

**The Regulation of Private Sector Participation in
Urban Water Supply and Sanitation:
Realising Social and Environmental Objectives in
Developing Countries**

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Abstract

There has been a significant increase in private sector participation (PSP) in the urban water supply and sanitation (WSS) sector in recent years. However, even with increased PSP, public authorities will still have to: ensure that the service providers do not use their market power to exploit customers; internalise public health and environmental externalities; provide mechanisms whereby water consumption is sustainable and is allocated efficiently between alternative uses; and, serve as a guarantor of a level of service provision which is consistent with a basic standard of living. While there is considerable literature addressing the first of these four issues, the latter three are less adequately addressed. Through a review of five case studies (Abidjan, Buenos Aires, Córdoba, Mexico City, and Manila), this paper provides an overview of the issues involved and some of the mechanisms available to the authorities responsible for the regulation of the sector.

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1. Introduction

In recent years there has been a significant increase in private sector participation (PSP) in the delivery of urban water supply and sanitation (WSS) in developing countries. This is largely attributable to a perception that governments have been unable to manage the sector efficiently and do not have the funds required to undertake much-needed investments. However, due to the characteristics of the sector, the regulatory authorities will have to continue to fulfil the following functions:

- ensure that the service providers do not use their privileged position in the market to exploit their customers;
- internalise the externalities associated with adverse effects on public health and the environment;
- provide mechanisms whereby aggregate water use is sustainable and water is allocated efficiently between alternative uses;
- serve as a guarantor of a level of service provision, which is consistent with a basic standard of living.

While there is considerable literature addressing the effects of increased PSP on the first of these four issues, the latter three are less adequately addressed. This paper is not primarily about the relative merits of private versus public service provision in terms of the efficiency of service provision, but rather about how best to meet environmental and social objectives given increased private sector participation. Moreover, since it is the agency whose role has changed most significantly (indeed it may have only come into existence with the onset of PSP), the paper concentrates on the role of the sectoral “economic” regulator, rather than other public authorities that influence the sector.

The study is an overview report, drawn largely from five case studies (Manila, Buenos Aires, Córdoba, Mexico and Abidjan), prepared by researchers familiar with the sector in the respective cities.¹ While the individual reports provide more detail on the individual cases², this paper attempts to draw together the experience in the five cities in order to highlight some of the potential opportunities and pitfalls presented by PSP in terms of the realisation of social and environmental objectives.

Following this brief introduction, Section 2 reviews the role of PSP in the sector. Section 3 provides a discussion of the need for public intervention in the sector on the basis of the potential for market failure with respect to social and environmental concerns and discusses the role of the economic regulator in ensuring that these social and environmental objectives are realised. Section 4 reviews some of the main conclusions based on the four case studies.

2. Private Sector Participation in the WSS Sector

Until very recently, the only countries with a significant degree of private participation in the WSS sector were France, the United Kingdom and the United States. Of all public utilities, WSS was the sector in which the formal private sector was least active and, in developing countries was almost non-existent. However, this is changing rapidly as many developing countries involve the private sector

¹ The case studies were prepared by Cristina David (Manila), Martin Rodríguez Pardina and Sergio Mazzucchelli (Buenos Aires and Córdoba), Lillian Saade (Mexico City) and Ake N’Gbo (Abidjan). The project was funded by DANIDA and the full report will be published in due course. In the interim, mimeo copies of the report can be obtained from the corresponding author. Details on the publication of any of the case studies can also be obtained from the corresponding author.

² Details about the publication of any of the case studies can also be obtained from the corresponding author.

(usually European or North American firms in partnership with a local firm) in the provision of WSS in urban areas. Between 1990 and 1997, the cumulative new private sector capital expenditure on WSS projects in developing countries was \$25 billion, compared with \$297 million in the period 1984-1990. By 1997, a total of 97 projects had been implemented in 35 developing countries, ranging from management contracts to leases, concessions, divestitures and build-operate-own-transfer (BOOT) agreements (see Silva *et al* 1998).

The increase in PSP has been driven in large part by a desperate need for increased capital investment in WSS in many cities. In the majority of developing countries experiencing rapidly growing urban populations and a reduction in assistance for WSS from international development agencies, public sources of finance are no longer able to bear the costs of system rehabilitation and expansion. In addition, it is often considered that public authorities have been unable to manage urban WSS efficiently. A number of closely related reasons have been frequently cited in the literature as being responsible:³

- *Gamekeeper-Poacher Problems* - Public water and sewage utilities will tend to be inefficiently managed since governments have multiple objectives but limited financial resources. With the government as both owner and provider, the utility's management is subject to a number of conflicting influences which it may not be able to balance if clear priorities are not established.
- *Flexibility and Autonomy* - At the level of operations, public utilities are often constrained by bureaucratic requirements which do not affect private firms. For instance, there is often considerable inflexibility in the management of human resources within public utilities.
- *Absence of Competitive Discipline* - Since public utilities are not usually subject to the disciplines of the market they have fewer incentives to minimise costs (and maximise tariff collection rates) and provide services in the manner customers demand.

However, it must be recognised that there are numerous examples of efficiently managed public water and sanitation utilities in developing countries (see Ingram and Kessides 1994 and Nickson 1997). There are documented cases in countries as diverse as Ecuador, Chile, Zimbabwe and Botswana. In many cases, this has been attributable to the provision of a certain degree of autonomy to the service provider (municipality, parastatal, etc...), as well as the introduction of effective incentives to the provider and staff members (see Estache 1994).

“Government failure” is not, in itself, sufficient to justify private sector involvement in the sector. A private monopolistic service provider may well exacerbate the situation, taking advantage of its privileged position in the market at the expense of service users. Thus, perhaps an equally important motivation for the increase in PSP, is the fact that there is now a widespread belief that PSP need not result in monopoly profits. On the one hand, the consensus that water and sanitation services are natural monopolies has been called into question. While the entire chain of provision (raw water supply, water treatment, water distribution, wastewater collection and wastewater treatment) may exhibit economies of scale, individual aspects of the WSS system may not be characterised by decreasing costs, thus allowing for vertical “unbundling” of the sector with multiple providers at some stages. For instance, metering, operations and maintenance, billing, and a number of other aspects of service provision can be hived off from the core of the WSS sector. Similarly, firms can be given contracts to undertake significant investments in specific infrastructural areas such as wastewater treatment plants. On the other hand, it has been recognised that even if technological and economic characteristics are

³ See Nickson 1997, Ingram and Kessides 1994, Idelovitch and Ringskog 1995, and Mody 1996 for discussions.

such that monopoly provision is “efficient”, more comprehensive forms of PSP can still be introduced. Drawing on the work of Baumol, Panzar and Willig (1982) it has been pointed out that as long as a market is contestable (i.e. there is the potential for firm entry), a single provider will not necessarily behave monopolistically as long as there is competition *for* the market, if not directly *in* the market.⁴ Thus, firms can be granted the right to provide all WSS services within a given area over a pre-defined period of time.

There are many different options for the participation of the private sector. These can be classified as follows⁵:

- *Service contracts* - are the simplest form of PSP, involving short-term contracts to provide limited services, such as reading meters, repairing leaks, and mailing statements for payment. These contracts entail carrying out specific duties and do not require any overall private sector responsibility for system operation. Small service contracts have existed in many cities for a number of years, but in recent years there has been a shift towards more comprehensive types of service contract.
- *Management contracts* - require somewhat greater private sector responsibility with the private company assuming day-to-day responsibility for system operation and maintenance. However, management contracts do not usually require any private investment, the private company does not assume commercial risk, and does not have any direct legal relationship with the consumer. The national or local government must maintain financial responsibility for the system and the capacity to plan and finance system expansion. The contractor does not get paid unless fees are collected from the consumers, and has an incentive to improve system management under the stipulations of the contract.
- *Leases* - allow a private operator to rent facilities from the public authority for a stipulated period of time. The public authority retains ownership and responsibility for system finance and expansion, but the private contractor is responsible for financing working capital and accepts some commercial risk in the day-to-day operation of the system. The private contractor is not responsible for any capital costs, and rental fees are often based upon the costs of debt service for capital costs. The contractor has a direct incentive to maximise fee collection since its returns equal revenue generated less operating costs and rental fees. Occasionally the relationship is reversed, with the private firm building a facility and leasing it back to a public provider.
- *BOOT contracts* - are mechanisms that allow a private contractor to *Build, Own, Operate, and Transfer* a specific capital investment such as a wastewater or potable water treatment plant. Usually, the investment is quite substantial and the contract period is long enough to allow for the recuperation of capital expenditure. Generally the public authority must guarantee a certain demand, such as a volume to be treated. The contractor accepts a risk if this demand is not met. There are numerous variants on this option, such as BOTs, “reverse BOOTs” and others.
- *Concessions* - are long-term contracts which require the private company to invest in the system. The concessionaire has overall responsibility for the system, including operations, maintenance, investment and expansion. The concessionaire receives payment directly from the consumer and accepts the risk that costs do not exceed revenues. The contract period is usually long enough to

⁴ Bidding procedures and contract design are very important in this respect. See full report for a discussion of these issues.

⁵ For different taxonomies of PSP and private-public partnerships see Idelovitch and Ringskog 1995, Gentry and Fernandez 1997, and Brook-Cowen 1997.

allow the contractor to recover investment costs. Penalties may be imposed upon the contractor if specific targets or standards are not met.

- *Divestiture* - may be partial, allowing for shared government and private responsibility for service provision, through a separate corporate entity. Generally, a corporate agreement will stipulate private and public responsibilities, including representation on the board of directors and division of profits. Private finance may be facilitated by the establishment of a separate credit rating with support from the public authority. Less frequently, the provider may be fully private, with the government only serving a regulatory role.

In general, concessions are the most popular form of PSP in terms of both number and size of investment. BOTs (and variants thereof) are also common (see Table 1). Regionally, investment has been concentrated in Latin America and East Asia. Sub-Saharan Africa, on the other hand, accounts for less than 1% of total investment.

Type	Projects	Total investment in projects with PSP (1997 US\$ millions)
Concession	48	19,909
BOT/BOOT	30	4,037
Operations and management	13	n.a.
Divestiture	6	997
<i>Total</i>	97	24,950
<i>Source: World Bank 1998</i>		

The case studies analysed cover a number of these options. While Mexico has been one of the pioneers of the use of BOOT contracts (and variants thereof), Mexico City is an example of a service contract, albeit an exceptionally large one. Under a phased contract, the four international consortia which were awarded the contracts are to install meters, bill households and rehabilitate the distribution infrastructure within the Federal District. The last phase has been described as a *Rehabilitate-Operate-and-Transfer* contract. Given the scarcity of water resources in Mexico's Central Valley and the lack of information regarding the customer base, water consumption levels and network conditions, the primary objective of the contracts is to allow for better management of water resources, and perhaps more comprehensive forms of PSP.

Buenos Aires and Córdoba are concessions for the operation and management of the entire network. While part of a larger national strategy to privatise public utilities, the specific motivation for the involvement of PSP in the WSS sector was a recognition that the public service provider *Obras Sanitarias de la Nación* (OSN) had been under-investing in the service for many years and was not in a position to reverse this trend. The concessions, which are to last for 30 years, were awarded in 1993 on the basis of international bidding procedures. The main difference between the two concessions relates to coverage. In Buenos Aires, both water and sanitation are included, while in Córdoba the municipality has retained responsibility for the sanitation system.

Manila is also a concession, covering both water and sanitation. However, unlike in the cases of Buenos Aires and Córdoba, the concession has been split in two. The contracts were awarded in 1997 on the basis of an international bidding procedure, and are to cover a period of 25 years. It is hoped that the division of the contract will facilitate the task of the regulator, which may be important since far fewer resources were devoted to preparing the regulatory framework than in the Argentinian cases. Unlike many other arrangements, the contract makes explicit allowance for alternative service providers within the concession areas, but it is assumed that the two concessionaires will eventually monopolise service provision.

Finally, in the case of Abidjan, where experience with PSP is much greater than elsewhere, private sector participation has evolved from a lease arrangement, to joint ownership with the state, and eventually to a concession. The concession was awarded in 1987 for 20 years. At present, the private service provider has full responsibility for the provision of water services, and a separate service contract to maintain sanitation facilities. However, a concession contract is being prepared for the provision of sanitation services. Unlike in the other concessions, the regulatory regime guarantees a return of 5% on investment undertaken, significantly reducing risks (and incentives).

Firm empirical evidence of the relative merits of private and public management of the sector in the four case studies in terms of economic efficiency is limited.⁶ Indirect evidence can be obtained through comparison of tariff rates before and after PSP. For instance, in the case of Buenos Aires, tariffs charged by the private consortium were 73% of those previously charged by the state utility, although they have since risen.⁷ In Manila tariffs in the east and west of the city also fell, 25% and 57% respectively, relative to pre-concession rates. However, to the extent that these figures do not reflect the effects of accompanying reforms in the sector as well as changes in service quality, such evidence is not conclusive. Only in the case of Buenos Aires has there been a systematic study of the “efficiency” effects of private sector participation, and it is revealing that according to most criteria the sector appears to have performed relatively worse than other privatised utilities (see Crampes and Estache 1997).

3. The Potential for Environmental and Social Market Failures in Water Supply and Sanitation and the Role of the “Economic” Regulator

In addition to the potential for market failure through monopolistic service provision, there are three other types of market failure in the sector which relate directly to environmental and social concerns: over-exploitation and misallocation of raw water supply; health and environmental externalities from wastewater; and the under-provision of basic needs for poorer households. This means that a significant degree of public intervention will always be necessary to ensure that provision is not only economically efficient, but also socially equitable and environmentally sustainable. However, in many senses public authorities’ regulatory functions will not have changed appreciably with PSP. Implementing agencies with direct responsibility for the realisation of social and environmental objectives may well have roles which are indistinguishable from those they fulfilled previously when public authorities had direct responsibility for service provision.

⁶ The role of ownership (rather than management *per se*) is better documented, but most of the evidence relates to the United States since it is one of the few countries with a mixed private-public sector. Crain and Zardkoohi (1978) found that the behaviour of public water utilities was much further from cost-minimisation than those owned privately, and concluded that most of the observed difference in efficiency was due to differences in labour productivity. Conversely, Feigenbaum and Teeple (1983) did not find that ownership played as significant a role in determining the relative efficiency of water and sanitation utilities as had been thought previously. This result may be explained by the fact that unlike previous studies, they included a number of supply-side variables which tend to vary systematically with ownership (i.e. source of raw water supply, population density of area served, etc...). They also distinguish between the characteristics of the service provided (i.e. treatment levels, reliability of service, etc...). Teeple and Glyer (1987) refined this analysis, using more general econometric specifications. They found that for the least restricted regression, ownership was statistically insignificant. Two other studies (Lambert and Dichev 1993 and Bhattacharyya *et al* 1994) have even found that public utilities are on average more efficient, albeit with much greater variability in performance.

⁷ They remain 17% below the pre-concession rate, although the tariff structure has just been reformed once again. (See Jaspersen 1997 and de Yeregui 1997.)

As such, the discussion in this section concentrates on the “economic” or “sectoral” regulator since it is its role which changes with increased PSP. Indeed, in most cases the “economic” regulator will only come into existence because of PSP, mainly through concern about the potential of private sector providers to exercise market power. Through a variety of mechanisms (price regulation⁸, service quality standards, coverage targets, etc...), the regulator seeks to ensure that the service provider does not over-price or under-provide services. However, although often indirectly and unintentionally, the behaviour of the economic regulator may have very significant environmental and social consequences. Indeed, in some cases the role it plays may be even more important than that of the agencies with direct responsibility for environmental and social matters. These issues are explored in this section, with a focus on how conditions and incentives are likely to change with PSP.

3.1 Conservation and Allocation of Water Resources

In general where water is scarce and valuable, access to water is characterised by high excludability (e.g. access to the resource can be restricted) and high subtractability (e.g. consumption by one agent reduces availability for others), and thus has many private good characteristics which allow it to be rationed efficiently through prices. However, despite these characteristics, water is rarely treated as a private good, and as a consequence it is often used excessively and allocated inefficiently (Dellapenna 1994).

From the perspective of urban service provision, two issues are of particular importance: the allocation of water between urban and other users in the river basin, and the allocation of water amongst users within the urban area. The allocation of water between urban and other users is especially important in situations where water is scarce and urban areas are growing in both income and population. In these cases a reallocation of water between different sectors can be expected, often leading to conflict (Hearne and Trava, 1997). Excessive consumption by urban users (residential, commercial and industrial) will impact adversely upon competing uses, such as water used for irrigation of agricultural land (the converse is, of course, also true). For instance, in the cases of Córdoba (Lago San Roque), Mexico (Cutzamala) and Manila (Angat Dam) urban households using water compete directly with users outside the city. This is not as true in the case of Buenos Aires which draws most of its water from the Rio de la Plata, for which there are no directly competing uses due to the river’s massive flow. Water scarcity is also less of a concern in Abidjan. In cases where raw water supply is scarce, the over-use of water will not only impact upon other water users, including industry and agriculture, but it will also reduce the water available for ecological services such as the maintenance of wetlands and fish populations.

Effective conservation and allocation of the use of groundwater is particularly problematic since it is very difficult to ensure excludability of users. Moreover, the volume of groundwater resources is often not known with any degree of certainty. The exact volume of aquifers is difficult to determine, and monitoring of withdrawals is often costly. For this reason, groundwater is often allocated indiscriminately on the basis of firms’ and households’ willingness and ability to invest in wells. Since aquifers span large areas, one withdrawal will have a negative external effect on others. Where groundwater extraction exceeds recharge, the negative external effects of pumping include the following:

⁸ This can either take the form of cost-plus regulation (which guarantees a level of profits for the provider) or price caps (which guarantees a price for users). While, the latter is usually advocated since it provides more incentives for efficiency improvements, cost-plus price regulation is more common. However, in practice the two systems of price regulation are quite similar

- 1) the scarcity value of the groundwater stocks is not taken into account, and withdrawn water is not available for other users in the urban area. With aquifers which span large areas or whose resources are transported great distances (e.g. Mexico City) this may affect users outside of the urban area;
- 2) the increased cost of pumping from an increased depth is imposed upon others. In Buenos Aires, groundwater from the upper strata is no longer potable, and households and firms are having to drill deeper wells (or put their own health at risk);
- 3) excessive groundwater depletion can even lead to land subsidence (Mexico City) and saltwater intrusion (Manila).

Given the externalities associated with unsustainable water consumption, it is important that the scarcity value of water be reflected in costs faced by service providers and service users. With private sector participation in the sector, the service provider's access to raw water supply is the first issue to be addressed since the incentive to ration and allocate water use *within* the urban area is dependent upon the scarcity of water being reflected in the provider's decision-making. In cases where water is allocated freely to an urban service provider (so that it does not have to account for the needs of other users), water will not be treated as a scarce resource by the provider. However, if the urban service provider's access to raw surface water supply is limited in quantitative or financial terms, then it will have an incentive to treat water as a scarce good and to ensure that its customers do so as well.

The introduction of PSP is potentially significant since it may change the incentives of the public authorities with responsibility for water resource management. Public authorities with responsibility for water resources may be more likely to charge for raw water supply when it is a private sector service provider which is the buyer than when it is another public authority. However, despite the opportunity presented by the introduction of PSP, this route is rarely taken. For instance, in Mexico City urban water service providers have not been required to pay the full scarcity value of water provided to the City from the Cutzamala system. The case of Manila, which draws much of its water from the Angat Dam, is particularly interesting. The service providers pay nothing for raw water supply and are given priority access to the dam's water. While the regulator rejected efforts by the concessionaire to allow for tariff increases due to water shortages during the drought which followed *el Niño*⁹ - claiming that it was a recurrent phenomenon and thus should have been foreseen by the concessionaires - other users have fared even worse. For instance, no water at all was provided for irrigation. The treatment of such phenomena in the regulatory structure is important.

In general, there has been greater attention paid to introducing incentives for the users of services within the urban area. Despite the cost involved, a large number of contracts have included targets to increase metering of household connections. Along with the introduction of use-based tariffs (usually covering both water and sanitation), these measures provide incentives to conserve scarce water resources. Indeed, in the case of Mexico City, where water shortages are particularly acute, the first two phases of the contract were largely designed to help achieve this objective. Water consumption has subsequently fallen by as much as 10-20%. However, it must be emphasised that the nature of service contracts are such that incentives are weaker than in more comprehensive forms of PSP. Thus, perhaps more significantly, the phased nature of the contract may allow for the collection of information which will make future efforts to manage resources more effective. Understandably, in relatively "water-rich" cities, such as Abidjan and Buenos Aires, fewer incentives are included in the contracts to increase metering and use-based pricing. In the latter case, monthly water charges are

⁹ Water availability fell by 25%-30%.

adjusted by a variety of criteria which are supposed to reflect levels of household water use (e.g. dwelling surface area), but these do not provide marginal incentives to the individual household.

Many of the contracts have more direct provisions which impact upon water conservation. For example, many concession agreements have targets for reducing “unaccounted-for water” (UFW) through, for example, service rehabilitation. In Buenos Aires, UFW is targeted to drop from 45% to 25% by the end of the 30-year concession. In Manila, a reduction of UFW from 60% to 30% is required over a 25-year period. Other contracts include targets for the rehabilitation of the distribution system in order to reduce water leakage rates. This is one of the primary objectives of the third phase of the contract in Mexico City. While such targets are valuable, in many cases it may be more effective and less burdensome on the regulator to charge the service provider for the scarcity value of the raw water supply and let them determine what level of “leakage” is economically efficient. Imposing leakage reduction targets - while simultaneously providing free raw water to the concessionaire - is likely to be an economically inefficient and administratively costly means of conserving scarce water resources.¹⁰

3.2 Health and Environmental Externalities

Inadequate WSS provision may result in negative environmental and public health externalities due to unsanitary potable water supplies and inadequate wastewater collection and treatment. Waterborne diseases include diarrhoea, cholera, and typhoid. Diarrhoeal diseases alone can affect 700 million people annually and result in over 5 million deaths per year. Bilharzia can affect 200 million people annually (see Hardoy *et al* 1992 for a review). Significant reductions in morbidity and mortality, especially among children, can be achieved through:

- adequate access to safe, potable water;
- adequate access to water for washing and cleaning; and
- proper removal, treatment, and disposal of wastewater and effluent.

Households recognise the adverse health effects of these diseases and (if they can afford to do so) adjust the nature of their WSS provision accordingly. However, even if households recognise the health benefits of improved water and sanitation provision, they may not consider the external benefits of their own improved WSS facility on the health of the wider community. For instance, a household might choose to use a simple pit latrine which is perfectly sanitary in terms of immediate environmental consequences, but, depending upon soil conditions and housing density, it may result in externalities by contaminating the groundwater supply of the community. Even if the household itself draws water from this supply, there will still tend to be excess contamination since the household’s cost of avoiding it is likely to be greater than the household’s expected benefit from better quality groundwater arising from their own efforts. Thus, if on aggregate individuals only account for their personal preferences this service will be under-provided in qualitative terms. Groundwater pollution from inadequate sanitation facilities is a significant problem in Buenos Aires and Manila.

In many cases, dealing effectively with externalities from sanitation requires the provision of collective infrastructure to treat the wastewater that is collected. For instance, in the case of Córdoba, residential sewage discharges have contributed to the eutrophication of the Lago San Roque, from which the city also draws its drinking water. To a certain extent, pollution of surface waters due to inadequate treatment is of significant concern in all of the case study cities. However, the adverse effects of inadequate treatment will depend upon the characteristics of the receiving waters and their

¹⁰ However, in the case of Manila it may reflect a concern that increased water tariffs arising from pricing raw water supply may increase the tendency for households and firms to “informally” draw down scarce groundwater even further.

alternative uses. For instance, until the new Sudoeste treatment plant is completed only 5% of the wastewater collected in Buenos Aires will be treated prior to discharge. However, the city benefits from the huge assimilative capacity of the Rio de la Plata. In contrast, its two primary tributaries (the Matanza–Riachuelo and Reconquista) into which many industries and residential neighbourhoods discharge, are heavily polluted.

As with the treatment of the scarcity value of water, the urban water and sanitation service provider is affected by the regulation of environmental and health externalities, both as a user of raw water and as a provider of water and sanitation services. On the one hand, the service provider's costs of production and its ability to meet the public authority's objectives will be affected by the quality of raw water supply. On the other hand, the service provider will be affected by regulations on the quality of potable water and wastewater discharges. However, as with measures to efficiently allocate and conserve water resources, there is no *a priori* need for changes to these regulations with increased PSP. Nonetheless, PSP may necessitate the formalisation of regulations to mitigate environmental and health externalities, since private firms may have greater incentive to reduce treatment costs than public sector providers had. This can be one of the great benefits of PSP, making trade-offs between different objectives more explicit. If environmental standards increase service costs, then this will be more readily apparent.

With PSP, it is vital that there is co-ordination between the different authorities. For example, in the case of Buenos Aires, the concessionaire (Aguas Argentinas) argued that changes in regulations which prevented the dumping of sludge from wastewater treatment plants at sea were not foreseen when the tariffs were agreed upon. It has also been argued that the public authorities have not adequately regulated the quality of discharges into the sewerage system, also affecting the viability of the concession. Thus, the means by which environmental standards are treated in the regulatory regime is crucially important, particularly when prices are regulated through "price caps" rather than "rate-of-return" formulae. In the case of Abidjan, where "rate-of-return" regulations are used, the firm will always be able to pass on the cost of changes in standards.

Efforts to mitigate environmental and health externalities are often included directly in the contracts through which PSP is established. Most directly, this arises when specific quality objectives are incorporated into the contracts. For instance, concession agreements often include schedules for upgrading from direct discharge to primary treatment and eventually from primary treatment to secondary treatment (this is the case in Buenos Aires). Similarly, drinking water quality standards are also often incorporated directly into the contract. To some extent, these obligations may appear to be redundant in the presence of equivalent environmental regulations, enforced by environmental agencies. However, by attaching such obligations directly to commercial incentives, there may be an increased likelihood of targets being met. Moreover, as with water conservation objectives, the incentives of public authorities to enforce the regulations (or introduce stricter standards) may increase with PSP. Relative to standards prevailing under OSN, water quality variables such as turbidity, bacteriology, and free chlorine have improved markedly in Buenos Aires since the granting of the concession. WHO standards were achieved in 1996, and principal parameters conform to the standards required by the Argentine Ministry of Health.

In most contracts, failure to meet environment-related service quality standards can result in penalty payments, usually paid for out of a performance bond deposited with the regulator. However, it is important that the penalties provide appropriate incentives (i.e. be sufficiently high to affect firm behaviour) but also be credible (i.e. not be so high as to discourage their application). For instance, some contracts only allow for the "dissolution" of the contract, which is hardly likely to be appropriate or credible for minor infractions. Other contracts only allow for penalties which are of a lesser value than that of the infraction to the firm. Thus, the determination of penalties appears to be a delicate

balancing act. The use of performance bonds (as in Manila, Mexico City and Buenos Aires) helps to ensure that enforcement of penalties is credible, thus providing better incentives.

Perhaps the most significant effect of PSP on the realisation of environmental and health benefits arises from contractual targets for expansion of the wastewater collection system (or regulated on-site facilities). Since many on-site sanitation facilities have adverse effects for groundwater pollution and neighbourhood environmental conditions, expansion of the system will have important effects on the reduction of local externalities. In most cases the necessary financing requirements are agreed upon with the firm when such targets are established, with households usually paying for expansion costs through connection charges. However, in many cases this has been unrealistic. The inability of many households in Buenos Aires to pay the proposed \$US1,000 sewer connection charges resulted in delays in network expansion, and eventually re-negotiation of the contract with a revised tariff structure, whereby the costs of expansion were borne by all service users.

In cases where the capacity of public authorities to regulate externalities is inadequate, it may be possible to design PSP in such a way as to overcome this problem, perhaps even expanding the scope of the contract in order to internalise incentives within the firm. For instance, by keeping sanitation in public hands in Córdoba it can be argued that an opportunity to internalise externalities directly through the contract itself was lost. With the sanitation service provider discharging wastewater into the water supply service provider's raw water supply (Lago San Roque), a contract which covered both services might have been easier to manage since the firm would have appropriate internal incentives. Paradoxically, in the case of Buenos Aires where water and sanitation is not a "closed" system, the concession included both services.

3.3 Basic Needs and Merit Goods

Access to adequate water supply and sanitation facilities are usually described as basic needs. This implies, amongst other things, that lower-income households will tend to spend a large proportion of their disposable income on water and sanitation. Moreover, their expenditure on water and sanitation will be proportionately much greater than that of richer households.¹¹ For instance, in Mexico, the lowest decile spend just over 5% of their total expenditure on water services, relative to just over 1.5% for the highest decile. In Manila, the lowest income bracket spends 8.2% of income on water services, while the highest spends just 0.6%.¹² These differences between rich and poor in the proportion of total expenditure allocated to water are not primarily a consequence of decreasing proportional consumption levels, but rather, are mainly due to the inequality in access to public facilities. In Buenos Aires, only 19% of households in the lowest socio-economic classification have household water

¹¹ Bahl and Linn (1992) review a number of country-level studies of water demand in developing countries and find estimated income elasticities ranging from 0.0 to 0.4. This is confirmed by cross-sectional evidence, indicating that the income-elasticity of water consumption is in the region of 0.3 (Anderson and Cavendish 1993). However, it should be emphasised that if the nature of the service provided by the good changes with income then the demand function may exhibit changing elasticities. For instance, higher-income households in which a significant proportion of water is used for recreation and aesthetic purposes (e, swimming pools, gardening and car washing) may have highly price-responsive demand. Thus, not surprisingly it has been found that the *price* elasticity of demand for water differs with income levels, with elasticities being much lower for poorer households (see Anderson and Cavendish 1993, Bahl and Linn 1992 and Idelovitch and Ringskog 1997). For related reasons *income* elasticities may also differ by income level.

¹² Relative costs and expenditure on sanitation facilities are more difficult to compare since the variation in service quality is so wide. A number of alternative low-cost on-site facilities provide relatively inexpensive and adequate alternatives to off-site collection systems. For instance, in many cases on-site sanitation facilities will be preferable (in environmental, health and even convenience terms) than some types of off-site sanitation facilities, even though they may be technologically less sophisticated and considerably less costly (see Mara 1996 and Cairncross and Feachem 1993). However, as population density increases the number of feasible on-site options becomes more constrained.

connections, while 86% of the richest households do. The comparable figures for sanitation are 13% and 79%. Only 20-25% of “low-income” households in Manila have household water connections. Since the cost of vended water can far exceed network water, non-connection itself can be one of the most important determinants of disposable income for poorer households (see Table 2 for a comparison of the cost of vended water relative to “network” water in Abidjan and Manila).

Table 2: Price of Water by Source in Abidjan and Manila		
	Abidjan (FCFA/m³ in 1996)	Manila (P/m³ in 1995)
Vended	1,000 - 2,000	21.80 - 71.93
Network Water	324	5.53 ¹³

Water and sanitation facilities have been characterised not only as basic needs, but also as “merit” or “beneficial” goods (Mody 1996, Roth 1987 and Franceys 1997). This implies that society as a whole values private consumption by individuals above and beyond those benefits reflected by personal preferences and external health and environmental benefits. Merit goods have two characteristics. First, they are fundamental to a person’s capacity to function in society (see Sen 1983). Access to affordable water and sanitation facilities are thought to constitute one such case since they are unarguably fundamental to the realisation of a basic standard of living (see Franceys 1997 and Fass 1993). Second, there are significant information failures in the provision of water and sanitation facilities. Households do not have access to (or are not able to use) all of the information necessary to make informed choices regarding consumption. Such preference failures are particularly important in demand for WSS, given the complexity of health effects from the consumption of too little water or water of inadequate quality, and from the use of inadequate sanitation facilities.¹⁴

Thus, even without the existence of health and environmental externalities of the sort described above, in the presence of “preference” failures, households may consume too little water or water of inadequate quality. The combined effect of these two characteristics of WSS imply that there is a significant demand-side potential for under-provision (in both quantity and quality) even in the absence of supply-side market failures and health and environmental externalities. However, as with the other market “failures” cited above, state provision is not necessary to ensure that the basic needs of poorer households are met. Rather, the state must serve as a guarantor of a certain level of affordable provision. It can do so by direct means, such as providing public subsidies for water and sanitation services to poorer households and neighbourhoods. “Free” water points would be one such example.

In most cases these programmes do not materially affect the service provider, whether public or private. However, there are a variety of ways that social objectives can be realised through the contract itself. One of the most common ways of attempting to realise social objectives in WSS is through a price regulation regime which mandates a tariff schedule with positive distributional consequences. Thus, rising block tariffs are applied in Abidjan and Manila. In other cases (e.g. metered households in Buenos Aires and Córdoba), a lifeline tariff is used, with a certain level of consumption being free.

However, with private service providers, there is a danger that cross-subsidisation of this form will provide disincentives for service providers to expand into poorer neighbourhoods. Since consumption is (moderately) income-elastic, private firms may find that their profit rates are higher if they serve higher-income areas first, where consumption per connection (and thus average tariff rate) is likely to be higher. Thus, the dynamic distributional consequences in terms of service expansion rates may be

¹³ Households with sewer connections paid 8.52 P/m³.

¹⁴ Roth (1987) cites an example from Thailand.

negative since unserved areas are disproportionately poor. Conversely, the success of cross-subsidisation in static terms may be undermined where there are multiple-household dwellings, shared water points or public water taps. In such cases, rising block tariffs may have perverse distributional consequences since poorer households are more likely to rely upon sources with multiple users. This appears to be the case in Manila. To some extent, in the case of Buenos Aires this problem has been addressed by adjusting the lifeline tariff for multiple household dwellings.

Even in cases where consumption is not metered, other means are often used to cross-subsidise consumption for poorer households. For instance, Córdoba applies “zone” coefficients, in which households in poorer neighbourhoods pay slightly more than 50% of the monthly charge of wealthier neighbourhoods. In Buenos Aires, a variety of proxies which are thought to be related to household wealth (construction date and “type” of dwelling) are also applied at the level of the household for the determination of monthly charges. However, there is likely to be a trade-off between the administrative costs and the effectiveness of progressive pricing in reducing inequities. Zone coefficients and other dwelling-related proxies are unlikely to be very good guides to relative wealth, while “means-tested” measures are likely to be costly unless they can be “piggybacked” onto other social programmes with wide coverage.

The spatial definition of the concession area can also be socially significant since it will determine the potential scope for cross-subsidisation. In most cities (e.g. Buenos Aires and Abidjan) single tariff schedules are applied across the entire city, resulting in cross-subsidies from low-cost areas to high cost-areas.¹⁵ Depending upon the relationship between the costs of service provision and the distribution of poorer households this can have significant social implications. However, if concession areas do not cover a reasonable proportion of wealthier neighbourhoods it will be difficult to cross-subsidise poorer households. As noted, in Manila, the concession has been split in two, with tariff rates in the East Zone less than 50% of those in the West Zone. Although such a split eases the regulatory burden through enabling ‘yardstick’ comparisons to be made, it may limit the potential for cross-subsidisation if one of the zones contains an insufficient proportion of wealthy households.

The means by which expansion costs are financed is also important. As noted above, the terms of many contracts have required private sector service providers to finance network expansion out of connection fees. This has often resulted in unaffordable connection fees for many poorer households with little or no access to savings or credit. Indeed, in many cases the costs will be even greater in poorer neighbourhoods since they may have been developed in an unplanned manner, located far from the existing network, or be situated in areas with difficult topographical conditions. One possible solution is to provide finance for credit schemes which effectively convert connection fees into monthly payments. In Buenos Aires, the concessionaire has to provide two-year financing for connection charges.

Alternatively, it may be preferable to finance expansion costs from charges imposed on all users and not just new users. This is likely to be more equitable since in many cases users of the existing network did not pay for access when they were connected. The Buenos Aires case, where a surcharge on all users has been applied, is illustrative in this regard. In Abidjan, an investment fund is financed out of a special water tax, effectively reducing connection charges for new users. In addition, a number of free “social” connections are provided for poorer households. Since these are financed through the water tax, this means that the “social” connections are cross-subsidised by all connected users. Finally, another alternative which avoids this problem is the use of in-kind labour inputs as a

¹⁵ Indeed, the same rate applies to all of Côte d’Ivoire, with low-cost Abidjan cross-subsidising other areas.

substitute for financial payments in exchange for connection. Such a strategy has proven to be successful in Buenos Aires, actually accelerating service expansion rates.

However, it is important to remember that even if the terms of the contracts are met, full water and sewerage coverage will not be attained in some neighbourhoods for up to thirty years. Since the costs of provision are often higher and demand lower in poorer neighbourhoods, it is likely to be the most disadvantaged that find themselves in such a position if the firm is allowed to determine the spatial pattern of expansion. This raises the question as to whether or not the obligations of the agreement should be prioritised by area, since poorer households may not have the financial resources required to adopt alternative measures which do not generate externalities. Unlike many other contracts, the Manila concession provides targets at a relatively decentralised level, although it is not clear that socio-economic criteria were used for prioritisation. In other cases it may be preferable to differentiate services by neighbourhood, reflecting differences in the ability and willingness to pay for WSS services. In the case of Buenos Aires the concessionaire has worked with NGOs and local communities to try to devise alternative sanitation systems which are more consistent with households' ability and willingness to pay. However, in such cases it is important that the services provided actually reflect demand and that tariffs reflect the lower level of service provision.

In a related vein, it may be necessary to mandate "interim" measures in the terms of the concessionaire's contract. For instance, the concession could include obligations for latrine and septic tank maintenance, as well as the provision of public water points or trucked water. The Manila concession includes obligations of this kind, requiring the concessionaires to provide and manage public standpipes and septic tanks in areas where household water connections and sewerage are not scheduled to be introduced in the near future. Analogously, in peri-urban areas of Abidjan, SODECI, the concessionaire, works with licensed retailers to supply water to low-income households who have not yet been connected to the system. However, this licensed resale has resulted in higher unit costs than for direct network customers. More controversially, since many poorer households are dependent upon "illegal" sources of water (directly and indirectly), it will not be equitable to close all illegal connections immediately upon granting monopoly rights of provision to a private firm (Manila introduced an "amnesty" on illegal connections when PSP was introduced). The same holds true for unregulated and unlicensed groundwater abstraction, which is a persistent problem in many of the case studies.

3.4 Conclusions

Although the primary responsibility of economic regulators is to ensure that private sector service providers do not over-price and/or under-provide services, the means by which they regulate the sector can also have significant environmental and social implications. Indeed, in some cases their role may be even more significant than those public authorities that have direct responsibility for environmental and social concerns. Table 3 reviews some of the measures, described above, which have been important in the five case studies examined.

Source of Market Failure	Measures	Examples
Merit goods and preference failures	<ul style="list-style-type: none"> • Lifeline tariffs • Rising block tariffs • Credit/financing schemes • Social connections and preferential tariffs • Service Differentiation 	<ul style="list-style-type: none"> ⇒ Buenos Aires, Córdoba ⇒ Abidjan, Mexico ⇒ Buenos Aires ⇒ Abidjan and Córdoba ⇒ Manila and Buenos Aires
Raw water conservation and allocation	<ul style="list-style-type: none"> • Use-based water pricing • Metering targets 	<ul style="list-style-type: none"> ⇒ Manila, Córdoba, Abidjan ⇒ Mexico

	<ul style="list-style-type: none"> • Leakage targets • Rehabilitation contracts • Withdrawal fees/permits 	⇒ Manila, Buenos Aires, Mexico ⇒ Mexico ⇒ Mexico, Córdoba
Environmental and health externalities	<ul style="list-style-type: none"> • Quality targets • Treatment upgrading targets • Coverage/expansion targets • “Interim” Measures¹⁶ 	⇒ Buenos Aires, Abidjan ⇒ Buenos Aires, Manila ⇒ Buenos Aires, Manila ⇒ Manila, Abidjan

However, as with ensuring that efficiency objectives are realised, in order to ensure that social and environmental objectives are realised, the economic regulator must be effective. This means overcoming three potential barriers to the regulator’s effectiveness:

- *Insufficient technical expertise.* Regulatory offices are often staffed by employees of the previous public provider. Since the skills required are very different, this can prove to be a significant constraint on effective regulation.
- *Rent-seeking.* While this problem exists in all countries (see Helm 1994 for a discussion of the UK case), regulators may be more susceptible to rent-seeking in countries where the gap in pay between the regulatory office and the service provider is great.
- *Regulatory capture.* The potential for regulatory capture increases in conditions where information is scarce. Since the introduction of PSP has often been undertaken very quickly and with limited preparatory work, regulatory capture is quite likely.

As has been discussed elsewhere, overcoming these barriers can be exceedingly difficult, particularly in poorer countries with limited financial resources and which have only recently reformed their sectors (see Mody 1996 and Kerf and Smith 1997). Perhaps more importantly, the service provider will be subject to different forms of regulation from the environment ministry, the health ministry, the rivers and/or coastal waters authority, municipal housing agencies, and land use and planning agencies. This raises the potential for “common agency” problems, whereby a number of regulatory agencies or ministries are involved in the operating conditions of the utility and there is insufficient co-ordination between them (see Sappington 1996). Resolving these two sets of problems is key to the realisation of economic, social and environmental objectives.

4. Conclusion

PSP in urban WSS is likely to continue to increase in importance in developing countries in the coming years. For this reason it is vital that PSP is consistent not only with efficiency objectives, but also with the realisation of social and environmental objectives. On the basis of the case studies examined, it would seem that the experience thus far has been mixed. In many cases, there have been clear and important benefits, with positive environmental and social consequences: service networks have expanded into poorer neighbourhoods, users often have more appropriate incentives for more prudent water use, wastewater treatment levels are improving; and, in some cases measures are being adopted to make services more affordable. However, there is still a great deal to be done. The following are particularly pertinent:

¹⁶ In the case of Buenos Aires a number of interim measures have been introduced but these were not explicitly included in the contract.

- The technical specifications of the contract must be consistent with household preferences and their ability to pay for services. Expansion targets cannot be met if services are unaffordable and/or inappropriate. In some cases it may be preferable to differentiate services by neighbourhood. This will usually require considerably more preparatory work - including household surveys, and not just technical feasibility studies - prior to initiating the bidding process.
- Even in cases where the ultimate objective is universal coverage of a standardised level of service provision, the sheer level of under-investment in the past means that this may take many years. Thus, it is important to introduce measures which help poorer households realise some of the benefits of PSP in the short- and medium-term. In some cases this may involve explicit prioritisation by neighbourhood, or the inclusion of interim forms of service provision explicitly in the contracts. Measures that increase access to credit and the provision of alternative payment schemes (including in-kind inputs) may also be used.
- While it is important that lower-income households have access to affordable services, it is also important to ensure that efforts to realise this objective through service pricing do not result in unintended and even perverse effects. For instance, providing various subsidies to connected lower-income households may result in reduced service expansion rates, and thus be unintentionally regressive in the longer-run. Similarly, tariff structures that penalise households that rely upon multiple-use connections or public water points must be avoided.
- It is important to design contracts in a way that places the least burden possible on regulatory authorities. There are numerous aspects of PSP contracts that have been designed to meet environmental and social objectives, but which are economically inefficient and/or administratively costly. For instance, setting targets to reduce leakage rates while providing raw water at zero cost places a significant burden on the regulator, and may not be efficient.
- There must be a high degree of co-ordination between the different agencies that have an impact upon the regulatory environment of the sector. One of the advantages of PSP is that it makes choices and trade-offs between alternative objectives explicit, particularly since there can be important trade-offs between the realisation of environmental and social objectives. For instance, excessively stringent technical specifications for wastewater treatment quality may increase service costs or result in delays in expansion of the system into poorer uncovered areas. Thus, responsibilities need to be clearly established at the outset.
- Finally, it is important to remember that, with some exceptions, experiences with PSP in the sector have been concentrated in countries with considerable administrative capacity. However, in the coming years it is likely that PSP will grow in importance in countries which have more extreme levels of urban poverty, are faced with greater environmental constraints, and possess less regulatory capacity. The benefits of different forms of PSP need to be weighed against the potential costs if the public authorities are not able to intervene effectively. Thus, a more pertinent issue than whether or not there should be PSP, is the precise form which such PSP should take, given existing economic conditions, sectoral objectives and domestic regulatory capacity.

This last point needs to be emphasised. In general, the complexity of dealing with environmental and social objectives complicates the role of the regulator, particularly in developing countries. Where information is scarce - and it is particularly scarce with respect to household preferences and supply conditions in poorer neighbourhoods and with respect to environmental conditions and trends in standards - the regulator must be particularly effective. Since it will be very difficult to identify appropriate forms of service provision *ex ante* and since environmental regulations and conditions are changing quickly in developing countries, some degree of flexibility may have to be introduced in the

contract in terms of the technical specifications of the services provided, management of collective systems (including neighbourhood inputs), and the tariff structure. However, it is important that this does not undermine the enforceability of the contract. Balancing trade-offs between the flexibility needed to ensure that environmental and social objectives are realised and ensuring that private service providers meet their contractual obligations is one of the most pressing concerns arising from PSP.

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