



Public–private partnership in water desalination

Muhammad Al-Rashed, Mahmoud Abdel-Jawad*

*Water Technologies Department, Water Resources Division, Kuwait Institute for Scientific Research, PO. Box 24885, 13109 Safat, Kuwait
Tel. +965 498 9310; Fax: +965 498 9309; email: mrashed@kisir.edu.kw; majawad@kisir.edu.kw*

Received 9 April 2008; Accepted 8 April 2009

ABSTRACT

Historically, governments have the largest share of funding for investments in water resources projects. These projects include water supply and sanitation, communications, agriculture and industrial sectors. Due to the various enormous estimates for future investments in the water sector, domestic and international private firms/investors will be the largest contributors to these requirements. Countries located in arid regions and suffer from water scarcities, such as the GCC countries, rely on non-conventional water resources to meet the needs of almost all sectors. Today, desalination of seawater, in particular, offers a cost-effective supply of freshwater for these countries. It exists in more than 100 countries and it is very difficult to draw a general cost comparison between their investments and operating costs. However, the general trend shows that production costs have fallen steadily over the years. A significant decline in the cost is attributed to fierce competition between prequalified competitors and a transparent prequalification and bidding process. This paper reviews some case studies of BOOT projects and PPP criteria for successful water BOOT projects.

Keywords: BOOT projects; Costs; Criteria; Finances

1. Introduction

Less than 1% of the water in the world is available as fresh water. This very small fraction has remained the same for hundreds of centuries and is expected to be the same in the future. However, in the past century, the world population has increased threefold, whereas the world demand for freshwater has increased sevenfold [1]. If these trends will continue in the future, it is expected that the world during the 21st century will face a drastic shortage of fresh water, which is essential to every aspect of life. Without any doubt, the demand for more water in the future will be increasing and the fresh water will be a scarce commodity, despite a good management of the demands and the use of non-conventional production of fresh water from the sea and ground aquifers. Annual

future funding requirements for the global water sector are estimated between US\$ 111 billion to US\$ 180 billion [2,3]; these global figures are indicative of the magnitude of the financing challenges that the communities will have to face in the near future.

2. Current situation

Piped water and sewer issues had been recognized in the 19th century as of prime public interest for healthy urbanization. During this period, private sector participation in providing such services was long debated and the concept was controversial [4]. It was argued that privatization increases customer rates and raises company's profits. In addition, customers who cannot pay will be cut off. Moreover, with regard to cost, no clear support to the claim that privatization is a key benefit for savings.

*Corresponding author.

This claim is true when the contracts of the private sector are comprehensive and well controlled by a balanced regularity framework [5]. On the other hand, it was argued that privatization of the water sector ensures efficiency and reliability of services [6]. A recent study has reviewed the major technical, socioeconomic and political changes that are related to the United Kingdom water industries over the period 1974–2006 and stated that “privatization has had impacts on improved water quality and customer service, higher capital investment and changes to pricing mechanisms [7]. A study using 22 empirical tests and 51 case studies has reviewed the difference in efficiency between public and private infrastructure sectors, showing no significance [8]. Assessment of the Brazilian public and private companies of water supply showed no clear evidence that they are significantly different in their efficiencies [9]. Another study on comparison between water services in some European countries indicated that P-PP has several advantages including acceleration of development, increasing project time implementation, decreasing its cost, improvement in service quality, improvement in management efficiency, etc. [10]. It is worth noting that most public water sectors need some kind of reform to improve their managements and operation. Major required reforms include:

- Over employment (should be 2–3 employees per 1000 water connections for efficient utilities) [11].
- Promotion of staff mainly by seniority (should be on the basis of qualification and performance).
- Loose accountability/high expenditure.
- Weak professional labor force.
- Operational practices are inefficient and maintenance are inadequate.
- Revenues are not sufficient to cover reasonable amount of the expenditure.

Today, most of the water sanitation utilities in the developing countries are under direct supervision of their governments and financed from budgetary resources or sovereign borrowings. In spite of the shortcoming of the public sectors, the degree of privatization in water and sanitation sectors remains the subject of major debate. In the world summit on sustainable development which was held in Johannesburg (August/September 2002), it was argued that in any form of public-private partnership, the asset should remain under the control of the government and users and the needs of the poor should be duly considered.

On the other hand, partnership with the private sector for financing urban water and sanitation infrastructure remains an interesting option for many countries in light of the increasingly interconnected world (globalization). However, the United Nations commission on Sustainable Development, noted in 2001, that “Globalization should

not be seen as a panacea for sustainable water development and management. In order for globalization to take roots there needs to sufficient funding, robust institutional structures, adequate human resources and a solid understanding and assessment of freshwater resources in relation to social, economic and environmental process” [12].

3. Public-private partnership

There is no denying that water is a gift of God to all people and the earth’s ecosystem. However, clean and abundant water resources can no longer be taken for granted. Water consumption has almost doubled during the second half of the 20th century and the water quality continues to worsen [13]. Moreover, human activities over the last 200 years were developed to an extent that now few natural clean water bodies still exist. The world’s current environmental, ecological, political and economic situation of water issues puts the water sector in most countries as a very important topic [14].

Therefore, to secure healthy freshwater, most available water resources should be treated by conventional or unconventional treatment and transported to consumers. Hence, water became a commodity that must be paid for.

Valuing water, taking into consideration all capital and operating costs, is critical for attracting a viable private sector to participate in the needed projects. It seems that water during the 21st century would come further and further under control of market forces. Current global trade in water is estimated to be US\$ 800 billion servicing only about 6% of the world’s population through common legal arrangements. By the year 2015 private water systems are expected to serve about 17% of the world’s population, and the global trade in water expected to be a multi-trillion dollar industry [15]. The Water Executive Forum of 2007 gave a lower estimate for the current sales of water as US \$300 billion to US \$400 billion [16].

4. Common legal arrangements for water privatization

Privatization is the terminology for a financial technical and legal structure that uses private investment to develop a public sector. It requires varying degrees of government involvement and support to promote public-private partnerships. There are many types of privatization; e.g., build, operate and transfer (BOT), BOO (build, own and operate), BOOT (build, own, operate and transfer), BTO (build, transfer and operate), etc. [17]. However, common legal arrangements for water privatization are management contracts, leases or concessions [18].

The management contract keeps control over labor, tariff structure, assets and expansion of the water

infrastructure, in the hands of the government. The length of the legal arrangement varies from country to country but most often is less than 8 years. The source of company income is set as a fee for the required service, e.g. operate, maintain, collect tariffs, etc.

The lease contract keeps the assets in the hands of the state, whereas the control over labor is passed to the private company. The control over the tariff structure will be given to the company with state oversight. Other aspects, such as expansion of the infrastructure, vary from contract to another. Duration of the lease contract has a medium length between 8 and 15 years, during which the company derives revenue from customer fees.

The concession contract usually takes control over all labor, tariffs, responsibility for infrastructure and expansion, and the assets. The length of the concession contract is between 25 and 30 years. For a more meaningful public–private partnership, the state usually gains the assets at the end of the contract and it keeps full control or oversight over the tariff structure and the source of the concessionaire income, provided that a reasonable rate of return on investment will be made allowable for the concessionaire, e.g. 8–10%.

The International Monetary Fund (IMF) and the World Bank (WB) promote water privatization for all borrowers under certain conditions to contribute to the overall government deficit, i.e.,

- encourage an end to state subsidies,
- full cost recovery
- better management and administration of the accounting and fee collection procedures.

The two institutions believe that the private sector is more efficient and cost effective as a provider of services or commodities, including water. The full cost recovery from the institutions' point of view implies that consumers should cover the cost of operation, maintenance, and expansion of the water system, as required, with provision of a reasonable rate of return on investment. It is worth mentioning that the Federal Clean Water Act and the safe drinking water of the US subsidize about 10% the water and sanitation needs [19].

5. Desalinated water resources

Governments and water service providers face the challenge of meeting the growing demand. Some believe in improving supply management, applying conservation measures, and restructuring tariffs to discourage excessive consumption. Others thought to minimize the unaccounted for water. However, increase in consumption requires at some point augmenting the water supplies. Knowing that water scarcity is growing, many countries, including the GCC region, turned to the largest water

reservoir on earth — the sea — to meet the growing demand, fully or partially.

For over half a century, desalination was part of power-water co-generation plants. Today, most water installations have to be carried out separately and in record time. In fact water desalination is no longer a practice limited to the Gulf region, but has become common practice to almost 100 countries. Over the past half a century global desalination capacities reached almost 30 million m³/d, contributing significantly to the fresh water supply of these countries [20].

Over the last 15 years, major advances have been made in certain desalination technologies, which resulted in notable cost reductions. Large-desalination units, better energy utilization, improved materials of construction, refined operational and engineering practices, etc. have all contributed to improving overall performance, and thus reducing the cost of desalinated waters. Seeing that desalination is a fairly stable, predictable, reliable, and it is becoming more affordable over time, and that oil and gas are readily available as the primary source of energy, then it is reasonable to conclude that desalination shall continue to serve as the main pillar in the freshwater supply infrastructure in the State of Kuwait and the rest of the Gulf countries, as well as other parts of the world which may be of similar situation with regard to water demand.

Water resources in Kuwait and the Gulf region rely heavily on the non-conventional methods of sea water treatment, i.e., desalination, and the desalinated water is supplemented with a low percentage of brackish water. The fact is that water supply and sanitation in these countries are under total governmental monopolies. Fresh water is heavily subsidized and supplied at a very low cost. Moreover, sanitation activities are fully covered by the government. Water supply and sanitation are in a critical situation due to very high rate of population growth, very high per capita consumption of fresh water, very high rate of urbanization and rise in standard of living. Groundwater aquifers are over-exploited without replenishment and the water supply and distribution facilities are expanding at staggering rates exceeding 10% in some of these countries. Current and future investments in upgrading and expanding these facilities are beyond the reach of most rich countries, including GCC countries. The critical situation of water in the GCC countries could be attributed to inefficient management coupled with need for legal and institutional reforms and environmental limitations. There is a clear need to generate funds for the water programs beyond the only source so far i.e., national funding. Limitation to mobilize local funds to water programs is due to: absence of effective water metering and charging for real services, lack of legislation, and ineffectiveness of many regulatory controls.

As demand of water resources is increasing rapidly,

measures of conservation and demand management need to be urgently developed and strengthened. Governmental agencies should also modify their role service from provider to regulator. Experience has shown that water supply services are most efficient when delegated to private and accountable service providers. Most water agencies require a phased program to increase the autonomy and accountability of service providers, either as a new enterprise or by reorganizing existing agencies. Strategies within each country should identify the need for introducing such reform. Private sector initiatives and market-oriented behavior are expected to improve performance and efficiency in service delivery.

Evaluation of Buenos Aires water and sewerage services privatization was carried out by a consultant on coordination with the Universal de San Andres in Argentina [21]; the author stated:

“Prior to privatization, water and sewerage services of Buenos Aires suffered from: Lack of investment and inadequate maintenance, overstaffing, unresponsive customers service, high levels of unaccounted-for water, and low collection rates.

“After privatization, positive results in rapid improvement in the performance. The investment constraint was lifted, the labor force halved, cost-savings policies out in place and new collection devices implemented. Water interruptions diminished (for the first time in 15 years there were no water summer shortages). Un-accounted-for water was reduced from 45% to 30% in three years. Water pressure increased substantially, appropriate repair and maintenance was reassumed and service coverage expanded more rapidly.”

Kuwait also has successful experience in the privatization of the largest wastewater treatment plant using membrane separation processes for advanced treatment. The plant was completed and operated in November 2004. The concession is for a period of 30 years and currently the plant treats over 400,000 m³/d almost to a distillate level. It is worth noting that the cost of very advanced treatment using two-membrane separation systems (i.e., microfiltration and RO) was almost equal to the estimate by the state to treat the wastewater conventionally to secondary/tertiary levels. The very low costs of the BOT project can be attributed to the transparent prequalification and bidding processes and the fierce competition between the prequalified consortia.

Although governments should be primarily responsible for water resource management, several activities should attract private investors or contractors. Global experience already showed that public responsibility and ownership is often best blended with private management. In many countries, water supply and waste water treatment services are leased to the private sector or concession made against agreed performance parameters.

It is clearly recognized that a significant increase in the level of public sector investment in water resource management including infrastructure, and institutions and capacity building is needed. Private investment should be directed towards the development, management and conservation of water resources including production, storage and distribution. If the capital-intensive programs are to be implemented in a timely way, and if efficiency is required, then the private sector should share the burden of investment.

Conservation and sustainable use are increasingly critical factors in managing a scarce water resources. There is a critical need to recognize water as an economic good; therefore, financial incentives for optimizing water use should be strengthened through a mixture of water charges, market-based instruments and penalties. Such a program should be reinforced by public awareness programs. The incentives include natural water use rights, effluent charges, water treatment fees, environmental liabilities, and tax incentives, wherever applicable. Management of water demand is a function of efficient pricing, effective regulation, and appropriate awareness. Future expansion of the water production and services require that the capital costs be recovered within the sector by developing appropriate tariff structures. Consumers are expected to meet the full operating and maintenance costs of water facilities and service provision and sanitation schemes. Subsidies of these services may be taken into consideration based on countries special conditions. There is evidence that the limited income consumers are increasingly willing to pay for water services that are predictable and effective. Subsidies are a controversial issue in the water sector. Subsidies can be supported in the following circumstances:

- where a limited quantity of fresh water for the limited income consumer are regarded as basic human need;
- when water is needed in preventing health problems;
- when the cost of water is very high.

In the long run, subsidies as economic conditions improve should be phased out.

6. Conclusions

Based on the successful experiences in public-private partnerships, the following conclusions can be made:

- Privatization should be implemented as part of comprehensive economic reforms, including the tariff, the subsidies, and the tax.
- Privatization should have political commitment at the highest level.
- All modes of privatization should be analyzed to select the most suitable one that can maintain the assets in

the hand of the state control the tariffs systems and safeguard the right of the low income consumers.

- Privatization proved to be economical and cost effective. It can destroy the barrier of the conventional tendering process provided that there are appropriate mechanisms to alleviate most of the risks involved and careful systematic preparation through professional transparent prequalification of the interested parties, thoroughly prepared bidding documents and concession contract and finally through transparent evaluation of the submitted bids.
- A qualified and authorized regulatory entity should be formed prior to the commissioning of the plant or taking over the service.
- Water resources problems in the GCC region are among the most urgent and complex ones.
- Water strategy must be flexible and tailored to the requirements of individual countries.
- For comprehensive water planning and management, institutional reform is needed.
- The nature of the water resources requires:
 1. setting long-term strategies
 2. assigning policies
 3. reallocating resources
 4. establishing and enforcing quality standards
- With privatization, governments are still required to control the planning and regulatory entities.
- Development and implementation of public awareness programs including the real costs of the water and wastewater services, environmental impact assessment and recycling of water for non-potable uses.

References

- [1] Freshwater Future, J. Ingleton, ed., From Potential Conflict to Cooperation Potential, UNESCO, Tudor Rose, 2003, p. 110.
- [2] W. Cosgrove and F.R. Rijsberman, World water vision, World Water Council and Earthscan, 2000.
- [3] PricewaterhouseCoopers, Water, A World Financial Issue — A Major Challenge for Sustainable Development in the 21st Century. Sustainable Development Service, Paris, 2001.
- [4] Freshwater Future, J. Ingleton, ed., UN-Habita, Water and Cities, Tudor Rose, 2003, p. 127.
- [5] G. Bel and M. Warner, Does privatization of solid waste and water services reduce costs? A review of empirical studies, *Res. Conserv. Recycling*, 52(12) (2008) 1337–1348.
- [6] M. Barlow, Blue Gold, The Global Water Crisis and the Commodification of the World's Water supply. Council of Canadians, IFG Committee on the Globalization of Water., 1999.
- [7] T. Rachwal, 30 years of technical and organizational development in the UK water sector: Thames water's experiences of moving from public to private sector. *J. Water Supply: Res. Technol., AQUA*, 56(6–7) (2007) 419–423.
- [8] E. Pérard, Water supply: public or private? An approach based on cost of funds, transaction costs, efficiency and political costs, *Policy Soc.*, 27(0) (2009) 193–219.
- [9] G. DaSilva, E. Souza, R.C. DeFaria and T.B.S. Moreira, Estimating the relative efficiency of Brazilian publicly and privately owned water utilities: A stochastic cost frontier approach, *J. Amer. Water Res. Assoc.*, 43(5) (2007) 1237–1244.
- [10] R. Gukov, Public-private partnership in water supply [Javno-privatno partnerstvo u vodoopskrbi], *Harvatske Vode*, 15(58) (2007) 3–16.
- [11] E. Idelovitch, The transition from public to private operation — The Buenos Aires Case, The World Bank, 1994.
- [12] United Nations World Water Development Report, UNESCO, WWAP, 2003, p. 335.
- [13] United Nations Population Fund (UNFPA), The State of the World Population, New York, 2002.
- [14] A.P. García, A social perspective on water issues [Una perspectiva social de la problemática de la agua], *Investigaciones Geograficas*, 62 (2007) 125–137.
- [15] C. Santiago, Monitoring sustainability of globalization, Malaysia. Asia Europe Crosspoints, Transnational Institute (TNI) website, September, 2002, www.tni.org/reports/asia.
- [16] M. Henley, Pricing, scarcity will impact future water business, *Ultrapure Water*, 25(2) (2008) 13–18.
- [17] UNIDO Guidelines for Infrastructure Development through BOT Projects.
- [18] IMF and World Bank Push Water privatization, News & Notices for IMF and WB Watchers, www.citizen.org/documents.
- [19] Federal Clean Water Act and the Safe Drinking Water of the USA.
- [20] K. Wangnick, IDA worldwide desalting plants inventory, Report no. 17, 2002.
- [21] M.A. Abdala, Welfare effects of Buenos Aires water and sewerage services privatization, Universal de San Andres, Argentina, 1996.