Policy brief on the role of an integrated approach

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Water is an amazing substance—just a simple mix of two fundamental elements found scattered throughout the galaxy. The world was recently mesmerized by the search for water on Mars by smart machines because we understand that the presence of water may mean the presence of life. Here on our own planet, water means far more than simple chemistry. It is infused with cultural, political, environmental, and religious importance. If we understand these complexities, there is hope that we can move forward to solve our water-related problems. (Peter Gleick, The World's Water 2004-2005)

Valuation can be used in many ways: to assess the total contribution that water for food and ecosystems make to human well-being, to understand the incentives that individual decision-makers face in managing water for food and ecosystems in different ways, and to evaluate the consequences of alternative courses of action. Valuation is primarily used in the latter sense: as a tool that enhances the ability of decision-makers to evaluate tradeoffs between alternative water management regimes and courses of social actions that alter the use of water and the multiple services it provides. This usually requires assessing the change in the mix of services (values) provided resulting from a change in its management.

Most of the work involved in estimating the change in the value of the flow of benefits provided involves estimating the change in the physical flow of benefits (quantifying biophysical relations) and tracing through and quantifying a chain of causality between changes in ecosystem condition and human welfare. A common problem in valuation is that information is often only available on some of the links in the chain and then only in incompatible units. The challenge is therefore to make various disciplines better aware of what is needed to ensure that their work can be combined with that of others to allow a full assessment of the consequences of altering the various functions of water. The value of water for food and ecosystems in this sense is only one of the bases on which decisions on ecosystem management are and should be made. Many other factors, including notions of intrinsic value and other objectives that society might have (like equity among groups or generations) will also feed into the decision framework. *Even when decisions are made on other bases, estimates of changes in utilitarian value provide relevant information.*

Water valuation has, however, some limitations. Various characteristics of water make it more difficult to value water. It must also be noted that values are context-specific, depending on quality, timing and place of water supply. Values of water can therefore often not be generalized or up-scaled. A second issue that must be taken into account is that stated and perceived values or benefits (monetary or non-monetary) may not provide relevant or accurate information to base decision-making on. A third point is that gathering information on water issues may involve high costs due to their inherent complexity. These costs may be so high that it is no longer profitable to aim for a complete valuation. Thus the use of values for decision-making has its limitations. Careful consideration must be taken whether a comprehensive and costly valuation exercise will lead to accurate information that should be included

into decision-making processes. An alternative to valuation is establishing institutions (rules and regulations) that will ensure that the interests of the different stakeholders in water use (and allocation) are protected. As was described above, institutional settings determine to a certain extent the values that stakeholders hold. In some cases, these institutions can make explicit values, as do markets or market-based initiatives.

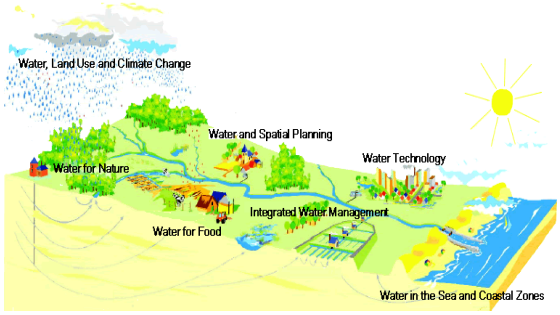

Figure 1: Wageningen Water Solutions

Figure 1 shows an illustration of the interrelationship between different water uses in a watershed, which are determined by both natural processes as well as human process. These different uses have different values to the stakeholders in a watershed. But a specific use at one location has consequences for the possible uses at other locations – uses are interrelated and therefore decisions on water must take into account these interrelationships. Thus a Land, Water and Ecosystem Management approach is recommended. One can think of different analytical windows for looking at this picture.

The first is the natural-processes window, which analyses the water, land and ecosystem interactions. This leads to the first insight. While the GWP definition of Integrated Water Resources Management (IWRM) refers to 'co-ordinated development and management of *water, land and related resources*', it still reflects the traditional focus of the water resources sector on the liquid water part (surface and groundwater) of the hydrological cycle. But as the figure shows, this is only part of the water in a watershed. Once we consider rainfall as the source of all freshwater and the land as a processor of rainfall, with water resources as one of its outputs, we are more ready to accept the view that ecosystems are providers of fresh water resources, rather than a new sector that is competing for water with the traditional water using sectors. Not irrigation, but evaporation is the biggest water user (the total of rainfed and irrigated agriculture only uses 7% of the rain; the major users of rainfall are the terrestrial ecosystems).

The second window analyses the human influence through land and water management. First are the direct impacts on water by humans. Natural processes are influenced by man-made infrastructure such as canals, dykes, wells, irrigation systems etc, which are quiet visible in the landscape. Invisible, but as important are the agreements on who can use water and how. Various stakeholders have rights to different parts of the water and different uses. These rights can be conflicting, as the use in one part of the watershed may conflict with the use in another part. Because water in linked in a watershed, *rights* over water are also linked. Decision-making on water allocation is basically a matter of assigning and re-assigning rights[1]. How these rights are assigned or redistributed can be done in different ways. Often this is done by a central government with authority over the whole watershed[2]. But the government can also decide to leave it to a community when it concerns common-pool resources (i.e. a subset of the watershed). A popular solution nowadays is for the

[1] If there are no rights, there is open access, which usually leads to rapid dissipation of resources

[2] It becomes more complicated when the watershed is divided over several administrative levels

government to allocate tradable rights, after which stakeholders can exchange rights and thus decide over water use. In this way, a water market is established. This system often leads the rights to be bought by those with the highest value, and sold by those with lower values. But in any institutional arrangement, third party effects will always be relevant, which is made clear by picture 1, and which calls for either government interventions, stakeholder consultation (e.g. multi-stakeholder platforms) or conflict resolution through formal ways (e.g. courts).

More indirectly, but not less importantly, *land uses* influence water flows through management decisions. An important land use is agriculture. Agricultural land managers will implement soil and water management practices (e.g. tillage, S&W constructions such as terracing), crop decisions (e.g. water intensive crops vs water extensive crops), irrigation decisions, which all determine the flow of water, the quantity and quality available for other options. But other land use decision such as planting or cutting trees can influence the water flows (groundwater and evapotranspiration) tremendously. Land management decisions are in turn influenced by environmental factors (soil quality, rainfall etc) as well as economic factors (prices, agricultural product markets, international trade policies).

Today's land use is the result of past decisions, made by many individual landowners who mainly considered the productivity of the *land*, *not water*. While they sometimes may also have considered productivity of the water resources, they will only have looked into the implications for their own property, not for the whole catchment. Even the investment decisions for public irrigation systems were largely based on the *return on capital*, not on the return on water. It seems justified, therefore, to expect that in almost all catchments the value that is generated from the rain can be increased substantially, by adapting current land use and water allocations.

Combining both windows, we can derive a checklist for better water management:

1. Do we have an overview of the major water consumers in our river basin?
2. Do we have an estimate of the benefits produced by the major water consumers?
3. Do we have evidence that there is scope for improving the overall (People, Planet and Profit) benefits from water use in our river basin?
4. Do we have evidence that the benefits expected from the proposed intervention(s) cannot be accomplished by more simple and less costly means?
5. Do we have evidence that the interventions that we propose (when adopted on a large scale): do not increase benefits of one P at the expense of the other P's and do not increase benefits of upstream users at the expense of downstream users?

It is therefore important to use an integrated approach that is able to combine the different disciplines in a watershed. This can support policy makers with respect to their decisions regarding water management as it can show the socio-economic and environmental implications for those directly concerned, and society more generally.

Policy Brief on the role of water valuation

Petra Hellegers

During the FAO/Netherlands International Conference on Water for Food and Ecosystems in February 2005 the importance of insight into the value of water was emphasized. But why is it so important? What kind of decisions can it support? Does it indeed contribute to the decision making process already in reality?

Water valuation is important because it enables us to have discussions and gain insight into trade-offs. It is not an instrument that solves issues, but a valuable analytical tool for understanding the nature of water and how its use can be controlled and influenced. This enables us to handle it and move forward to solve our water-related problems.

We distinguish four main purposes here, which water valuation can serve. The role valuation can play with respect to the bi-lateral water-related problem in respectively Ethiopia, South-Africa, India and Brazil is described in the grey Boxes below.

Valuation enables us to assess the implications of water reallocation and shows whether there is scope to improve the overall benefits of water use.

When water is scarce, allocation decisions should take into account the benefits of water to each user, the costs of service provision, and foregone benefits to users who do not have access. This kind of information can support policy decisions on the allocation of water among users, although criteria beyond simple profit and loss – such as social equity and environmental sustainability- will be hard to value explicitly (as it is difficult to define a single numeraire).

Box 1. In the Central Rift Valley in Ethiopia insight into the value of water will enable us to assess the implications of water reallocation among different farming systems as well as between food and ecosystems (water for National Park Abijata-Shala). This shows whether there is scope for improving the overall benefits from water use. Water resources in the area were already overexploited even before investments in greenhouses -producing vegetables and cut flowers- took place. The largest irrigated area is currently managed by smallholder farmers and state farms. Insight into the private as well as social returns on water for each of these farming systems can support policy decisions and justify new extractions with high returns in terms of the production value as well as employment, rural development, poverty alleviation etc.

Bi-lateral Water for food and ecosystems in Ethiopia project 2006 and 2007.

Insight into the value of water shows to what extent allocation and use can be guided by market forces or requires public intervention to serve objectives.

When there are multiple objectives and/or third-party effects, public intervention is often required. In the case where the value of water is substantially higher than the price for water (which is usually the case), a substantial increase in the price will be required to balance supply and demand of water. This may be politically infeasible as this will clearly have a significant adverse effect on farm income. Quantifying the water-related benefits can help to increase the willingness to pay for water-related services.

Box 2. In the Inkomati Basin in South-Africa insight into the value of water

will enable us to study the potential role of Payment for Environmental Services. The ability of downstream users to financially compensate upstream users to maintain or modify a particular land use that affects the availability of water resources will be assessed. Insight into the productivity of water in South-Africa, Mozambique and Swaziland can support policy decisions regarding transboundary water policy. Whether there is scope to improve the overall benefits from water use by means of PES will depend on the kind of benefits generated and the size of the transaction costs. When schemes generate social benefits, or when downstream beneficiaries are not willing to pay, external funds are often needed.

Bi-lateral proposal for 2007 Nr.32.

Valuation can justify water resource investment decisions.
Insight into the value of water is required when a social cost benefit analysis is needed to assess a society's returns from an investment. To judge whether an investment is worthwhile, we have to understand its implications.

Box 3. In the Krishna Basin in India insight into the value of water is required to justify an investment decision in a wastewater treatment plant. Within the basin there are a number of ways of balancing the demands from agricultural, industrial and domestic users. These include principally either redistributing water or spending a large amount on infrastructure to treat wastewater. What makes this basin interesting is that farmers use the existing wastewater, complete with its nutrient pollutants, to irrigate crops. It is hard to think of a solution in the basin in which agriculture is not affected either through the quantity or quality of water it receives. The approach taken is to use a social costs benefit analysis. It does not resolve the problems, but offers a method through which problems can be addressed.

Bi-lateral Krishna Basin project 2006

Valuation provides insight into the ability to pay for water, which is (when related to the costs of provision) an indicator for financial sustainability.
It is important to know who benefits from water use. Consumers may for instance benefit from irrigation through lower food prices. Irrigated agriculture may also support economic development in rural areas, providing jobs and supporting agro industries in areas, which should otherwise become depopulated. This explains why the government often subsidises part of the irrigation costs.

Box 4. In the Campos (Rio de Janeiro) area (delta Paraiba do Sul)in Brazil the value of water for the various beneficiaries will be estimated and the costs of provision, which gives an indication of their ability to pay and can support decisions regarding the level of charges for water (i.e. full- versus partial cost recovery). This kind of info is required to develop a financial sustainable system for water management.

Bi-lateral proposal for 2007 Nr.9.

Conclusion
In summary, valuation is a tool which is mainly important to improve insights and raise awareness. It is important to note that it is often based on various assumptions and that it is often difficult to define a single numeraire. Although many valuation studies have been conducted, the carry-over on policy decisions is rather limited. Although Payment for Environmental Services is very promising, it is not taking place on a large-scale yet. There seems to be a gap between the role it can play in theory and what we see in reality due to many challenges that remain especially with respect to the institutional aspects. It is therefore important to put this on the research agenda. Lessons need to be drawn from pilot cases, which have to become accessible in practical policy guidance documents (practitioner's guides).

Policy brief on the role of markets

December 2006

Gerdien Meijerink

In the past two decades, water markets have come up as allocation mechanisms for water. An important reason was the weak performance of many centralized management systems around the world, which showed low rates of cost-recovery, low productivity, high debt burdens and ultimately low service quality and coverage. The notion of water as an economic good was reinforced in the early 1990's and this contributed the increased importance of cost recovery and economic performance of water allocation mechanisms. This further led to a shift of focus from government managed water allocation mechanism to market based mechanisms, which include privatization, decentralized mechanisms such as local or community allocation and management, and hybrid forms such as public-private partnerships.

However, during the FAO water conference in 2005, the question was raised whether market-based structures (water markets, pricing, public-private partnerships) are appropriate to safeguard public needs? Conversely, are centralized management systems fulfilling these needs?

The failure of centralized management systems

Water has long been seen as a "natural monopoly", implying that some centralised management system, such as a government should be in charge of water allocation and pricing. Thus historically, the government has usually been the one in charge of allocation. The government's role is particularly strong in inter-sectoral allocation, as the government is often the only system that includes all users of water resources and has jurisdiction over all sectors of water use (household, agriculture, industry, recreation and nature). In allocating water, the government can use different criteria, such as prior rights, equity, basic needs, or political pressure (lobbying). It is often assumed that public allocation intends to promote equity objectives – i.e. ensuring water supply to areas of insufficient quantity, protecting the poor, sustaining environmental needs and providing a given level of water to minimal needs.

However, the experience has been that governments are not always efficient, effective or fair, especially in developing countries, leading to a lack of access to water for many poor. Several reasons can be put forward for the failure of governments to allocate water effectively and fairly. But these different reason amount to the fact that often the expectations of what governments can and should do are too high, compared to what in reality governments can or cannot do.

The role of information and transaction costs

The failure of many governments to safeguard efficient and fair allocation of water has been attributed to a lack of leadership, others stress "political failure", or lack of administrative processes, especially in developing countries, which often have capacity problems. These are quite harsh judgments, and there is another way to look at the "failure of governments".

In general, there are very high information costs involved in allocating water. Information, including the value of water for different stakeholders, plays a major role in determining how and to whom to allocate water. Gathering this information can be extremely time-consuming and costly, as is illustrated in box 1.

Box 1: Pricing and information costs

In setting prices for water, the usual prescription is usually that the marginal cost of water should be used. However, in reality it very difficult to actually measure the marginal cost, because of the (information) costs involved. Implementing marginal cost pricing requires volumetric monitoring, which is very costly and difficult to administer. Secondly, the information requirements for an efficient system of administered prices are demanding and much of this information would necessarily be gathered by trial and error experimentation.

In the argument of marginal cost pricing, there is an implicit assumption that data on costs and demand are either given to the regulator or that the regulatory agency can readily obtain these data.

The marginal cost price approach has therefore been criticized by Nobel Prize winner Ronald Coase as being "blackboard economics". In theory (and on the blackboard) it is simple to calculate marginal or average prices, in reality it is too costly: transaction costs (in this case information costs) make it impossible.

Such transaction costs or information costs have long been ignored, especially when the government involvement was seen as the most appropriate in water policy and allocation. It is assumed that governments are all-knowing, have all the information necessary to make and enforce allocation decisions. Thus, it is assumed that they know the exact water requirements of different parties, have the necessary information to set (different) prices that will result in efficient water use (i.e. allocate water to its highest value and prevent excess use), know who is violating allocation rules (e.g. using more water than permitted), etc. In addition, the government is expected to have the capacity to act on this information, thus being able to allocate water to those who need it, set prices and collect the revenues, punish those who violate the rules.

Governments in developing countries that face capacity difficulties, will have difficulties in assuming all these roles and carrying out all these tasks, even when there is political will.

Are markets the solution? The importance of institutional context

In the light of the failure of governments to provide safe water fairly and efficiently, many have turned to more market-based mechanisms. It has been shown that in general markets or market-based instruments can constitute more efficient and even fair allocation mechanisms than public ones. Two market-based allocation mechanisms can be distinguished:

- exchange of water use rights
- (temporary) exchange of a given quantity of water between (neighbouring) users

In general markets and market-based instruments can be seen as exchange mechanisms, whereby the government sets the conditions and leaves it to private entities to engage in the actual exchange. This means therefore that market-based initiatives usually require active government involvement to create and maintain the necessary conditions for markets to operate. First and

foremost, property and user rights must be defined or allocated, and the legal and infrastructural conditions for trade must be specified.

An important issue in market-based allocation mechanisms is to whom the initial water (use) rights are assigned. This can differ from small scale users (e.g. farmers) to large private entities such as companies. Often market-based approaches are confused with privatization of water services, which are not entirely the same. Privatization means that property rights are transferred from a public body (government) to a private firm.

Markets and market-based instruments depend on complex legislative and administrative arrangements, and so are a product of, and are constrained by, specific institutional contexts. Governments in developing countries with weak capacity might not be able to ensure these complex legislative and administrative arrangement. Therefore, market-based initiatives might not always be a feasible option in developing countries.

Third-party effect

In some situations, markets can constitute fair allocation mechanisms, provided that the property rights to water are allocated fairly. But water usually does not stay within this market context and is typically reallocated spatially (e.g. downstream, into groundwater aquifers) and to other stakeholders. This effect is called "third-party effect". See box 2.

Box 2: Third party effects in Ethiopia

Ethiopia has adopted the Agricultural Development Led Industrialization policy as the main and overarching national development program. This policy framework is based on a market-based strategy including the creation of favourable investment conditions for intensification of agriculture. The area under horticulture and floriculture increases rapidly thanks to these enabling conditions. Property rights to use water have been given to farmers engaged in floriculture and horticulture. The third-party effects of water use by these irrigating farmers include pollution of surface water and decreased availability of water for nature, agriculture, industries and the fisheries sector. As a consequence recent development of ecotourism in the region may considerably be held back.

Especially the effect of water trade and use within markets on ecosystems can constitute important third-party effects, which are often ignored when water (or other) markets are established.

Conclusion

Centralized management systems are often not fulfilling the role they are required to fulfil, due to the huge information requirements and transaction costs. Information on values, costs, water needs of different stakeholders can be extremely difficult and costly to collect and manage. Market-based systems overcome these information requirements *in theory* through the "invisible hand" mechanism.

But well-functioning market-based structures depend on complex legislative and administrative arrangements. Secondly, a fair market-based system requires a fair distribution of water rights because these determine who can and who cannot participate in these markets. Therefore, a well-functioning market depends a well-functioning government.

But many developing countries, the government does not function well, due to various capacity problems. Therefore, markets are not an alternative, as markets and governments are not substitutes but complements.

New Issues

Payment for Environmental services

During the FAO/Netherlands International Conference on Water for Food and Ecosystems in February 2005 the role of Payment for Environmental Services (PES) schemes at catchment level was highlighted. In these schemes, upstream farmers are financially compensated by downstream users to maintain or modify a particular land use that affects the availability and/or quality of downstream water resources. PES schemes can help to promote the adoption of good agricultural practices through financially rewarding their positive environmental (water-related) effects. This can simultaneously support rural development, by generating direct payments to people in rural areas in return for their beneficial activities.

Despite the potential benefits of PES schemes, many challenges remain, especially with respect to the institutional aspects. Which governance structure is best suited (market or government intervention)? What is the most suitable contract? Who has the initial rights? What is the size of the transaction costs? Is a bottom-up or top-down approach more suited? Should the scheme be voluntary or compulsory? Formal or informal? How to make schemes financially sustainable? What should be the basis for compensation (land use, ownership or specific activities)? What is the amount of compensation to be paid? How schemes are financed is a crucial issue. When schemes generate social/environmental benefits, or when downstream beneficiaries are not able to pay, external funds are often needed and this begs the question whether they are able to operate independently in the long run. Schemes that do not rely on external funds are usually those that generate private benefits.

Role indirect instruments

Although water pricing and markets can lead to an efficient allocation in theory, there is at this point in time little empirical evidence of the effectiveness of these instruments in practice. The question was raised whether water management is not better served through indirect economic instruments like i) agricultural policies; ii) trade policies; iii) energy tariff policies for groundwater extraction; iv) policies to stimulate adoption of new technologies to increase water use productivity; v) globalization policies (i.e. emerging opportunities through supermarkets, horticulture and cut flowers; and vi) climate change policies (i.e. carbon sequestration and bio fuel policies). A first review showed that indirect instruments significantly affect trends in water use. It is therefore important to take account of water management objectives (i.e. reducing water use) when designing and implementing public policies, which affect farm-level decisions regarding crop production and marketing. Integrated Water Resource Management should go beyond water Management policies and also consider other public policies.

Water for Food, Ecosystems and Biofuels

Biofuels have come up as an important topic in recent years. What is unknown yet is what is the impact of increased demand for bio-fuels on water scarcity and land use (will it compete with food/fodder crops; will forests be transformed into plantations). Will it affect food prices, food security. Who will get the incremental income etc? As energy prices rise, we will increasingly see trade-offs between energy use on the one hand and food security and water conservation on the other hand. Insight into the major water consumers (agriculture, nature, bio-fuels) and their productivity will be required.