ambientalia
Revista Interdisciplinar de las Ciencias Ambientales
Editorial Universidad de Granada

IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE IN ITALY: STATE OF THE ART AND SELECTED RESEARCH ISSUES

D. Viaggi[a], M. Raggi[b], L. Sardonini[a], D. Ronchi[a]

[a] Department of Agricultural Economics and Engineering, University of Bologna (Italy)
[b] Department of Statistics, University of Bologna (Italy)

Abstract

The Water Framework Directive (WFD) was implemented rather late in Italy. The actual implementation took place in 2006 with decree 152/2006 but the Directive was not completely effective until the beginning of 2009, when law 13/2009 provided for the implementation of river basin plans by basin authorities.
The objective of this paper is to describe the implementation of the WFD in Italy and to discuss selected policy and research issues. The paper begins with an introduction highlighting the specificities of Italy in terms of water management.. With regard to implementation, the general administrative setting, as well as the interpretation of WFD categories related to economic evaluations will be illustrated. Two major issues of particularly high relevance in the present debate are then discussed: a) the evaluation of environmental and resource costs; and b) water regulation in agriculture.

Keywords: Environmental and resource costs, WFD, Italy, choice experiments, water-related measures in agriculture.

1. INTRODUCTION

Sustainable water management has become a major issue in Europe. In 2000 the European Union approved the Water Framework Directive (WFD, 60/2000), the purpose of which was to provide a reference framework for water management in Europe for the coming decades.

In summary, the main objectives of the WFD concern the preservation, protection and improvement of water quality, as well as a rational use of water resources by different economic sectors (urban centres, industry, agriculture and energy). It is based on the principle of preventive action, the reduction of damages, at both the source and the sink, and the 'polluter pays principle'.

Approximately ten years after its approval, WFD implementation is not yet complete. The process has been particularly difficult in Italy, where the operational implementation of the directive actually commenced at the beginning of 2009, with the intention to "catch up" and meet the 2010 deadlines.

Some of the issues related to the process of WFD implementation in Italy are connected to the specific environmental and regulatory context of the country. Italy is mostly characterised by a Mediterranean climate, but it is very heterogeneous in terms of environmental characteristics including precipitation (with a range from an average of 3500mm per year to 250mm; from 120 rainy days to less than 60), altitude (from 4810m to -3.44m), climate (subtropical, temperate, continental), etc. The socio-economic characteristics of the country are also diverse including the level of industrialization, the relevance of agriculture and consequently, the differing levels of water use. These differences have, up until now, hindered the adoption of a single national policy to manage water resources. In fact,, water management tasks are distributed amongst several actors and different administrative levels, including the central government, regional governments, basin authorities, ATO (Ambiti Territoriali Ottimali), provincial authorities and irrigation boards.

The objective of this paper is to describe the status of WFD implementation in Italy and to discuss selected policy and research issues.

In spite of the attempt of this paper to provide a global picture of WFD implementation in Italy, when it comes to specific case studies the heterogeneity of local conditions makes any evaluation rather specific; in addition, available literature is mostly concentrated in few study areas (mainly in Central and Northern Italy). As a consequence, the empirical results reported in this paper mainly focus on the geographical areas from which more studies were available.

Over the course of WFD implementation, two issues proved to be particularly challenging: a) achieving a monetary evaluation of water status improvements to support full accounting of Environmental and Resource Costs and Benefits (ERCB); and b) addressing agriculture water use both in terms of a full cost evaluation and cost recovery. Accordingly, these two issues will be addressed in some detail, in order to complement the general illustration of WFD implementation in Italy.

In the following, we first illustrate the implementation process in Italy, its progress and difficulties. We then address the two major issues identified above: a) the evaluation of environmental and resource costs and b) water regulation in agriculture.

2. WFD IMPLEMENTATION IN ITALY

The WFD implementation process is not yet completed in Italy, but over the last year it took a considerable step forward. According to the Italian government, this progress should enable Italy to make up for the previous delays in WFD implementation and bring the country in line with the pace of implementation of other EU countries. In this section, a short description of WFD implementation in Italy is provided.

It was only in 2006 that the Italian government initiated the implementation process of the WFD by way of decree 152/2006 which reformed the entire body of environmental regulations in Italy. This process also included provisions regarding waste management, environmental impact assessment, strategic environmental assessment and other environmental issues. In particular,, this decree substituted decree 152/1999 about water regulation.

Decree 152/2006 was suspended at the end of 2006 by decree 284/2006, the results of which was to restore the situation previously introduced by 152/1999. The water management

was regulated by a set of different laws. Therefore, decree 152/2006 was not fully effective until recently. In fact, at the beginning of 2009 law 13/2009 (previous decree 208/2008, providing extraordinary measures for water resource and environment protection, was converted into law 13/2009) provided for WFD implementation in the river basin plans of basin authorities. These river basin plans should have been ready by the end of 2009 and should have included previous WFD activities not yet carried out (e.g. river basin characterisations).

One problem inherent in Italian water management is the lack of a distinct hierarchy between the multiple levels of authority (region, province and basin). The main responsibilities related to water management were originally centralized and delegated to the regions. Each region enacted its own laws and the provinces had their responsibilities in terms of local implementation. In parallel, the basin authorities were mainly charged with flood control. Decree 152/2006 attempted to clarify this division of responsibility and the first step was the identification of eight hydrographical districts in Italy. The districts are Serchio, Padano, Eastern Alps, Northern Apennines, Central Apennines, Southern Apennines, Sardinia and Sicily.

In 2009, a basin district authority was incorporated into each hydrographical district. Each district authority was given the responsibility to draw up a management plan of the basin area (http://www.direttivaacque.minambiente.it/index.html). Furthermore, the previous decree 152/2006 established that the regions must draft protection plans for their territory. These protection plans contain aspects such as a description of the state of the water bodies, qualitative and quantitative water protection measures, etc in order to assist the design of the river basin plans established in 2009.

While waiting for the establishment of the district authorities (all of which are still not fully operational) law 13/2009 established that the adoption of management plans was responsibility of the Institutional Committee of the Basin Authority of national importance, supplemented by members appointed to the regions including the territory which lies in the district covered by the plan.

At the time of writing, the status of the basin plans in the various hydrographical districts is rather heterogeneous. In the majority of cases, the plans have not yet been published and, those that have contain weak economic analyses. In further detail, the situations of the individual districts are as follows:

- Serchio (pilot basin): the management plan was published on 24 February 2010. The economic analysis is essentially complete, although it is limited by the unavailability of data for some issues. It includes the evaluation of the cost of measures and a Benefit transfer exercise concerning the effects of the plan as a whole;
- Padano (Po river basin): the management plan is not yet published. Only the project of the management plans (July 2009) has been published;
- Eastern Alps: the management plan was published on 24 February 2010, but the economic analysis is only theoretical and qualitative;
- Northern Apennines: the management plan has been published and includes a specific economic analysis application in a pilot case study (in the province of

Arezzo). This study regards the methodology and the application for the economic analysis; it calculates the total cost for each sector but environmental and resource costs are not considered due to the unavailability of data:

- Central Apennines: same as Padano basin;
- Southern Apennines: same as Eastern Alps basin;
- Sardinia: same as Padano basin; in the economic analysis (September 2009) there are some quantitative evaluations but nothing about the ERCB;
- Sicily: same as Padano basin.

3. ENVIRONMENTAL AND RESOURCE COSTS AND BENEFITS (ERCB) AND THEIR EVALUATION IN ITALY

The implementation of the WFD introduces economic concepts into water management, including the need to take into account the full cost recovery (FCR) principle in water-related decisions. In Italy, this principle has become an important reference for water management decisions, though it is still only partially used for the implementation of water management instruments.

The application of full cost concepts requires the development of techniques for the evaluation of such costs. Operational techniques and guidance for the measurement of some components of the FCR were studied in detail in the AquaMoney[1] project. The full cost is composed of three components: financial, environmental and resource costs. The last two components do not have a common definition applied by all European Member States. At present, the most exhaustive definitions for ERCB are provided in Wateco (2002) and in DG ECO2 (2004). Depending on the point of view, the environmental and resource costs could be interpreted as a welfare gain for some (benefit-based approach) or a welfare loss for others (cost-based approach). In the literature, these approaches correspond to two methods: cost-based and benefit-based. Moreover, in the second method, the approaches can be divided into market-based and non-market-based. The former approach measures benefits by analysing actual market transactions and considers the value of water as a production factor in agriculture and industry, or through the market price of fish caught from a river. Due to the nature of environmental improvements, many effects are not reflected in market transactions. This consideration shows the need for non-market-based methods.

In the literature, in the non-market-based methods, revealed and stated preference methods are distinguished. Revealed-preference methods (such as hedonic price or the travel cost approach) imply the influence of environmental factors on observed market transactions, while stated-preference approaches (such as contingent valuation or choice experiments) are based on individuals' preferences for an improvement in quality and/or quantity of water resources. One main advantage of these methods is the possibility to estimate the benefit without referring to production activities. The benefit values are identified by considering an individual's willingness to pay (WTP). The most frequent approach is the use of the WTP and it has been given peer review endorsement in a number of

1 "Development and Testing of Practical Guidelines for the Assessment of Environmental and Resource Costs and Benefits in the WFD" (www.aquamoney.ecologic-events.de), funded by the European Commission under the 6th framework program, contract n. SSPI-022723.

studies (Cummings et al., 1986; Arrow et al., 1993).

In Italy, only a few studies on environmental evaluation have been carried out. These studies address water quality issues such as pollution damage (Stampini, 1998; Marangon and Tempesta, 2004; Travisi and Nijkamp, 2004), and in one case, water quantity problems (Notaro, 2001).

In this part of the section, we report results from a recent evaluation which is also the most directly pertinent to the implementation of the WFD in Italy. This work entails two evaluation exercises, both of which were carried out in Italy. According to the objectives of the WFD economics section, a basic choice experiments (CE) methodology was applied to estimate the environmental and resource costs and benefits (ERCB) with regard to water scarcity problems (see Sardonini et al. 2009 and Viaggi et al. 2009). The main purpose of this method is to describe environmental goods in terms of their attributes and to apply a probabilistic model to the choices between different bundles of attributes following the maximization of the individual utility (McFadden, 1974).

The two exercises, referred to as IT1 and IT2, are focused on water scarcity problems. The common characteristic is the introduction of a hypothetical market using a price attribute (increase of the household annual water bill).

In particular the IT1 case study is directly linked to the AquaMoney project and the methodology applied was common between the countries. The CE design considers an environmental evaluation of quantitative water uses and the willingness to pay to reduce the risks of water shortages. Case study IT2, for its part, is the result of a second questionnaire implemented only in Italy and the CE design focuses on an environmental evaluation improvement due to a percentage decrease of water used by one of the economic sectors.

In both studies benefits are linked to a greater availability of water in the environment, and the resulting improvements with respect to biodiversity, aquatic ecosystems, and increased possibilities for water recreation activities.

The questionnaire used is divided into five parts and the choice experiments and the contingent analysis are the core of the survey. The first CE design (IT1) considers attributes related to:

- 'external household water restrictions' in terms of the probability of reducing water restrictions for external household uses in the summer (e.g. garden uses, washing machines, etc.). It is assumed that in the current situation[2] the number of years of water restrictions is estimated to be 4 years over a 10 year period; a reduction to 3, 2 or 1 is proposed as alternative attribute levels;
- 'environmental improvement' of water bodies from a poor level (current situation) to sufficient, good or very good level.

The second CE design (IT2) is composed of attributes related to:

- 'environmental improvement' due to changes in water quantity. Specifically, a reduction in the present uses of water is

[2] The hypothesis in the current situation in Italy depends on the specific location. Hence, in general the hypothesis of the status quo is not equal in all areas of Italy but we expected it to be useful to elicit the willingness to pay to secure water availability. In addition, we used the hypothesis to compare results between countries in the AquaMoney project.

assumed in order to maintain a greater amount of resources in the environment;

- 'allocation across different economic sectors' regarding the water reduction of the current uses in the economic sectors (with exception of the civil sector which is covered by legislation).

The combination of one level of each attribute makes one scenario, then a card is defined using two scenarios plus the status quo. The respondent can express his/her preference between two scenarios, or opt for the status quo in four cards. In status quo scenarios in IT1 and IT2, the additional payment in the household annual water bill is absent In IT1, the status quo scenario presents the following attribute levels:

- 'external household water restrictions' the probability of an external water uses reduction is equal to a four years restriction over the next ten years;
- 'environmental improvement' poor environmental level.

In IT2, the status quo scenario presents the following attribute levels:

- 'environmental improvement' maintain the current water availability in the environment (same water use between sectors);
- 'allocation across different economic sectors' the current distribution of water uses between sectors and the primary guaranteed sector is the agricultural sector (although not all crops are guaranteed, i. e. arable crops).

In the following, the differences between, and the results of, the surveys are presented. The two samples were collected in two different periods and locations: 242 face-to-face interviews in Modena (southern part of the Po Basin River) at the beginning of July 2008 (IT1) and.350 face-to-face interviews were carried out in northern Italy by students in the spring of 2008. Both surveys had a gender balance in terms of the respondents which was consistent with that the Italian population. There is a difference in the average age between the samples: in IT1 40.4 years is the average age versus 48.4 years in IT2; the age frequency distribution is balanced in IT2 but in IT1 there is a large group of under 45 year olds (63%) due to the fact that 23.1% of the interviewees are students.

Before considering in detail the water scarcity problems, the questionnaire presents a question about the most frequent general problems in the area. The answers obtained vary significantly between respondents, but less so between the two samples. Accordingly, it is interesting to highlight the lack of cases in which environment/water problems are listed as being the most important. Only when asked directly are environment/water problems mentioned as being relevant. This behaviour calls for a careful evaluation of the importance given to the environment as it actually proves to be a problem of marginal importance for the respondents. In most likelihood, the low frequency of water recreation activities could influence this perception; in fact, only 39% (IT1) and 36% (IT2) practice water–related activities, such as walking, fishing, picnicking and swimming.

The respondents' perception of the relationship between environmental quality and water scarcity is greater when they are asked directly, and they believe that the environment is affected by water scarcity problems, even though only 29% (IT1) and 19% (IT2) of respondents have actually suffered restrictions in the past 10 years. It should be noted that the stated causes of

restrictions do not only represent specific water scarcity problems in the area but also take into account other causes such as water pipe problems.

Questions about the annual water bill, household income and the maximum that respondents were willing to pay to have the best attribute level were asked directly. The average annual water bills are higher in the IT2 sample with 327€/year as opposed to 250 €/year for IT1. Although the IT2 value seems high, the large standard deviation indicates a large range of amounts. This points to relevant differences in water bills, but also the uncertainty of respondents with respect to the actual amounts of water bills. With regard to household income there are no differences between the samples. The amount of willingness to pay (WTP) directly asked resulted very low if compared to the importance apparently attributed to environmental issues in the first part of the questionnaire. Considering only positive answers, in IT1 the WTP shows a mean value equal to 36.04 €/year per household for environmental improvements and 34.44 €/year for a reduction of external water restrictions. In IT2, the WTP shows a mean value equal to 43€/year per household for water in the environment needed to obtain a 'very good' level, and 30€/year to guarantee water use in the agriculture sector, 23€/year for energy and 14€/year for industry. A direct comparison between attributes is not possible, but in IT2 the WTP for an environmental improvement is larger than in IT1, although the number of attribute characteristics is larger and this could cause a higher willingness to pay. However, it is also useful to remember that the income level of the IT2 sample is higher and the respondents are younger.

The results for the CE are obtained by applying a Multinomial logit (MNL) model as a way to identify which variables can influence, positively or negatively, the probability of choosing a given scenario. The pseudo Nagelkerke R^2 is about 0.1 for each model and the value is consistent with the literature.

Table 1: MNL estimates of IT1 case study.

Variable	B	WTP	Sd	Sig
Environmental improvement sufficient	0.869	62.07	0.212	0
Environmental improvement good	1.674	119.57	0.208	0
Environmental improvement very good	1.9	135.71	0.228	0
External household water restriction	0.015	1.07	0.062	0.804
Bill	-0.014	/	0.002	0
ASC	-1.153	/	0.075	0

Table 1 and table 2 present the results of the analysis for both IT1 and IT2 samples and only significant estimates are reported. This means that the individual characteristics do not influence the choice process because they are not significant.

In IT1, people pay to move from a poor environmental status to another and the WTP amount is given in the second column in Table 1. In particular, all of the attribute levels are significant and positive and the amount increases when the level of improvement increases, though the increases are non-linear. With respect to the second attribute, the estimate for the external household water restriction is positive but not significant and this means that people are not worried about the possibility of reducing the probability of water restrictions. It should be noted that this behaviour could be biased by the hypothesis of the status quo, which shows a worse situation than the actual one.

In IT2, the environment coefficient is positive and significant which means that people are willing to pay for maintaining a higher amount of water in the environment (Table 2). In IT2, for the second attribute, the estimates concern the guaranteed economic sectors. Very different estimates are presented in Table 2. In particular the agriculture coefficient is positive but not significant, energy is positive and significant, whilst industry is negative and significant. Therefore, respondents are willing to pay only for the energy sector.

Table 2: MNL estimates of IT2 case study.

Variable	B	WTP	Sd	Sig
Water increasing in environment	0.064	7.11	0.026	0.016
Agriculture protection	0.198	/	0.113	0.079
Energy protection	0.452	50.22	0.156	0.004
Industry protection	-0.687	/	0.127	0.000
Bill	-0.009		0.001	0.000
ASC	-0.534		0.287	0.063

Because of the differences in the CE designs, a direct comparison between attributes in the two surveys is not possible. However, the main result is that people are willing to pay for an environmental improvement in both surveys, but the probability of choosing a scenario decreases when the bid increases and this is consistent with expectations. In particular, there is a gap between the importance attributed to the environmental theme and the willingness to pay.

4. APPROACH AND SOLUTIONS TO THE EVALUATION OF MEASURES

The difficulties encountered in the implementation of the WFD in Italy reflected in particular on the ability to provide an appropriate evaluation of measures, as revealed by the status and content of the basin plan illustrated in section 2. Due to the late implementation of the WFD and the national provision for the preparation of the basin management plans, proposed measures were designed in only a few months and their evaluation was mostly carried out in parallel with measure selection and design, and hence without a sufficient level of project detail.

The rationale adopted in the guiding documents at the national level was that of a cost/effectiveness approach (Massarutto et al., 2005, Massarutto, 2007). This approach is suggested by WATECO which justifies the use of the approach in other EU countries as well (e.g. Hanley and Black (2006), Görlach and Interwies (2004)).

In fact, due to time constraints, the main drivers regarding the choice of the methodology for the evaluation of measures were: a) the participatory process and the related debates; b) the Strategic Environmental Assessment (SEA) process for the approval of basin plans; and c) the content of the WISE forms for information reporting to the EU.

The preparation of basin plans was based on a participative process. This involved the obligation of 2-3 public events intended as consultations. This participatory process overlapped with the SEA process, which also obliged basin authorities to leave basin plans open for a 60 day public consultation, followed by observations. In most cases unofficial consultations were also carried out, particularly when the actual implementation of measures fell under the authority of bodies other than the basin authorities, e.g. irrigation boards, provinces, etc. During these processes, the perception of the relative costs and benefits of measures was largely

taken into account implicitly, as well as the distribution of such costs and benefits.

The fact that the procedure for the approval of basin plans followed the SEA legislation forced to take into account the related norms in the drafting of the basin plans. In fact, this imposed a need to consider environmental factors related to the WFD implementation within the SEA, though in a mostly descriptive and qualitative manner. The cost of measures was not considered in this exercise.

The request for information through the WISE system was a major driver of the provision of cost information; however, this followed a slightly different structure from that envisaged for the economic analysis in the implementation of the WFD. In particular, it focused on financial costs, mostly related to investment and labour. In addition, only non-water environmental costs were considered. In most cases these were not directly relevant and not estimated at all. For example, in the case of the Serchio (one of the 8 Italian hydrographical districts) river basin plan, this type of cost was calculated only in the case of hydropower production.

The costs accounted for in the WISE procedure for each individual measure were for the most past not made public and in any case were not associated with the environmental effects, and therefore they did not contribute to a proper cost-effectiveness analysis.

As a result, one may argue that the approval of basin plans in Italy was undertaken, up until now, without a proper evaluation of measures. In spite of the relatively low quality of the exercise aimed at evaluating the measures, this first attempt identified a number of bottlenecks and issues to be tackled in the future process design. The most important ones are the following:

- the use of an economic evaluation to support the design/choice of measures requires a suitable design for the procedure itself, able to allow a consistent sequence of measures proposal and preliminary design, economic analysis and participatory decision process; this was not possible during this round of basin plan preparations due to very short time constraints;
- the cost/effectiveness or cost benefit approach, stemming from the project evaluation, is not systematically applicable when hundreds of measures are to be evaluated, as is the case in the majority of basin districts, simply because of the excessive effort (even if there was more time for the evaluation process); it is not surprising that only the smaller basin in Italy (Serchio) has attempted to evaluate measures;
- on the other hand, measures included in the plan are also very heterogeneous, ranging from proper infrastructural investments, to the implementation of simulation tools and economic studies; some of them are not suitable for usual cost/effectiveness or cost benefit approaches and, in any case, some discriminatory criteria to focus on a selection of major measures would help concentrate evaluation efforts on the cases in which the potential impact of the measures is more relevant;
- some key concepts deriving from the policy evaluation are not emphasised clearly enough in the discourse about the evaluation of measures; for example, the need to consider the additionality of policy effects by comparing policy implementation with an

appropriate counterfactual is poorly taken into account in the evaluation of measures;

- the evaluation of measures still appears surprisingly inconsistent with respect to the structure of full costs, e.g. it is not clear if environmental and resource costs are to be taken into account;
- some major components have not been adequately analyzed e.g. income forgone due to policy implementation, which is often much more important than the direct costs of the measures implemented, in particular when regulatory measures are proposed.

With these considerations as a background, two major drivers of the unsatisfactory evaluation of measures to date are:

- the lack of data availability from past studies, including basic physical data on water resources, which hints at the fact that a proper economic evaluation needs to be built on an ongoing process of data and information collection;
- the lack of economic expertise in both the Italian context and, specifically, in the bodies charged with the preparation of basin management plans.

In both respects, it should be noted that the present round of basin plan preparation was implemented without any additional resources from the Italian government.

5. WATER REGULATION IN AGRICULTURE

Agriculture is a key component of the water management strategy in Italy as it accounts for about half of the country's water use and the majority of some key pollutants, such as nitrogen (Agenzia Nazionale per l'Ambiente 2001).

Water regulation and policy instruments in agriculture and the effects of implementing the WFD have been the subject of numerous studies in Italy

Early studies addressed the effects of WFD implementation and related policy scenarios on the sustainability of farming systems in Italy (e.g. Bartolini et al., 2007a; Gallerani et al., 2009), generally emphasizing, once again, the heterogeneity of such systems, but also their fragility when faced with potentially adverse scenarios.

In addition, attention was given to the analysis of costs, including those in support of water tariff decisions (e.g. Dono, 2003)

More recently, policy design issues have been directly addressed. Dono et al. (2010) discuss the issue of the application of volumetric pricing in agriculture, a central issue in the implementation of the WFD, emphasizing the potential shortcomings.

In their study dealing with limitations in payment mechanisms associated with the lack of water metering, Gallerani et al. (2005) analyse the possibility of using a menu of contracts to improve the overall social welfare derived from irrigation water use, in the presence of asymmetric information and transaction costs. Bartolini et al. (2007b) demonstrate how different ways of designing measures to reduce nitrogen use in agriculture may affect a policy's cost-effectiveness. The results may be relevant in the evaluation of programs of measures in application of the WFD. Different ways of accounting for information asymmetries or, better, different policy design options may lead to differences in costs for the reduction of pollution from agriculture of up to three- or fourfold. This may strongly affect the overall evaluation of the cost-effectiveness of

different measures and the assessment of disproportionate costs. Bartolini et al. (2010) evaluate the perceived outcome of different scenarios from the point of view of different stakeholders, as an instrument to support policy in the sector of irrigated farming with the contemporaneous application of the WFD and the 2003 CAP reforms. Basic contrasts between farmer-related and environmental/water institutions are emphasised when faced with different scenarios. The results suggest that greater coordination is necessary to provide consistent policies and appropriate incentives to farmers and the need for a re-evaluation of the relationship between agriculture, natural resources and social objectives. They also point to the need to provide the institutional basis for effective planning at the river basin level.

The economic analyses directly related to the implementation of the WFD emphasise the paucity of data available from the agricultural sector. As most water used in agriculture is not metered, precise water use is not generally available at a small scale (excluding very rough estimates). In economic terms, the costs and revenues of irrigation boards are very heterogeneous and systematic reviews of such costs are not available as they are for other sectors (e.g. COVIRI, 2008). This often results in claims that irrigation board are not transparent with regard to their economic performance.

In fact, this highlights the relevance of the discrepancy between the specificities of the regulation of irrigation boards and water delivery to agriculture, and the innovation introduced by the WFD. The same does not apply for other sectors that, in principle, already use a tariff system based on volumetric pricing and are obliged to recover full costs (though it is unclear if accounting methods for environmental and resource costs are satisfactory). The irrigation boards are nonetheless subject to a specific regulation in Italy which establishes the rules for cost recovery. In particular, the Italian system requires the irrigation boards to recover their current costs and some of the costs related to capital, whilst capital costs, resources and environmental costs are usually not recovered. Most of the water distributed is unmetered, though new distribution systems are based on pressure pipes for which water is metered. In the cases of unmetered water, costs are recovered by way of an area-based tariff, while in the cases of metered water, a volumetric, or at least binary, price is used. However, even in cases of volumetric prices, the primary aim of the irrigation board remains that of recovering costs, rather than providing incentives through volumetric pricing

A significant debate has arisen concerning the balance between the positive and negative role of irrigation boards and the extent to which irrigation can be identified as a consumptive, or rather a non-consumptive, use; different interpretations of this issue were also provided in the different river basin plans.

Furthermore, with the 'Health Check' of Common Agricultural Policy, the water management issue (along with bio-energy, climate change, biodiversity and innovation) becomes one on the main challenges that the European Commission is seeking to face in order to better address market and social demands in environmental terms.

In fact, the protection and management of water in the agricultural sector has increasingly become a problem in some areas. For this issue, the Community framework for good agricultural and environmental conditions should therefore also be reinforced through the funding of the second pillar of the CAP, with the aim of

protecting water against pollution and to improve the sustainability of irrigation water use.

In particular rural development measures could be used to encourage innovation in water management as follows:

- investment in new irrigation technologies by way of axis 1;
- adoption of environmental measures to improve the capacity to better manage available water resources in terms of quantity and protect water in terms of quality (axis 2);
- conservation of natural heritage can help in protecting high-nature-value habitats and high-value water bodies via axes 3 and 4.

Unfortunately, at the time of writing, to the best knowledge of the authors, no *ex-post* studies are available on these measures where they have been implemented (in some regions, the implementation has not yet started).

6. CONCLUSIONS

The case of Italy is characterised by a delay in the application of the WFD and only a partial implementation of its principles. A slow administrative process and contrasting political positions have certainly contributed to this situation.

In spite of the generally unsatisfactory results, the experience up to now can teach a great deal about the practicability of WFD principles and prospects for future applications.

First of all, the timing and the WFD application procedures in Italy, as discussed in section 2, highlight a number of obstacles stemming from complementary national regulations, i.e., water management task distribution across different administrative bodies, specific regulations for irrigation boards, etc. Moreover the various entities located throughout the national territory do not always have specified hierarchical positions in the implementation process.

Second, the key principles of the WFD do not appear to be sufficiently defined, nor supported by specific guidelines and cheap and effective methodologies.

As a result of this lack of clear guidelines and the short time as deadline, the evaluation of the ERCB was carried poorly, relying mostly on available information, or relaxed to the setting up of preliminary explorative data collection.

Some of these problems could be solved by benefit transfer applications, but the few exercises undertaken in the literature underscore the significant limitations of this method due to erroneous estimates and the unavailability of detailed input data.

The lack of economic analyses in the WFD may also be motivated by the lack of economic expertise in the bodies in charge of developing the basin management plans. Indeed, these bodies used to be mainly devoted to hydraulic and engineering activities related to water management.

This was further exacerbated by the lack of data available in advance. The data used in the 2009 WFD implementation were often collected by different entities and for various studies with different aims. This highlights both the difficulties in finding and obtaining data and also that the information collected is neither homogeneous nor exhaustive. A proper collection of information built over time is a key component of any meaningful decision making process in the water sector (as well as for other issues).

Given the state of the art illustrated in this paper, improving benefit estimations and water

management in agriculture remain key issues for the future. Also the coverage of existing economic studies is rather heterogeneous, and while in some areas economic aspects of water management have gained some relevant attention, other areas of the Italy are still poorly studied, particularly in the perspective of the WFD implementation and concerning environmental and opportunity costs.

In addition, the issue of the economic evaluation of measures, essentially not yet addressed in Italy and hence not discussed in this paper, can be identified as the single most relevant economic theme for the future steps in WFD implementation.

AKWNOLEDGEMENTS

The results reported in this paper were funded by various bodies and were obtained under different research projects. The main sources were the European Commission in the AQUAMONEY project. The paper does not, however, necessarily reflect the views of the EU and in no way anticipates the Commission's future policy in this area.

REFERENCES

Arrow, K., Solow, R., Portney, P.R., Leamer, E.E., Radner, R., Schuman, H. (1993). *Report of the NOAA* Panel on Contingent Valuation, Federal Register, 58,10, 4601- 4614.

Agenzia Nazionale per la Protezione dell'Ambiente (2001) *Primo rapporto SINAnet sulle acque. ANPA* - Dipartimento Stato dell'Ambiente, Controlli e Sistemi Informativi. ISBN 88-448-0255-4

Bartolini, F., Bazzani, G.M., Gallerani, V., Raggi, M., Viaggi D. (2007a). *The impact of water and agriculture policy scenarios on irrigated farming systems in Italy: an analysis based on farm level multi-attribute linear programming models*, Agricultural Systems, 93, pp. 90-114.

Bartolini F., Gallerani V., Raggi M. and Viaggi D. (2007b): *Contract design and cost of measures to reduce nitrogen pollution from agriculture*, Environmental management, 40, pp.567-577.

Bartolini, F., Gallerani, V., Raggi, M., Viaggi, D. (2010). *Water management and irrigated agriculture in Italy: multicriteria analysis of alternative policy scenarios*, Water Policy, 12 pp. 135–147.

Brouwer, R. (2008). *The role of stated preference methods in the Water Framework Directive to assess disproportionate costs*. Journal of Environmental Planning and Management, 51(5), 597-614.

Coviri (2008). *Rapporto sullo stato dei servizi idrici*'.

http://www.coviri.it/contenuti/documenti/stato_servizi_idrici.pdf

Cummings, R.G., Brookshire, D.S., Schulze, W.D. (1986). *Valuing environmental goods: An assessment of the contingent valuation method.* Rowman and Allanheld, Totowa, 1986.

DG ECO2 (2004). *Assessment of environmental and resource costs in Water Framework Directive* (WFD), Information sheet prepared by Drafting Group ECO2, Common Implementation Strategy. Working Group 2B.

Dono G., (2003), *Costi della distribuzione idrica per l'irrigazione nell'Italia meridionale e problemi della formazione dei prezzi dell'acqua per l'agricoltura,* Rivista di EconomiaAgraria, n.1.

Dono G., Giraldo L. e Severini S. (2010), Pricing Irrigation Water Under Alternative Charging Methods: Possible Shortcomings of a Volumetric Approach, Agricultural Water Management, 97 (11): 1795-1805. DOI: 10.1016/j.agwat.2010.06.013.

Gallerani, V., Raggi, M., Viaggi, D. (2005). *Pricing irrigation water under asymmetric information and cost recovery constraints,* Water Science and Technology: water supply, 5,6, pp. 189-196.

Gallerani V., La Via G. E Zanni G. (a cura di) (2009): *Acqua e agricoltura in Italia: valutazioni di scenari e strumenti di supporto alle decisioni,* FrancoAngeli, Milano.

Görlach B and Interwies E. (2004) *Assessing Environmental and Resource Costs in the Water Framework* Directive: the Case of Germany Ecologic, Institut für Internationale und Europäische Umweltpolitik

Louviere, J.J., Hensher, D.A. and Swait, J.D. (2003). *Stated choice methods: analysis and applications.* Cambridge University Press, Cambridge.

Hanley N and Black A. R. (2006). *Cost-benefit analysis and the water framework directive in Scotland, Integrated Environmental Assessment and Management* Volume 2, Issue 2, pages 156–165, April 2006

Marangon, F., Tempesta, T. (2004). *L'inquinamento da atrazina delle acque sotterranee. Un confronto tra metodi alternativi per la stima monetaria del danno ambientale,* Aestimum, 44, 1-24.

Massarutto, A., Basoni, A., de Carli, A., Lodi, A., Paccagnan, V. (2005). *Studio di fattibilità concernente lo sviluppo dell'analisi economica dell'utilizzo idrico a scala di bacino del fiume Po così come prevista dalla Direttiva 2000/60/CE.* Autorità di bacino del fiume Po.

Massarutto, A., (2007) *Water pricing and full cost recovery of water services: economic incentive or instrument of public finance?*, Water Policy Vol.: 9 Issue: 6 Pages: 591-613.

Massarutto, A; Paccagnan, V; Linares, E (2008) *Private management and public finance in the Italian water industry: A marriage of convenience?* Water Resources Research Vol.44, Issue: 12 Article Number: W12425.

McFadden, D. (1974). *Conditional logit analysis of qualitative choice behavior.* In: P. Zarembka, ed. Frontiers in Econometrics. New York: Academic Press, 105-142, 1974.

Notaro, S. (2001). *Il valore economico di una risorsa idrica quale informazione di supporto per il decisore pubblico.* in Marangon F., Tempesta T., eds. La valutazione dei beni ambientali come supporto alle decisioni pubbliche. Forum, Udine, pp. 47-59, 2001.

Sardonini, L., Raggi, M., Ronchi, D., Viaggi, D. (2009). *A choice experiments approach towards evaluating household perception of environmental and resource costs attached to water scarcity. Paper prepared for 2nd International Conference on Water Economics,* Statistics & Finance, -Alexandroupolis, Greece, 3 – 5 July 2009.

Stampini, M. (1998). *Il metodo delle valutazioni contingenti e la valutazione del danno ambientale: applicazione a un caso di inquinamento di acque pubbliche*, Economia Pubblica,1, 89-117.

Travisi, C.M., Nijkamp, P. (2004). *Willingness to pay for agricultural environmental safety: evidence from a survey of Milan Italy residents In: Proceedings of the 13th Annual Conference of the European Association of Environmental and Resource Economics*, Budapest, Hungary, 25-28 June 2004.

Viaggi, D., Raggi, M., Ronchi, D., Sardonini, L.. (2009) Deliverables D41: Pilot case study results and D51: Best practice recommendations from pilot case studies . AquaMoney Project.

WATECO (2002). *Economics and the environment. The implementation challenge of the Water Framework Directive (WFD*). A guidance document.