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Appreciation of water: four perspectives

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Abstract

The aim of this paper is — given current controversies in the field of water resources management — to formulate a limited number of coherent views. The paper starts with describing some of the major current controversies among water scientists and policy makers. These controversies refer to questions like: what factors determine water demand, what is the possible role of technology, how much water is available, what is water scarcity and what kind of policy to adopt under water scarcity conditions? It is shown for instance that pricing of water is only one particular way of appreciating water. As a starting point in the search for coherent views, the four 'perspectives' from the cultural theory of Thompson are used: the hierarchist, egalitarian, individualist and fatalist. It appears that current controversies in the water management field can be well understood from these four perspectives. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Water policy; Value of water; Perspectives; Cultural theory

1. Introduction

The question of this paper is: how to appreciate water in development studies? As Mahmoud Abu-Zeid, president of the World Water Council, notes: "The cultural and socio-economic values of water are still a very elusive subject. Several learned meetings stressed the economic value of water, while others stressed its social and cultural values. The importance of one or the other will vary from one society to another and from time to time, depending on the

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specific historical background, cultural heritage, extent of fresh water availability and the socio-economic conditions of the concerned region. Developing a unified approach is required, with clearly defined associated conditions and limitations for its applicability, which should accommodate the diversity of the world's regions.'' (Abu-Zeid, 1998). Stakeholders in water policy hold different views and use different terminology and even assume words differently. There is a clear lack of common vocabulary.

The aim of this paper is to look how the social sciences — and more particularly the cultural theory of Thompson, Ellis and Wildawsky (1990) — can contribute to developing shared understanding. The set-up of this paper is as follows. I start with identifying the major controversies in the field of water resources management. Controversies often betray the presence of differences in basic values, beliefs and assumptions. Secondly, the cultural theory is briefly described, insofar relevant in this context. In the third step, the controversies are placed within the framework of the cultural theory, which actually gives a better understanding of the different positions in the current debate on water.

2. Controversies

2.1. The concept of water demand

'Water demand' is not one clear concept, as it might seem at first sight. Different scholars use the term in different ways. Three main schools of thought can be distinguished.

The first common attitude towards water demand is to regard it as some kind of need that should be met. This approach takes population growth, economic development and the increasing demand for food as given processes that imply certain water requirements. This school of thought starts from the premise that human activities bring along a certain water need, which will or will not be met. Projections of future water demand are made on the basis of growth scenarios for population, agriculture and industry and assumptions with respect to efficiency improvements. This approach can often be found among engineers. Shaw (1994) for instance contends that ''once the needs of an area have been established, and some continuing requirements for the future made, then the engineer must investigate the availability of the resources''.

Another view of water demand is that water use is a necessity only if it is related to the fulfilment of basic needs, such as for example drinking, cleaning and food preparation (Gleick, 1996). A distinction is made between basic human and environmental 'needs' for water and the much larger set of 'wants' for water to provide additional goods and services (Lundqvist & Gleick, 1997). 'Needs' for water exist independently of economic or political status and, in principle, they cannot be manipulated. Water demands above the minimum requirements are considered a luxury and largely subject to social and political desires. Within this view, economic motives and political priorities are an important factor in establishing water demand per sector. Adherents of this view point out to the example of irrigation: governments have centrally planned most of the large irrigation schemes in the world. The same is true for domestic water supply schemes. A review of public water supply projects financed by the World Bank has shown that about 65% of the average supply costs are covered by public

funds (Serageldin, 1995). At community level, water demand is thought to be largely a function of customs and human behaviour, which may change through improvement of environmental awareness or through for example the imposition of water taxes.

A third perception of water demand is the economic view, in which water demand is considered subject to the price charged (Bower, Kindler, Russell & Sewell, 1984; Rogers, 1985). Economists often speak about 'effective demand' (Merrett, 1997). Effective water demand is subject to the willingness and ability of people to pay for water. According to this view, water demand and supply achieve (or should achieve) equilibrium through the price mechanism. Increasing water scarcity leads to higher prices, which result in lower demand and incentives to develop more efficient technology. According to Anderson (1995) for example, a 10% increase in price would decrease agricultural water use in California by 6.5% and cut overall water use by 3.7% in the 17 western states of the USA. Critics consider the economic view of water demand to be an ideal of economists rather than a reflection of the actual world. Anderson (1995) recognises this when he notes that despite the evidence that most water projects do not make economic sense, political pressure continues to allow these projects to proliferate because the interest groups that capture the benefits constitute a formidable political force.

2.2. The concept of water availability

There are different approaches to define water availability as well. One approach is to take the total annual runoff in a river basin as a measure of water availability in that basin, on the basis that fresh water is a renewable resource and the renewal rate is therefore a measure of water availability. Many authors divide the total annual runoff in an area by the number of people in that area, to obtain a measure of the available water resources per capita (Kulshreshtha, 1993; Seckler, Amarasinghe, Molden, De Silva & Barker, 1998; Shiklomanov, 1997; WRI, 1996). An advantage of this 'total runoff approach' is that water availability is defined in an unambiguous way, leaving no room for dissent other than over the runoff data. A criticism on this approach is that it does not account for losses due to flood-runoff, runoff in remote areas and pollution, thus giving a profound *overestimate*. Another kind of criticism is that it only considers the possible supply of *fresh* water, ignoring the possibility of desalinating seawater. According to this latter point of view, the approach yields a *conservative* measure of water availability.

Some authors regard the total runoff in a river basin as the upper limit to water availability and propose reductions for losses due to flooding and runoff in uninhabited areas (Ambroggi, 1980; Postel, Daily & Ehrlich, 1996). This approach results in a much lower assessment of water availability than if one were to consider total runoff (Fig. 1). On a global scale, Ambroggi (1980) arrives at a figure of 23% of the total runoff and Postel et al. (1996) at a figure of 31%. A further reduction could be made to account for dilution requirements and to guarantee a certain minimum runoff for maintaining aquatic and riverine ecosystems. A final factor of importance in water availability is climatic variability. It would be better to use a dry year for calculations rather than an average one, to ensure that the measure of water availability also applies in dry years. The 'reduced runoff approach' may have the advantage of carrying carefully balanced information on water availability, but the definitions used may give rise to many different interpretations and calculations.

Defining water availability on the basis of total or stable runoff carries a difficulty that is recognised only by a few. The problem is that the actual runoff from a basin is already affected by water withdrawals, which makes it a measure of water leftover rather than a measure of total water availability. If water withdrawals are relatively small, the difference can be ignored, but if people withdraw and evaporate a significant amount of the net precipitation, the effect will be significant. In the Colorado basin, for example, the remaining flow to the ocean has become nil, due to the intensive use of water in the basin (Schwarz, Emel, Dickens, Rogers & Thompson, 1990). However, the fact that *actual* runoff has become zero does not mean that the water availability in the basin is zero, only that the available water has been fully consumed. To get a more accurate picture of water availability, it would be better to consider *natural* runoff, understood as the runoff that would be measured if there were no consumptive water use. Natural runoff could be defined as actual runoff plus the volume of consumptive water use.

In the views discussed above, water is perceived as a renewable resource. Water can however also be regarded as a non-renewable resource, especially in cases where humans have to rely on groundwater (Rogers, 1985). A common example is when the water in rivers and lakes is too heavily polluted for human use, so that people are entirely dependent on groundwater. This leads to falling groundwater tables, most pronounced if withdrawals exceed natural replenishment, and depletion of deeper aquifers. Additional pressures on groundwater availability are saltwater intrusion in coastal areas and other types of groundwater contamination. Two key words in this approach are therefore pollution and depletion, both

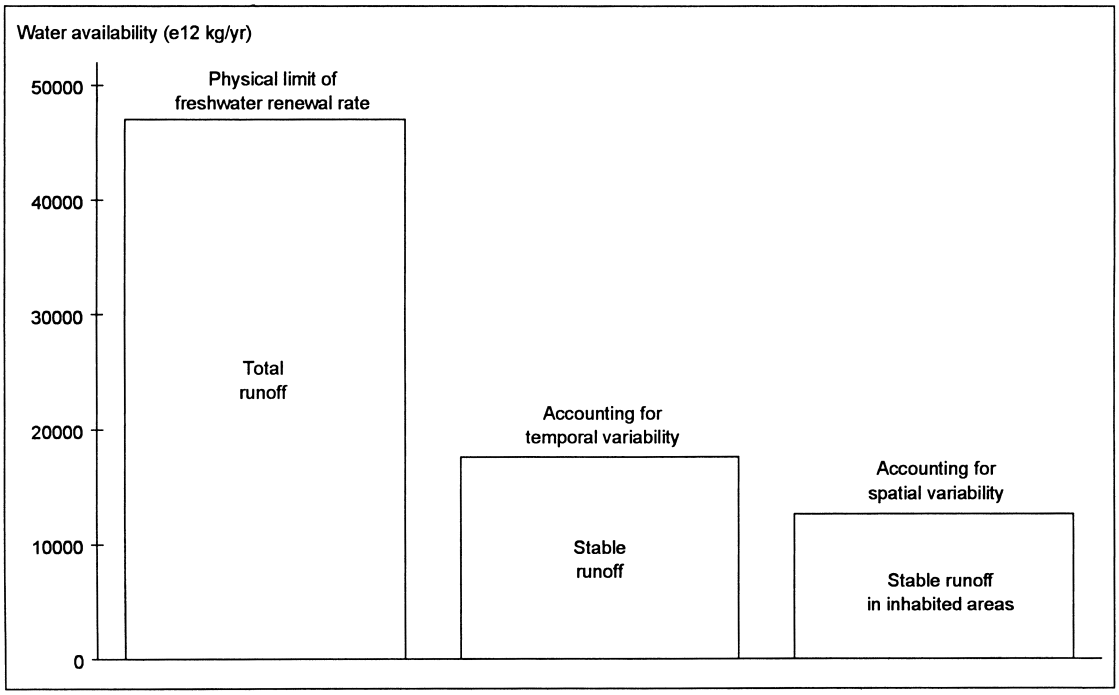

Fig. 1. Some perceptions of global water availability.

processes that reduce the stock of clean, fresh water. Available freshwater stocks are now more appropriate indicators of water availability than water flows. From this perception, the remaining amount of clean fresh water is clearly a better measure of the effect of pollution and intensive water withdrawals, and thus for the capacity for more withdrawals, than the ratio between water use and total (or stable) runoff. For the availability of fresh surface water, a proper measure could be the size of the stock that meets certain quality standards. This is an important measure, as rivers and freshwater lakes form only 0.22% of the total freshwater stock, while providing about 71% of the world water supply (Kulshreshtha, 1993). For the availability of fresh groundwater it would make little sense to consider the entire stock, as most groundwater is unexploitable. More useful information is for instance the depth of the groundwater table and the type of aquifer. Declining groundwater tables can be regarded as a signal that water withdrawal exceeds water availability. This would be better than assuming that groundwater availability equals groundwater recharge, because it takes into account the dynamic response of the groundwater system to withdrawals.

Although the concepts of water availability mentioned above differ considerably, they agree in their recognition of *some form of limitation*. However, as Falkenmark (1989) observes, it is by no means generally accepted that a limit to water availability actually exists. Both engineers and economists exhibit a certain amount of opposition to the so-called 'water barrier' concept. Their technological optimism leads them to believe that problems of scarcity will be solved through new technologies that can enlarge supply or make water use more efficient. A confirmation of this view is found in the growing capacity of desalination plants in many water-poor regions. In Saudi Arabia, for example, desalination of salt or brackish water already accounts for about 20% of the total water supply (Gleick, 1993). Because the oceans can be regarded as both the primary source and the ultimate sink of all water on earth, the possibility of obtaining our water from the sea implies, in principle, that there is no limitation on water availability, apart from a possible restriction from an energy perspective. Another possibility is water reuse after treatment (Dean & Lund, 1981) for either the same or a different purpose, thus creating a large new source of fresh water; only actual losses would have to be made up for from outside the recycling system. Other unconventional technologies to extend our resource base, attracting attention in recent decades but still in an experimental and conceptual stage and often regarded as mere fantasies, are weather modification through cloud seeding and towing icebergs to wherever water is needed. According to L'vovich (1979), ''the views of certain authors who believe that population growth and economic development will be limited by the shortage of fresh water can serve as the most vivid manifestation of pessimism''.

2.3. The nature of water scarcity

Water scarcity is a term that is often loosely used in different contexts. The term is used in arid countries where the dry climate is responsible for a continued state of low water availability. The term is also used to refer to temporary water shortages that occur as a result of a period of drought. If properly used, the term water scarcity always refers to a situation in which people have to compete over water. This often happens in arid countries (although not necessarily), but it happens in humid countries as well. Water scarcity thus relates to both climate and human activity. However, even if used properly

the concept of water scarcity is not unambiguous. It appears that different scholars have different perceptions of what scarcity is and of how it can or should be solved. Below, three extreme points of view are discussed. In the literature one can find all kinds of mixtures of these stereotypes.

One point of view is to regard water scarcity as a problem of water *shortage*. Water demand is seen as a given need and water supply as something that has to meet demand. If water supply does not meet demand, there is water shortage. Water demand is not considered a policy issue, but a fact emanating from population growth and agricultural and economic developments. The actual issue is understood to be the provision of enough water of sufficient quality for the relevant sectors of society, leaving enough to fulfil ecological requirements. Water scarcity is thus a *supply problem*. In this view, water policy should aim at proper management of the physical water system, an approach found all over the world. Attention is given principally to the analysis of available water quantities and qualities and the construction of a proper water supply infrastructure. If relevant, studies should include possible effects of erosion, consumptive water use and climate change. Water pollution is described in terms of the violation of water quality standards. Wastewater should be treated to bring it up to the required standards. It is perhaps not surprising that this line of thought is often found among natural scientists (e.g. hydrologists) and engineers.

Another point of view is that water availability is limited and that demand cannot continue to increase. Water scarcity is thus a *demand problem*. The augmentative demand is seen as the actual driving force behind growing water scarcity. Underlying forces are population growth and economic development (Falkenmark, Da Cunha & David, 1987). In nearly all parts of the world, the water utilisation level increases, which is a signal for action in regions that have reached critical levels. Water quality deterioration is a further consequence of the increasing pressure on the water system and this problem has to be solved at its roots. Wastewater *treatment* is not enough, wastewater *production* should be reduced. Solutions for water scarcity should somehow manage demand and thus human behaviour. As La Rivière (1989) states, a water management project should lean toward increasing the efficiency of water use rather than toward increasing the supply of water. The only exception might be primary needs such as drinking. In this view, minimum water requirements (small but important) should be fully met, while remaining demands (large and of secondary importance) should be reduced. A reduction in water use could be achieved by for example increasing 'water literacy' among the population and charging the full costs of water to the user with — if necessary — an additional amount in the form of a tax. The price of water for *primary* needs should also reflect the ability of people to pay (Young, Dooge & Rodda, 1994).

A third view of water scarcity is the economic one. Simon (1980) states that the only meaningful measure of scarcity in peacetime is the cost of the asset in question. A substantial group of scientists applies this view to water as well (e.g. Anderson, 1995). This idea has also caught on in politics, because one of the 'guiding principles for action', embodied in the so-called Dublin Statement (ICWE, 1992) is that "water has an economic value in all its competing uses and should be recognised as an economic good". In this view the cost of water is the most appropriate indicator of water scarcity. If the price mechanism functions well, factors such as droughts, pollution and increasing demand will automatically and properly be

accounted for in the water costs. Solutions to water scarcity are primarily sought through privatising water supply companies, introducing water markets and tradable water rights, and charging true costs to water users.

From the above it is clear that trade-offs between water demand and water supply policy options in a country or a river basin do not just depend on hydrological and socio-economic circumstances. Apart from the 'facts', a subjective element plays a role: which view on water scarcity dominates. Following the rationale of those who believe in limits to water supply and who feel that a global water crisis is close, one can understand their arguments for a radical change in demand patterns. However, following the rationale of people who do not really believe in a radical change in demand, one can understand their conviction that new water resources *must* be developed. Adopting the idea of markets as a regulating mechanism, one can understand why some believe that all water problems can be solved if water is treated as an economic good. In other words, it is easier to understand the different opinions in the debate on water and development if the basic attitudes and beliefs of people are taken into consideration.

Consider for instance the debate on dams. Building dams has become the pre-eminent engineering solution to water scarcity. The benefit of artificial reservoirs is their stabilising influence on a variable water inflow. This can greatly increase the stable runoff per year, which is often useful for a further expansion of water supply. Other purposes of dams are hydroelectric power generation, downstream flood control and improved navigation. A beneficial side effect might be the recreational value of the reservoir. Nevertheless, most of the plans for new dams today are heavily criticised. According to the opponents, the benefits of dams far from outweigh the disadvantages: loss of land and valuable ecosystems, forced displacement of people (in some cases hundreds of thousands, up to one million) and — after completion — evaporation losses, sedimentation and water quality problems (Pearce, 1992). The different points of view of dam advocates and opponents do not just reflect different results of a simple weighing of pros and cons, but can be brought back to more fundamental differences in the perception of scarcity and how people should interact with their environment. If water scarcity is perceived as a supply problem, it can easily be understood that dams are considered an important solution to water scarcity. Negative aspects may be serious, but *have to be overcome*. If water scarcity is perceived as a demand problem, however, dams cannot be regarded as a fundamental solution, and it is therefore wise to reject dam construction if there are negative side effects. In the more extreme case, dams become a symbol of the industrial mistakes of the past. From the economic point of view, dams cannot be regarded as principally good or bad. Plans for dams should be evaluated on the basis of a benefit–cost analysis, which might give different results in each case.

3. Cultural theory

As main references for the cultural theory, I use Thompson (1988), Thompson et al. (1990) and Schwarz and Thompson (1990). However, one of the roots of the cultural theory lies in the anthropological research of Mary Douglas. In her book *Natural symbols* (Douglas, 1970), Douglas introduced a group–grid typology of cultures, based on a comparison of social

structures and corresponding ideas about ritual, sin and self. She argues that the character of social relations can be described along two axes: group and grid. The group axis represents the degree to which an individual is incorporated into confined units. A positive score on the group axis means that an individual strongly feels that he or she belongs to a group. The grid axis denotes the extent to which an individual's life is circumscribed by externally imposed prescriptions, or in other words, the extent to which external rules determine someone's behaviour. A positive score on the grid axis indicates a high role definition, strong regulation of interactions between people and little room for individual choice. On the basis of the two dimensions, Douglas proposes to distinguish four types of social relations (Fig. 2). The combination of high group and high grid refers to social groups where individuals are involved with other people, but separated from them by numerous limits and boundaries. In the case of high group but low grid, all status is insignificant apart from one kind, the status involved in belonging to a defined group. Low group plus low grid means that individuals are free from social constraints: group organisation barely exists and fixed rules for behaviour are lacking. In the last combination, low group and high grid, individuals do not belong to a circumscribed group, but they are nevertheless constrained in their relations with other people.

The group–grid typology reappears and has been further developed in the cultural theory, where the four types of social structure are called 'ways of life'. The four ways of life are described as the hierarchist, egalitarian, individualist and fatalist (Fig. 2). To these, a fifth way of life has been added: the hermit, autonomous or ineffectual way of life, where the individual withdraws from coercive or manipulative social involvement altogether. The hermit escapes social control by refusing to be controlled or to control others. In this research only the first four ways of life will be considered, following Schwarz and Thompson (1990), because hermits

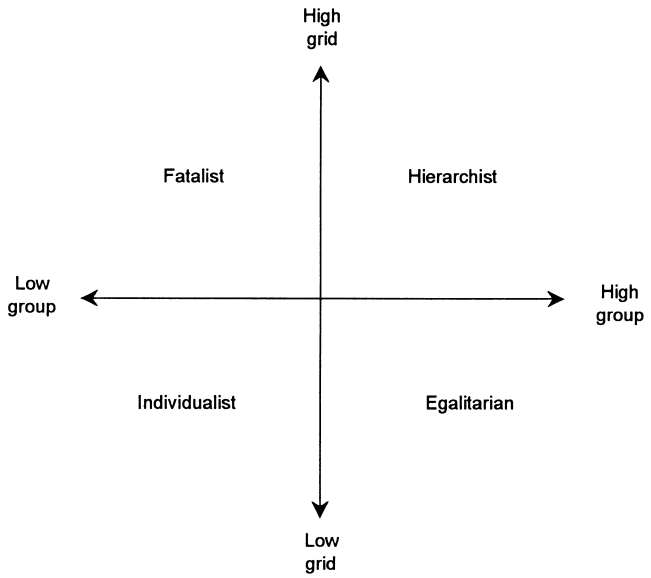

Fig. 2. The group–grid typology of cultures.

Table 1
Characteristics of the hierarchist, egalitarian, individualist and fatalist[a]

	Hierarchist	Egalitarian	Individualist	Fatalist
Social structure	high group, high grid	high group, low grid	low group, low grid	low group, high grid
Myth of nature	perverse, tolerant	ephemeral	benign	capricious
Rationality	procedural	critical	substantive	fatalistic
Knowledge	almost complete, organised	imperfect, holistic	sufficient, timely	irrelevant
Needs	given, unmanageable	social, manageable	individual, manageable	unmanageable
Resources	scarce, manageable	depleting, unmanageable	abundant, manageable	lottery, unmanageable
Management style	control, regulatory	preventive	laissez-faire, adaptive	passive
Learning style	anticipation	trial without error	trial and error	luck
Desired systems'properties	controllability	sustainability	exploitability	capability
Ideal scale	large	small	appropriate	no preference
Economic growth	desirable, with conditions	undesirable	desirable, unconditionally	desirable, good fortune
Desired technology	high-technology	small-scale technology	cheap technology	no preference
Salient risks	loss of control	catastrophic developments	threats to the free market	surprises
Risk-handling style	institutionalisation	reduction	taking the opportunities	acceptance

[a] Sources: Thompson et al. (1990) and Schwarz and Thompson (1990).

are not involved in social transactions within the fourfold system of hierarchists, egalitarians, individualists and fatalists and as such can be ignored. It has also been said that hermits 'leave the social map' in their ambition to attain total enlightenment.

Thompson et al. (1990) describe cultural theory as a theory about socio-cultural viability which explains how ways of life maintain (or fail to maintain) themselves. They argue that the viability of a way of life depends upon a mutually supportive relationship between a particular cultural bias and a particular pattern of social relations. It is claimed that there are five viable ways of life. As a result of societal and environmental changes, people can be dislodged from their way of life into a different way of life. A persistent pattern of surprises, understood as discrepancies between the expected and the actual, forces individuals to look for alternative ways of life which can provide a more satisfying fit with the world as it appears to be. It is claimed that each way of life depends upon each of the four rival ways of life, so that the plurality is not merely fortuitous but a prerequisite.

Table 1 shows how hierarchists, egalitarians, individualists and fatalists fit into the group–grid schematisation by Douglas, and gives some further characteristics of the four different ways of life. Thompson et al. (1990) point out that in particular the archetypes of the hierarchists and individualists have also been described in various social theories other than the cultural theory (Lindblom, 1977; Williamson, 1975). The hierarchist represents the bureaucrat, the technocrat, the manager–engineer. Hierarchies consist of confined social groups that are neatly ranked and ordered in relation to each other. By contrast, the individualist represents the entrepreneur, pioneer, adventurer, liberal, capitalist. A central element in market cultures is the autonomy of individuals and their freedom to bid against and bargain with each other. According to the authors of the cultural theory, this dichotomy cannot adequately describe the diversity of cultures. Many people reject both the individualism of the market and the inequalities of the hierarchy: egalitarians for instance, who stress the importance of cooperation and strive for social equality and voluntary relationships. The egalitarian represents the communard, the sectarian, the original socialist, the green movement. Finally, there are the fatalists, the marginal members of society, who experience life as a lottery, in which they are not able to influence events. Fatalists feel their behaviour is prescribed to such an extent that freedom of choice is minimal.

In the context of this study, it is most interesting to consider how each way of life faces issues such as scarcity, growth, technology, and the management of needs and resources. The typical response of hierarchists to resource scarcity is to allocate physical quantities by direct, bureaucratic means. Needs are regarded as given and unmanageable, so that the only strategy available to prevent shortages is to increase resources. By contrast, egalitarians believe that resources are given and finite, so that needs have to be reduced to ensure a reasonable supply of resources. Scarcity is perceived as a depletion of resources, due to overexploitation of nature. The solution is to change people's life-style and to opt for small-scale technology. Egalitarians have little interest in economic growth, because it will make it more difficult to attain equality. Individualists reject the idea that natural resources are limited, arguing that human skill and knowledge are the ultimate resource. Scarcity is perceived as the driving force behind a further refinement of this skill and knowledge. Human ingenuity is multiple: both needs and resources can be managed. Economic growth is considered a prerequisite for the continued development of science and technology and thus for survival. Fatalists, finally,

regard both their needs and their resources as unmanageable. Their management strategy involves coping with an environment over which they have no control. Nature is perceived as a lottery-like cornucopia, where resources might be abundant, but it has to be seen whether and when they will be available. Fatalists regard economic growth as good fortune for some and do not believe they can actively increase their own wealth. Chance may bring it their way.

Another issue of interest within the context of this paper is risk. Douglas and Wildavsky (1982) argue that the traditional distinction between objectively calculated *physical risks* and subjectively biased individual *perceptions of risks* is inappropriate to understand current controversies over risks. They show that these controversies can only be understood if the concept of risk is regarded as a social construct. Both private, subjective perception and public, physical science are closely connected to culture, shared beliefs and values. The apparatus of scientific investigation is as unique to a specific culture as are its results. As a consequence, risk assessment cannot be disconnected from cultural bias. Schwarz and Thompson (1990) and Thompson et al. (1990) elaborate on this argument and include it in their cultural theory. Each way of life has a particular attitude towards risks. The largest fear of hierarchists is that they might lose control. In response they strive hard to manage the entire risk system, which explains their readiness to set acceptable levels of risks. The largest threat to egalitarians is unbridled growth, resulting in catastrophic, irreversible and inequitable developments. Egalitarians tend to do everything they can to avert these risks. The largest threat to individualists is an improper functioning of markets. However, individualists are generally optimistic: risk is opportunity. If there was no uncertainty or danger of loss, there would be no prospect of personal reward and hence no scope for entrepreneurs. Lastly, the primary concern of fatalists is to cope with the surprising events the future will bring to them. Fatalists do not knowingly take risks, but through their passivity, they in fact accept ambient risks, whatever these risks may be.

4. Perspectives on water

4.1. An overview

In this section, the hierarchist, egalitarian, individualist and fatalist perspectives are elaborated for issues that in some way relate to water. Two lines of thinking have been followed and brought together (Hoekstra, 1998). First, reasoning along the line of cultural theory, it was asked: what perspectives on water can be deduced from the cultural theory? Second, starting from the current controversies on water policy issues (see Section 2), it was asked: what coherent perspectives may underpin the different points of view? It proved possible to bring both lines together reasonably well, without deviating from the main theses in the cultural theory and without distorting the prevalent views in the world of water policy researchers and analysts. The main characteristics of the four perspectives on water that have resulted from the two-way approach are presented in Table 2.

Table 2
The four perspectives on water

	Hierarchist	Egalitarian	Individualist	Fatalist
Water demand	a given need	a manageable desire	price-driven	an unmanageable desire
Water-conserving technology	large-scale technology push	small-scale technology push	price-driven	no policy
Water price policy	incremental price increase	water taxing	market pricing	no policy
Water availability	stable runoff	stable runoff in inhabited areas	total runoff or no limits	irrelevant to individuals
Water scarcity	supply problem	demand problem	market problem	problem of individuals
Groundwater use	inevitable	below sustainable level	desirable if cost-effective	profitable to a few
Artificial groundw. recharge	solution to water scarcity	should not be necessary	desirable if cost-effective	no policy
Artificial surface reservoirs	solution to water scarcity	undesirable	desirable if cost-effective	no policy
Water trade	controlled trade	no water trade	free trade	trade is for the rich
Food security policy	food self-reliance	food self-sufficiency	free trade	no policy
Hydrological cycle	robust within limits	vulnerable to perturbations	robust	unpredictable
Sensitivity of sea level	moderately sensitive	highly sensitive	insensitive	unknown
Public water supply	incremental improvements	basic supply to everyone	driven by economic growth	given to the rich
Water quality evaluation	functional quality standards	pristine quality as reference	economic value	no reference
Wastewater policy	treatment to meet standards	treatment, decrease production	'polluters pay' principle	no policy
Flooding risks	divergent risk levels	equal risk principle	economic trade-off	risk acceptance

4.2. The hierarchist perspective

A typical characteristic of hierarchists is to regard scarcity as a supply problem. Their management strategy is to look how they can manage their resources. Water scarcity is translated into a problem of how to increase supply in order to meet demand. Water demand is regarded as a given need, emanating from facts such as population size, economic development and need for irrigation. Water resources are available within certain limits. Stable runoff may be regarded as an appropriate measure of water availability and can be enlarged through construction of surface reservoirs and artificial groundwater recharge. However, the ultimate limit to water availability is total runoff. Hierarchists do not reject further building of large dams to increase stable runoff, although they recognise that the negative aspects of dam construction — often intangible and difficult to compare to the benefits — should be mitigated as far as possible. Groundwater use is regarded as inevitable, but the danger of overexploitation of aquifers is recognised. Artificial groundwater recharge might be a good solution, having the additional advantage of natural purification.

Interbasin or international trade of water is regarded as a possible way of improving the allocation of water, but it is seen as an issue to be regulated by governments rather than by free enterprise, due to the public character of water. Achieving food security is an important aim, but hierarchists do not consider it necessary to attain this goal by striving for food self-sufficiency. Countries should aim at some sort of 'food self-reliance', where food needs can be met through a combination of own production and a stable trading environment.

Hierarchists are willing to strive for more efficient water use, but regard efficiency improvements as seriously hampered by all kinds of social and economic constraints. As a result, one should not have great expectations of programmes aimed at the development or introduction of water-conserving technology, particularly not if one expects changes to come from collective efforts to introduce small-scale water-conserving technology. People should rather aim to develop and introduce high technology on a large scale (on the supply side, not the consumer side). Hierarchists are not inclined to push water prices strongly in the direction of real costs (market pricing), because a rapid increase in water prices would disturb socio-economic stability to an unacceptable extent. As their ultimate goal, hierarchists aim for a situation where water charges fully cover operational and maintenance costs. It is not considered fair that water consumers should have to repay all investment costs. An argument for this position is the importance of investments in public water supply for improving public health. In the case of irrigation, one might say that irrigation investments stimulate the general economy and that hidden taxes are often already imposed on farmers through price controls for agricultural products (Peterson, 1987).

Public water supply and proper sanitation facilities for everyone are desirable goals. However, policy targets should be realistic, as was shown during the International Drinking Water Supply and Sanitation Decade in the 1980s, when targets appeared to be unattainable despite successful efforts to include the Decade within the various international aid programmes.

Hierarchists, who perceive nature as tolerant, consider that disturbances such as global warming, land use changes and consumptive water use will alter the hydrological cycle to some extent, but not uncontrollably. It is assumed that disturbances can be assimilated as long as

they do not reach critical levels. An issue such as wastewater treatment becomes important if water quality standards are not reached. Standards can differ by type of water source and type of intended use. Hierarchists typically advocate the diversification of water use: clean groundwater for drinking, slightly polluted surface or groundwater for manufacturing or irrigation, more severely polluted surface water for cooling, etc. Risks of flooding are if possible regulated by formulating maximum acceptable risk levels and improving dykes or other defences to conform to these levels. Acceptable risk levels vary for different areas, from relatively high in undeveloped areas to comparatively low in highly developed areas.

4.3. The egalitarian perspective

Egalitarians, who perceive nature as fragile, are prudent in assessing water resources and take account of temporal and spatial variability. Stable runoff in inhabited areas may be an appropriate measure of water availability, but in addition indicators of excessive water use, such as for example the actual decline of groundwater tables and the remaining amount of high-quality water, are essential.

Water scarcity is regarded as a problem caused by growing water demand and pollution. The solution is supposed to be the management of human needs. Water demand is seen as a manageable desire that can be changed by policy incentives and shifts in social customs and preferences. Applying small-scale water-conserving and reuse technology can lower water-use intensities in all sectors. The egalitarian is more sensitive to communal programmes to introduce new technology than to an increase in the water price. As Gibbons (1986) observes, the risk-averse farmer facing water cost increases will be the last to switch to new irrigation techniques or to different crops which use less water. Nevertheless, to accommodate the environmental consequences of excessive water use, egalitarians advocate that such impacts are included in the price of water as a tax. However, everyone should have access to water to fulfil basic needs, which means that water should be free to people who otherwise would not have it.

Because egalitarians attach great importance to equity, access to safe drinking water and sanitation facilities for everyone is a principal policy goal. It would be typically egalitarian to promote a second International Drinking Water Supply and Sanitation Decade. The (first) International Drinking Water Supply and Sanitation Decade (1981–1990) was also an egalitarian initiative. The subsequent institutionalisation of the Decade was in contrast hierarchist achievement. In the egalitarian view, too much bureaucracy has meant that the goals of the Decade have been far from achieved. From a hierarchist point of view, this was instead a consequence of several kinds of inevitable social and political constraints, such as for instance insufficient involvement by women and political resistance to cost-sharing (see Christmas & De Rooy, 1991).

According to the egalitarian, the fragile dynamic equilibrium of the water balance is easily disturbed by human activities. Intensive water use, human-induced temperature change and deforestation may considerably affect stable runoff and the sea level. Fertilisers and household and industrial waste will not only remain in some hot spots, but will spread throughout the world (witness the fact that several manmade chemicals have already been found in Antarctica). According to the egalitarian, wastewater should as a matter of principle be treated before disposal. Even better than wastewater treatment is a reduction in wastewater

production. Bodies of water should if possible return to their pristine quality, i.e. the quality before significant human disturbance.

Egalitarians are strongly opposed to further building of large dams, arguing that the social and ecological costs of dam construction by far outweigh possible benefits. Groundwater use should be reduced to stop overexploitation of aquifers. As a measure of an acceptable level of groundwater withdrawal, one should not only look at natural recharge (which might give an overestimate), but also at the actual effect of withdrawals on water tables. Artificial groundwater recharge is not regarded as a real solution, because the water would have to be taken from surface waters that are vulnerable to overexploitation as well.

Water trade in any form is considered undesirable, because water is seen as public property. Importing or exporting water-intensive products (trade in virtual water) is undesirable as well. Transfer of water between different river basins is rejected from an ecological point of view. In principle, countries should strive for water and food self-sufficiency.

In the egalitarian view, risks of flooding should be first reduced in areas where risks are highest (equal risk principle). Egalitarians are most concerned with the protection of less developed regions, where poor but densely populated areas are exposed to regular flooding. In the case of increased flooding frequency as a result of land cover changes, erosion or climate change, preventive strategies are preferable to defensive strategies.

4.4. The individualist perspective

The perspective of individualists largely coincides with what has been described in Section 2 as the economic point of view: water is an economic good and should be managed as such. Individualists regard all options to improve water supply conditions as realistic, provided they are cost-effective. Efficiency improvements that reduce demand are often profitable, as they save not only water but also money. However, extending the resource base — for instance through exploitation of untouched aquifers or increasing desalination capacity — can be profitable as well. The right mixture of water supply and demand management will be a function of circumstances that are different in time, per region and per user.

Individualists consider total runoff the proper measure of water availability. Remote or flood flows can be made available if demand is large enough (which means if people are willing to pay). If water recycling and desalination techniques become more efficient and economically feasible on a large scale, water might even become an unlimited resource, so that the problem will no longer be one of availability but one of the efficient exploitation of water. The hydrological variability of water in time and space is not a real limiting factor to individualists, who regard free trade as the ultimate solution to carry water and water-intensive products (virtual water — see Allan, 1994) to the demand areas.

Water demand is determined by the price mechanism: higher prices as a result of increased scarcity will lower demand and stimulate the development of more efficient technology. If new water-conserving techniques become cost-effective, they will replace older techniques, prices will drop and demand will rise again. Individualists strongly discourage subsidies on water, at present common practice all over the world. Water prices should be established by market mechanisms. In cases of high water scarcity, high-tech options for water supply (e.g. desalination) could be stimulated by government institutions, but always on payback basis.

Individualists do not pursue an active policy in public water supply and sanitation, because they believe that economic development will increase public water supply and sanitation coverage adequately. Economic development is even regarded as a prerequisite for water supply and sanitation improvements. According to the individualist point of view, wastewater treatment is an economic trade-off. Application of the 'polluters pay' principle will force polluters to treat wastewater if this is preferable to paying for the damage caused by pollution (which has to be expressed in financial terms in some way). The value of a body of water of a certain quality depends on its economic value.

In the individualist view, reducing or accepting risks of flooding is an economic trade-off, which means that acceptable risk levels are a function of economic development. In line with their perception of nature as robust, individualists tend to regard possible disturbances of the hydrological cycle as of minor importance. If intensive water use, land use changes or global warming have some effect on the hydrological cycle, the resulting changes will occur slowly enough for people to adapt.

4.5. The fatalist perspective

According to fatalists, there are so many uncertainties that changes to the hydrological cycle can in practice be regarded as unpredictable. If even scientists disagree on global carrying capacity and possibilities of growth, and if policy makers propose contradictory types of measures, there is little reason to believe that people can knowingly improve their own future. Whether people are provided with enough clean water or not is seen rather as a matter of individual luck than as a matter of regional water shortage or abundance. Why else are people dying from waterborne diseases in many places in the world where water is said to be abundant? Questions such as 'is water a finite or infinite resource' or 'should water availability be measured as total or stable runoff' are considered academic questions which are irrelevant to individual people. Water scarcity is seen as a problem of individuals. Water is given to the rich, both in water-poor and water-rich parts of the world. The poor seem to lack adequate water supply and sanitation under all circumstances. Water demand is regarded as an unmanageable desire, which is or is not satisfied. Water trade is only possible for the rich people in power and does not benefit the poor. Risks of flooding are accepted and have to be handled, because fatalists do not feel they can reduce them.

Fatalists are not in favour of any particular management strategy, which means that their management strategy essentially comes down to doing nothing, merely coping with whatever situation evolves. In the fatalist view, people are unable to control the future, and even if they could, interests diverge and strategies would counteract each other to such extent, that the net result would be a lottery. An increase in water prices or the introduction of water taxes would not make sense, because one could question who would profit and who would suffer. Several studies show that it is the urban poor who spend the highest proportion of their income on water (World Bank, 1993). The chances are that increasing prices would make life even worse for the poor, without affecting the rich who can pay easily. Improving 'water literacy' among people through education, in order to conserve water, is not regarded as a very useful policy either. According to the fatalist point of view, the people who might learn most from these kinds of programmes are often not those members of society in a position to conserve much

water. The people who are in such a position are already well educated, but probably unwilling to give up their privileges (such as a shower, garden and private swimming pool).

5. Conclusion

In the previous, it has been demonstrated that many of the current controversies among water researchers and policy makers can be explained from the existence of different cultural perspectives. These perspectives differ in their underlying basic values, beliefs and assumptions.

It has to be stressed that current scientific knowledge does not provide sufficient argument in favour of one particular perspective. One reason is that uncertainties about the various interactions between man and the environment are still very large, leaving room for different interpretations of the available data. Another reason is that most of the water problems of today are not merely technical but strongly value-laden. Therefore, from a scientific point of view, it would be advisable to involve different perspectives in any development study. An additional argument for doing so is the fact that basic assumptions and perceptions influence the outcome of the analysis probably more than anything else does.

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