UNESCO-IHE
Institute for Water Education

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July 2006

# Water as an economic good: the value of pricing and the failure of markets

Value of Water

Research Report Series No. 19

# WATER AS AN ECONOMIC GOOD:

# THE VALUE OF PRICING AND THE FAILURE OF MARKETS


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H.H.G. SAVENIJE


JULY 2006

VALUE OF WATER RESEARCH REPORT SERIES NO. 19


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The Value of Water Research Report Series is published by
UNESCO-IHE Institute for Water Education, Delft, the Netherlands
in collaboration with
University of Twente, Enschede, the Netherlands, and
Delft University of Technology, Delft, the Netherlands

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## Contents

## 1. Introduction: the concept of water as an economic good

The concept of water as an economic good came up during the preparatory meetings for the Earth Summit in Rio de Janeiro of 1992. It was brought forward and discussed extensively during the Dublin conference on Water and the Environment (ICWE, 1992), and became one of the four Dublin Principles (see Box 1.1). The first principle says that water is essential and finite, requiring an integrated approach to water resources management. The fourth principle says that water is an economic good. However, since Dublin considerable misunderstanding remained about what the concept of water as an economic good really implies.

*Box 1.1: The Four Dublin Principles (ICWE, 1992)*

1. Water is a finite, vulnerable and essential resource which should be managed in an integrated manner.
2. Water resources development and management should be based on a participatory approach, involving all relevant stakeholders.
3. Women play a central role in the provision, management and safeguarding of water.
4. Water has an economic value and should be recognised as an economic good, taking into account affordability and equity criteria.

The interpretation of the concept "water as an economic good" causes confusion. Two schools of thought may be distinguished. The first school, here called the market proponents, maintains that water should be priced through the market. Its economic value would arise spontaneously from the actions of willing buyers and willing sellers. This would ensure that the water is allocated to uses that are valued highest. The second school interprets 'water as an economic good' to mean the process of integrated decision making on the allocation of scarce resources, which does not necessarily involve financial transactions (e.g. McNeill, 1998; Perry et al., 1997).

The latter school corresponds with the view of Colin Green (2000) who posits that economics is about “the application of reason to choice”. In other words: making choices about the allocation and use of water resources on the basis of an integrated analysis of all the advantages and disadvantages (costs and benefits in a broad sense) of alternative options.

This paper argues that water is a special good for which there is no substitute, that therefore its allocation is a societal question that cannot be left to market forces alone and hence that the price of water should not be determined by the market, and finally that, notwithstanding the foregoing, water should have a price in order to achieve two objectives, namely recovering the cost of providing the particular water service and giving a clear signal to the users that water is indeed a scarce good that should be used wisely.

## 2. Does economic pricing conflict with Integrated Water Resources Management?

The concept of Integrated Water Resources Management (IWRM) stems from the first Dublin principle (see Box 1.1). It implies four aspects (Savenije & Van der Zaag, 2000, pp.15-18):

a) considering all physical aspects of the water resources at different temporal and spatial scales (the integrity of the hydrological cycle and the related quality aspects);
b) applying an inter-sectoral approach, recognising all the interests of different water users (including environmental, social and cultural requirements);
c) giving due attention to the sustainability of water use and the rights of future generations;
d) involving all stakeholders, at all levels in the management process, giving due regard to women.

An interesting feature of these four aspects is that each of them, in different ways, may conflict with the first school's interpretation that "water is just another economic good that needs to have an economic price" (Savenije & Van der Zaag, 2002). This section attempts to show that a contradiction exists between the first and the fourth Dublin principle, if the latter is interpreted in a narrow market sense.

The first aspect of IWRM states that water is not divisible into different types or kinds of water: it is a system and it is fugitive (see Box 2.1). It naturally flows into a downstream direction so that upstream interventions affect downstream availability. Water may be groundwater at some stage, at a later stage it will become surface water. Earlier in the water cycle it was rainfall and soil moisture; but it all remains the same water. Use of soil moisture diminishes the availability of groundwater; use of groundwater diminishes the availability of surface water etc. Thus any use of water affects the entire water cycle. Related to this first aspect is the temporal variability. The availability of the resource depends on climatic variability, but also on land use and human interference, sometimes hundreds of kilometres away. Also demand varies over time, both in the short and long term, as the structure of the economy and population changes. All this makes it difficult to establish the value of third party affects (externalities) of any type of water use.

Consider, for example, farmers in an upstream catchment area of a river basin who produce rain-fed crops and who have managed to triple yields due to prudent agronomic measures, soil husbandry practices and nutrient management. It is known that the increase in crop yields decreases water availability downstream in the river. Do these rain-fed farmers therefore require a water right or permit for increasing their yields? If so, is it known by any measure of precision how much the additional water consumption is, compared to which baseline situation?

The second aspect of IWRM, to consider and balance all sectoral interests, limits the applicability of market principles as well. The water "market" is not homogeneous. Different sub-sectors (agriculture, industry, power, transport, flood protection) have different characteristics. There are important water uses that have a high societal relevance but a very limited ability to pay, particularly the environmental, social and cultural requirements. Yet most if not all societies respect these interests. Decisions on water allocation appear to be taken seldom on purely "economic" (using the word in the interpretation of the first school) grounds. On the contrary: governments generally take decisions on the basis of political considerations; sometimes, and in our view more often then not, governments are sensitive to and concerned with social and cultural and, admittedly less frequently, also environmental interests. Of course, economic and financial considerations are an integral part of these decisions but these seldom are the overriding decision variable. This pragmatic approach is in agreement with the second school of thought. Sometimes governments fail to allocate the water in accordance with societal needs. This is exemplified by the lack of access to safe drinking water in many rural areas in Africa. In this example 'less government more market' is unlikely to solve the problem because of a limited ability to pay of those affected.

The third aspect, calling for long-term sustainability, also makes the application of market principles difficult. Economic analysts can easily demonstrate that the future hardly has any value (in monetary terms). The discount rate makes future benefits (or costs) further than, say, 20 years ahead negligible and irrelevant. The market, by itself, will therefore ignore long-term benefits. This, like the previous aspect, illustrates that market thinking in this limited sense goes against stated policy objectives, and that additional state control is always likely to be necessary.

Finally, the aspect of participation, which by itself corresponds with the second and third principles of Dublin, requires decision-making processes in which the interests of all stakeholders are considered. This aspect further complicates the role of economic pricing in the allocation of water. It is for instance difficult to assess environmental externalities and internalise them in the price of water, especially in situations involving conflicting interests. The perpetrators of externalities usually evaluate damage less severely than other interest groups. Proponents of water markets tend to disagree with this point of view, since they believe that if a market is properly structured and supervised all different interests will be well accounted for. This may be possible for certain sub-systems (aquifers) or sub-sectors (irrigation; see e.g. Kloezen, 1998), but that it is not feasible for more complex systems in a multi-sectoral and multi-interest environment. The only country we know where the latter has been attempted, Chile, has recently (March 2005) approved a new water law that strictly circumscribes and limits water trading, among other things in order to control speculation and protect ecological interests. The new law seems to negate the many success stories of Chile's system of tradable water rights that have been published during the last decade.

*Box 2.1 Characteristics of water making it a special economic good (after Savenije, 2002)*

- **Water is essential**

There is no life without water, no economic production, no environment. There is no human activity that does not depend on water. It is a vital resource. The same can be said about air, land, fuel and food.

- **Water is non-substitutable**

There is no alternative for water. Economic theory is based on the existence of choice. But what alternatives are there for water? There is no alternative, there is no choice. The only exception is coastal cities that could afford to produce fresh water from seawater through desalinisation.

- **Water is finite**

The amount of water available is limited by the amount of water that circulates through the atmosphere on an annual basis. All the water stems from the rainfall. The amount of rainfall that falls on the continents is finite.

- **Water is fugitive**

Water flows under gravity. If we don't capture it it's gone. The availability of the water varies over time and so does the demand for water. It flows through our fingers unless we store it. Water is different from air and land, because these goods don't need to be stored: they are stocks, whereas water is essentially a flux. There are of course also stocks of water: groundwater aquifers and natural lakes. But these lakes and aquifers only can be used sustainably if they are replenished by the flux. We can store water artificially but then the stock is small compared to the flux. Annual recharge rates determine safe and sustainable yields, not the stocks.

- **Water is a system**

The annual water cycle from rainfall to runoff is a complex system where several processes (infiltration, surface runoff, recharge, seepage, re-infiltration, moisture recycling) are interconnected and interdependent with only one direction of flow: downstream. If the flow is interfered with upstream, downstream impacts result, and externalities and third party effects occur. Many downstream users depend on the return flows of (inefficient) upstream users; increasing the efficiency of those upstream uses will decrease return flows and impact downstream. If groundwater is abstracted from an aquifer, further down in the cycle at some later point in time less water will flow in the river. If waste is discharged at some point, damage is incurred somewhere downstream. A catchment is one single system and not the sum of a large number of subsystems that can be added-up or optimised in a regular economic model.

- **Water is bulky**

Although water is essential for almost any economic activity, there are not many examples of water being transported over any considerable distance, particularly not against the force of gravity. Where these transfers nevertheless occur, they concern water destined for high value uses (for the domestic and industrial sectors) and, in some exceptional cases, for highly subsidised agricultural purposes. Although normal commodities are shipped and wheeled throughout the globe, we do not send super tankers with water to drought stricken areas. We transport the produce instead: grains, textiles, dried fruit, etc.; commodities that house more than 1,000 times their weight in virtual water, the water required to produce it.

## 3. Why water is a special economic good

We have already seen that water is essential and finite. This combination makes that water is scarce in some river basins. The fact that water is scarce strengthens the argument that water is an economic good, in the sense that it cannot fully satisfy demand for all its alternative uses. Also, the fact that water is a complex system (see Box 2.1) can be addressed by economic modelling. It requires the integration of hydrological and economic models. This can be done, as demonstrated by e.g. Keyzer (2000), Rosegrant et al. (2000) and Cai et al. (2003). The fact that water is fugitive (see Box 2.1) would not be a problem either if it weren't so bulky.

Its bulkiness can best be appreciated by the enormous quantity of water required for the production of biomass. All uses that involve biomass require huge amounts of water compared to the benefit we derive from it. If the water is not naturally and easily available (rainfall), making this water available through engineering interventions is both difficult and expensive. Storing and transporting water from one place to another (as we do with normal economic goods such as fuel or food) becomes very expensive if large amounts of water are required for small amounts of produce. If, however, we could store and transport it easily (or cheaply) we could move it from an area of access (the source) to an area of shortage (the user), like we do with most commodities. This process could cater for the fluctuation of water needs over time. We could also transport water from downstream to upstream. A water market could deal with this efficiently and effectively. But besides exceptional cases, this is not done, because water is too bulky. A domestic or industrial water user may be willing to pay about 1 $/m^3$. A farmer, however, is seldom able or willing to pay more than a fraction of that amount. Although a price of 1 $/m^3$ appears low, it amounts to a lot of money if we realise that 1 kg of grains requires more than 1 $m^3$ of water. As a result, 1 kg of grains would have to cost at least 1 $ just to pay for the water input. Of course when a crop is rain-fed the water is available on-site and does not require transport or management interventions. Rainwater is considered for free and nobody pays for rainwater as a production factor.

Worldwide, water is traded in the form of its products: grains, timber, meat, fodder, fruits, flowers, etc. This is called the trade of "virtual water" (Allan, 1994), where one kg of produce roughly corresponds with one $m^3$ of water (a condensation of a factor of 1000). It is easy to show that it is more attractive to trade the products than the water. This applies to the international situation, but also nationally and within a river basin. To minimise the need for transporting water, food should be grown in places where land and water (particularly rainfall) are abundant. It is only for political reasons that food is grown in water-scarce areas. Hence it is more useful to think about a free and open food market rather than a free water market.

Another illustration of the bulkiness of water is that manufacturers minimise the water content of a commodity for transportation. To transport orange juice manufacturer first make a juice concentrate, which after transport is again diluted with water. Transporting water is almost always inefficient.

Moreover, water is non-substitutable. Although other economic goods have alternatives, water has none. Some economists disagree and argue that there are alternatives for water in the irrigation and industrial sectors; this is, in our view, suggestive. Irrigators can turn to water saving technologies or to less water demanding crops and thus use less water but they cannot substitute water for another liquid. In addition, there is a limit to the amount of water than can be saved: crops need to transpire a certain minimum amount of water to produce a certain amount of biomass. Similarly, industries can switch to water saving technologies, but certain processes simply require water.

For fuel one can choose between oil, gas, coal, wood, hydropower or solar power. For food one can choose between bread, pasta, rice, or maize. But what alternatives are there for water: rainwater, groundwater, surface water, …? It is all the same water from the same system, from the same source. There is no alternative, there is no choice; with only one exception: fresh water can be produced from seawater through desalinisation, and this is indeed an increasingly viable alternative source of water for coastal cities. But this water is far too expensive for other then industrial or domestic use, such as agriculture. Otherwise, fresh water is non-substitutable (see Box 2.1). The only choice to be made is how to allocate water and finding the most efficient way of using it. Water, then, is not an ordinary economic good; it is special (Grimble, 1999; Savenije, 2002).

Hence we are looking at a good that is essential, non-substitutable and too bulky to be easily traded over large distances. The consequence is that we should use it when and where it is available. There is no other economic good that has such a complicated combination of characteristics (see Table 3.1) that trading is unattractive besides in exceptional cases (such as with bottled water). As a result, water markets can only function if they are very localised and take account of the fact that water flows in a downward direction (e.g. in a micro-catchment or within a subsystem, such as an irrigation project).

*Table 3.1: Aspects of water and how they apply to other goods (after Savenije, 2002)*

| | water | air | land | fuel | food | Observations |
|---|---|---|---|---|---|---|
| essential, vital | + | + | + | + | + | |
| scarce, finite | + | | + | + | + | finite, high demand |
| fugitive | + | | | | | fluxes versus stock |
| indivisible | + | | | | | it is a system |
| bulky | + | + | + | | | virtual water trade |
| non-substitutable | + | + | + | | | |
| non-homogeneous market | + | + | + | | | see section 5 |

Although the above conclusion that water is not freely tradable is the most important argument to give water a special treatment, there are a number of additional aspects that make water complex in comparison to other economic goods. Economists would say that all of these aspects can be dealt with, but the fact that there are so many complications makes water very special indeed.

1. In many situations water must be considered a public good. In such situations markets will fail and it should be the responsibility of governments to make sure that there is safe access to water (for domestic and other

economic uses) and that society is protected from water related hazards. It should be noted, however, that it is not the responsibility of governments to provide water related services for free, a misinterpretation often made.

2. Most of the world's water resources are part of international river systems, and even if they are national they cross provincial or state borders. As a result there are different authorities that are responsible for the supply and demand of these waters, which is a complicating political and administrative factor.
3. There are high production and transaction costs involved even when gravity is used to transport water. To achieve water re-allocation all kinds of hardware are required, including diversion structures, pumps, boreholes, canals, pipelines, dams, reservoirs, etc. These structures are expensive to build, maintain and operate. Metering and billing often is complex.
4. There are macro-economic interdependencies between water using activities. Water use in agriculture affects industry, services, etc. Since water affects all economic activities the relations are complex. This can be dealt with, but certainly is a complicating factor.
5. There is always the threat of market failures in water supply. Partly this is caused by the fact that water is bulky. To reach economies of scale, large investments are required, which lead to natural monopolies in virtually all water services: hydropower supply, drinking water supply, irrigation, drainage, sewerage, flood protection, navigation, etc. Water works have the character of public infrastructure, where there is a choice between a state monopoly and a private monopoly. Only for urban water supply are there examples of successful privatisation processes, but these are also complex and highly demanding in human capacity for control.

In sum, the first (market) interpretation of “water as an economic good” led to considerable misunderstanding in the debate, both at the Dublin conference in 1992 and at the Earth Summit in Rio de Janeiro, later that year. This misunderstanding still continues. Many observers feared that the adoption of this Dublin principle would lead to market pricing of water, which would damage the interests of the poor and make irrigated agriculture virtually unfeasible. As a result, a number of disclaimers were added to the 4th Dublin principle, stating that water is also a “social” good and that water should be affordable to the poor.

In the second school water economics is understood to “deal with how best to meet all human wants” (Gaffney, 1997), making informed choices about the most advantageous and sustainable uses of water in a broad societal context. This is in agreement with the other Dublin principles and the concept of IWRM. Considering water as an economic good is about making integrated choices, not about determining the "correct" price of water.

Instead of market pricing there is need for defining reasonable pricing structures that aim at cost recovery but that simultaneously ensure access to safe water for the poor, while taking ecological requirements into account. Giving a reasonable price to water has the additional benefit that it sends out a clear signal to water users that water should be used wisely. The prime target of water pricing, however, remains cost recovery. Even then policies may opt for cross-subsidies (for equity reasons) or subsidised water prices (e.g. for irrigation water justified by multiplier effects of the sector).

## 4. The urban water bias

Why is the above message so difficult to convey? Much of the confusion about the economics of water may stem from the fact that many people appear to assume that the water issue is about drinking water, and particularly about urban water supply, where water pricing is an important and often hotly debated issue (as is the case in South Africa, for example; see Kasrils, 2001). The drinking water sub-sector is often confused with the much larger and much more complex water resources sector. Water issues refer to more than the Millennium Development on providing safe drinking water only. Although the drinking water and sanitation issue is one of the largest societal challenges of this century it is a minor issue with regard to global water scarcity (see e.g. Falkenmark and Rockström, 2004). The main issues in terms of water resources allocation are water for food, water for nature, sustainable use of water resources, closing water and nutrient cycles, water resources management in mega-cities, options for non-water borne sanitation, flood management, etc. These issues are of high societal importance, requiring substantial investments and hence are essential parts of economic planning. Yet they have little features in common with the urban drinking water sub-sector and cannot be solved by measures of privatisation and other market-oriented solutions, so often prescribed for drinking water. It is this (urban) drinking water bias, which leads people to believe that water is just another economic good.

If the water market is to function, it should at least do so in well-serviced parts of urban centres. In such areas potable water is provided to individual consumers directly through private connections, and consumption is metered. In such a specific case water may be considered a private good, because of its high excludability (the degree to which customers can be excluded from the good or service) and high rivalry (consumption excludes others from usage). Apart from bottled mineral water, this is the only case known to the authors where water indeed takes on most characteristics of a private good, since all other types of water use (e.g. water provided by public standpipes, water provided to an irrigation scheme with many small-scale producers, drainage, sewerage, flood protection, navigation etc.) have either a low excludability, a low rivalry, or both. If there is one sub-sector where the market should be able to function it is in those well-serviced urban areas.

In urban centres indeed a kind of water market exists; but quite a peculiar one. The water is priced volumetrically and many can access the resource on demand and consumers decide for themselves how much of the product to buy. However two important aspects distort the functioning of the market: the water supplier always is a monopolist; and in those urban centres applying an increasing block tariff, the most essential (and thus most highly valued) uses are priced lowest (the first block), whereas other less essential uses are priced highest (subsequent blocks). (See Box 4.1 on the price elasticity of demand for water.) So even in an urban environment, where pipe networks and pumping stations have overcome the bulkiness of water and provide the means to transport it against the forces of gravity and friction and where most users are indeed metered, no perfect market exists.

*Box 4.1 Price elasticity of demand for water (Savenije & Van der Zaag, 2002)*

With ordinary economic goods there is a relation between price and demand following a demand curve. The dimensionless slope of this demand curve is called the price elasticity of demand *E*. It is defined as the percentage of increase in demand resulting from a percentage of increase in price. This elasticity is a negative number since demand is expected to decrease as price increases and for water normally ranges between -1 and 0. The problem is that *E* is not a constant. It depends on the price, it depends on the type of water use and it varies over time.

Primary uses of water have a special characteristic in that the elasticity becomes rigid (inelastic; *E* close to zero) when we approach the more essential needs of the user (Figure 4.1). People need water, whatever the price. And for the most essential use of water (drinking) few alternatives exist, if any. For sectors such as industry and agriculture demand for water is generally more elastic (*E* closer to -1). This is because to some extent higher efficiencies can be achieved (e.g. introducing water saving production technologies, shifting to less water demanding products/crops).

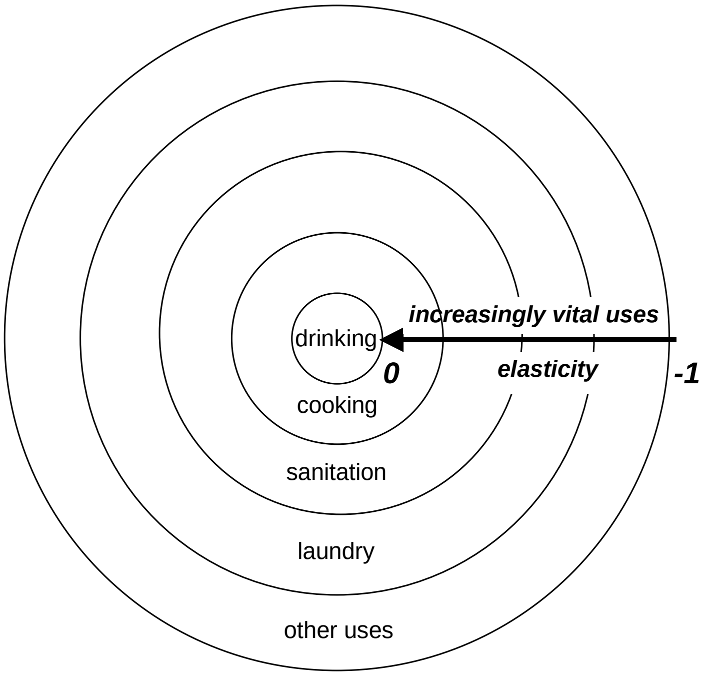


*Figure 4.1: Schematic figure of different uses of domestic water and their elasticities of demand (Savenije & Van der Zaag, 2002)*

The increasing block tariff system, by many societies accepted as achieving the best compromise between economic efficiency and social equity for domestic water supply, poses an interesting paradox. It prices the highest value use (the most essential requirements such as drinking and cooking) lowest (first block at "lifeline" tariff), and the lowest value use (less essential uses such as washing a car) highest.

## 5. The valuation of water and its alocation

We conclude this paper with two observations about water valuation that are, in our view, often overlooked.

*Valuing water*

Although being part of one and the same hydrological cycle, the economic value of water differs depending on when, where and how it occurs. Whereas rainfall is generally considered to be a free commodity, of all types of water it has the highest value (Seyam et al., 2003). This is recognised by many African societies, which is related to the fact that rainfall generally has a quality of pureness and is considered life-giving (Van der Zaag, 2005). The high value of rainfall may also be understood because of it being the starting point of a long path through the hydrological cycle (infiltration, recharge of groundwater, transpiration, moisture recycling, surface runoff, seepage, re-infiltration) (Hoekstra et al., 2001). Rainfall therefore has many opportunities for use and for re-use: in rain-fed agriculture, irrigation, for urban and industrial use, environmental services etc.

Water flowing in rivers therefore has a lower value than rainfall. But also this “blue” water has differing values, depending on when it occurs. Water flowing during the dry season (the base flow resulting from groundwater seepage) has a relatively high value, because it is a fairly dependable resource just when demand for it is highest. In contrast, peak flows during the rainy season have a lower value, although these peaks provide many important services, such as recharging aquifers, providing water pulses essential for ecosystems, and filling reservoirs for later use (“reservoirs transport water through time”). The highest peak flows occurring as destructive floods have a negative value. Based on a catchment in Southern Africa, Figure 5.1 depicts that the highest valued water in a river, the base flow, may only be 10 to 25% of the total discharge.

Thus whereas we talk about the same water belonging to the same water cycle, its value varies, depending on when and where it occurs.

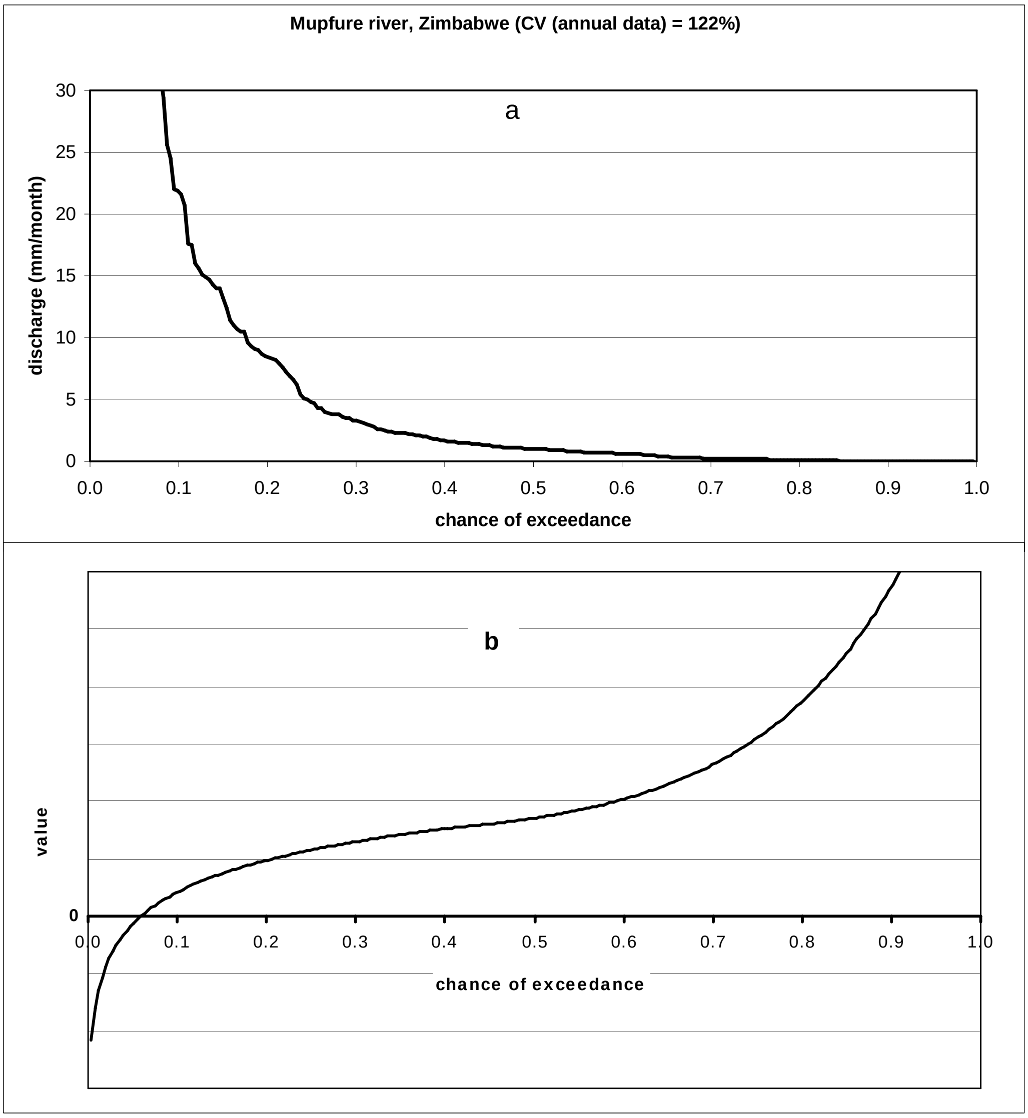


*Figure 5.1: Flow duration curve of natural flow in the Mupfure river, Zimbabwe (a); and an indication of the value of this water (b)*

### *Water allocation between sectors*

Some types of water use add more value than others. The classic case is the different value water has in the agricultural and urban sectors: the value attained in urban sectors is typically at least an order of magnitude higher than in agriculture (Briscoe, 1996). Economists then argue that, if water is currently used in the agricultural sector, the opportunity cost, i.e. the value of the best alternative use, may be at least 10 times higher, subject of course of "location and the hydraulic connections possible between users" (Briscoe, 1996). Thus a shift towards the higher value use is often promoted.

However, the water market in a basin is not homogeneous, especially between agriculture and urban & industrial water use:

1. Irrigators need a lot of water but have a low ability to pay; urban and industrial users need relatively little amounts of water but generally have a high ability to pay.
2. Urban and industrial users need water of high quality and high reliability whereas irrigators may accept water of lower quality and lower reliability.

The water needed for both sectors is not completely substitutable. In other words, the opportunity cost of water currently used in agriculture is much lower than the value of water for its highest use, namely urban and industrial uses, even if one only considers raw water, and exclude the cost of treatment. This is so because of two major reasons:

1. Whereas the opportunity cost of water for domestic water use may be highest, the moment availability is higher than demand, the opportunity cost of the water will fall to the next best type of use. It should be noted that this occurs frequently because of the stochastic nature of the flow regime. In such cases it will just not be possible to consume all the water at the highest value use. The proper opportunity cost for irrigation water may therefore be only half, or less, than the best alternative use (Rogers et al., 1997).
2. Water for irrigation requires a lower level of assurance of supply than, for instance, water for urban and industrial use: the same storage dam supplying irrigation water at 80 % reliability (failing once in five years), yields much less water for urban water supplied at 96 % reliability (failing once in 25 years). Figure 5.2 demonstrates this for a river system in Zimbabwe with a hydrological regime typical for many other rivers in semi-arid environments. Here the dam yielding a certain flow at 80% reliability can only provide between 50% to 65% of that flow at 96% reliability, depending on the level of flow regulation, as defined by the reservoir constant (the ratio of reservoir volume to mean annual runoff).

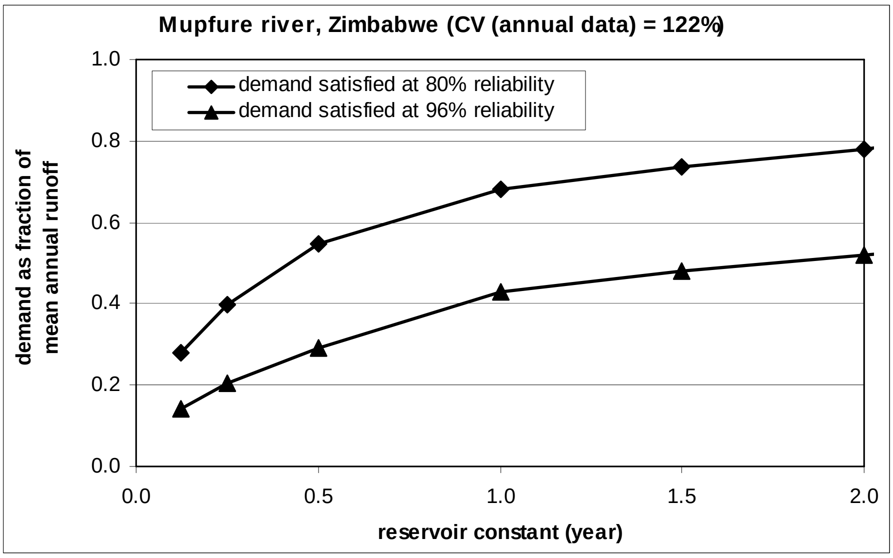


*Figure 5.2: Comparing the yield of a reservoir at 80% and 96% reliability*

The true opportunity cost of water is thus only a fraction of the highest value use. Figure 5.3 illustrates the variation of supply and demand in an imaginary case. It shows that, in general, primary (domestic) and industrial demands, with the highest ability and willingness to pay, require a high reliability of supply, which is normally achieved through relatively large storage provision. Also environmental demands are not the most demanding on the resource. Agricultural water requirements tend to be much higher, fluctuate strongly but also accept a lower reliability of supply.

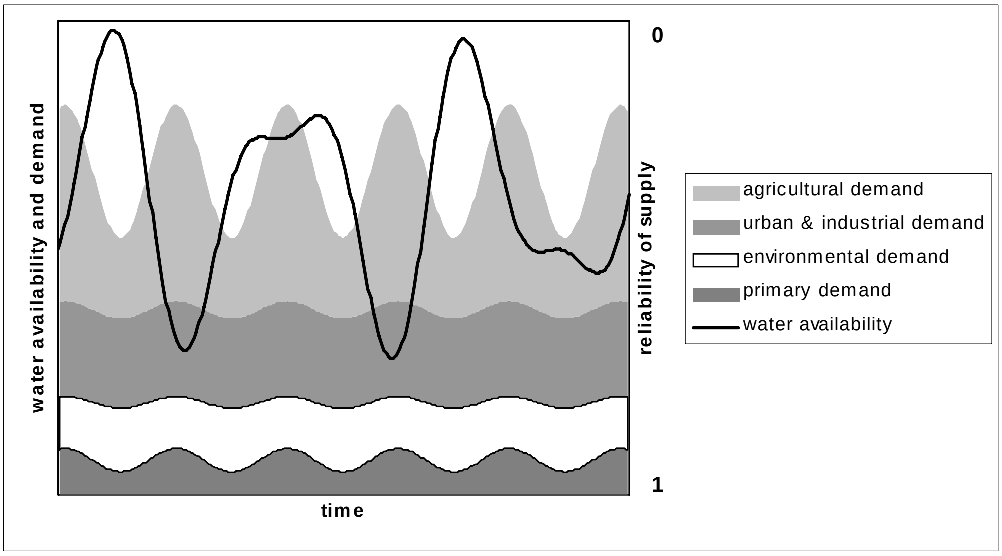


*Figure 5.3: Variation of water availability and demand, and reliability of supply (Savenije & Van der Zaag, 2002)*

The emerging picture, then, is fairly straightforward: the sectors with highest value water uses in most river basins require only 20-50% of average water availability, and these demands can easily be satisfied in all but the driest years. In most years much more water will be available, and this water should be used beneficially, for instance for irrigation. There is therefore no need for *permanent* transfers from agriculture to other sectors, except in the most heavily committed catchment areas of the world. What is needed is a legal and institutional context that allows *temporary* transfers of water between agriculture and urban areas in extremely dry years. No market is required to cater for such exceptional situations. A simple legal provision would be required, through which irrigators would be forced to surrender stored water for the benefit of urban centres against fair compensation of (all) benefits forgone. To enhance the transparency of such a measure, a system of well-defined water rights or permits is required. Whereas not all countries have such systems in place, if water really reaches scarcity levels, such a right or permit system is simply a must.

In those heavily committed catchment areas where permanent transfers of water out of the agricultural sector are required, normally voluntarily negotiated solutions can be agreed, provided the laws allow this to happen.

If there is competition for the resource, the essential requirements for urban and industrial users will always get priority over irrigators as a result of political priority setting, irrespective of the price they pay for water. This does not require a market; it simply happens. Admittedly, the resulting water allocation may not be optimal. This paper hypothesises that; as long as fair compensation is paid to those who are forced to surrender water, such a political allocation system is relatively efficient.

## 6. Conclusion

This paper has argued that water is indeed an economic good, but a very special one. Letting the market decide on the price of water has been shown to be at odds with the concept of integrated water resources management, as it will not automatically lead to the desirable allocation and use of water by society due to all kinds of market failures. Considering water as an economic good is about making informed choices about the use, conservation and allocation of water. Water pricing as such is, in our view, a financial issue, which should serve the purpose of financial sustainability through cost recovery, often (if not always) combined with cross-subsidies. Water having a price will give a clear signal to the users that water is indeed a scarce good that should be used sparingly. It will stimulate conservation, may curb demand and encourages the use of water for high value uses. Water pricing, interpreted in this sense, is consistent with the concept of integrated water resources management and with the fourth Dublin principle.

## Acknowledgements

The authors gratefully acknowledge the detailed constructive and critical comments on an earlier version of this paper by Colin Green, François Molle and three anonymous reviewers. We take responsibility for any errors of judgements that this paper may suffer from.

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