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Water, Societies and Sustainability:
A Few Anthropological Examples of Non-Market Water Values

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Abstract

In a sustainable development research context, how can the anthropological literature on social management of water be reread? This article proposes to recall—in the context of a certain number of studied societies, in cases where water management is entrusted to local users—why and how the economic argument is not primary. It will then examine the nature of a possible link between anthropology and economics, specifically identifying differences in rationales, and inviting us to take a closer look at the most enduring technical systems, in their relationship to the land and to the people who use them.

Key words
Non-Market Water Values, sustainability, rationales, anthropology, economy

Introduction

In July 2010, an article in the French newspaper *Le Monde* announced the creation of a traditional knowledge world bank near Florence, Italy, that would inventory, safeguard and promote sustainable techniques. In the main accompanying photograph, a water proportioning weirs from the Algerian oasis of Timimoun shows the comb's teeth that divide the water into as many shares as there are plots of land needing irrigation. In a smaller photograph, a proportioning weirs depicted on a wedding rug represents the lineage and interconnection of families in space and time (*Le Monde,* 11-12 July 2010).

Associating techniques with a society's modes of operating is an everyday matter in anthropology. People interviewed in the field encourage the correlations themselves, more or less consciously—and more or less veraciously—linking the precedence and perpetuity of technique knowledge to family genealogies, stories of sharing and heritage, events of a festive, mythical or traumatic nature: in other words the formative moments of the group's social existence. The mnemonic connections are operative and effective. Gestures and the transmission of knowledge and practices operate according to rationales that are known and shared by all[1]. These rationales are almost always more a matter of social organization than of economic rationality. Water management, at the very heart of societies, does not depart from these principles.

In one of the articles in this volume, Barbara Morehouse says that *Water is an idea, an icon, a metaphor, and a concrete reminder of our dependence on the natural*

[1] Without necessarily, moreover, and without contradiction, the whole of a system (of irrigation for example) being known by everyone (Netting 1974, Wateau 2000).

world. Water is also a weapon, a pretext, a frontier, a link, a trigger and, without any contradiction, a dialogue that is always open to questions of technical efficiency, economic profitability, egalitarian distribution, pollution. Water is a landscape component with extremely strong social interconnections; water is currently one of the particularly acute economic issues. This article sets out to recall, in the context of a certain number of studied societies, *and in cases where water management is entrusted to local users*, how and why the economic argument is not primary. The social prevails over the economic—at least this is what anthropologists seem to see, retain and show. Next we will question the nature of a possible link between the social and the economic, and sustainability, examining the differences between these rationales and inviting the reader to take a closer look at the most enduring technical systems, both in their relationship to the land and to the people who use them, in order that—maybe—some past heritage can be retained for the future.

The literature presented here is essentially—but not specifically—French, since we also have the opportunity to provide English readers with a summary of more recent French research related to the topic[2]. To the writings of anthropologists are added those of some geographers, socio-economists and political analysts, so much does the water management discussion motivate current research and constitute a wide-ranging interdisciplinary program.

Water: a mode of operation in society

Social anthropologists see, retain and show systems of water distribution where its economic value, strangely, barely holds their attention in the analyses. As they closely observe people in the field and attempt to get near to ways of behaving and thinking, it is other local organizational rationales that they bring to light. Anthropological texts on water societies, in contexts of both scarcity and abundance, address kinship, territory, hierarchy, conflict, identity, representations, symbolism or even patrimony. Water is treated as a context, a framework for reflection, a pretext, rarely as an object of study in its own right. Just as rare are anthropological studies whose conclusions reconsider water's market value or the system's technological and economic optimization. On the other hand, some of them are already able to anticipate the social effects of possible socio-technological and political change. It is no doubt here that their contributions are most open to interdisciplinarity.

Water, kinship and territory

In his work on Pul Eliya, for example, Edmund Leach (1961) shows to what extent the interweaving of the kinship system and the irrigation network is tight and complex. Although he stresses the fact *that the student of social structure must never forget that the constraints of economics are prior to the constraints of morality and law*, he focuses his interpretation of a Sri Lankan rice-growing society not on profitability, water depletion or the network's economic optimization (in fact he takes only a passing interest in the irrigation system), but on *the relation between land use and kinship within that very narrow territorial framework*. Thus is he able to explain how *it is much simpler for the human beings to adapt themselves to the layout of the*

[2] The extracts quoted from the French literature have been translated by the translator of the present text.

territory than to adapt the territory to the private whims of individual human beings and why the local endogamy is not a caste relic, but *the necessary corollary of the fixed layout of the cultivated fields and the equal property rights accorded to both men and women*. His approach is deterministic, but more than anything else it shows how, in complex and difficult geographical contexts, over the course of centuries, modes of social organization make physical and technical water distribution systems possible and perennial. The rationales that govern this distribution are social; water's division and its sharing order between irrigated areas correspond to the social hierarchy.

In the Nepalese village of Aslewacaur, in another rice-growing society, Olivia Aubriot (2004) shows that water distribution is also based on kinship, but with the addition of another referent: cosmology. Water is distributed and managed according to a genuine lineage rationale. It is based not on a technical rationale, but on egalitarian sharing of the resource between lineages. It is also based on precise temporal division and arithmetic, which forces the water to follow a steady pace, similar to the passing of time and reminiscent of the use of an astrological model that is particularly important in the everyday lives of Hindus. Thus the water clocks used by astrologists to determine the moment most conducive to the realization of collective action are also used in Aslewacaur to determine the duration of each person's irrigation. This link between the social and the cosmological enables the author to advance the idea that the structural inertia apparent in the irrigation system examined by Leach (*it is much simpler for the human beings to adapt themselves to the layout of the territory*) is here manifested as the rice-growers' desire to maintain a social balance and a traditional organisation. It is water's users who limit the contrast between irrigation structure and societal change. The irrigation system has its own share of social symbolism.

In the Portuguese municipality of Melgaço, I myself showed (Wateau 2002), for the irrigation of mixed farming fields, that water was distributed according to a land occupation seniority rationale, respecting a "circuit of deference." Sites occupied the longest are irrigated first, that is to say lands located near the church and those near the Roman road. Seniority is a social rationale of respect and priority—one that is applied outside of irrigation—which agronomic engineers did not succeed in decrypting by tracking the water's circuit over a period of one week. In fact, on this quite bizarre circuit, which takes place on a steep mountainside, the water "climbs" and "descends" by means of a set of small hatches with sliding doors; physical rationality (according to which water flows from top to bottom) or economic rationality (which admits of a flow from top to bottom and by contiguous parcels to prevent water loss) is not defended or given priority by its users (Fig. 1: the deference circuit). The social rationale is stronger than the economic rationale. It makes sense because it reflects values and principles that are part of history, that receive form and expression in the very land itself.

This way of associating techniques with modes of operation in society has other effects. With time, water infrastructures also become memory aids for social organization, regardless of whether these memory references are accurate or entirely erroneous. Thus in Madagascar, the canal has become a mnemonic aid for genealogy. Ingrid Hall (2008) explains that beyond two ascending generations, it is the structure of the canal that makes it possible to go up one level in the water heir lineage. It serves as a basis for the elaboration of discourse in terms of kinship. Defining one's

genealogy, in the still recent context of Madagascar slavery, also means making a statutory claim. Owning a share of the water enables one to infer the existence of shared origins, allowing someone who does not know his relationship to another water owner to say: "if we refer to the canal, we're relatives". The proportioning weirs, structures that divide up the shares of water, thus serve as technical, mnemonic and discursive markers. In a comparable way, in Aslewacaur, the water proportioning weirs are 'visible objects'; they are historical markers (Aubriot 2000, 2011). They reflect a territorial transcription of the social organization, and can serve as an archive to the villagers, who read their own history in this irrigation network, and use the water reference and this aid materialized in space to legitimize an ancient organization, rights or even to add to their historical narratives. Examples of links are many. In Melgaço, in an entirely erroneous way, some consider the current, extremely fragmented minifundia landscape to have resulted from the application of the 1864 egalitarian distribution of goods. Before then, they say, in the time of majorats, the lands belonged to the "three brothers", that is to say to three large, distinct groups—and yet this claim, which threw me off several times in the field, was resolutely invalidated by a geographer and a historian: the landscape here has nothing to do with kinship.

Consequently, we can see why meddling with water infrastructures and modes of distribution can deeply affect the system these societies use for understanding the world, by calling into question principles, values and representations; that is to say priorities that far outweigh the question of water.

Water, conflicts and identities

Water is an icon and a metaphor to which numerous conflicts are attached. Clifford Geertz, speaking of Morocco, summed it up well: water "provides as much [...] a vocabulary of argument as anything else" (1972), it serves as a pretext for altercation, it brings forms of power into play, it requires exchanges with others, and if one prefers to refer to Simmel (1920), it is one of the triggers that sets off the conflict that is formative for society. This characteristic, found in many places throughout the world, has its effects on how populations function.

Geneviève Bedoucha (1987), in a Tunisian oasis, showed that the installation of a new, more technically efficient proportioning weirs, while removing opportunities for conflict, at the same time removed opportunities for reconciliation: exchange obligations, the circulation of goods and the celebration of marriages between the four communities concerned with this water point. Technical performance did not translate positively into sociability. Sharing water, a sensitive matter that necessitates discussion and assumes some degree of altercation, forced *de facto* a search for solutions, compromises and agreements between the different parties. Negotiations and tensions constituted the social environment of these communities; water supplied a possible framework for asserting differences and identities. Here we have a clear example of how new technology changes social relations and how anthropology can analyse the social dimensions developed by users of a new irrigations system. To take a contrasting example, this time in a context of water abundance—and to avoid knee-jerk economic argumentation hinging on questions of abundance or scarcity—in Portugal's wet north-west, water is also the locus and pretext for the affirmation of conflicts and identities. In Melgaço, one fights not for water, but with the help of

water. On the occasion of the collective cleaning of irrigation channels, conflicts and verbal provocations relating to this resource arise, not so much over water itself, but as a reminder—through an activity that brings communities together—that all those present have been sharing the same rights and the same territory for generations, according to precise rules. Water contributes to claims of territorial affiliation, the naming and recognition of families, the reaffirmation of identities, and in particular to distinguishing oneself from migrants who have left the region (Wateau 2002).

When governments plan a diversion of water—so integral to identity and the territory—for the benefit more or less distant neighbors, conflicts can also break out with violence. The case of Spain is remarkable in this respect. In the Ebro basin, another site of abundance in north-west Spain, geographer Sylvie Clarimont explains very well why transfer policies benefiting the arid Andalusia region in the south are so controversial and violent. Water is a landscape component with very strong social connections. Water is bound to the identity of the Aragonese, who strongly reject the idea of supplying one of the place's characteristics to another region, especially for intensive greenhouse irrigation, which reduces water to the status of a mere economic attribute (Clarimont 2006). Regional disparities in terms of water, which are very marked in Spain, are regularly the subject of controversy. Here water is a symbol and a heritage in direct conflict with a market value. Wendy Espeland might interpret this data in terms of incommensurable values, whereby people refuse to accept choices that challenge their identities (Espeland 1998).

On the geopolitical level, and even outside the context of water users entrusted with water management, other geographers have corroborated this notion of water as an altercation framework, not an altercation cause: the conflicts generated around water are not conflicts sparked by water. "No conflict has broken out with water as the principal motive" (Wolf quoted by Laserre 2006). "The question of water can be a major element of regional tension [...] but often it overlaps with other territorial, socio-economic or political disputes, which it exacerbates." Thus "in the Arab-Israeli conflict, water is the very logical counterpart to the question of the distribution of territories and the survival of the economies they support; in the case of Egypt and the Nile, the desire for regional domination and, therefore, Cairo's geopolitical objectives, are not extraneous to the conflict; finally the Kurdish issue, used by Damascus but still a serious domestic problem for Turkey, is an important dimension of the dispute over the sharing of the Euphrates" (Laserre 2006). Marwa Daoudy (2005), too—in the particularly sensitive context of the sharing of waters between Syria, Iraq and Turkey—does not speak of war or of the market value of water, but rather of negotiations, respective positions, crises and phases of detente. Here again, the approach is societal. It is clear that water sharing aggravates clashes of interests, she says, but this does not mean it directly causes the emergence of military conflicts. Water management is ensured by the balance of power, not by one state maximizing its use of the resource[3].

[3] "At first glance we can assume that it is in the interest of states to maximise the use that is made of the water resources at their disposal. This dynamic would appear to be confirmed when the state acts unilaterally in advance. The power rationale will favour a dynamic in favour of more equitable distribution among residents. These consecutive phenomena of water-related, environmental and strategic insecurity overlap horizontally when this maximisation is at the expense of the security interests of another resident. Because even the most powerful state has security costs that cut into their ability to maximise their potential economically and in terms of water." (Daoudy 2005: 212)

Water, heritage and technical efficiency

Several works written over the past few years have recalled the relevance of ancestral water heritage as it relates to technical efficiency and social efficiency. As physicist Larbi Bouguerra (2007) tells us, after several millennia in operation, the Algerian *foggaras* and *meskat*[4] just might be restored by water technicians in the name of water architecture heritage, and also because as a management system it is ecological, it suits the specific environment and it also appears advantageous when regarded from the perspective of current desalination techniques that are very costly and polluting. He emphasizes the ethno-political ingenuity of societies in Maghreb, which is both a big user and a big saver of water (gardens, mosques, public fountains, religious ablutions). He points out that water has always reflected concerns for dignity, humanity and self-respect. Citizen participation in the discussion is encouraged. Archaeologist Patrice Cressier also stresses this expertise, praising the control of water in al-Andalus, the technical skill with which it is captured and used, as well as the management abilities and methods applied to this valuable asset (Cressier 2006). This sensitivity to ancestral water heritage, moreover, continues to spread, as far as the Web. Exactly the same observation has been made by environmental activist Anupam Mishra, who works to preserve rural India's traditional rainwater harvesting techniques and promote smart water management. He champions the idea that every community is self-sustainable and that an increasingly scarce and precious resource should be preserved. He also challenges modern water management technology[5].

In France, Michel Rouvière (2006), in his examination of the old small reservoir pond in the Ardèche region, while claiming not to be backward-looking, endeavors to remind us of the practicality of simple practices based on savings, which are of course intended for very small plots of land, but are environmentally-friendly, consume no energy, and suit the specific location, meeting its needs and those of the water's users. The sometimes very great complexity of these systems does not prevent them from functioning, and management errors and the existence of tensions ideally lead to a greater sensitivity to water management: unlike a faucet, the origin and destination of whose water one does not concern oneself with, this resource actually creates social links.

This is precisely what is happening today, in 2011, in the water management of some small hillside reservoir ponds in northwest Portugal, an example I will develop here. The practice seems archaic: a water reserve flanking a rock cliff, surrounded by a low stone wall (*poça*); a more or less regular inflow of water from one or several small streams and rain; an outlet *(pau)* to drain the contents of the pond twice daily; and an instrument for measuring and sharing out the water, to be graduated (*cana*) and readjusted for each pondful. Every day the beneficiaries are different; the quantity and volume of their share of water varies; the water circuit operates over 19 half-days; and there is an established water-taking rotation. It is an ancient practice: users of this *poça* speak of a primitive, pre-Roman system (B.C.), but it is certainly more accurate to correlate the use of this technique in the region with the late seventeeth-century arrival of corn, a thirsty plant that the frequent rainfall did not water sufficiently. It is a complex practice: rights-holder meetings need to take place twice daily, in the

[4] The former a kind of water mine, the latter a kind of impluvium.
[5] http://www.ted.com/talks/lang/eng/anupam_mishra_the_ancient_ingenuity_of_water_harvesting.html
See also Saurabh Gupta, 2011, about Politics of Rainwater Harvesting in Rural Rajasthan.

morning for the first pondful and in the afternoon for the second; a reed stick needs to be graduated and agreement needs to be reached on sharing; it allows small water thefts and sometimes violent conflicts, although as I have said, we are dealing with a context of abundance (3000 mm on the summits). And yet, when agricultural engineers suggest another system[6], the rights-holders join forces to defend and demand a traditional complex system, which rests upon a deference rationale and a principle of rotation (see above). What are the reasons for these demands? The different audiences who saw my film[7]—including the new generation of agronomical engineers at the University of Santiago de Compostela in Spain—certainly gave answers worth remembering. Some saw in this system "the establishment of democracy": admittedly a complex organization, but one that gives everyone the possibility of expressing him- or herself, one that is based upon an equitable rotation, one that, though it admits of differences in wealth among rights-holders, subjects everyone—both rich and poor—to the same rule of proportional sharing of water volumes. Others thought that, with inexpensive arrangements, this system could become the very essence of sustainable development: a way of sharing water that keeps people on the territory and forces them to be sociable, that does not pollute, that is perennial and efficient enough to be satisfactory on technical, economic and cultural levels. About ten or fifteen years ago, maybe they would have viewed it as folklore or as an emergency ethnology. Views on the environment and its management are changing; *It isn't easy being green* (Townsend 2009), but scientific research and current policies seem to be going to great lengths to do so. As for those I spoke with in the field, when I asked them what the future might hold for this simple water-measuring reed stick, they answered with this phrase in the film: "in principle, the future (of the reed) will always be the same. But one day we'll reach the point that land will no longer be cultivated and reservoir ponds will no longer have any purpose". What they think about and refer to is the abandonment of food agriculture or even cash crops, not the question of water or technology.

Water: a new issue of the twenty-first century

Of course, water serves economic interests, even at the local level. In northwest Portugal, it facilitates crop intensification. Everyone knows this and no one is under any illusions. But this is not the dimension that is stressed most in discourse. Water is a basic, implicit condition; it also supports territorial and identity claims. Of course the examples given here treat of small-scale management methods. Economics and economic issues certainly proceed very differently at larger scales, when larger populations are concerned. For economists, the value of water is linked to its scarcity. The more scarce water is, the greater its value. It must therefore be managed as well as possible through markets in order to ensure good governance. It is also agreed that scarcity generates covetousness, which leads to conflicts, thus legitimizing—at least partly—water control and centralized, modelled management. But the argument that

[6] In the 1980s, agricultural engineers attempted to create a distribution system that was rational from an economic and physical perspective, namely top-to-bottom irrigation through contiguous plots. In vain on the Portuguese side.

[7] For a more detailed description of the water sharing method, see Wateau 2001. An English version is available on the HAL SHS site at the following address: http://halshs.archives-ouvertes.fr/halshs-00630061/fr/.
See the film in English: http://video.rap.prd.fr/video/cnrs/cetsah/La_canne_VALg_Prog_stream.mov

scarcity creates conflict is precisely that which I have challenged in my own writings (Wateau 2000), to show that water conflicts could exist in regions abounding in water, receiving as many as 3000 mm per year on the summits. Water is most certainly involved in power play, in the exercise of pressure and tensions, but these tensions are rooted in situations that are much more complex and open-ended than those relating solely to scarcity, price or economic value. Unless scarcity itself is at stake in speculation and profits—on this subject see the Trottier's and Molle's particularly interesting work on political and economic intentionality in the structure of scarcity (Trottier 2008, Molle 2008)—scarce water has become a political and social construction, a good economic channel worth exploring, a trans-national idea to explore and especially to reinforce for some time yet. Water, in other words, is what we make of it (Linton 2010).

What anthropologists show—if they are not addressing the economics of commercial water—are ways of working together, complex organizations, specific rationales that are part of the history of places and populations, and are in operation because they are rooted in shared mindsets, learned by heart, that make sense to the great majority. Philippe Descola explained it very well in the context of the non-domestication of peccaries in South America (1994). These views, after all, are already well-known, though they are perhaps "detached by design". As a reminder: 1. "a new technique would not be adopted if it manifestly imperilled the identical reproduction of the socio-economic system's objectives and the values on which this system is based [...]. Thus, the considerable productivity gains made possible in New Guinea by replacing stone tools with metal axes did not lead to an increase in horticultural production, as good marginalist logic would have allowed us to hope, but rather to a reattribution of time saved to socially desirable activities such war and ceremonial life (Salisbury 1962 quoted by Descola 1994); 2. To be retained, a technique must next be compatible with the whole technical system into which it has been inserted; 3. In every technique amounting to a relationship between man and either living or inanimate matter (including himself), this relationship must be *objectifiable*. [...] Objectifying a technique assumes that the original relationship that it institutes between man and matter can be represented using the preexisting stock of relationships considered logically possible within the socio-cultural totality [...] I therefore consider "innovation" to be the product of a reconfiguration of elements already present [...]" (Descola 1994).

Models and patterns of thought

The problem that must be faced today is the way in which local and social, cosmological and symbolic rationales clash with global and economic, technical and efficiency rationales. Water management, like the management of other resources, is today not conceived at the local level, or even entrusted to local users. It stems from a conception and a system of management that have become global, and are now entrusted to traders, entrepreneurs or theorists who are sometimes far removed from the concrete realities of the land. Globalized (Schneier-Madanes 2010) or alienated water is the product of general models that one would like to apply to a diversity of physical, technical and social situations. But to this day, the models have failed to convince anthropologists. Only three simple, brief examples suffice to demonstrate the highly debatable effects of market rationales applied to water. From the sacred water of sub-Saharan animist societies to commercialized water, sociologist Catherine

Baron has shown how, with urban growth, an increasingly large segment of the African population now finds itself deprived of access to drinkable water. Two rationales clash but end up leading to a single model that, for sanitary reasons, results in the closure of free standpipes (Baron 2007). In Madagascar, sociologist Marie-Christine Zelem studied an NGO's development project, which reflected the twofold altruist modernization paradigm described by Olivier de Sardan (1995), demonstrating the clash between a foreign rationale and the rationale driving the target community. Of course setting up a water well in the middle of the village facilitated the work of women—who had until then been responsible for water—by shortening their long walk to the river. But the machine was difficult to handle and frequently broke down, necessitating a resort to men's strength, leading to an increase in women's dependence on men, and thus a loss of representative power (Zelem 2005). Finally in Morocco and Tunisia, since the 1990s, when new water management policies were implemented that involved, on the one hand, significant state disengagement from the distribution of this resource and, on the other hand, irrigators now being invited to assemble into more participatory, more implicated collectives, practicing irrigation appears to have become a riskier and more uncertain activity for the populations. Alia Gana observed, after three years of irrigation in the Zaghouan region of Tunisia, that half of the farmers had returned to dry food crops and sheep breeding. The reasons for this return are many. Evoked first are problems of a technical-economic nature, such as regular access to water not being ensured and quantities being insufficient; the quality of water that had excessive salinity; the price of water, also considered excessive. But in a more subtle and complex way, social obstacles appear as well, like farmers' dependence on a collective management system that, in this case, arouses a feeling of deep injustice and leads to the rejection of irrigation (Gana et al.2006)[8]. It is the water supply policy that needs to be directly questioned. And, following the example of François Molle, concerning the management of reservoir ponds, we will rightly consider "why enough is enough," and consequently how water scarcity could appear "as artificially created rather than the mere result of fatality" (Molle 2008).

Imposing behavior through policy, technology or economics, even through taxes or penalties, could hardly—and there are many examples—increase efficiency in the era of the search for sustainable development for the planet.[9]

The anthropological and the economic

No doubt anthropologists sometimes sketch somewhat idyllic landscapes, of societies that "work," where everything is said to be balanced or being balanced in terms of collective social values, suggesting that existing systems should be left as they are. But societies are also, and always, in the process of renewing and adapting themselves: to the abandonment of farmland, to metropolitization, to external influences, to globalization. And women, in part, though they are losing in representation, also know how to appreciate the fact that they no longer have to carry water home from the river, and how much easier it is to have a tap that serves the village or, even better, to have drinking water at home. So let us also not fall into a

[8] On irrigator associations and their limitations, see also Valony 2006.

[9] A beautiful text by Eduardo Viveiros de Castro compares Brazilian Indians to myrtle, growing back more beautiful after being cut by Catholic missionaries who, imposing a religion and a way of life by force, did not achieve their purpose in the period considered (Viveiros de Castro 1993).

passive and simply descriptive assessment, the appetence for ease and modernness being values that are shared by an ever-increasing number of societies. What remains is to find a happy medium, one that encourages anthropologists to speak more loudly and make themselves heard by decision-makers, not always observing dysfunction in hindsight, but placing themselves in advance of decisions, taking their place in civil society alongside economists, politicians and traders. It is no simple undertaking since, as Philippe Descola explains, our interpretations of societies are probably detached by design. Yet some anthropologists seem to thrive in this area, considering and proposing methods for better evaluating and overcoming risks, for example in the case of dam construction linked to population displacement (Cernea 2008). Let us ensure, in other words, that the anthropological does not fiercely oppose the economic, and that they can realise ideas and applications mutually. Fortunately, other sciences are working in this area. In particular, geography and political science offer complementary, constructive interpretations. Then it remains for economists to admit social sciences as science, and not just as more or less weak indicators of a human factor that is so subjective—not to say subversive. There is a long way to go. Because although quantity, quality and cost can be calculated mathematically, revealing the best "objective" options, their proper implementation must admit of the "subjective," the underlying culture, history, values and ideas that make a society distinct and not necessarily similar to a neighbouring society endowed with the same economic indicators.

In conclusion, let us remember that the societal issues of today are still: universal access to the resource, water of quality that respects the environment, more awareness and education about water so that management systems are better-adapted, making possible a "new water culture" at the global level. In the context of much-sought sustainable development, it is doubtless advisable not to reject traditional systems that have worked for some societies for over 2000 years. One should attempt to combine them with more modern and sophisticated technology. The impress of the past can furnish valuable lessons in the search for sustainable future perspectives. Let us not forget that in the field, technical efficiency often appears less important than social efficiency. In other words, when technology is effective, society still needs to be able to incorporate it and use it according to its own preference and relevance criteria.

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