

**Asia-Pacific Environmental Innovation Strategies (APEIS)
Research on Innovative and Strategic Policy Options (RISPO)
Good Practices Inventory**

**Public-private partnerships for water supply and sanitation services
in Macau (China)**

Summary of the Practice

Keywords: Public-private partnership (PPP), Macau, water supply, sanitation, public goods

Strategy: Improving urban environmental services through private sector participation

Environmental areas: Urban environment

Critical instruments: Design, planning and management, Organisational arrangements

Country: Special Administrative Region of China

Location: Southern part of Coloane Island, southeast coast of China.

Participants: Civic and Municipal Affairs Bureau, Office for Infrastructure Development and private sector

Duration: PPP process (long history from 1905);

Water supply: a 25-year concession agreement (from 1985) for PPP;

Sanitation: management and operation contract (three years each—from 1996 to 1999; from 1999-2002)

Background:

Macau, China has a total area of just under 17 km and its population was 436,700 in 2001. Per capita GDP at current prices was U.S.\$14,281 in 2001, and household income was \$15157 in 1999. The major industries include tourism and textiles. Macau retains its own political and legal system (based on the Western system of separation of executive, legislative, and judicial powers) as a Special Administrative Region of the People's Republic of China.

Water supply:

The private sector was involved in waste supply 1905, with the operations owned and managed by Mr. Ho In, a local business magnate, between 1936 and 1982. These operations were only a minor part of his commercial and industrial activities. By the end of this period, this system had deteriorated considerably.

- Water quality was extremely poor, with high salinity and turbidity. (This deterioration was due to the poor quality of the raw water drawn from the eastern tributary of the Pearl River, a treatment plant working at overload capacity and a lack of scientific management and technology.)
- Some areas were only receiving water at night due to the lack of water supply capacity and pressure.
- There was a high level of unaccounted-for-water consumption and the water utility was operating at a loss.
- The private ownership did not provide adequate investment and showed insufficient planning.

Customers and the government expressed their dissatisfaction with the performance of the existing business style. Later, a joint venture partnership was formed.

Sanitation was also not very well managed and the seawaters were getting polluted resulting into serious damage to fisheries and other aquatic species. Therefore, there was an urgent need to address the management of water supply and sanitation in Macau.

Objectives:

The main objective was to improve the coverage and efficacy of water supply and sanitation through private sector participation. The other objective was to improve the previous private sector participation process and involve international companies to bring better technology and efficient

management.

Description of the activity:

Concession award:

New World Group, a Hong Kong (China) based development company took over the operations of the Macau Water Supply Company, commonly known as Societal de Abastecimento de Aguas de Macau (SAAM) in 1982. The government applied the condition that tariffs could not be increased. New World increased water revenues by replacing meters and improving the utility's management and financial systems. The unaccounted-for-water was reduced from 40.3 percent in 1982 to 24.5 percent in 1984. In that year, the government and New World invited Lyonnaise des Eaux to help them improve water quality. Based on negotiations, a concession contract, which was not put to commercial tender, was signed in 1985 and runs for 25 years until 2010. SAAM was restructured and 85 percent is now jointly owned by the joint venture company Sino-French Holdings Ltd., comprising Lyonnaise des Eaux and New World. The remaining 15 percent for the shares are held by shareholders in the old water company. The operation of SAAM is the responsibility of the Sino-French joint venture. The 25-year concession contract, a formal legal relationship between the government and SAAM, includes:

- Annual payments to governments of rental fee and sales tax based on the gross sales value of water supplied.
- Water supply quality to be improved to meet European Union Standards.
- Water supply quantity must meet specified levels.
- Uniform water tariffs based on volumes consumed (government receives a small discount and water used for fire fighting is supplied free of charge).
- A tariff revision formula based on operating costs.
- Detailed regulations governing the utility's relations with customers, where provision is made for water supply to be disconnected for non-payment of water bills 45 days in arrears, in this instance a reconnection fee applies.
- Government delegate to act as a regulator of SAAM.
- Submission to government delegate of annual and five year forward investment plans for approval.
- Dispute resolution procedures.
- Specified ratio of shareholders funds to net fixed assets.
- Partial compensation for rehabilitation of existing SAAM assets, implemented in early years through the tariff revision formula.
- Macau (China) general company taxation laws apply to the utility's profits.
- SAAM is prohibited from investing in other countries including China.
- A government right of early redemption of the concession contract subject to two years notice after the expiration of the first half of the concession's term.
- Provision for extension of the concession contract by mutual agreement.

Privatization process:

Under the concession contract an investment plan was submitted to the government, and based on that, SAAM invests approximately 40 to 50 million Patacas per annum in expanding and improving the water supply. These investments have been mainly arranged by loans from domestic financial markets. This contract also includes the development of a new raw water source and the most appropriate source was the Modaomen estuary of the West River situated in China. However, due to geographical restrictions for business under the contract, the company needed to develop a relationship with a third party to supply it with this new source of raw water. Thus, the Water Supply to Macau Company (WSMC) was formed, which is 100 percent owned by PRO, supplies water to Macau and nearby Zhuhai in China. SAAM has built a close relationship with WSMC by providing loans and technical and managerial expertise. The contractual agreement between these two companies specifies that raw water tariffs can only increase in line with retail water tariffs. In addition to that deal, SAAM has undertaken the following on-going investments:

- upgrading and extending water treatment plants,
- replacement of major pipelines,
- reservoir construction and post-chlorination stations,

- leakage detection activities and related investments,
- introduction of computerized Supervisory Control and Data Acquisition (SCADA) system,
- introduction of an automated water production control system,
- on-going upgrading or replacement of meters,
- construction of new head office, and
- a fully-fledged purpose-built laboratory.

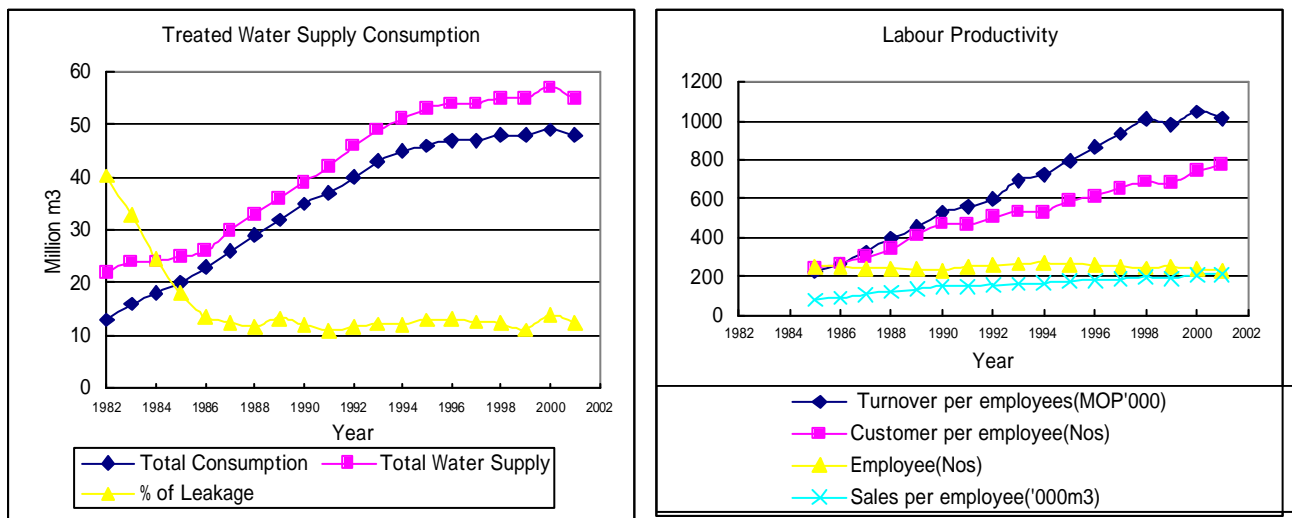
Tariff regulations:

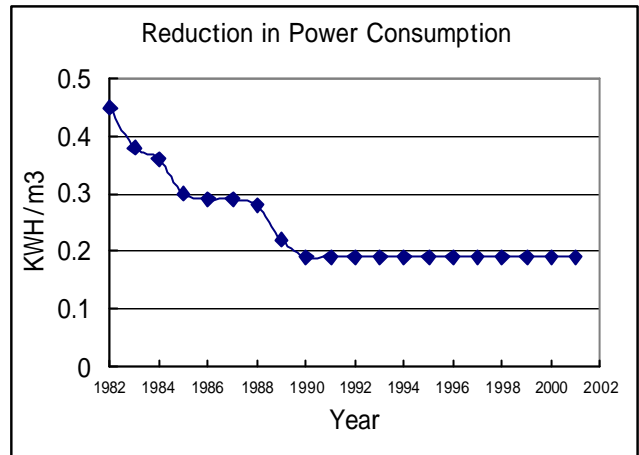
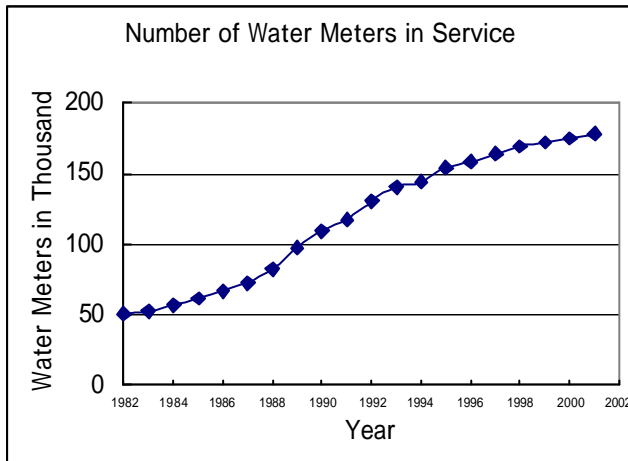
In Macau, China, the water tariffs remained the same for many years and did not fully reflect the cost of the water supply. The government agreed to raise the tariffs twice between 1980 and 1985, from P1.80 to P2.30 per cubic meter in 1983, and then to P2.5 per cubic meter in 1985. The concession contract stipulates that the tariffs should be set at a uniform rate for all customers. To regulate monopoly prices and profits, however, a number of approaches can be adapted, including rate-of-return regulation, cost-plus regulation, and “price index minus X” regulation. This contract does not stipulate a minimum rate of return but uses a form of cost-plus tariff regulation. The annual revision of the tariff is based on the costs of raw water, energy, labour, and specified repairs and maintenance costs. This annual revision has not resulted in the full increase in the tariff as per formula, mainly due to economies of scale thanks to increasing demand, in line with the population and economic activity growth. SAAM has therefore implemented a lower tariff increase than what they could have been entitled to do by the agreed formula. This approach has resulted in a reasonable profit and as well as good relations with the government and consumers.

Outcomes:

This has been a win-win situation for all the actors, namely the government, the concessionaire, and the citizens. The water quality was brought up to European Union standards within three years of signing of the contract. Now everyone receives good-quality drinking water, at consistent pressure, for 24 hours a day. Although water demand tripled between 1982 and 1998, the treatment capacity still exceeds maximum daily demand by 20 percent. Eighty-five percent of distribution system was replaced after the contract began. Investments over MOP 666 million and a 20 percent reduction in water charges were achieved. The amount of unaccounted-for-water from leakages has declined from 40.3 percent in 1982 to 20.2 percent to 1985 (when the concession commenced). The leakage was 12.4 percent in 2001, which, the concessionaire believed was mainly due to leaks within customer boundaries. Power consumption for the water supply has declined from 0.45 in 1982 to 0.19 kilowatt-hours per cubic meter in 2001. Number of water meters in service has increased from 50,000 in 1982 to 178,000 in 2001. Labour productivity has improved significantly (Figure 1).

Figure 1. Overall impact of public-private partnership for the MWSC project.





Sanitation:

In a move to prevent polluting the city and its surrounding waters, the government of Macau has been working since the mid-1980s to overhaul the city’s drainage system, a project that culminated in the construction of a Waste Water Treatment Plant (WWTP). Besides this plant, a second WWTP was built on Taipa Island and a third one is currently under construction on Coloane Island. The plant on Taipa Island has been in operation since 1996. The construction of Coloane’s WWTP is scheduled to be concluded in 1998. The government has invested a total of MOP520 million in the construction of these three plants. By the summer of 1998, when the WWTP of Coloane Island is scheduled to start its operations, all the waste of Macau will be subject to treatment. The combined capacity of the three plants assures 100-percent treatment of all the waste until 2020 (taking into account the expected population growth). At the time of planning, the WWTP was designed to service half a million people, with a daily through-put of up to 144,000 cubic meters, of which no more than 11 percent would be industrial waste. The WWTP was built at a cost of MOP328.3 million by a consortium consisting of Teixeira Duarte Engenharia e Construcões S.A., Sociedade de Construcões Soares da Costa S.A., and Water Engineering Hong Kong Ltd. It is “turnkey” contract.

Management & Operation contract:

The WWTP of Macau is managed by Engenharia Hidraulica de Macau Limitada, a company established for this purpose by the consortium. This consortium was responsible for the design and the construction of the plant as a turnkey contract. The Office for Infrastructure Development (GDI) signed the management and operation contract with the same company. The merit of this approach is that the same company is familiar with the plant and able to carry out equipment replacement and maintenance. The management contract started in April 1996, and was valid for a period of three years, at the end of which it could be extended for a similar term.

Outcomes:

According to the exclusive contract, the company invested a large amount of resources to modernize the equipment and facilities in sewerage treatment, to modernize the laboratory facilities for better water quality control, to replace the city piping network and install an up-to-date computerized remote control system to control the overall city water supply system. The WWTP’s zero environmental impact means the surrounding area is not affected in any way by the normal running of the WWTP, during which solid and liquid pollutants, odors, noises and gases from incineration are produced.

Critical Instruments

Overview

An organization arrangement through setting up clear departmental and individual roles, coupled with essential resources (human, financial, and technical) is the basis to plan and implement successful projects. For an efficient and effective private sector participation to improve public services like water supply and sanitation, it is very critical to have strong organizations, who have capacity to plan and implement this whole process; moreover, to oversee the management of water supply and sanitation, with special emphasis on coverage, quality, and tariffs. The regulatory body should be intact on impartial basis to undertake any issues without going for arbitration in the courts. The second important aspect is the clear goals and conditions in the contract document to provide private companies good bases for their performance.

Design, planning and management

Contract Management

- When inviting private investment and/or management for urban environmental infrastructure, there is a need to offer contracts that will be attractive for the private sector. These contracts should be comparable with the other opportunities available for the private sector. However, it is difficult to draw direct comparisons with other investments, as the nature of investments is quite different, and in the area of public-private partnerships, many factors remain to be learned, as the recent trend toward PPP is relatively new. The major differences are due to investment in infrastructure projects, which are characterized by large and sunk investments with long payback periods. Due to this reason, the public sector, with scarce resources, cannot arrange the investments alone, and the private sector cannot invest in risky businesses without any guarantees, and attractive terms and conditions. The flexibility in the application of the concession contract is critical to success, as some factors, for example in demand, may be difficult to predict.
- The following issues should be included as contents of PPP agreements: (1) contents of the project (option(s), details of service, allocation of functions and risks, implementation period; (2) Conditions for entry into, and exit from the market; (3) Regulations to define property rights or profits; (4) Conditions for transferring the subject facilities; (5) Setting of disposition/service costs, methods of payment; (6) Setting of rates of electricity generated by waste product recovery power plant or sewage processed as industrial water; (7) monitoring and control systems; (8) how to achieve compliance with environmental standards; (9) penalties as countermeasures against risks; (10) method to cancel contract; (11) settlement of disputes by arbitration; (12) specified incentive policies; and (11) guarantees, etc.

Organisational arrangements

Clear Roles Lead towards Effective Management

- The monitoring of the compliance of the contract is divided into two areas. In the Public Administration area, a government representative is commissioned to the company by the Secretary for Transport and Public Works to monitor compliance of the exclusive contract and affairs related to public administration. In the municipal Management area, according to the administrative statues of Macau Special Administration Region (Regulamento Administrativo n. 32/2001 de 18/12/2001), Civic and Municipal Affairs Bureau (IACM) is the committee to monitor the water quality of the urban water supply and related technical matters. The company reports to the president of the IACM monthly on the situation of the local water catchment, conditions of local reservoirs, quantity of raw water acquired from adjacent areas, the quantity of water produced and consumed, the number of new meters installed, etc. The IACM laboratory is the technical department for monitoring the quality of water. The company has to send reports to the Laboratory LACM monthly; it includes water analysis reports and other technical matters. The Laboratory LACM collects about 2000 water samples per year from urban the water system, together with the laboratory of the company, and conducts individual

analyses on over 50 different parameters to ensure that the quality of the water meets the requirements laid in the administrative regulations (Regulamento Administrativo n. 46/96M de 19/08/1996). It is also necessary to set up a specific organization like the Office for Infrastructure Development (GDI) to be in charge of document preparation, contract management, and negotiations.

Impacts

- PPP in Macau is not simply about the financing of capital investments, but about exploring the full range of private sector management, commercial and creative skills. The private sector facilitated the use of creative and innovative technology and approaches to show their good performance, which helped improve the efficiency of operations and management capability in local governments.
- The government changed its role from service provider to regulator and manager, while the private sector provided financial resources, technical capability, and entrepreneurship to provide environmental services. The government was able to concentrate its attention on how to set up the most suitable public works system, with its tasks including planning, financial arrangement, monitoring, and management, in order to achieve small, but effective government.

Lessons Learned

- Privatisation does not in itself ensure success, unless there is a successful combination of competent and qualified concessionaire, capital, local knowledge, appropriate technology and expertise, and the regulatory framework including regulations on the tariff.
- Flexibility in the application of the concession contract has been critical to this success. Some of the aspects are difficult to predict, such as water demand and foreign exchange.
- A cost-based formula may not take into account the potential for cost savings due to economies of scale. Moreover, a uniform tariff structure for all customers may not be a viable or efficient option for resource allocation.
- A positive two-way interaction between water supply improvements and economic growth is important.
- The existence of high quality and abundant sources of raw water help make success possible. Increased economic activity upstream (in China) can put Macau's resources in jeopardy and this risk needs to be managed through one authority, through economic instruments.
- The formula for bids resulted in extra costs due to a 50 percent devaluation. "Re-basing" (resetting the currency exchange rate levels on fixed dates every five years) is a good way to renegotiate tariffs.

Potential for Application

Macau is one of few cities that have a long history of PPP in the field of urban environmental infrastructure. The detail PPP arrangements in this case, including the options for PPP, governmental management system, and contract documents, could provide a good example to other cities of the region, especially to Chinese cities, because the issue of how to involve private sector finance in developing water and sanitation services has become an important and central policy issue in China today. The process of PPP and relevant information in Macau is transparent compared with some other cities. It would be useful to share this experience in public works management, including information disclosure to the public.

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