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WATER SCARCITY:
INSTITUTIONAL CHANGE, WATER MARKETS, AND PRIVATIZATION *

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Abstract

A number of countries face water shortages because they need to make some basic changes in their water management. Policy options do exist. Most of them share the objective of treating water and water services as an economic good, by regulating private inefficient appropriation of open-access resources, and by making the demand for water less independent of users' willingness to pay for it. The aim of this paper is to provide an overview of these policy options by illustrating their rationale and possible caveats. We begin by stressing the importance of improving countries' social capital (i.e., institutional arrangements and management rules for allocating water between competitive uses). We then concentrate on some economic approaches to improving water management, i.e., the establishment of water markets and the privatisation of water utilities, by focussing on experiences and on-going developments in the United States and the European Union.

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1. INTRODUCTION

Increasingly, water scarcity is described as a major challenge facing the world (Postel, 1999). However, its definition remains a controversial issue. For instance, water scarcity is not an absolute concept, and is dependent on a number of factors besides water's annual availability. A number of countries face water shortages because they need to make some basic changes in their water management including, in some cases, infrastructural and institutional changes to facilitate management. Another group of countries have water shortages because they need to make management changes and develop new sources of water supply. A third group needs to change institutional arrangements for managing and allocating water.

Policy options do exist. Most of them share the objective of treating water and water services as an economic good, by making water demand less independent of users' willingness to pay for it. Policy options also include regulations and other instruments designed to help prevent the inefficient use of open access water resources.

The aim of this paper is to provide an overview of some of these management policy options by illustrating their rationale and possible caveats, both in terms of the available theoretical literature and real world applications. We begin in section 2 by stressing the importance of improving countries' social capital (i.e., institutional arrangements and management rules for allocating water between competitive uses).

In section 3 we describe a number of institutional issues that have arisen in the establishment of water markets and the privatization of water utilities. We also discuss some legal and regulatory changes that may be required if water is to be used more efficiently.

In section 4 we focus on water policies in the United States and European Union. The aim is to provide an overview of some ongoing developments, especially in regards to privatization and the use of water markets. National statistics in both areas seem to show a relative abundance of fresh water. Yet the persistent geographical water imbalances, the increasing importance of quality issues, the competition between traditional water uses and instream uses, and a reconsideration of the role of the public sector, raise serious questions regarding the traditional approaches to the operation and management of water services.

Finally, section 5 provides some general concluding remarks and policy suggestions.

2. WATER SCARCITY AND SOCIAL CAPITAL

The term scarcity is commonly used to describe smallness of supply compared with demand. In the case of freshwater, both supply and demand are open to different qualifications and definitions. As far as supply is concerned, a frequently used indicator of countries' freshwater availability is the total amount of internal renewable flows, generally evaluated according to annual and long-term average precipitation and evapotranspiration rates.

Although (per capita) internal renewable water flows may prove useful to highlight situations of relative abundance, or potential scarcity,[1] they may mask significant

1 Following Brouwer and Falkenmark (1989), renewable freshwater available in a country (TR) is defined as the total amount moving in rivers or aquifers; TR may be divided into the amount originating from «domestic» rainfall or by water received from neighboring countries in transboundary rivers and aquifers. According to the Falkenmark's water

geographical unbalances, and inter-annual or seasonal fluctuations: *ceteris paribus*, the higher these unbalances and fluctuations are, the more a country is prone to water shortages.

Providing adequate supply has several components. It involves providing an adequate quantity of water, of the required quality, where and when is needed. Fulfilling these supply conditions depends on a country's capital endowments, namely on man-made capital--infrastructures able to (re)distribute water over space and time and water treatment facilities--and on a country's social capital. The latter concerns the relationships between individuals, between institutions, and between individuals and institutions (Pearce and Atkinson, 1998). The empirical evidence suggests that communities relatively poorly endowed with freshwater, but which have been able to develop appropriate formal or informal resources management rules, perform better than societies which, despite their theoretical global abundance, are unable to properly allocate water resources between different users: ceteris paribus, the more binding are the economic and political constraints facing a society in developing appropriate man-made or social infrastructures, the more water scarcity is likely to emerge.

For water demand, a distinction should be made between water needs and the much larger set of wants for water to provide additional goods and services (Lundqvist and Gleick, 1997). Tracing this borderline is not easy, in that the concept of needs reflects individual and social value judgements, which vary over time and space. But if the term need is intended to mean «basic human requirements,» then it is possible to draw a distinction, within water demand, between what is independent of economic and social conditions, and what can be manipulated through prices, or other social and legal rules.[2] In this respect, it must be emphasized that in many countries, the lack of institutional arrangements aimed at regulating private appropriation of common (open access) resources, and the subsidization of water services, have helped transform the concept of water demand into one that should be more properly described as «water requirements under the expectation of quasi-null cost» (Arrojo, 1999).

The failure to treat water (and water services) as an economic good is also generally responsible for a circularity between rising demand, inadequate supply, and increasing (perceived) scarcity. When water is demanded at prices below supply costs, consumers do not provide enough revenue to expand water supply systems (Garrido, 1999). Consequently, users feel deprived of what they perceive as a need, simply because water demand has been derived, de facto, substantially independent of their willingness-to-pay for it.

The number of water scarce communities becomes large only when you add those who lack the economic, administrative, and political ability to reduce the water resource constraint. Many areas, around the world, fall within this latter category. But in many of these countries the current unbalances between water demand (wants for water) and supply could be bridged through improving their «social capital,» i.e., through appropriate institutional arrangements (demand-side management reforms).

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stress index, while a country with more than 1,700 cubic meters/year/person is expected to experience only intermittent and localized water shortages, the threshold of 1,000 cubic meters has been proposed as an approximate benchmark below which a country is likely to experience widespread and chronic shortfalls; at less than 500 cubic meters per capita, water availability becomes a primary constraint on socio-economic development.

2 Water for basic human requirements would have almost a completely inelastic demand.

3. IMPROVING WATER MANAGEMENT THROUGH INSTITUTIONAL CHANGES

For most of the U.S. and Europe the lack of water is not likely to be a major constraint to future increases in food production or cause people to change how they use water to meet their basic needs. However, future water availability may well depend on how fast both regions pursue policies to improve water management, including the introduction of water markets and the privatization of water utilities. Cheap water has weakened the link between any pending scarcity and innovation. Thus, while we work to conserve and substitute for scarce resources, we continue to use «cheap» water lavishly.

The rapid growth in water demands between 1940 and 1980 has forced a number of countries to rethink their approach to water management. The shift in thinking has been slow in coming but seems to have taken hold in some countries. The new approach has involved changing the role of government in managing water. More emphasis is placed on water as an economic good and less on the idea that since people have a basic right to water it should be provided no matter what the cost.

There is a growing realization that water management provides a bundle of services that can be divided up, with some of the services better (more efficiently) provided by the private sector (Easter and Feder, 1997). By unbundling services, the public sector can maintain its role where it is most important, i.e., protect against monopoly power, negative externalities, the under-provision of «public goods,» and the overuse of «open access» water. The private sector and market forces can then be used to help better manage and allocate water services.

The western United States, Chile, and Mexico have used the water markets approach fairly extensively over the past two decades. Water markets have also been developed for groundwater in a number of countries (Easter, et al., 1998). The privatization of public water entities has occurred more extensively in Europe and Latin America. England was one of the leaders when it sold off its public water assets to large private companies in 1989.

3.1 Institutional changes: objectives and constraints

Clearly, as a country takes stock of its water resources and considers the need for institutional change, they have to spell out their objectives and potential constraints. How important are efficiency considerations relatively to equity concerns? For example, how important are concerns about potential monopoly rents, or the ability of the poor to pay for a reliable and clean water supply? If the decision is to move toward an efficient allocation and management of water over time, a number of institutional arrangements need to be in place.

After examining their objectives, many states in the United States and countries in Europe would probably find that in the last two decades a higher priority has been given to cleaner water for recreation and ecological uses. This is illustrated by the decision to reallocate some of the water going to irrigation in the central valley of California to improving water quality for fish habitat.

Another objective that is important for some countries is the desire to reduce public spending, especially for large projects involving big physical changes in natural water systems. This is important in the United States as illustrated by the fact that the last major United States federal water project (the Central Arizona Project) was approved for

construction over 25 years ago. European countries also want to reduce public spending on the delivery of water services and are focusing on water quality for domestic services.

In designing their water institutions, European countries are more constrained because of the international nature of most of their river systems; most European rivers cross three or more countries. In the United States, only a few rivers cross more than one country, and those that do, cross only two countries. For example, the Mississippi River basin is almost totally within the United States' boundaries, while the Great Lakes involves only Canada and the United States. The United States, along with its two neighbours, has generally developed institutional arrangements (such as the International Commission on the Great Lakes) to coordinate the management of much of its international water resources. In contrast, if the Mississippi or the Great Lakes were in Europe, water management would involve at least six or more countries. The February 2000 cyanide spill from a Romanian gold mine illustrates this co-ordination problem. The spill first polluted the Tisa River (which flows into Hungary and Yugoslavia) before it reached the Danube River (Associated Press, 2000).

3.2 Water markets

Establishing the institutional and organization arrangements for effective water markets may not be worth the cost, until the value of water is high value at the margin or soon will be. The eastern United States and northern Europe have not reached this level of water scarcity and are not likely to in the near future (these areas are primarily concerned with water quality problems). In contrast, the western United States and southern Europe have sizable areas that face periodic water deficits (during years with low rainfall) and could benefit from establishing such arrangements.

To establish an active water market, water laws may need to be changed. Rights-to-water use must be authorized separate from land, and should be granted for a long enough time period and be secure enough to provide users an incentive to invest in water conserving practices. For surface water, this may require establishing priorities in water use, such as the seniority system for appropriative rights as used in the western United States. In the case of groundwater, where recharge is limited or nonexistent, volumetric rights need to be established. If rights are not clearly established, groundwater users will ignore the «user cost» or «scarcity rent» attributable to the groundwater stock. Consequently, the groundwater will be used more rapidly than is economically optimal. If recharge is adequate to replace the water pumped, then rights need to be established so that pumping does not interfere with neighbouring wells or with surface water rights. Where surface water and groundwater are closely linked, then water rights must be jointly established on some noninterference or volumetric basis.

While establishing a system of water rights is essential, it is also important to develop a procedure for registering, monitoring, and enforcing the rights. This can be done nationally, regionally, or locally depending on how the region's water management is structured. Many times it will be cheaper to do it locally, particularly if water-user organizations are active. Where return-flows or economic third-party effects are an important concern, some state or national involvement may be necessary to assure that the interdependency in basin's water use is taken into account. In some cases, sales of water rights have been limited to consumptive use or not allowed between basins because of possible third-party effects.

Once users can buy and sell water, institutional and organizational changes may be needed to broaden the market and make it more competitive. For example, improvements in canal infrastructure may be needed so that trading can take place over a larger area, e.g., canals connecting different systems. In addition, management may have to be improved so that orders to buy and sell water can be easily implemented. The managers may also need improved control structures so that they can easily increase the flow in one canal and decrease it in another.

Another important institutional arrangement for effective water markets is some mechanism for resolving conflicts over water rights and water delivery, such as a committee of respected water users elected by the community. The role of such a group would be closely tied to how well the water rights are specified and how they were established and distributed to users. If water rights are unclear, and the distribution contentious, then there will be numerous difficult conflicts that may have to be resolved, probably in court rather than by a committee of users. One of the contentious issues is likely to be how much water is allocated to ecological and environmental uses. As suggested above, this issue will be of growing importance in the future. Still, if water rights are clearly specified and their distribution is based on past use, then most of the disputes can be resolved by an elected body of respected users.

Since the assignment and allocation of water rights generally involves the distribution of significant economic rents, the allocation rules must be carefully developed in a transparent manner. In many cases this can be done based on past use, much like it was done in Chile, where water-use associations played an active role in verifying past use. However, this will not work when past water allocations significantly exceeded actual supplies. In cases where you have overlapping claims for water use, such as in Peru, then you may need a water court or tribunal to determine who has priority. Another possibility is to uniformly reduce all claims enough to balance supply and demand during a normal year's water supply. Some combination of setting priorities and reducing claims could also work.

3.3. Privatization of water services

Reforms addressing the water sector have, particularly in Europe, concentrated on reformulating public sector's functions and activities, and on involving new actors in the supply of water services.[3] For instance there is a tendency towards decoupling or stressing distinctions between water resource-planning and operation of water utilities. In addition, there is a trend towards introducing more competitive pressures in the water industry, an objective often, although not exclusively pursued, through involving the private sector in the operation and management of water utilities.

The latter process is generally broadly referred to as privatization of water services, though the term privatization is sometimes also used to describe restructuring processes not necessarily involving the private sector. These alternative processes may take on the form of decentralization, where local authorities take over control functions which were previously state-owned, or the form of corporatization of public firms. On the other hand, privatization, *stricto sensu*, occurs through sales of previously state or municipally owned

3 The term water services includes water abstraction, treatment and distribution, as well as interception and treatment of waste waters (sewage and sanitation systems). Although many considerations also apply to the latter, in this paragraph we will mainly consider freshwater supply.

firms, contracting-out of water services, or through granting a concession for a private company to run a water utility (Hall, 1997a).

Broadly speaking, the main theoretical justification for the involvement of private companies in the provision of water services is to increase the water industry's performance, i.e., to get better and/or cheaper services (Cowen, 1997). In fact, the private sector is potentially capable of injecting technological, financial and managerial resources which the public sector may be unable to obtain, because of fiscal and bureaucratic constraints, and the lack of adequate incentives (Spulber and Sabbaghi, 1994). This is also, in general, the prime justification advocated by governments when embarking on a privatization process, although other economic and political considerations may influence such decision. These considerations may include the desire to obtain receipts from privatization to reduce public sector debt and/or finance tax reductions and shifting the cost of providing previously subsidized services from taxpayers to water users. For instance, using privatization receipts as a way of «laundering» taxation is not uncommon.[4]

There are four different means of introducing more competitive pressure in an utility market which include: (a) product-market competition, (b) yardstick competition, (c) competition for the market, (d) competition to supply inputs. Product-market competition can be further divided into the three different ways it can be promoted: (i) the installment of competing networks, (ii) private supply and retail competition, or (ii) common carriage competition (Webb and Ehrhardt, 1998).

In general, installing competing networks is not a serious option in the water supply and distribution industry (Cowan, 1998; Webb and Ehrhardt, 1998). Although it should not be always ruled out,[5] duplication of networks is generally undesirable, given the current state of technology, in that it would imply losing scale economies and higher average water distribution costs.[6] However, the fact that existing main networks are naturally monopolistic does not mean that additions should be owned by incumbent operators (Cowan, 1998). For instance, reform of water services could in principle allow groups of consumers to supply themselves (private supply), or allow consumers to buy water from new operators (retail competition) (Webb and Ehrhard, 1998).

Shared use of existing networks by different firms (common carriage competition) is another option for injecting competitive pressure in a utility market. For instance, competition in telecommunications, public transport (railways), gas and energy have been, and are being mostly pursued by regarding transmission systems as a separate enterprise, and by allowing more firms to operate on the same system. However, opening up water distribution networks to common carriage may pose specific problems that need to be carefully addressed. One specific issue is that of water quality and whether the standards set can be safeguarded (Byatt, 1998). For instance, quality from different companies sharing

4 For example, in France, local governments have imposed an «entry fee» for water concessions, and successful bidders have then been able to increase water charge to cover the fee; in Spain, the successful company pays an annual rent which can be transferred to water charges (Hall, 1997a); the water concession in Budapest was awarded to the private bidder offering the greatest financial benefit for the municipality, although it involved a higher price for consumers (Hall, 1997b).

5 In some areas the available water distribution network may be so inefficient or provide such a poor service that the construction of a competing network could be economically feasible (Webb and Ehrhardt, 1998).

6 The only economically feasible competitive distribution networks are bottled water distribution systems, which are a minor (typically, a complementary) component of the whole water distribution system.

the same distribution network may vary, and once contaminated water (water not satisfying existing standards) flows in the system, it mixes with and affects water quality from other sources. This is a serious and challenging issue, but not an insurmountable problem (Byatt, 1998). Other network industries (e.g., electricity) face similar (though generally less severe) problems, and must ensure minimum quality standard and technical compatibility in order to avoid damages to the network (Webb and Ehrhard, 1998).

Although theoretically appealing, opening up existing networks is not a common mean for injecting competition pressure in the water industry. Even in countries which have adopted a strong privatization process, common-carriage is either prohibited by current legislation, or has not occurred to a large extent. In one of the few examples, OFWAT (the Office of Water Services in the UK which regulates the water industry) in 1995 relaxed the definition of a qualifying site for «inset appointments,»[7] and allowed new utilities to supply large consumers in an incumbent's interconnected system by paying a fee for using the system. Only a few cases of inset competition have occurred so far, but the interest manifested by various companies and customers to take advantage of the possibility of common-carriage has had an effect on incumbent firms. In response to the threat of competition, the vast majority of UK water companies have lowered tariffs for large users with cuts ranging from 1 percent to about 25 percent (Webb and Ehrhardt, 1998).

Yardstick competition is a potentially powerful means for regulating and putting pressure on incumbent firms when the intrinsic nature of the privatized utility does not allow the entry of an adequate number of competing firms. In particular, as far as the water industry is concerned, because of its naturally monopolistic features, a single company is likely to emerge in each location. However, comparative competition between geographically separated suppliers may be injected (either through setting an appropriate regulatory regime or through providing comparative information on charges and levels of service) in order to stimulate firms' efficiency and pass back efficiency gains to customers (Byatt, 1998). To be effective, comparative competition requires an adequate numbers of comparable agents, diversity of ownership, and consequent variety of management styles. It follows that a low degree of competition within the whole water industry, and/or mergers between firms may significantly undermine the potential advantages of yardstick competition.

Large initial investment requirements and economies of scale inevitably provide the incumbent firms with market power and reduce market contestability. However, the sector's performances could be improved through institutional arrangements designed to introduce competition for the market. In other words, competitive pressure can be injected through awarding the right to operate, in a given area, to the company able to submit the best offer in terms of overall quality and cost of the water service.

In recent years, many countries have used competition for water concessions, and the approach has often delivered substantial benefits to consumers (Webb and Ehrhard, 1998). While in developing countries the involvement of private companies, through awarding the concession to run a water utility, is often regarded as the only sustainable way to acquire an adequate infrastructure (World Bank, 1994), in developed countries the prevailing approach seems to be improvement of the operation and management of existing assets. For instance, in developed countries, franchising of water services is often combined with public

7 The concept of «inset appointment» was introduced by the Water Act 1989. A new company can apply for an appointment to supply water (or sewerage) to customers located in a defined area. Originally (until the Act was amended in 1992), the only customers eligible for inset supply were new customers, i.e. sites that were not already connected and that were more than 30 meters from the local water utility's distribution main (or sewer).

ownership of the main infrastructures (Cowan, 1998). One of the best known example is the French *gestion deleguée*. Thus, competitive bidding for water concessions has become one of the most common forms of competition (World Bank, 1993).[8]

The benefits, in terms of private companies' performance, stemming from competitive bidding for running water utilities, obviously depends on a number of conditions. These conditions include the degree of competition in the water industry and the long-term credibility of initial contractual arrangements. In the former case, similarly to yardstick competition, the effectiveness of the competition for the market can be undermined by the shortage of competitive bidders. In this respect, it is worth noting that the water industry is dominated by a small number of companies (Hall, 1999). The majority of privatized water concessions in large and small cities on every continent are run by two French companies: Vivendi (previously known as Generale des Eaux) and Suez-Lyonnaise des Eaux. Where present, national companies often operate through joint-ventures with these multinationals.

As far as the contractual arrangements is concerned, a critical issue is the appointing authority's ability to maintain regulatory pressure on the agent during the life of the contract. For instance, while there may be competition in awarding the concession, maintaining competitive pressure may prove to be difficult, because of the lack of credible sanctions. Attracting private companies into the market may be relatively easy, but expelling them may be much more difficult (Clark and Mondello, 1998; Moretto and Valbonesi, 1998). This, in principle, makes short-term contracts the preferable solution, but they could prove to be unattractive for firms due to the large sunk costs involved in acquiring the water concession.

8 In France there are three types of «concessions». For instance, a private company may: (i) either acquire the complete responsibility for operating the water system, making the necessary investments in the infrastructure, and take responsibility for financing them at its own risk (concession in the strict sense, «concession» in French), or (ii) operate the business and carry on maintenance at its own risk, but a public authority is responsible for investments (operating concession, «*affirmage*» in French), or (iii) receive a flat fee to manage the system, without taking any responsibility for investments (management contracts, «*gérance*» in French) (Hall, 1997b).

Competition to supply inputs is another option for improving the overall performances of a water utility. If there is sufficient competition between input suppliers (e.g. for billing and revenue collection, and maintenance of infrastructures), competitive procurement may allow for significant cost-reductions which, in principle, could be passed on to consumers (or taxpayers). In the public sector, competitive contracting out has become commonplace. For example, EU legislation imposes competitive procurement on member states' public sectors. However, paradoxically, the privatization of a water utility may reduce the potential benefits of competitive contracting out of specific activities. For instance, if a water concession is a concession in the strict sense, then the company running the business is not subject to requirements of EU legislation, and the company can contract out a specific activity (e.g., construction of new infrastructures), to a fellow-subsidiary, without advertising it for tender (Hall, 1997a).

3.4 Regulatory issues

Important regulatory issues have arisen as countries and states move to use water markets and privatize various aspects of their water supply and waste water treatment systems. In some cases laws and regulations have had to be changed to allow water markets to develop and management of public water and treatment systems to be privatized. In a number of countries this has involved changes in tax codes. For example, the U.S. federal tax code was changed so that contract terms for private firms managing public water and treatment facilities could be for more than 5 years. The removal of these limits in 1997 eliminated a key constraint to private management of water and treatment services. Under the old rules a facility that was managed under a contract of more than five years was not eligible for tax-exempt financing. The new limits have been set at 20 years which allows private firms more time over which to spread investment costs. However, private ownership of infrastructure-intensive water and treatment systems is still discouraged by the U.S. federal tax code. Municipal debt is tax-exempt while private debt is not. Changes may also be required in U.S. state and local property tax codes where municipal-owned facilities receive tax breaks but privately-owned facilities do not.

Another major problem facing privatization efforts are the regulations that have been introduced at different levels of government to regulate water prices. There has been a general concern that private firms or even public utilities may use their monopoly power in setting water prices. Yet it is not clear that monopoly pricing is a legitimate concern for domestic water users. Given our need to encourage users to conserve water and the fact that the water bill is no longer a significant share of most families' income in the U.S. and western Europe, higher water prices are in most cases socially desirable. If current price regulation is resulting in low prices and the overuse of water, then maybe it is time for a general deregulation of water pricing. This would also remove a barrier to privatization of water system management.

Modifications in environmental laws may also be necessary. In most cases these laws were not written with a concern for efficient water use or the need to have water reallocated among different uses. Consequently, many environmental laws and regulations tend to be inflexible when questions arise concerning the trade-off among different uses, including environmental uses. For example, the U.S. Endangered Species Act may be used to prohibit

water sales and transfers since the transfers may affect the habitats of species that are listed as endangered.

There are a number of other regulations and laws that are likely to limit the future operations of water markets in the U.S. and Europe. One which has received particular attention in the U.S. west is the «public trust doctrine.» It has been used in U.S. state courts to limit private water uses that infringe on certain public water uses such as water for fish habitat. The basic idea is that these public rights have existed since the U.S. and individual states were founded and they must be recognized (Huffman, 1997). In some cases this means existing uses such as irrigation are faced with reduced water allocations.

A second set of issues arises because of the lack of consistency in country and state laws which can act as barriers to market transactions across borders or even within borders. The difficulty occurs when rivers cross country or state borders and no sharing arrangements have been established among the states or countries along the river. Even when appropriative rights have been established with priorities set for each state or country, there are no priorities regarding the whole river. Thus downstream users will find that what they receive for their water right is held hostage to how water is used upstream, which will change over time. The uncertainty created by these transborder problems will lead to inefficiencies in water use and poor investment decisions. A similar uncertainty is created by laws that reserve rights for potential future uses or users. In the U.S., the reserve rights for Native American tribes are an example where a certain quantity or share of water is allocated to a tribe whether or not it is or will be used now or in the future (Colby, 1998).

A third area of concern involves specific national (federal) or state laws that restrict water use and limit water transfers outside their borders. Many U.S. federal and state projects disallow sales to users outside the districts that have water contracts (Howe, 1997). These institutional restrictions on water transfers are primarily the product of national and state resource protectionism (Huffman, 1997). In the U.S. the commerce clause prevents the states from limiting interstate commerce while NAFTA may have a similar impact on future water trading in North America (Frerichs and Easter, 1990).

A fourth institution that will limit water trading and increase transaction costs is the no-injury rule. This is found in a number of institutional arrangements designed to protect third parties against damages from water sales or transfers. These damages might be in terms of reduced return flows for downstream users or reduced economic activity (fewer input sales, or fewer products to process and/or market) in communities serving the irrigators selling water. «The big issue facing U.S. western states and other areas introducing water markets[9] is how to address third-party effects associated with the reallocation of [...] water without making transaction costs too high» (Howe, 1997, p. 83).

Fifth, the «beneficial use doctrine» connected with many water rights may no longer be appropriate in a time of growing water scarcity and the development of water markets. The beneficial use requirement may cause owners to misuse or waste water so that they can maintain ownership. If water sales are judged to show that the original owner is not making beneficial use of the water, then it will essentially prevent water trading.

3.5 The intersection of markets and privatization

9 Added by the authors.

Although the water markets and privatizing water utilities have been discussed separately, there is no conceptual reason why both could not be used to improve water use and allocation in a given water system. A private firm could manage and operate a water system and water rights' holds (users) would pay the firm a fee for the service. The sale of water rights among users could be done through the water firm or some other coordinating body. The water company would just have to have an up-to-date record of who owns how much water. Whether or not a market or privatization of the water system or both should be pursued depends on where the big inefficiencies are in the system. If the problem is inefficiencies in the over all management of the water utility, then some form of privatization would be good medicine. In contrast, if the problem is inefficient water use by consumers, then water markets could be the solution. Markets would provide consumers a sense of the value of their water and an incentive to use it efficiently. Effective water pricing by the water company could also have a similar effect.

Of course, water markets have been found mostly in areas with a significant amount of irrigation. They are generally used to transfer water among irrigators and from irrigators to water companies or water utilities. There are also cases of individual households in rural areas buying water from irrigators (Easter et al., 1998) as well as trade among utilities. In principle, transfers could also take place among urban households, although no good examples currently exist. For urban households the problem of allocation the water rights and keeping track of relatively small transactions may mean high transaction costs relative to the value of the water saved. Thus, for most urban settings the preferred option is likely to be some form of privatization of water utilities. Most efficiencies gained from a water market could then be achieved if the water company is allowed to raise prices enough to cover all costs plus some charge for the scarcity value of the water.

4. US AND EU: EXPERIENCE AND ON-GOING DEVELOPMENTS

The U.S. and European experience with privatization of the water sector and establishing water markets has been partly guided by their respective water policies. Their policies regarding water quantity are limited at the federal level in the U.S. and at the European Union level in Europe. Thus, the guiding water policies in the U.S. have been those from individual states while in Europe they are from individual countries. This means that the privatization and water market experience will vary from country to country in Europe and from state to state in the U.S. The institutional arrangements developed to either promote or limit water markets and privatization are also likely to be quite different. This situation could be changing in Europe as the Union is increasing the uniformity of policies particularly regarding water quality. However, in the U.S. states' policies are likely to continue to play a central role.

4.1 The U.S. experience with privatization and markets in the public water sector

Part of the reason why U.S. federal water policies regarding quantity are limited, is the fact that water development is viewed primarily as a state or local responsibility. For example, almost all cities and towns are supplied by local or state entities. The major exception to this, for consumptive water use, has been irrigation development which has in the past received large federal subsidies in the western U.S. However, even for irrigation the federal role has changed as more and more responsibility is shifting to local user entities. In terms of regulating water use the federal government has had an even more limited role with regard to water markets and privatization. The major exception has been federal court decisions regarding the sale of water across state boundaries (states cannot restrict such sales) (Frerich and Easter, 1990). For privatization the main impact of the federal government has been the tax laws that favor public entities relative to private firms and federal regulations for drinking water quality.

4.1.1 U.S. water policy

Currently, the United States does not have a comprehensive water resources policy. Since the Water Resources Planning Act of 1965 was eliminated in the early 1980s, along with the river basin commissions and funding for state planning assistance, federal water policy has been limited to water quality concerns (Muckleston, 1990). Questions of water allocation and pricing have been left to state and local entities as well as to a few regional entities such as the Great Lakes Commission that remained active after the 1980s debacle.

Even with the federal policy concerning water quality, the responsibility for improving quality is shared with the states. The water pollution control act was first enacted in 1948 and became the Clean Water Act in 1972 with additional amendments in 1977, 1987 and 1996 (Davis and Mazurek, 1998). The primary focus of federal water pollution control efforts has been on surface water and point sources of pollution (end of pipe). Most of the federal funds have gone for construction grants for municipal sewage treatment facilities, with over $700 billion spent from 1972-1996. This has added to the capital intensity of the

industry which is 3 to 4 times more capital intense than telephone and electric utilities. Because of the focus on capital investment in municipal waste treatment, nonpoint sources of pollution have been almost ignored and the efforts to protect groundwater have been, at best, fragmented. Thus the major challenge for future water pollution control efforts in the U.S. will be to devise a system that effectively addresses nonpoint pollution control issues and develops a more unified and effective approach to groundwater protection.

4.1.2 Privatization

The United States in the past two decades has experienced a shift towards deregulation and privatization in the public sector. Much of the shift was seen as a way to increase competition and reduce costs through improved incentives. However, the water sector has only recently seen a move towards privatization.[10] Two factors seem to have stimulated this new interest. First is the financial pressure, particularly for smaller systems, due to the general need to upgrade or expand water and sewer systems. In some areas, such as the eastern part of the United States, the water and sewer systems are old and in need of repair or replacement. The second factor, which is closely related to the first, is the increasing cost of complying with new health and environmental standards for water quality. Under the Safe Drinking Water Act Amendments (SDWA) of 1996, water utilities must meet stricter requirements for removal of contaminants. The SDWA imposes a tougher standard on bacterial and microbial contaminants and reduces the acceptable levels of harmful byproducts from disinfection. In 1998 the EPA estimated that compliance with these new requirements will cost over $1 billion annually nationwide above and beyond the existing need to replace aging distribution and treatment infrastructure (Seidenstat et al., 2000). The American Water Works Association, the nation's largest drinking water industry association, estimates 20-year costs of $325 billion for infrastructure (Seidenstat et al., 2000).

Interest in involving the private sector in managing water systems has been complemented by an expansion in the activities of U.S. investor-owned water utilities. In 1994, Price Waterhouse found that 90% of the investor-owned water utilities surveyed had either closed transactions with or were considering proposals to provide services to other cities (Beecher, et al., 1995). These private sector activities in the U.S. have taken a number of different forms, ranging from outright private ownership to public utilities contracting with private firms to do their water billing. With the exception of outright acquisition or ownership, the different options for privatization (listed in Table 1), involve either contracting to supply inputs or concessions to provide management, or construction and design services. Whether these arrangements provide adequate competition in the bidding process is not clear and probably varies a lot across the U.S. Yet there is evidence to

10 Historically, private provision of water services was the norm through the early to mid 1800s, but by the 20th century, municipal monopolies comprised roughly half of the water works in the U.S. (Baker, 1899). Today, ownership of water services varies by size of the community served, with private ownership predominating only in communities serving less than 500 individuals. The EPA estimates that while 33% of community water systems are privately owned, only 15% of all people are served by privately-owned companies (USEPA, 1999). Most large water systems are municipally owned and provide safe drinking water at affordable cost.

suggest that the design, build, operate, and transfer option has significantly reduced construction and operating costs (Siedenstat et al., 2000).

In a 1997 survey of 261 U.S. cities, 40% currently had some form of private/public partnership and another 14% were considering proposals. The most common arrangement was for private design and construction, particularly for water treatment facilities (71%). Meter reading (33%), billing and collection (31%), as well as operation and maintenance (44%) were the other private sector activities reported (Callahan, 2000). As this survey illustrates, public asset sales to private firms is very limited. Asset sales usually take the form of transfers of small water systems to investor-owned utilities that are located in neighboring areas. Until the early 90's, the federal tax code discouraged private ownership of infrastructure- intensive industries by making federal construction grants available only to public utilities. If a public utility had received such a government grant, the municipality was required to pay back 100% upon sale of the facility. In 1992 a Presidential executive order on infrastructure privatization required that only the remaining «undepreciated» portion of government grants be paid upon sale of the facility. Despite this change, other disparities in the tax law, whereby municipal debt is tax-exempt while private debt is not, have discouraged private purchase of water facilities. In addition, political concerns about maintaining control over water resource facilities have stymied efforts to establish private ownership.

Most water facilities in the U.S. are constructed by private firms and managed by municipalities after completion. This approach has been criticized for its lack of integration and inferior product delivery. The Design-Build-Operate and Transfer Model has been used to give the private firm control over the project in its entirety, creating a more integrated and better performing facility which has been estimated to have saved roughly 25% of the construction costs and 20-40% of the operating cost (Siedenstat et al., 2000). For example, Seattle's Tolt River Project is estimated to have saved 40% compared to the conventional model of private construction and public management of the facility.

Concessions for operations and maintenance are largely the result of tax code changes in 1997 as discussed above in the section on regulatory issues. Contracts for operations and management of facilities have varied significantly by provisions and length. For example, Buffalo, New York held a contract in 1997 with American Anglian Environment Technologies for operation of its system with a guarantee of no layoffs (Seidenstat et al., 2000). Under agreements in Cranston, Rhode Island, the private contractor paid cash up-front for significant capital improvements when the existing short-term lease was renegotiated for 25 years.

Privatization has brought about increased entrance of foreign, highly-specialized water companies and fostered consolidation among American water companies. The merger of French-owned firms Aqua Alliance with Metcalf and Eddy in 1998 resulted in their management of approximately 200 wastewater and 170 water utilities in the U.S. (Seidenstat et al., 2000). The British have also entered into the American water utilities market, i.e., Anglian Water PLS has joined in partnership with American Water Works, the largest U.S. investor-owned water company to compete for O&M contracts as American Anglian Environment Technologies.

The potential for inter-utility cooperation between the energy and water sectors provides another interesting potential for new competitors in the water industry. Deregulated, newly

competitive energy utilities could choose to ally themselves with large, captive customer bases of water utilities in order to achieve efficiencies in billing, metering, and office staff across utilities. Although energy utilities are restricted by the U.S. Public Utility Holding Company Act to refrain from expansion into other sectors, this Act may be repealed. If this happens, cross-utility endeavors are clearly possible. In 1998 New Jersey's Public Service Electric and Gas Company announced that its nonregulated subsidiary, Energis Resources, would partner with United Water Resource (Seidenstat et al., 2000).

The majority of private water utilities are subject to regulation by state public utility commissions and a traditional rate-of-return regulation. As of 1995, state commissions regulated roughly 8,537 water utilities (Beecher et al., 1995). Four states and the District of Columbia do not oversee water utilities due to the small number of privately-owned utilities in these areas. Many larger, publicly-owned utilities are not regulated except for certain issues such as selling water outside of their system.

The scope of regulation by public utility commissions varies and could include any of the following: approval of loans, mergers, service areas, acquisitions; oversight of management; review or audit of drought management practices and accounting; and setting of the rate of return. State regulatory commissions and local agencies have traditionally engaged water utilities in protracted rate-setting cases and have favored average cost-pricing schemes. Tight controls over rate-setting originally arose because of concerns about monopoly pricing power but, as pointed out above, these concerns may no longer be appropriate. The result has been a lack of flexibility in pricing water and a general decline in water systems. «Traditional rate-setting methods, employed by state regulatory commissions as well as local government agencies, appear to have produced a situation of rapidly deteriorating water systems, both rural and urban, characterized by aging capital facilities and under-maintained water systems» (Mann, 1981, p. 101). An interest in reducing these price subsidies and additional unfunded mandates under the SDWA have rendered these regulatory issues more serious and increased interest in privatization.

4.1.3 Water Markets

Given the dry conditions and rapid growth in the western half of the United States, it is not surprising to find water market activity concentrated in the U.S. west. During dry years, most of the river basins in the southwestern U.S. have water demands that exceed supply, e.g., the lower Colorado and the Rio Grande. In the drier areas water markets have played an increasing role in balancing water supply and demand over the past 25 years. The California State Water Bank is a good example of how water trading has helped prevent serious economic damage that could have occurred during the 1990s drought (Easter et al., 1998).

Water markets can be used to deal with supply and demand variabilities as well as with overall growth or shifts in demand. Short-term or temporary water transfers are best suited for managing supply and demand variability while permanent or long-term transfers are more suitable for handling increases or shifts in demand. California's water trading has been best suited to deal with supply and demand variability, because most of the water trading has been short-term in nature.

Hundreds of thousands of acre-feet (1 ac. ft. = 1,233m^3) of water are transferred annually in California but most of the transfers are for less than one year. These temporary trades occur mostly in the same irrigation district or system. Long-term trades have been limited to about 25 in the last 20 years and are mostly in response to urban demands. For example, in 1989 the Los Angeles Metropolitan District (MWD) obtained 106,000 ac. ft. from the Imperial Irrigation District (IID) while in 1998 the San Diego County Water Authority obtained 200,000 ac. ft. from IID. Most of this water will come from water conservation within IID's irrigation system (e.g., canal lining) and conservation by farmers.

In 1998 California's Department of Water Resource reviewed 23 transfer proposals that would use State Water Project facilities (Table 2). This, of course, leaves out the transfers that occur within districts or would be transferred in other facilities. Still the total proposed transfers in State Water Project facilities amounted to 362,102 ac. ft. in a year of relatively good rainfall. Over 44 percent of the transfers were from urban to urban while another 27 percent were from agriculture to agriculture.

The emphasis on temporary or short-term transfers in California is somewhat different from trades in Colorado, New Mexico, and Utah where many more permanent trades took place. MacDonnell (1990) reported that these states had 5,844 permanent water transfers during 1975-1984. Not surprisingly, the direction of these trades has been primarily from agriculture to urban users since Western agriculture receives nearly 85 percent of all water diversions (Howe, 1998). There have also been numerous temporary trades within the Western states but a trend towards more permanent trades is likely to occur because of shifts in demand to urban uses which require a more assured water supply than irrigation. Agricultural water use peaked in the 1980s while urban use has continued to expand (Gleick, 1998). The shift to more permanent trades would be facilitated by institutional arrangements that help clarify water rights and streamline the procedures for determining if there will be adverse affects on other water users. Howe (1998) points out that one reason Utah and New Mexico had the most permanent water transfers is because they both have a clear, nonlegalistic means of determining if there will be any adverse affects on other water users caused by proposed transfers. Once the assessment of potential adverse effects has been completed the proposal is approved or modified by the Office of the State Engineer. Court appeals occurred in only about one percent of the cases.

The shift towards more permanent transfers is evident in the 1998 data. Thirteen western states reported 140 separate water transactions in 1998. They included 104 transfers for municipal purposes, 24 for irrigation and 12 for public trust purposes. Most of the sales were by agricultural users. Of the total, 102 were purchases of water rights while the remaining 38 were short-term leases or exchanges. Because of good rainfall in the western U.S., 1998 was a low year for water trades. The number of unit transactions involving the Colorado-Big Thompson illustrates this point. In 1998, 3,187 units were traded as compared to 6,426 units (a record) in 1997 and 5,167 units in 1996 (one unit equals an average annual yield of 0.7 acre-feet).

California is also likely to experience an increase in longer-term trading. Many farmers are beginning to find that they can make more money selling water to urban areas than growing crops. Cities are willing to buy the water but they will usually want a long-term commitment and even permanent trades. If this trend accelerates, it could have major implications for agriculture and communities in the southern half of California's large San

Joaquin Valley. This is the area where some of the world's largest corporate farms are located and sales of water could reduce agricultural activity in this part of the valley.

4.2. The European Union

Like U.S. state policies, country policies in the European Union have provided the guidelines for their privatization of the water sector and development of water markets. An important question is how will this change in the future as the concerns for water quality grow and more areas find it difficult to obtain low cost clean water supplies? The growing concern about water quality combined with the fact that most of the rivers in Europe are international, seems to suggest that European Union directives will become increasingly important in future privatization and water markets in Europe. Yet there is still a strong sentiment in favor of local control over resources particularly in Northern Europe. This creates a growing dilemma in water resources management: the desire for local management and control of natural resources whose's uses have many international repercussions that require a broad management prospective.

4.2.1. The Community water policy

European water policy began in the 1970's, with environmental standards for surface waters used for potable water supplies, and later on, by setting binding quality targets for drinking water and by addressing other water resource uses (fish and shellfish habitat, recreation, and groundwater). While some directives have proved to be quite effective, other European legislation--such as the Nitrate Directive addressing pollution from agricultural sources--have been poorly implemented by member countries. According to a recent EC Commission's communication on the state of Europe's environment, while there have been substantial improvements in surface water quality due to reductions in point source discharges; pollutant emissions from diffuse or nonpoint sources have shown little change. EU maximum groundwater concentrations of nitrate and certain pesticides are frequently exceeded (European Commission, 1999).

By the mid 1990s, pressure emerged for a substantial redirection towards adopting a more global approach to the Community water policy, by integrating disperse pieces of legislation as well as by adding new objectives. In response to a request by the European Parliament's Environment Committee and from the Council of Environment Ministers, in 1997 the European Commission produced its proposal for a Water Framework Directive (COM(97)49), subsequently amended (COM(97)614, COM(98)76, COM(99)271). Currently it is being negotiated by the European Parliament and the Council of Ministers and the final adoption is foreseen for 2000.

The draft directive which, *inter alia*, would be the first piece of European legislation to address the issue of water quantity, is aimed at: (a) streamlining Community water legislation, (b) expanding the scope of water protection and achieving a «good status»[11] for all waters by a certain deadline (2010), (c) promoting in all member countries the adoption of single system of water management, namely management by river basin, instead of according to administrative or political boundaries; (d) increasing awareness of citizens and getting them more closely involved; (e) ensuring that the price charged to water users is based on the full costs of water.

The introduction of pricing oriented to full-cost recovery is undoubtedly one of the most important European water policy innovations (Blöck, 1999) and has been one of the most controversial component of the Commission's proposal. Whereas this principle has a long tradition in some countries, this is not the case in many countries, where, in general, the recovery rates vary considerably between water use(r)s and economic sectors. According to the draft Directive, «by 2010 Member states shall ensure full cost recovery for all costs for services provided for water uses overall and by economic sectors.» However, while full-cost recovery appears to convey a clear-cut criterion, when one considers how the concept is actually practiced, significant differences are found (OECD, 1999a). For instance, there are countries where the principle is translated into recovery of operation and maintenance (O&M) costs, in others into recovery of O&M and capital costs, while in other countries there is an effort to include scarcity values and negative externalities caused by water users.

11 The terms «good status» come directly from the EC directive and appear to mean water quality consistent with EC water quality standards.

In this respect, the draft directive does not provide an unambiguous and clear-cut operational translation of the full-cost principle and tends to leave some freedom to member states. However, «while the European Commission has set up modest objectives with regards to cost recovery, it has not ruled out the incorporation of scarcity values and environmental externalities in full cost recovery» (OECD, 1999a, p. 35). According to the Commission's proposal, the principle of full-cost recovery must be applied to all sectors, and cross-subsidization between sectors should be avoided. Member countries are allowed to grant exemptions, e.g., for providing basic services to households at an affordable price or for regions entitled to structural fund support, but all deviations from full-cost recovery prices should be explicit.

Besides European legislation directly addressing water issues, member states' management and operation of water services have also been indirectly affected by other policy developments at the European level. These developments include the legal requirement to integrate environmental protection into other EC policies, a principle which was established by the Single European Act and was given a more comprehensive legal basis in the Maastricht Treaty. A second indirect driving force has been the process of creating the European Monetary Union which has imposed a more rigorous budget discipline on member countries. A third force is the process of introducing more competitive pressure in the European utility markets traditionally dominated by publicly owned monopolistic companies.

4.2.2. Member Countries

European legislation has exerted an external pressure and has helped slightly reduce the heterogeneity of national environmental policies. Nevertheless, partly because of the lack of a global and comprehensive community water policy, significant differences remain between member countries regarding their legal and institutional arrangements, organization and management practices, and pricing principles. Yet a comprehensive overview of these national water policies goes beyond the scope of this paper. Instead we will focus on some significant features and developments involving privatization, water markets, and water pricing.

Increasing regulation of water uses

In Member Countries there has been an increase in the regulatory power of public authorities over water use. Generally speaking, increasing state regulation and centralized water management has been a common feature in southern countries, while involvement of local authorities has remained a typical feature of the institutional design in northern ones (Barraqué, 1998).

Contrary to countries which have embarked on a process of privatization of water rights, and establishing water markets, in Europe, although water markets are gaining interest, only Spain has recently taken steps in this direction.[12] In fact, there has been a tendency towards

12 The Spanish Government submitted in May 1999 Bill to the Parliament with the intention to reform the 1985 Water Law. Among the bill's breakthrough changes is the possibility of water rights holders to sell or lease-out their rights.

increasing the share of public waters, by subjecting water uses (abstractions and wastewater disposal) to licensing. Even groundwater is being included in this evolution to public waters. Recent reforms adopted in member states such as Spain and Italy, where groundwater abstractions were de facto traditionally considered as part of landowner rights, all water resources, including groundwater, have been formally placed in the public domain.

Water pricing

European water users face significantly different prices. Observable variations in service charges are only partly traceable back to differences in natural resources endowments, accessibility to sources, patterns of urbanization, or efficiency levels in the provision of water services. In fact, inter and intra-country price heterogeneity is mostly explained by differences in national and local water policies, and patterns of operation of water services, involving heterogeneous pricing structures and cost recovery rates.

Agricultural water pricing principles vary considerably within the European Union. While there are countries where farmers do not receive any special treatment, such as The Netherlands, England and Wales (OECD, 1999a), in general European farmers enjoy a privileged status, and are charged less than other water users. Capital costs for supplying irrigation water are usually covered through public budgets. In countries like Greece and Italy, water charges for agriculture are often insufficient to generate enough revenue to cover operation and maintenance costs.

In other countries which have experienced increasing competition between agricultural and other water uses, a tendency towards increasing farmers' contributions is gradually emerging. For example, France and Portugal, although maintaining a special status for agricultural water users, have made progress towards matching water charges and supply costs. Also in Spain, despite the administrative problems encountered in implementing the 1985 Water Law (which *inter alia* has introduced a levy intended to cover capital investments), there are many examples of collective and private efforts to use irrigation water more efficiently. In Italy, an innovative program is being implemented in the southern Capitanata region (one of the country's most important irrigated areas) with the aim of increasing cost recovery, introducing water-saving farming practices, and penalizing excessive consumption (OECD, 1999a).

Even household water pricing varies considerably among countries (Table 3), and often within the same country. In Italy, where in 1998 the average price was less than IT 800 lire per cubic meter as compared to 3,600 lire in Berlin (Lobina and Hall, 1999), the range of price variation for water supply and sewerage services is 1 to 10 or more (Massarutto, 1999). In general, although not exclusively, in Southern countries, households have benefitted from various measures aimed at tempering the industrial cost recovery rates for water services. This objective has been pursued through different mechanisms, such as public financing for infrastructural development, free use or «political» pricing for the operation of public water networks, or cross-subsidization among different utilities at the municipal or intermunicipal level.

The bill attempts to promote water markets, thus facilitating trading among right-holders or water claimants, although the priority allocation rules established by the 1985 Law will still remain in force (Garrido et al., 1999).

However, the general trend observable in Europe is towards an increase of cost recovery rates. This process will become mandatory in all Member states if the EC Water Framework Directive is approved. Even without the directive, cost recoveries are gradually increasing even in countries such as Italy where support for subsidizing water users has been traditionally stronger than in other countries (Massarutto, 1999). The 1994 Italian Water Law (36/1994) provides a new framework for water supply and sewerage through vertical integration of the water cycle (abstraction+ sewerage + treatment + discharge) into single territorial units ("*ambiti territoriali ottimali*"). In principle, the units should be defined according to river-basin criteria. The national act foresees a single system of water charges for the entire water cycle where prices have to be set so as to generate enough revenue to cover investment and operating costs. Tuscany, one of the most advanced regions in implementing Law 36/1999, has identified investment plans and proposed new charges in each territorial unit. In general, the process has been slow and on average, an increase of water charge of 35% is foreseen over the next 20 years in Tuscany (Il Sole 24 Ore).

Other European countries, either at the national or local levels, have conducted or are conducting household pricing reforms, aimed at integrating traditional social considerations with the objectives of using water more efficiently and treating it as an economic good. In Spain, the city of Barcelona has pioneered the use of prices designed to combine strong incentives to save water with equity considerations. In France, the 1992 Water Law prohibited the use of «flat fees» thereby ruling out both nonvolumetric schemes and prices combining a fixed charge with volumetric charges. For Portugal, Decree-Laws 379/93 and 319/94 prescribed that charges for privatized water services must be fixed at economic levels. Finally, Denmark's 1996 government declaration requires water utilities to ensure that all properties connected to public water supply have meters installed (OECD, 1999b).

Restructuring and privatization of water services

Private companies' contribution to the provision of water services varies considerably between member states. For water supply, in 1996 the private contribution ranged between about 90% in England and Wales to almost nothing in Denmark, Greece, Ireland, Luxembourg, The Netherlands, and Austria (Hall, 1997a). Generally speaking, there is an increasing involvement of private companies in service provision, although this takes different forms. Full privatization has only occurred in England and Wales, while delegation (concessions), traditionally dominant in France, is increasing rapidly in Spain and Portugal (OECD, 1999b).

Primarily water utilities in France are publicly owned, but 75% of the population is served by private companies working under operation and maintenance contracts (Seidenstat et al., 2000). Privatization in France has principally involved either concessions to construct and operate facilities or *affirmage* whereby the municipality bears the initial expense of construction and the private firm takes over operation. *Affirmage* is often chosen when the municipality can receive preferential interest rates. The price of water is often set by a contracted formula which may include a surcharge which the operator returns to the city as debt service. As a result of this system, the French water utility industry is characterized by multiple large and influential companies known for technological innovation and high-quality service delivery.

Private concessions have also appeared in Italy (the municipality of Arezzo has recently awarded a concession to a consortium headed by Lyonnaise des Eaux). However, the dominant process appears to be corporatization (sometimes associated with partial privatization through sale of equity) of municipally owned firms (*aziende municipalizzate*) which are starting to operate beyond their own traditional territories. In Germany, where like Italy, the water sector has been dominated by municipally owned firms (*Stadtwerke*), in 1999 the sale of 49.9% equity in Berlin's water company was announced. In addition, the city of Bremen has partially privatized its sewerage company (Hall, 1999).

5. FINAL REMARKS

One of the important reasons why countries are exploring economic approaches to water resources management is the potential economic and environmental benefits from doing so. Privatization and water markets both have the potential for establishing user incentives for efficient water use. This can reduce the need for expensive future water development and reduce government capital expenditures.

To realize these benefits some important institutional changes will be needed. In some cases it may be a change in tax laws and in others it may involve amending the basic laws regarding the sale of public assets. For water markets it means changing the rules so that private tradable water rights or water-use rights are established.

However, in developing the condition for privatization of water service or for establishing water markets it is important to guard against possible market failures. In water markets it is important to develop a nonlegalistic means for making sure that water trades

don't have significant third-party effects. For privatization, regulation may be needed to prevent entities from taking advantage of their monopoly control over either the water supply or the distribution network. Clearly second-best issues arise if significant third-party impacts occur because of water trades or monopoly control over the distribution system are ignored.

There are no unique answers to dealing with problems of water scarcity. What works in a community facing «real» water scarcity will be different from one where the problem is inadequate institution's and/or management. Thus problem identification and designing solutions in relationship to existing institutions are important in dealing with water issues.

The comparison of U.S. and Europe illustrate some interesting differences in their approach to water scarcity concerns. What explains these differences and what have been the results? The first question is not easy to answer but it may be associated with the relative importance of the domestic water supply relative to irrigation. Where irrigation is important, it is the largest user of water. Consequently, when water scarcity and the need for change hit Chile, Mexico, and California in the United States--where irrigation is important--they made use of markets to improve water-use efficiency and save water. In contrast, when England decided to privatize public water entities, it was in response not so much to water scarcity but to a government budget scarcity and the need for future water infrastructure investments. Privatizing water entities took them out of the public sector budget. In addition, it allowed the government to make the monopoly provision of water contestable where different firms could compete periodically to operate or manage a water system under a long-term contract.

In Europe, only Spain has shown some interest in water markets. One reason for this may be an emphasis on the basic right-to-water as opposed to water as an economic good. Another reason for the difference in approach could be the difference in past institutional arrangements. For some countries, past institutional arrangements may have lowered the transaction cost of making new institutional changes. For example, the western United States and Chile both had some experience with establishing tradable water rights.

There are some similarities between Europe and the U.S. in that both have a relative abundance of fresh water from a global perspective. Yet at the regional level there are areas that are facing serious shortages, at least, in some years. Many times the shortage is due to inadequate institutions or water management rather than an absolute scarcity.

A further similarity is their approach to water policy. Both lack a comprehensive federal water policy, especially for water quantity. The one exception to this is that both Europe and the U.S. seem to be moving towards a comprehensive policy for water quality at least for point sources of surface water pollution.

Another interesting similarity between the European and U.S. approach to water resources issues is their failure to effectively address groundwater and nonpoint pollution problems. These are clearly difficult problems to solve and none of the countries has devised an innovative means to approach either issue. For example, Italy's and Spain's approach of putting groundwater in the public domain could be a step backward because without effective enforcement, it will likely provide the current users an incentive to pump the groundwater even more rapidly. Passing laws is one thing, enforcing them is quite another.

Nonpoint pollution has some of the same monitoring and control problems as groundwater. Since pumpers as well as the nonpoint polluters are widespread and numerous, they are difficult to monitor and control. This means that institutions need to be created that change the incentives and allow more local monitoring and control. Can we create local pumping districts that set pumping rates for their aquifer? For nonpoint pollution a targeting of conservation practices and monitoring of critical areas might work. Another possibility for some areas may be to develop markets for pollution permits that will allow point sources to buy permits from nonpoint sources. Both U.S. and European countries need to try new approaches, such as those mentioned above, to address their critical water policy issues.

Table 1 - Privatization Options Found in the United States

Options for Private Sector	Description
Acquisition	Public utility sells the facility to private entity resulting in private ownership and operation.
Joint venture	Private entity owns facility in conjunction with public utility
Design, build, own, operate and transfer	Private entity builds, owns, and operates the facility. At the end of the specified period, such as 30 years, the facility may be transferred to a public utility.
Concessions to design, build and operate	Private entity designs, constructs, and operates the facility. The public utility retains ownership and financing risk, while the private entity assumes the performance risk for minimum levels of service and/or compliance.
O & M concessions	Public utility contracts with private entity for a fee to operate and maintain the facility. The public utility owns the facility.
Concessions to design and /or build	Private entity designs and/or constructs the facilities and turns it over to the public utility to operate.
Contract for specific services	Private entity contracts to provide public utility with specific services such as meter reading or billing and collection.
Management concessions	Private entity manages and supervises the public utilities personnel.

Source: Adapted from Beecher et al., 1995

Table 2 - Water Transfers Using State Water Project Facilities 1998

Type of Transfers	Number of Transfers	Amount of Water Conveyed
For Agricultural Use		
Agriculture to Agriculture	11	99,026 acre-feet
Agriculture/Urban to Agriculture	1	85,700
Urban to Agriculture	1	100
Subtotals	13	184,826
For Urban Use		
Urban to Urban	4	159,701
Agriculture to Urban	4	2,494
Subtotals	8	162,195
For Environmental Use	2	15,081
Totals	23	362,102 acre-feet

Source: Department of Water Resources, 1999

Table 3. Average Pricing (m^3) for Household Water Services (wate supply+wastewater services) in European Countries (Germany = 100)

Austria	19
Belgium (Flanders)	67
Belgium (Brussels)	51
Danemark	74
Finland	64
France	73
Germany	100
Greece	27
Italy	20
Luxembourg	24
The Netherlands	74
Spain	25
Sweden	68
England and Wales	73
Scotland	34

Source: Massarutto, 1999

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