiveness and the efficiency of economic instruments (or combination of instruments) including instruments such as incentive water pricing policies, permit trading, and other fiscal, financial or market-based instruments. Research will support the current and future EU water legislation. This project should also consider the water accounting methodology as developed by the Environmental Accounts (*e.g.* in the SEEAW statistical standards endorsed by the UN statistical Committee in 2008).

The impact expected from the research project(s) to be funded under this call is as follows.

The recommendations for the set of economic instruments that will emerge from the project(s) should be used to achieve EU water policy objectives, in a representative set of European environmental and cultural situations.

**Table 4 : Priorities issues raised to the scientific community**

| Policy and financial issues | Water tariffs/pricing system | Financial compensation and payments for environmental services | Pollution trading schemes | Tradable water (abstraction) permits |
|---|---|---|---|---|
| **Q1.** Is it "worth" financing integrated water resources management? What are the expected direct and indirect benefits, in particular resulting from financing "soft" water management tasks? What is the allocation of benefits that result from implementing different financing instruments?<br><br>**Q2.** Which methods and protocols can be applied in order to ensure that PoM are cost-effective and costs are not over-estimated? What is the order of magnitude of so-called "over-costs" in today's PoM?<br><br>**Q3.** How will the availability of financial resources be affected (if at all) by global changes such as: (1) the current economic crisis (and related budgetary crisis); (2) changes in financing in the Common Agriculture Policy; (3) climate change (competition for financial resources allocated to attenuation & adaptation)?<br><br>**Q4.** What are the long-term implications of today's investments? What is the burden placed on future generations in terms of operation and maintenance costs, renewal of infrastructure, etc.?<br><br>**Q5.** How have the WFD principles (*e.g.* the polluter pays principle, cost-recovery including environmental & resource costs, etc.) been considered and applied by individual MS when defining financing strategies for the WFD PoM?<br><br>**Q6.** How can access to financial markets be facilitated? Which new financial products could facilitate access to financial resources?<br><br>**Q7.** What are the transaction costs linked to the establishment and implementation of different financing instruments? | **Q1.** As a result of the lack of homogeneous data and indicators to compare countries and regional situations, which indicators should be created and assessed so that comparisons can be made?<br><br>**Q2.** Which multi-disciplinary approaches (economic, sociological, institutional, etc.) should be applied in order to assess the performance of water tariffs/water pricing? In particular, how does pricing help to achieve given environmental objectives?<br><br>**Q3.** What are the different impacts of water pricing? In particular, what are the trade-offs between efficiency, equity, cost recovery and the practical constraints (technical, sociological, political) that drinking water utilities might face?<br><br>**Q4.** What are differences in price elasticity between different types of domestic users (*with or without gardens, owners versus tenants, individual houses versus apartments*)? In particular, what is the long term price elasticity (using for example long term time series)?<br><br>**Q5.** In addition to statistical estimates of price elasticity, what are the factors that effectively affect consumer's behaviour? (complementing econometric analysis based on household surveys with research from sociologists and anthropologists in order to understand how consumers adapt to price increases)<br><br>**Q6.** What are the main factors that explain the successes and failures of water pricing policies in terms of effectiveness and efficiency, taking into account the specific (institutional, political, hydrological, etc.) context of individual countries and regions? | **Q1.** How can benefits be defined and measured (in physical or economic (monetary) terms)?<br><br>**Q2.** What should be the equivalence at the site level between damages and compensation & restoration? Resource-to-resource, service-to-service, value-to-value or value-to-cost?<br><br>**Q3.** Who should set prices for compensation? The market or the state? How transparent should this price setting be in order to account for the social and cultural background?<br><br>**Q4.** As "habitat banking" (US) and "Biobanking" (Australia) have different meanings, which terminology should be used in Europe to refer to this kind of compensation (*e.g.* biodiversity credits)?<br><br>**Q5.** Can multiple services from a single site be rewarded and marketed without over- or under-estimating the values of goods and services provided? Which methods could then be used to estimate values?<br><br>**Q6.** How can the value of the environmental benefits of voluntary measures be estimated (as this would help to illustrate their expected benefits to policy makers)?<br><br>**Q7.** What are the main factors explaining the willingness or interest of economic stakeholders (in particular farmers) to participate in voluntary schemes?<br><br>**Q8.** Definition of the water management products, in particular the types of water services (including ecosystem services) to be considered for cost-recovery purposes.; | **Q1.** How can uncertainty be accounted for in the design of tradable pollution permit schemes? How can the main sources of uncertainty (trading quotas, pollution persistence and ecological effects...) be reduced?<br><br>**Q2.** What are the expected (environmental, social and economic) effects of applying tradable pollution permit schemes? What are the spatial and temporal dimensions of the effects (Who wins? Who loses? Where and when?).<br><br>**Q3.** What are the transaction costs of tradable pollution permit schemes? (as the level of transaction costs might impact on expected economic efficiency)<br><br>**Q4.** What type of institutional framework and governance should be implemented in support of tradable pollution permit schemes? In particular, what will be the social acceptability and political feasibility? And what type of institutional interaction should be established?<br><br>**Q5.** What type of innovative design can integrate non-point source pollution into tradable pollution permit schemes? In particular, how can the agricultural sector be integrated into in a trading system within regulated sources?<br><br>**Q6.** What is the baseline scenario (i.e. what would happen without the trading scheme?) against which the impact of tradable pollution permit schemes will be assessed?<br><br>**Q7.** What is the potential for trading schemes in existing (European) legislative and institutional frameworks? How can current legislation and existing instruments to reduce polluting discharges into the aquatic environment be accounted for? | **Q1.** Which approaches and methods can be used to enhance our understanding of the bio-hydrological operation of river basins in order to improve the assessment of the potential (environmental and economic) externalities that might arise from tradable water rights and the development of water markets?<br><br>**Q2.** In addition to efficiency and effectiveness which are regularly assessed in support of policy decisions, what is the impact of tradable water rights & water markets on equity? More generally, what are the equity impacts of all market-based instruments?<br><br>**Q3.** What are the social externalities linked to the implementation of tradable water rights & water markets?<br><br>**Q4.** What added value could experimental economics bring to the debate on water markets and tradable water rights? In particular, how could it help to improve our understanding of the pros and cons of tradable water rights and thus support decision making?<br><br>**Q5.** Will changes in water scarcity imposed by 1) the Water Framework Directive (which imposes new ecological objectives that can affect water resources available for productive uses) or by 2) climate change (which affects the hydrology of river basins and therefore water availability and its temporal distribution) enhance the relevance of water markets and provide more opportunities for their development in Europe? |

# Executive summary

## *The context*

On December 9 & 10, a few days before the formal deadline for the adoption of the River Basin Management Plans set by the European Water Framework Directive, the Office National de l'Eau et des Milieux Aquatiques (ONEMA - France) organised a European workshop entitled **Economic instruments to support water policy in Europe: paving the way for research and future development**. As limited attention had been given to economic instruments in the first WFD planning cycle, this was an excellent opportunity to: i) **review the existing knowledge** concerning the application of economic instruments for achieving water policy goals under different socio-economic, institutional and hydrological conditions; and, ii) **identify priority research issues** that may need to be addressed in order to support future policy decisions for the design and implementation of (new) economic instruments for water management.

## *The European workshop attendance*

Around 120+ economists, water engineers, decision makers and water stakeholder representatives attended the workshop, representing the European scientific and policy-making communities. Selected high-level experts from non-European countries (US, Australia, South-Africa, etc.) were also invited to contribute their innovative experience to the European scene.

## *Key messages from the workshop*

The high attendance and the variety of presentations clearly contributed to the workshop's success and the richness of the debates. The workshop clearly emphasised: The **wide range of economic instruments that can play a role in the water sector**. Presentations and discussions concerning traditional tariffs for water services, environmental taxes and charges were supplemented by new insights into Payments for Ecosystem Services, tradable pollution permits and water markets: three newcomers to the European water policy scene.

**The need for effective bridges between disciplines in order to address issues linked to economic instruments**. Multi-disciplinarity will be essential for research in support of policy decisions concerning economic instruments. Water economists need to join forces with natural scientists, lawyers, anthropologists, water engineers, etc. in order to ensure that research results can help to support decision-making.

The need to broaden the **focus** of the assessment of economic instruments. Effectiveness and efficiency are only two facets of economic instruments. The issues of equity, social justice, social and policy acceptability, etc. must be addressed when assessing the impact and relevance of economic instruments.

The many **practical** lessons learned from many previous and on-going experiments. This makes the question of adapting existing instruments and implementing innovative (from an European perspective) instruments seem **very real** and **feasible**.

The challenge posed by the search for the **right mix** between **command -and-control, economic instruments** and... **collective action.**

## *Selected priority research questions*

Many issues requiring further research were identified and discussed during the workshop. These include inter alia:

Investigating **the bio-hydrological operation of aquatic ecosystems** so that the environmental effectiveness of economic instruments (and remaining environmental externalities) is measured and estimated more accurately.

**Broadening the assessment** of the performance of economic instruments by including **equity** and social impacts.

The **factors that effectively affect consumer behaviour**, and the consumers' adaptation to new economic instruments or to changes in existing economic instruments (*e.g.* price increases).

Assessing the **transaction costs** of (developing/ implementing) economic instruments – and comparing them with the transaction costs of traditional "command-and-control" instruments.

Identifying the right mix of **command-and-control, economic instruments** and **collective action** adapted to different **socio-economic, institutional andhydrological** conditions.

The questions of **governance**, social acceptability, political feasibility and institutional interactions.

Assessing the **new opportunities** for the application of economic instruments in the water sector that arise from global changes such as: i) the **adoption of the WFD** (and its new ecological status objectives); and ii) **climate change**.

## *After the workshop*

The workshop was clearly an **intermediate step for research and policy making**.

**Research questions** raised by the workshop will be investigated by relevant future research initiatives funded under the 7th Framework Research Programme of the European Commission and IWRM.Net.

The results of the workshop might inspire Member States to undertake further research into **innovative economic instruments** as possible mechanisms for achieving European water policy objectives cost-effectively.
The added value of the workshop points toward organising a follow-up event in the medium term as an effective contribution to strengthening the interface between the scientific and policy-making communities with regard to economic instruments for water management. ■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Water banking is “an institutionalized process specifically designed to facilitate the transfer of developed water to new uses; a water bank is an institutional intermediary that brings together buyers and sellers under known procedures and with some kind of public sanction for its activities.” (National Water Commission 2008)

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See HYPERLINK «http://www.millenniumassessment.org/en/index.aspx»

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The ultimate financing sources are the so-called 3 T’s, meaning: Tariffs and other user charges, Taxed-based subsidies, and external Transfers (*e.g.* ODA). However, whatever the solution chosen, attention should be paid to affordability risks.

Blending consists of combining concessionary finance with repayable finance in support of a project or a comprehensive lending programme. Its main purpose is to attract financing that would not otherwise be obtained.

Swedish Environmental Protection Agency. 2009. Proposal for a permit fee system for nitrogen and phosphorus.

E.g. too limited experience in water economics, lack of information and knowledge on new economic instruments, inadequate institutional setup requiring long policy process, lack of cost-effectiveness of economic instruments, uncertainty related to global changes such as climate change and the economic crisiss, etc.)

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*Previously published*

*Climate change: impacts on aquatic environments*
*and consequences for their management (February and August 2010)*

*Mesocosms: useful tools for aquatic environment quality managers?*
*(March 2011)*

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