

**Water Supply in Phnom Penh: From Devastation to Sector Leadership**  
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From devastation to leadership, from bankruptcy to profit: what was the key? What lessons can we learn from the PPWSA experience?

**This paper was partly published by WUMI, Water Utility Management International in September 2012.**

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## **Water Supply in Phnom Penh: From Devastation to Sector Leadership**

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**1992. Snapshot.** The population of the city of Phnom Penh is 800 000. The water facilities have been devastated by recent turbulence in Cambodia and by subsequent mismanagement. Water supply is intermittent and unsafe.

**2012. Snapshot.** PPWSA, the Phnom Penh Water Supply Authority – a state-owned enterprise - has emerged as an internationally recognised leader in the water industry. PPWSA has become a self-sufficient company, operating without subsidies from the state; the utility provides 24-hour service with 90 per cent coverage to a city of 1.7 million inhabitants. In April 2012, PPWSA launches a successful shareholding offering on the Cambodian Stock Exchange.

From devastation to leadership, from bankruptcy to profit: what was the key? What lessons can we learn from the PPWSA experience?

About the authors:

EK SONN CHAN was the General Director of PPWSA from 1994 to 2012. He is presently the Secretary of State of the Cambodian Ministry of Industry, Mines and Energy. In 2004, PPWSA received the Asian Development Bank Water Prize and, in 2010, the prestigious SIWA (Stockholm Industry Water Award) in recognition of its efforts in dramatically overhauling and extending the Cambodian capital city's water supply system. In 2006, Ek Sonn Chan personally received the Ramon Magsaysay Award (known as the Asia Nobel Prize).

Michel VERMERSCH is a water utility management specialist and an active member of the IWA Water Loss Specialist Group. Patrick VAUGHAN is the international operations director of Safège, a leading French firm of consulting engineers in the field of water and the environment. Both have been continuously involved in assisting Phnom Penh Water Supply Authority over the last 2 decades.

The capital city of Phnom Penh is located at the confluence of 3 major rivers, the Mekong, the Tonlé Sap and the Bassac, which constitute its main water resources. The first waterworks in Cambodia was built in 1895 by the colonial administration to provide water to the city: a 12 MLD water treatment plant and 30 km of distribution mains in cast iron. The network was gradually extended over the following eighty years.

In 1975, the revolutionary and genocidal Khmer Rouge period started. The capital city was practically emptied. Over the next four years there was almost no operation of the water facilities and the result was a high level of degradation. The Khmer Rouge regime was driven out of Phnom Penh in 1979, and people began to return to the city. The abandoned water facilities were brought back into service in a disorganised way.

In 1992, the situation was a nightmare to any water engineer or financial analyst. The war-torn water facilities were completely devastated. Consumers were trying to capture the last drops of water in what remained of the distribution network in the centre of the city. For that purpose, they installed small submersible pumps into broken-open pipes and manholes; flexible hosepipes were extended up to the windows of apartments, resembling a jungle of lianas. It was accordingly impossible for the distribution system to operate as a pressurized network and to supply the existing elevated water tanks. As regards

revenues: the situation was simply disastrous. Due to the displacement of population, customers' files were completely outdated and many water users were not registered. Less than 8% of the water produced was generating effectively-collected revenues.

Water supply in Phnom Penh over the following two decades was characterized by significant improvements in access, service quality, efficiency, cost recovery and governance. Today, the NRW (non-revenue water) rate of PPWSA is less than 6% which is one of the best in the region – and indeed worldwide - and the revenue collection rate is above 99%. The number of service connections has been multiplied by ten (from 20 000 to 200 000), service quality has improved from intermittent to continuous supply, water losses have been cut dramatically and the city's water utility has gone from being bankrupt to becoming profit-making. These achievements have been recognized through many international prizes as mentioned in the authors' presentation box.

PPWSA has gone through 3 periods over the last 30 years:

- 1980-1993: resuming operation, heavy government subsidies and very poor quality of service.
- 1993-1997: rehabilitation stage, restructuring and human resources development and preparation for autonomy.
- From 1997: restructuring and renaming as PPWSA, service extension, social responsiveness, financial autonomy and emphasis on quality services.

To make the content of this article easier to understand, the authors will present the achievements by topic and revert to the historical approach when necessary, even if it is clear that most actions were initiated and implemented simultaneously.

### **Breaking the Vicious Circle of Mismanagement**

As is the case with many water utilities in poor countries, the water service was jeopardized by the usual vicious circle: high water losses, tariffs below cost, financial deficit, no maintenance, no investment, low collection efficiency, mismanagement.

How to break this circle? To deal with this situation the decision was made to concentrate on 3 subjects as the core of the rehabilitation and recovery strategy: (i) network pressurization; (ii) NRW reduction; and (iii) revenue collection. For many developed water utilities, the decision to put the emphasis on reducing NRW and increasing revenue collection may appear to be obvious, based on "common sense", but the way forward is not so easy when starting from the point where Phnom Penh was in 1992. Many utilities around the world are still in a similar poor situation today and it is the authors' belief that the PPWSA's experience can serve as an example to inspire the management staff of these utilities.

By 1993, the situation was favourable for initiating a reform strategy. The Khmer Rouge had been driven out and UN forces were installed in Phnom Penh. In July 1993, the newly- elected government adopted a market economy strategy and the water utility became eligible for international assistance. In the same year, Ek Sonn Chan was appointed as General Director of the water utility.

### **Initial Crash Program: Customer Management and Water Metering Policy**

No management is possible when no data or statistics exist, as was the case prior to 1992. Accordingly, PPWSA embarked on a customer census to update its database and developed an overall water metering policy, for both water production and consumption.

As a first step, PPWSA set up an efficient customer management programme based on the overall census and the installation of a new computerised customer information system (CIS) to replace the former manual billing process. The CIS was operational as early as 1994. PPWSA elaborated new procedures and staff were trained and motivated. As is normal practice in such a context, the basic customer census was completed by an overall inventory and evaluation of the water distribution facilities that could be later used as the basis for a rehabilitation program. Many customers' bureaux were opened, where customers could pay their bills: so it was possible to replace the often corrupt bill collectors.

The follow-up stage was the installation of water meters on every connection; this operation was more or less completed in 2001. Based on aging studies, the meters are replaced every 10 years. To combat other commercial losses, an appropriate policy against illegal connections and water theft was developed, involving heavy fines for the defrauders but also including training and motivation of staff and customer participation.

### **Investment Policy on Water Production and Distribution Facilities**

It was not possible to achieve the population's adhesion to the newly-defined commercial policy and to break out of the former vicious circle without improving the quality of service. Accordingly, another priority was to replace and pressurize the distribution network, starting from the historical district in the centre (Daun Penh). However, the main question was: how to fund the investments?

After the appointment of the new government, a period of reconstruction began; it was spurred by the continuing stability of government, attracting new foreign investment and aid from many countries including Japan, Australia, France and other European countries. Loans were provided by the Asian Development Bank and the World Bank to reinstate a fully-functioning potable water supply. More than USD 223 M - consisting in USD 98 M grants and USD 125 M loans – were invested over the following 18 years.

As regards the distribution network: after the renewal of old pipes in the centre of the city, the network has been gradually extended and presently covers 90% of the new perimeter of Phnom Penh. Particular care was exercised in pipelaying operations, following state of art techniques, so as to avoid what happens in some utilities, where newly laid pipes leak more than the old ones. Due to this policy, the Phnom Penh water network is now mostly relatively new and the level of real (physical) losses is very low. The water distribution network has grown from 288 km to 2 000 km over the period.

As regards water production facilities: new treatment plants were built and commissioned when necessary to meet water demand. Presently, there are four main water treatment plants: Phum Prek, 150 MLD; Cham Car Morn, 20 MLD; Chruoy Chang War, 2x75 MLD; and Niroth for which the 1<sup>st</sup> stage of 130 MLD will be completed in 2013 and the 2<sup>nd</sup> stage of 130MLD in 2016. Raw water comes from the Mekong, Tonlé Sap and Bassac Rivers. The treatment process used in the four WTP is conventional: pre-chlorination, flocculation, sedimentation, filtration and sterilization.

*Lesson learned.* It is interesting to note that, even after the initial period, obtaining funds has never been a major problem for PPWSA. The reason is simple: donors and financing agencies were fully confident in the usage made of the funds and in their timely disbursement. The continuity and the commitment of

PPWSA administration and the follow-up of the performance indicators of the utility constituted a reliable guarantee for optimum usage of grants and loans.

PPWSA considers that the main factors which have attracted financing are:

- at the general level: continuity in PPWSA's policy and development strategy;
- at the design and implementation stages: intellectual capacity, know-how and professionalism;
- at the management and operational level: leadership, professionalism, integrity, commitment, ability to motivate staff, appreciation of the necessity for change and positive outlook towards managing changes.

**In 1996, the vicious circle was broken and PPWSA could then focus on improving the various managerial aspects.**

### **Institutional Change**

In 1997, the government took its initial steps to reform the institutional framework of the water supply sector in Cambodia. The government enacted a law to provide greater autonomy for PPWSA, created a Coordinating Committee for the Water and Sanitation Sector, and restructured water supply tariffs. The law addressed two major issues:

- PPWSA was authorised to recruit staff itself. This was, perhaps, the most important factor in PPWSA's turnaround.
- PPWSA was given the go-ahead to be run along commercial lines – thus ensuring adequate revenues.

### **Customer Management: Water For All**

In 1992, the Water Utility had to regain customer trust. This was gradually achieved via:

- Public consultation and public information campaigns.
- Providing targeted information to customers.
- Improving customer services and customer care.
- Water quality control and water metering control.
- Staff and public involvement in NRW reduction.
- Providing water for the poor under acceptable and realistic conditions.
- Extension of water coverage.

The objective was to provide water to every segment of the population under acceptable conditions in order to improve general welfare and public health. The target has been met and there has been general recognition of this by the population of Phnom Penh, where the PPWSA General Director and his staff are highly popular.

### **Tariff Issue**

Before 1997 the tariff was 250 Riel/m<sup>3</sup> for the domestic users and 700 Riels/m<sup>3</sup> for commercial consumers. However, consumption was estimated on the basis of physical parameters such as the number of residents in a house, number of tables and chairs in a restaurant and similar indicators.

In January 1997 - after full completion of the meter installation program- a progressive block tariff was decided and subsequently revised in January 2001: the tariff ranges from 550 Riel/m<sup>3</sup> to 1 270 Riel/m<sup>3</sup> for domestic customers and from 950 to 1 450 Riel/m<sup>3</sup> for commercial customers. The lowest tariff was applied to consumption between 0 and 7m<sup>3</sup>/month for domestic users. The tariff for government departments was 1030 Riel/m<sup>3</sup>/month. These tariffs have been frozen since 2001 despite the fall in exchange rate against the US dollar, from 2 300 Riel in 1997 to 4 000 Riel in 2012.

*Lesson learned:* PPWSA has always considered that tariffs should reflect both revenues and corporate efficiency and that the population – especially the poor – should not pay for any mismanagement of the utility. In spite of the frozen tariff, profitability has been growing steadily, due to efforts to control NRW, improve tariff collection rates and extend coverage.

### **Reaching Out to the Poor**

Before 1995, the poor and the squatter populations had access to water mainly through: community service connections applied for by the community representative; resellers; or hand-pumps installed in temporary ground reservoirs. But in most cases the community representatives abused their power and became water resellers, selling water at a price about 5 times higher than PPWSA's water tariff. In addition, water was frequently stolen through illegal connections.

In order to progress from the situation described above, PPWSA established a revolving fund to finance domestic connections to help the poor obtain access to the network. PPWSA has progressively facilitated the obtention of service connections by reducing the initial cost: 20% discount on connection fee and payment by instalments (1999); payments by instalment up to 20 months (2004); subsidies to connection fees of 30%, 50% or 70% (2005); 100% subsidized connection fee for certain categories of poor consumers (2006). Tariffs were minimised through a cross subsidies approach.

The criteria of selection for discounts or gratuity on connection fees are established by an evaluation commission; the decisions are fully transparent and published. More than 100 communities in Phnom Penh have received direct access to clean water from the PPWSA network. The current 27 000 subsidized connections supply 14% of the total number of domestic connections.

This policy has had a very significant effect in terms of health and welfare of families. It also motivates the population and reduces the risk of illegal water usage. There is a large impact in terms of NRW reduction.

*Lesson learned:* community participation and information sharing; ownership spirit and strong commitment from users and staff; stakeholders' involvement; good governance ("Fair to everyone, Firm to the objectives and Faith to leaders and subordinates"); transparency; and accountability are all keys for success.

### **Network Operation and Maintenance**

For management and control purposes, the Phnom Penh metropolitan area was divided into 8 district areas, subdivided into 42 metered zones. The telemetry system transfers the measured data to PPWSA headquarters, where volumes of inflows and minimum night flows are automatically analysed by

computers. The analysis of daily reports enables the distribution teams to launch leak detection campaigns (step tests) in those zones where anomalies are detected.

At the same time, innovative techniques were used in terms of water and energy savings: implementation of SCADA and large DMA for both leak detection and pressure management and variable speed drivers to control pumps and optimize energy consumption.

*Lesson learned:* the use of modern technology makes operation more effective and more efficient.

### **Human Resources**

Wages in 1993 were extremely low, and this contributed to a high level of corruption. Over the last twenty years PPWSA has invested in its staff. Incentives and bonuses are now considered as important elements of their remuneration. Some managerial staff paid 20 USD per month in 1993 currently receive ten times more.

The education level of the recruited staff has been increased and a very complete and tailored in-house training program has been implemented. On-the-job training, as well as attendance at national and international workshops, have also been developed.

*Lesson learned.* No need to describe here the training programs which can easily be found in specialized documentation, but lessons may be learned regarding the way the corporate culture has changed. Profits are shared with employees. Incentives are offered for many aspects related to performance. The utility pays particular attention to staff welfare. Discipline has been strengthened on clear and accepted bases. Employees are accountable for their outputs and these outputs are clearly defined and evaluated.

The staff are proud of working for PPWSA. They are motivated in assisting the population. The public image of PPWSA in Phnom Penh is excellent.

### **Stakeholders and Transparency**

PPWSA has implemented a policy of transparency. The utility produces and distributes progress reports and performance indicators on a regular basis to the staff, the government and the main stakeholders. Every three months PPWSA's administrative council reviews results and priorities. This information is then transmitted to all staff and commented upon by the General Director.

Every year, the Authority's accounts and procedures are subject to an audit carried out by an independent international auditor. Transparent procedures in turn foster the confidence of government, civil society, donors and financing agencies.

*Lesson learned:* neither the Government nor donors' assistance would have been so effective if PWSSA had not proved its strong commitment via its culture for driving through changes, its responsiveness and its self-motivation.

### **Stock Exchange and New Challenges**

By Government decision, PPWSA was the first company ever to be listed on the Cambodia Securities Exchange (CSX) on 18<sup>th</sup> April, 2012.

PPWSA will have to face new challenges in the coming years: (i) the Authority has now to deliver water to new, sparsely inhabited communes far from the pumping stations; this will result in higher energy costs; (ii) with NRW lower than 6% and a tariff collection ratio in excess of 99%, there is little scope to further boost revenues by increasing efficiency. Therefore, a new tariff policy will need to be set up to balance the continuous increase of energy costs.

PPWSA has decided to share its knowledge and valuable experience within the country and abroad: a specialised subsidiary has been created for that purpose.

### **The Miracle**

From a war-torn utility in 1992, PPWSA is now considered to be one of Asia's outstanding public utilities – financially and operationally autonomous and robust, achieving full cost recovery and an extremely low level of NRW, 6%; and a growing reputation for organizational excellence, customer-oriented service, and a high-level of service performance.

Some people talk about the “Phnom Penh miracle”. Those who have been involved prefer to highlight the ability for driving through changes, sustained efforts, commitments, leadership through example, hard work, responsiveness and self-motivation, which should be the basic and guiding principles of any public service.

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Some pictures :



Mr Ek Son Chan, PPWSA General Director

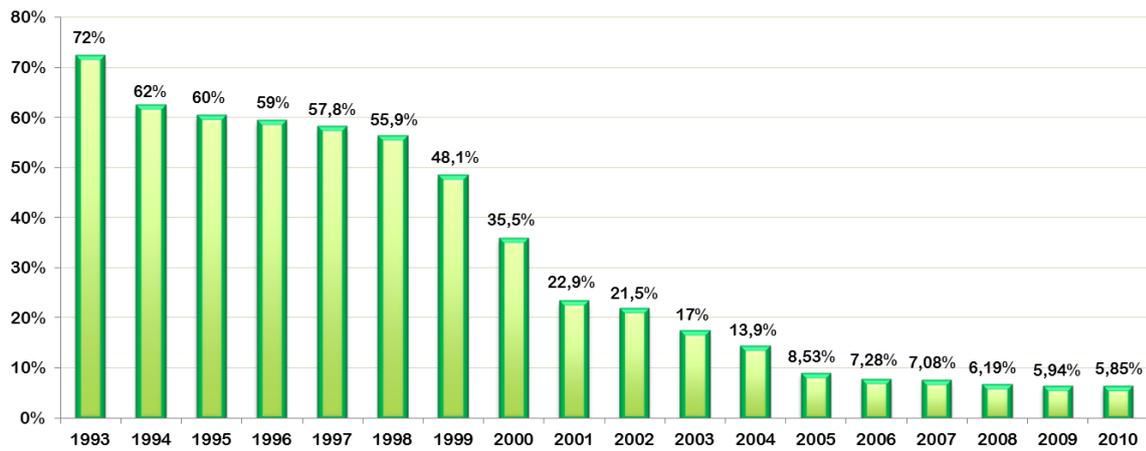
**Institutional reform**

**Turnaround The Process**

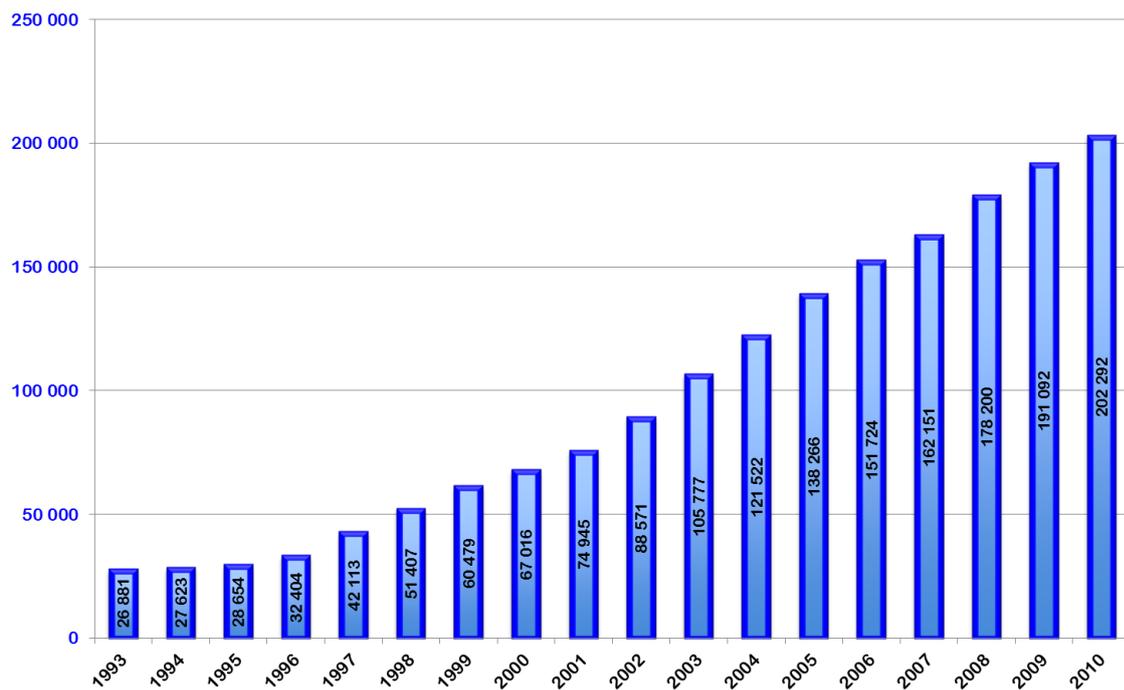
- Restructuring
  - Streamlined job responsibility
  - Reshuffling management based on quality
- Changing of culture
  - Management model
  - Incentive & penalty
- Team work
  - Common goals
  - Friendly environment, Participation
- Educating, Motivating & Disciplining.

An illustration of a team of five people in a yellow inflatable raft navigating through blue water with white-capped waves. The rafters are wearing colorful gear and helmets, suggesting a team effort in a challenging environment.

Phnom Penh Water Supply: Bases for the Change Management

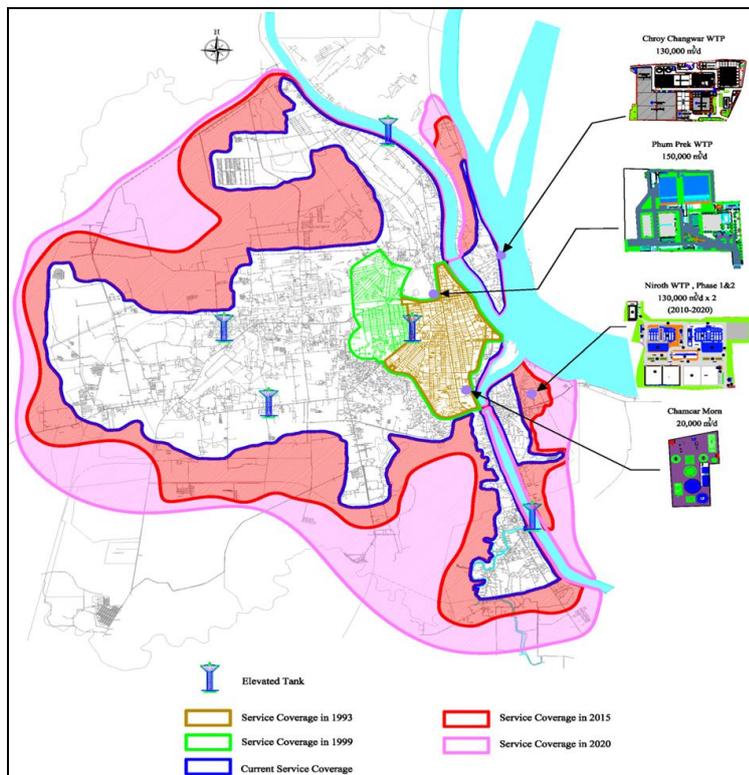


Phnom Penh – NRW rate in % of Water Input



PPWSA. Customer database

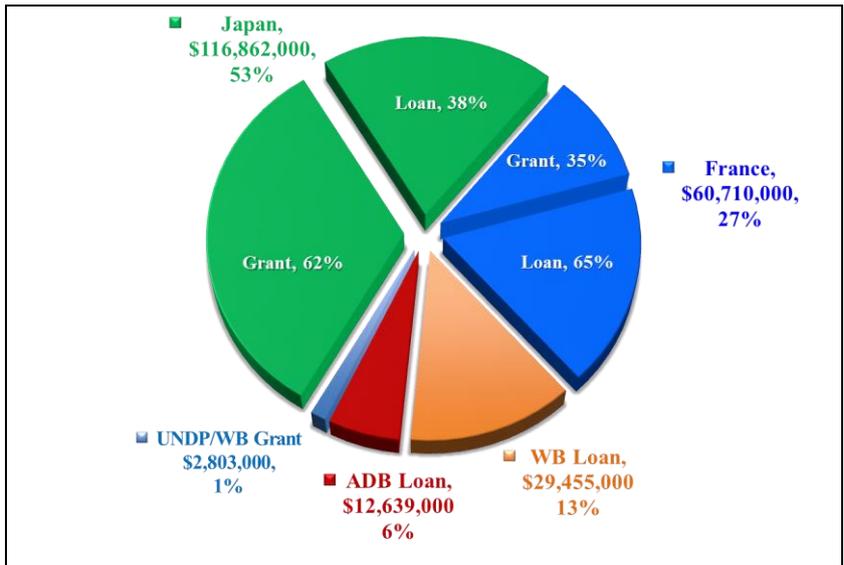
Phnom Penh Water Supply: a continuous expansion and NRW reduction process since 1992



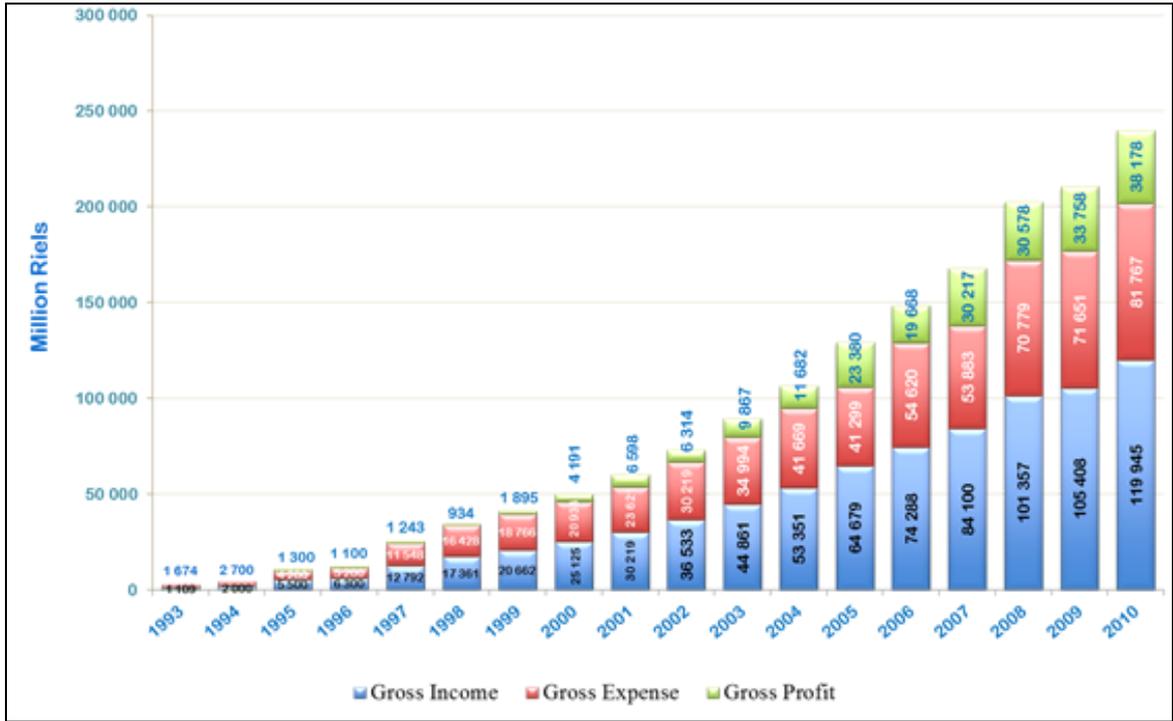
### Phnom Penh – Water Service coverage

INDICATORS	1993	2010
Population	800 000	1 300 000
Production Capacity (m3/day)	65 000	300 000
Network Distribution km	288	2 000
Service Connections	26 881	210 000
Coverage area	20%	92%
Average pressure (bar)	0,2	2,0
Water quality	n.a	WHO
Revenue Collection	48%	99,9%
NRW	72%	6%
Revenue Collection	48%	99,9%
Staff/ service connection	20	3
Operation ratio	150%	37%
Return on revenue	n.a	26,89
Return on Net Asset	n.a	7,39
Current ratio	n.a	3,04
Accounts receivables (days)	n.a	21

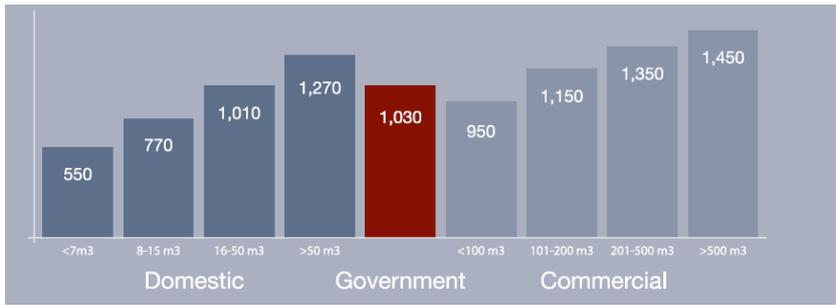
### Phnom Penh Water Supply - Key Performance Indicators (KPI), Then and Now.



Phnom Penh Long Term Investments – 223 Million USD



PPWSA – Financial Outcome from 1993 to 2010



Phnom Penh – Water Tariff Structure since 2001