




**WARMLY WELCOME
TO VISITORS
FROM
FEDERAL DEMOCRATIC
REPUBLIC OF NEPAL**

December 03-07, 2012

(Faint background watermark: PHNOM PENH WATER SUPPLY AUTHORITY)



**PPWSA:
From Bankruptcy to
Financial sustainability**

December 03-07, 2012

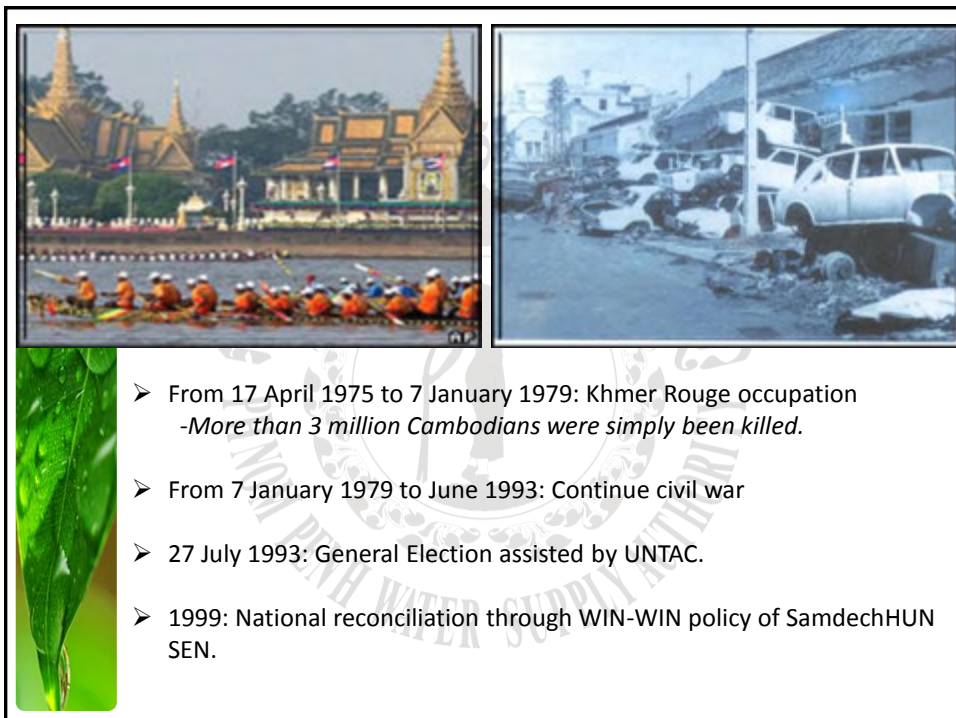
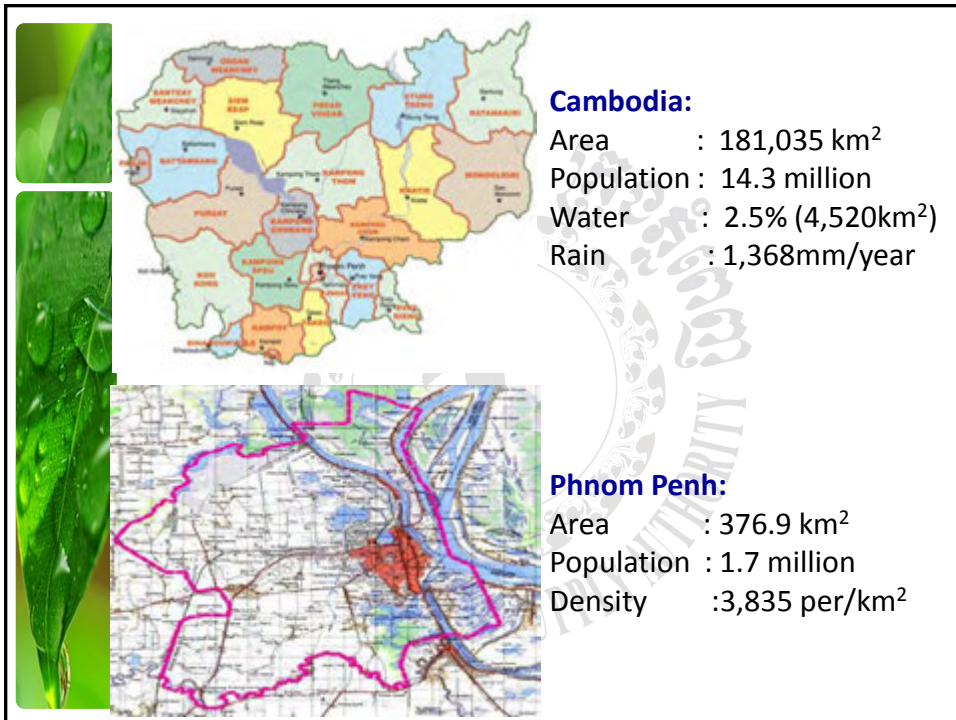
By: Khut Vuthiarith
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(Faint background watermark: PHNOM PENH WATER SUPPLY AUTHORITY)

CONTENT

- OVERVIEW
- PPWSA IN 1993
- DRIVEN REFORM
- INTERNAL REFORM
- RESULT
- LESSON LEARNED





PPWSA Situation in 1993

- Production below demand : 65,000m³/day (150,000)
- Old & unrepaired network : 288km (CI Pipe)
- Coverage : 20% of PP resident
- Supply duration : Intermittence (8-10hr/day)
- Supply Pressure : 0,2 bar
- Public Ground Tank : 1,945
- Unclear customer base : 25,960 / 26,881
- Collection efficiency : 50%
- Water losses (NRW) : 72%,
- Over-staff with low quality: 20 staffs / 1000 con.
- Organized corruption, dilemma, nepotism,
- Tariff below cost

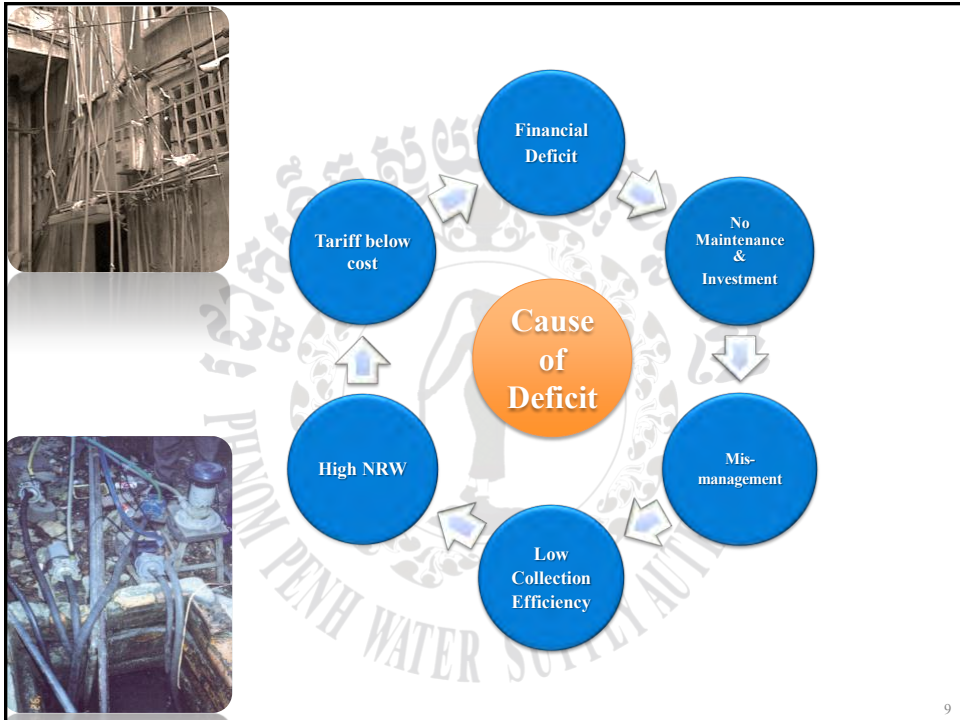


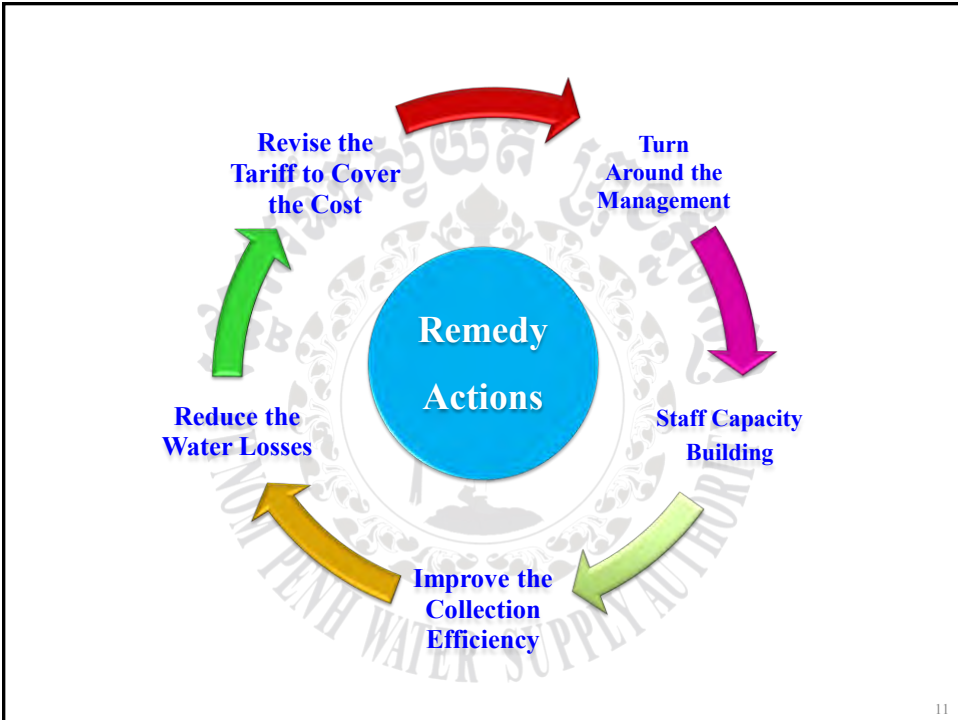
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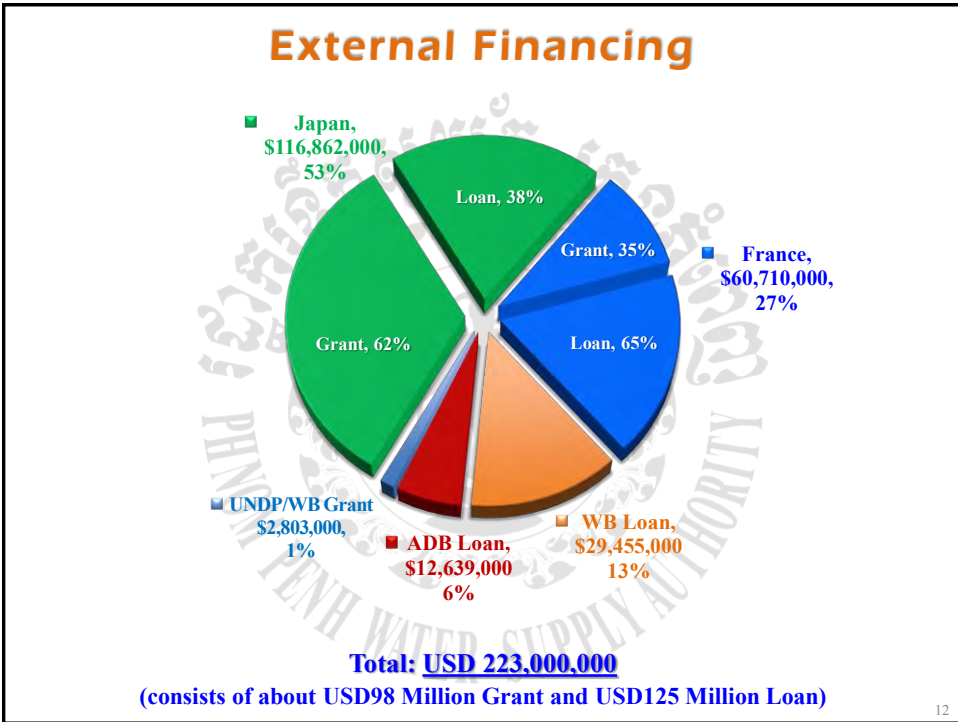
- Total revenue : 50% of Operation cost
- Heavily depended on Government subsidy.







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Management Change

1- New Mission:

- ↪ *Assuring the provision of clean and affordable water for everyone in Phnom Penh.*

2- New Vision:

- ↪ *To be the reference utility for Cambodia, and possibly for the region.*

3- New Taskforce:

- ↪ *Young dynamic staff, educated, strong will to the front line.*

- ↪ *Inefficient old timers to the dormant roles.*

4- New Organization Structure:

- ↪ *Clear job description,*

- ↪ *Decentralize decision maker and responsibility,*

5- Change of Culture:

- ↪ *Model from the Top.*

- ↪ *Transparence & Accountable.*

- ↪ *Right spirit: "One cent serve is one cent earn".*



Building Staff Capacity

Staff Capacity Building:

▪ Training

- ↪ *Very basic training,*
- ↪ *Local and abroad,*
- ↪ *In house and academic.*



▪ Living:

- ↪ *Eight years salary increase.*
- ↪ *Healthcare program,*
- ↪ *Social fund, to alleviate difficulties of poorest staff*



Improve the Collection Efficiency

1- Updated the customer base:

- ↳ 1993: 25,960 there are 12,980 no water connection
- ↳ 1994: 26,881 real recorded customer

2- Metered all the connection:

- ↳ 1993: 3,391/26,881 metered
- ↳ 2001: 74,945 connections, 100% metered with water meter cl

3- 1994: Train the meter readers and water bill collector,

4- 1994: Set up incentive and penalty system,

5- 1996: Set up the computerized billing system,

6- 1998: Set up the “Regain Public Trust” program:

- ↳ Convenient payment: Cashiers, bank check, ATM, internet, telephone ...
- ↳ Village-to-village dissemination of information,
- ↳ Round the clock respond to Customer Call: ONE HOUR, ONE DAY, THREE DAYS, ONE WEEK.



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Reduce the Water Losses

1- 24/7 standby leak repair team ready for action within “One hour prior information”,

- ↳ 1993: One team with 4 unskilled staffs,
- ↳ 1999: 4 teams with 48 skilled and well equipped staffs,

2- Pipe renewal by using the state of the art material:

- ↳ 1994-1999: 288km of old pipe replacement,
- ↳ 2000 onward: Expansion to economic potential area without overlooking the poor.

3- Fighting against illegal connections:

- ↳ Apply firm and heavy penalty without favor,
- ↳ Educate the public with bonuses for true information.

4- District Metering Area (DMA) Program:

- ↳ 2003: Introduced by Kitakyushu Water Bureau,
- ↳ 2010: Completed 8 DMA with 66 subzones,
- ↳ Apply internal service contract since 2003.

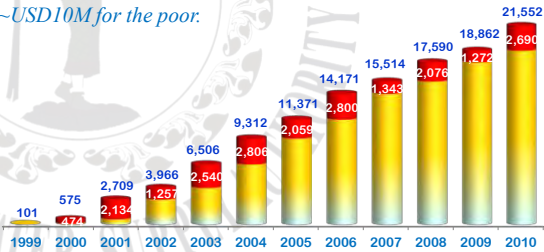


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The Right to Water

“Water for All”:

- ↳ 1999: Install payment to 10, 15 and 20 months on connection.
- ↳ 2005: Subsidy 30%, 50%, 70% & 100% on connection cost.
- ↳ Total subsidy: 3,831,725,363 Riels (USD 900,000)
- ↳ Each family could benefit about \$5/month, beside health improvement & saving time for women and children.,
- ↳ The program did save totally ~USD10M for the poor.



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Tariff Reflect Cost & Efficiency

Customer Category	Domestic		Administrative		Commercial	
	Volume (m ³ /month)	Tariff (Riels/m ³)	Volume (m ³ /month)	Tariff (Riels/m ³)	Volume (m ³ /month)	Tariff (Riels/m ³)
Before autonomy (before 01 Jan 97)	-	250	-	-	-	700
After autonomy (1 Jan 97 – 1 Jan 01)	0 – 15	300	-	940	0 – 100	940
	16 – 30	620			101 – 200	1,260
	31 – 100	940			201 – 500	1,580
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After 01 Jan 2001	0 – 7	550	-	1,030	0 – 100	950
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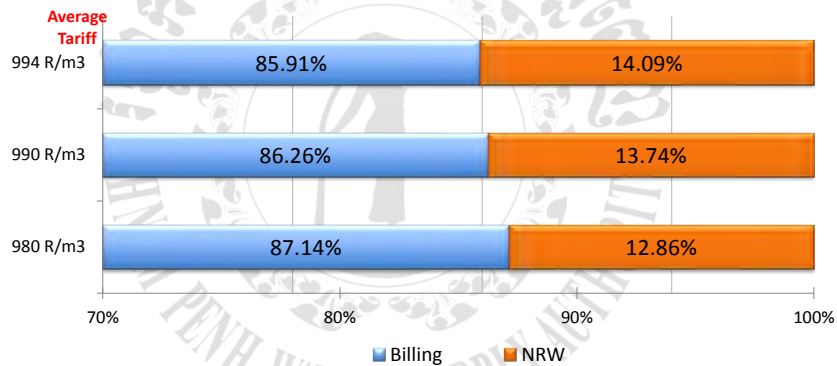
The Break Point of Profit

- As by 2010, PPWSA will no longer benefit if:

Total expenses \geq Average tariff x Total water volume produced x Billing ratio

=> Billing ratio \leq Total expenses / (Average tariff x Total water volume produced)

- Average tariff based change in Billing Ratio and NRW (Figure of 2009)



- By this, we do not make profit by increasing water tariff, but we make profit by increasing our efficiency.*

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Follow the Track, Going Further

- ❖ Increase production to cover demand

↳ 1993: 65,000m³/d; now: 300,000m³/d.

↳ 2012: 430,000m³/d; 2016: 560,000m³/d.



- ❖ Aggressively expand the service coverage:

↳ 1993: 288km, Coverage 20% of PNH

↳ 2010: 2000km, Coverage 90% of PNH City

↳ 2020: 3500km, cover 95% of PNH Metropolitan.



- ❖ Increase the Customer Base:

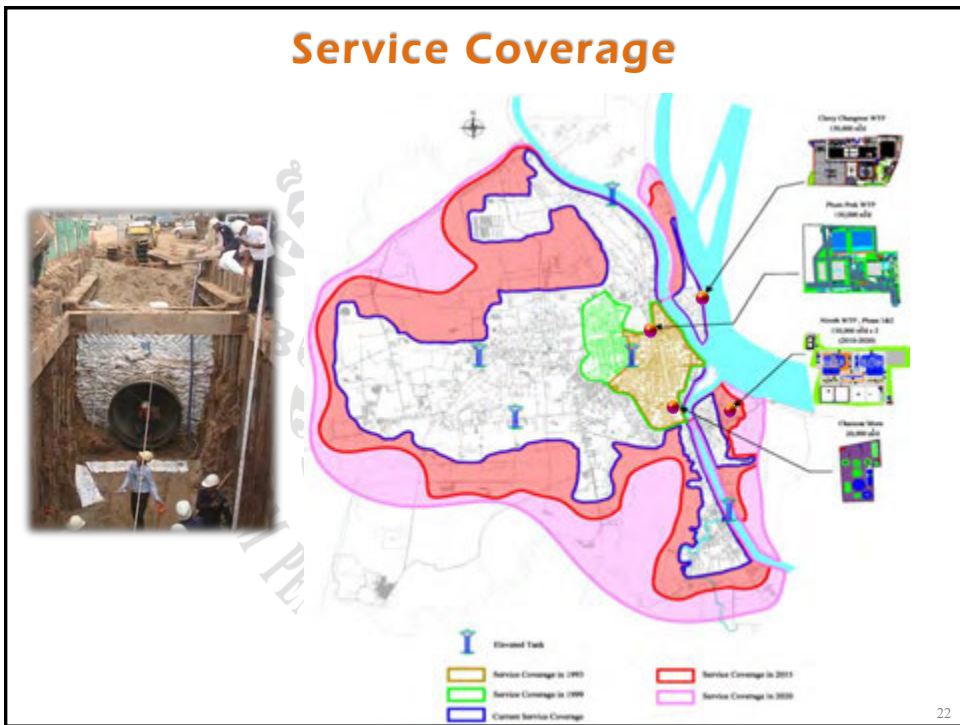
↳ 1994: 26,881 connections,

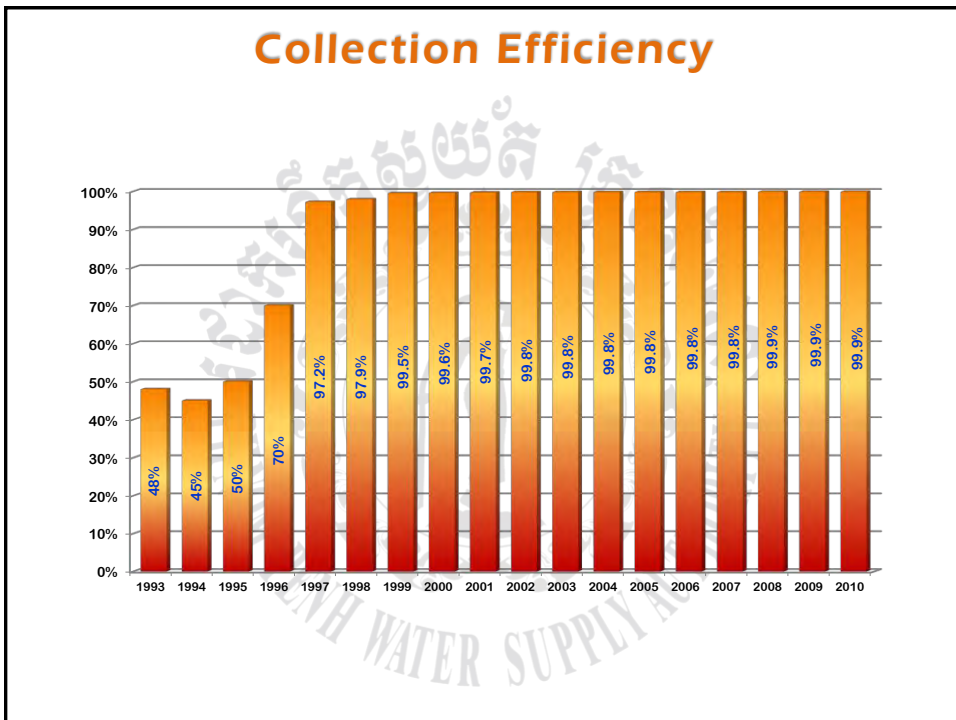
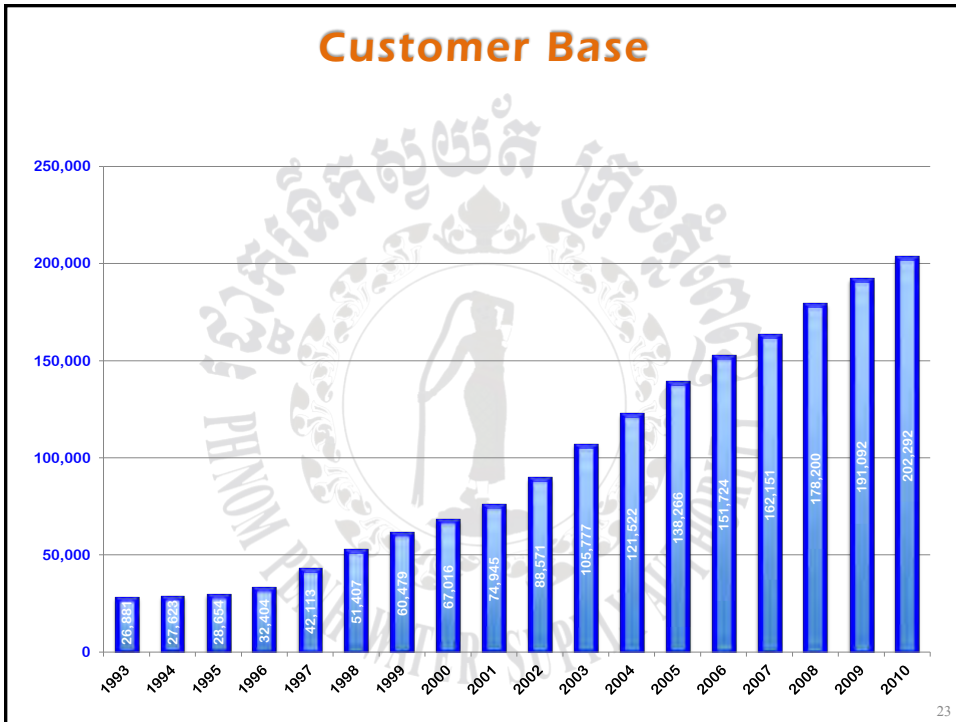
↳ 2010: 200,000 connections

↳ 2020: 350,000 connections

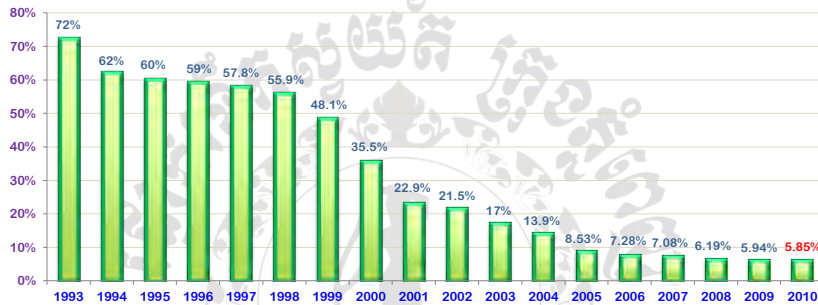


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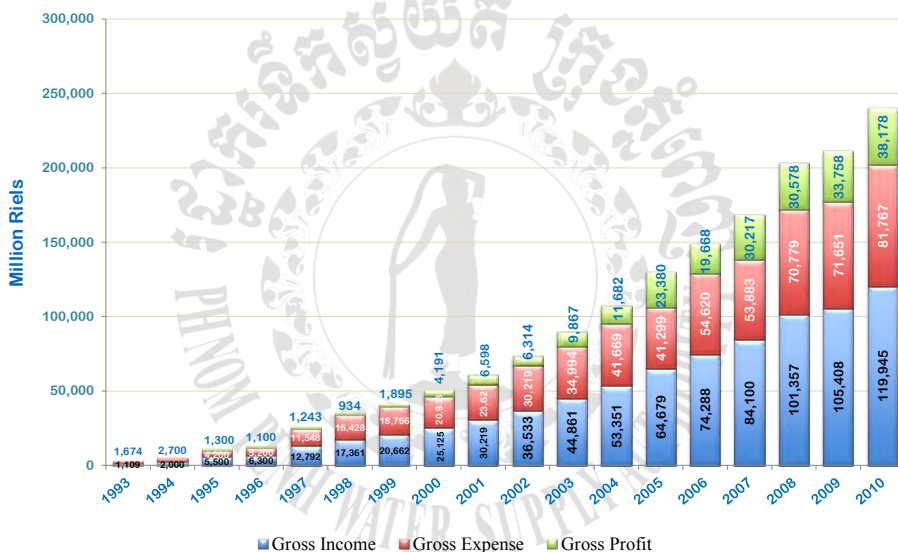
Water Losses (NRW)



- ❖ This NRW reduction is equal to a saving of about USD 150 millions on investment, and USD 18 millions of income per year.
- ❖ This means:
 - ↳ $72 - 6 = 66\%$ of water produced was saved,
 - ↳ As of today, production is 300,000m³/day; this 66% is equivalent to 198,000m³/day.
 - ↳ As of PPWSA average tariff is USD0.25/m³; this 198,000m³/day represents USD18,067,500/year.
 - ↳ In order to supply the amount of water lost, we need to build a WTP of 554,000m³/day (198,000m³ x 28/100), which should cost about USD150 million.

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Financial Outcome



PPWSA Water is safe to drink

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The Consolation

- ❖ **ADB Water Prize (to PPWSA)**
 - ↳ February 2004, for contribution to the achievement of MDGs under the Water for All initiative,

- ❖ **Ramon Magsaysay for Government Service**
 - ↳ 31 August 2006, for the success in the reconstruction of ruined water supply system, providing clean water to million people in a relatively short period,

- ❖ **Water Resource Hero**
 - ↳ June 2007, by Cambodian Prime Minister, for effectively running water utility,

- ❖ **Chevalier dans l'ordre de la Légion d'Honneur**
 - ↳ 01 February 2010, for great contribution to the nation,

- ❖ **Stockholm Industry Water Award 2010 (to PPWSA)**
 - ↳ 02 June 2010, for great contribution to the world environment sustainability.



Then & Now

1993	INDICATORS	2010
20	Staff / 1,000 connections	2.97
65,000	Production capacity, m ³ /day	300,000
???	Water quality	WHO
20%	Coverage area	92%
10 hr/d	Supply duration	24 hr/d
0.2 bar	Supply pressure	2 bar
26,881	Number of connections	210,000
72%	NRW	5.85%
48%	Collection efficiency	99.9%
150%	Operation ratio	37.11%
N/A	Return on revenue	26.89%
N/A	Return on net asset	7.39%
N/A	Current ratio	3.04 times
N/A	Debt service coverage	3.35 times
N/A	Accounts receivable	21 days

Lessons Learned

- ❖ **Performance = Money**
 - ↳ *With good performance, we could make money.*
- ❖ **The matching between performance and tariff is crucial:**
 - ↳ *Government: Usually weight on performance.*
 - ↳ *Operator: Usually weight on tariff.*
- ❖ **The international financial assistance should base on demand driven and in a timely manner,**
- ❖ **Peer support, learning from each other could short cut time,**
- ❖ **Internal effort with ownership spirit & strong commitment is the key of success:**
 - ↳ *Good governance: FAIR, FIRM & FAITH,*
 - ↳ *Transparency & Accountable to all the stake holder,*
 - ↳ *Proper take care staff capacity & living.*



THEN & NOW



THANK YOU!



Phnom Penh Water Supply Authority

Human Resources Management Of PPWSA

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2012



Content

1. Objective of HR Management
2. Background
3. Restructuring
4. Model Managers
5. Staff Capacity Building
6. Motivation Evaluation
7. Recruitment Process

1- Objective of HR Management

- To increase staff motivation and their moral
- To increase work efficiency
- To keep satisfactory service to the customers
- To keep the reasonable tariff to our people
- To keep the sustainability of water supply.

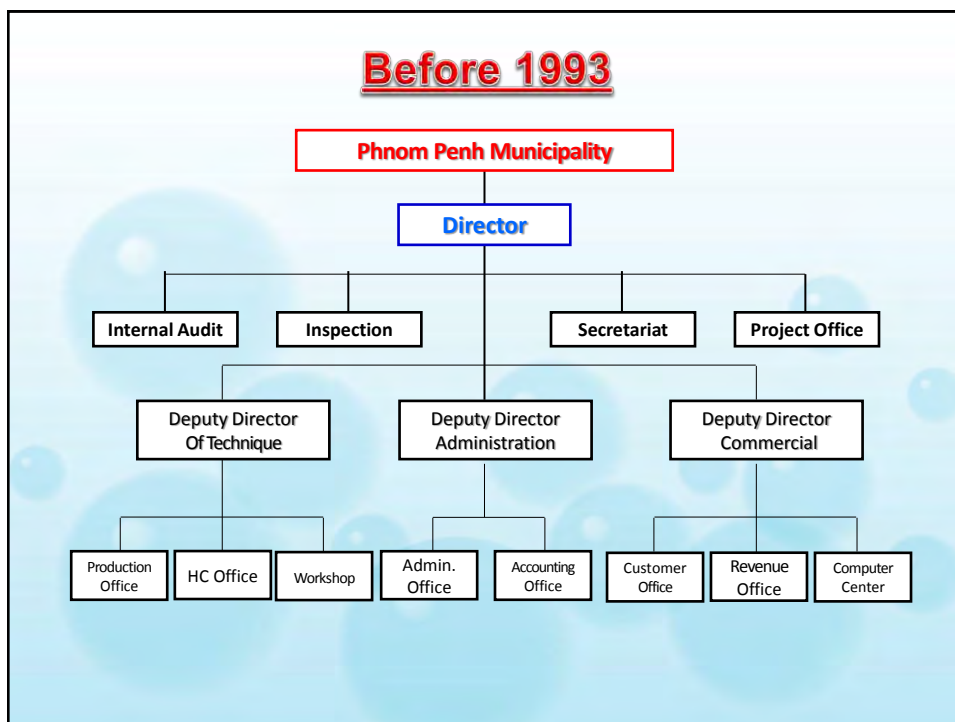
2- Background (Before 1993)

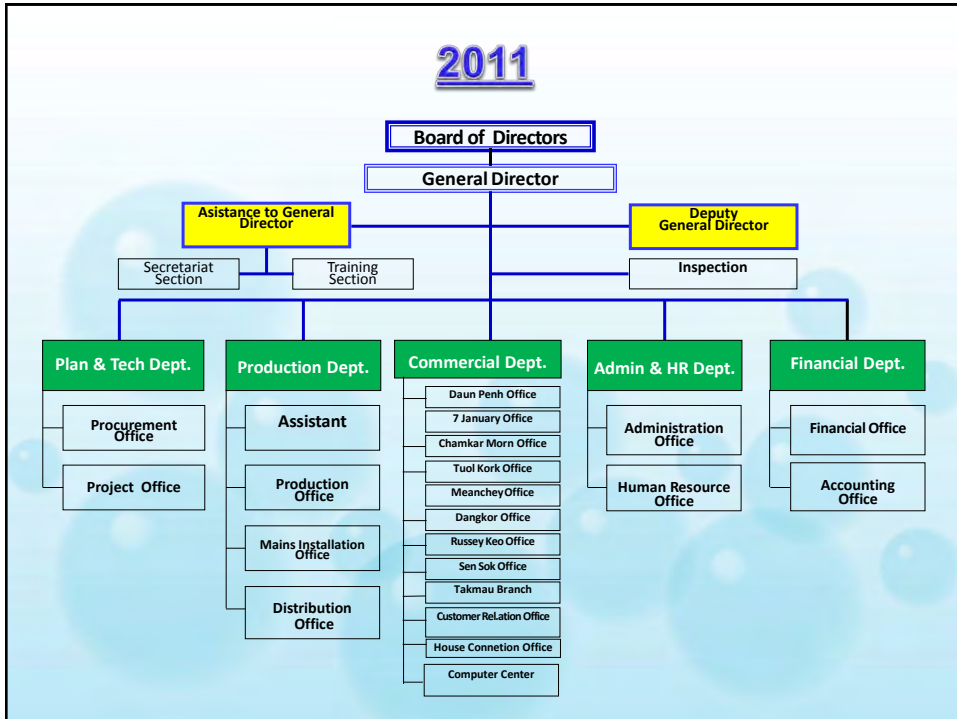
- Improper restructure
- 500 staffs (22staffs/1,000con.) with less then USD 20 salary.
- Under qualified, low discipline.
- Nepotism was widely practiced. Top managers and their cycle of men were working for self interest, abuse their power for their gains.
- The morale of other staffs was low.

3- Restucturing

3.1 New structure

- Simple structure with level, less boss
- Proper organization chart according to actual roles.
- Promote young dynamic staff to the front line
- Remove inefficient old timers to the dormant roles
- Remove inactive manager to lower position





3- Restucturing (con.)

3.2 Set up the roles

- Clear job description of each department and offices
- Clear roles and responsibilities of each staff
- Direct respond to managers
- Update according to the actual condition.

4- Management Style

- Making effective and timely decision
- Delegate work with support and checking
- Collectivity decide, individually responsible

4.1 Building of leadership

- Manager must be the model for their subordinates
- Giving opportunity to subordinates sharing their idea

4- Management Style (con.)

4.1 Fair Firm Faith (3F)

- Know you people and look out for their well being
- Free of nepotism
- Promoting base on actual result
- On standard apply to all
- Team work spirit

5- Internal Regulation

New Rule

- Set up internal regulation with agreement from staff
- Set up discipline council with members from all department
- Provide incentive and strictly apply penalty without favor
- Hard work and good result, better pay
- Heavy penalty for bad intention.

6- Motivation and Evaluation

6.1 Living support

- Gradually increase staff's salary base on annual financial result
- Create staff relieve fund with possible contribution from all staffs
- Support the poor staff via team spirit
- Provide health care and taking care of them

6- Motivation (Con.)

6.2 Incentive

- Provide incentive to those who well perform
- Good result, better pay
- Best staff competition with remuneration
- Staff evaluation every 3 months for the basis of improvement
- Provide opportunity to contribute to leaderships
- Promotion by evaluation

6- Evaluation (Con.)

Evaluation procedure is implemented every three months for permanent execution staffs until the manager office in accordance with a certain model.

7- Recruitment Process

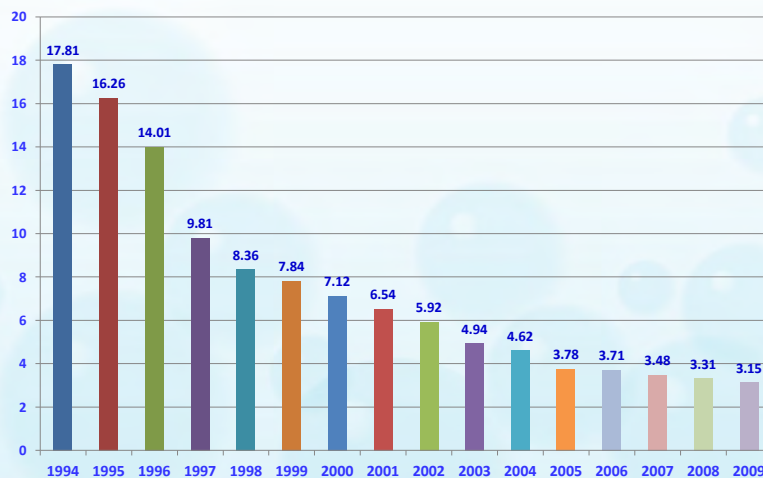
The recruitment based on

- Establishment of Recruiting Committee in accordance with personnel statute
- Criteria for permanent Employment

PPWSA complies with the following points

1. Stage 1 (Probationer/intern)
2. Stage 2 (Contractual Employee)
3. Stage 3 (Permanent Employee)

Staff Performance (number of staff/1000connections)



Employee's Education (August 2010)

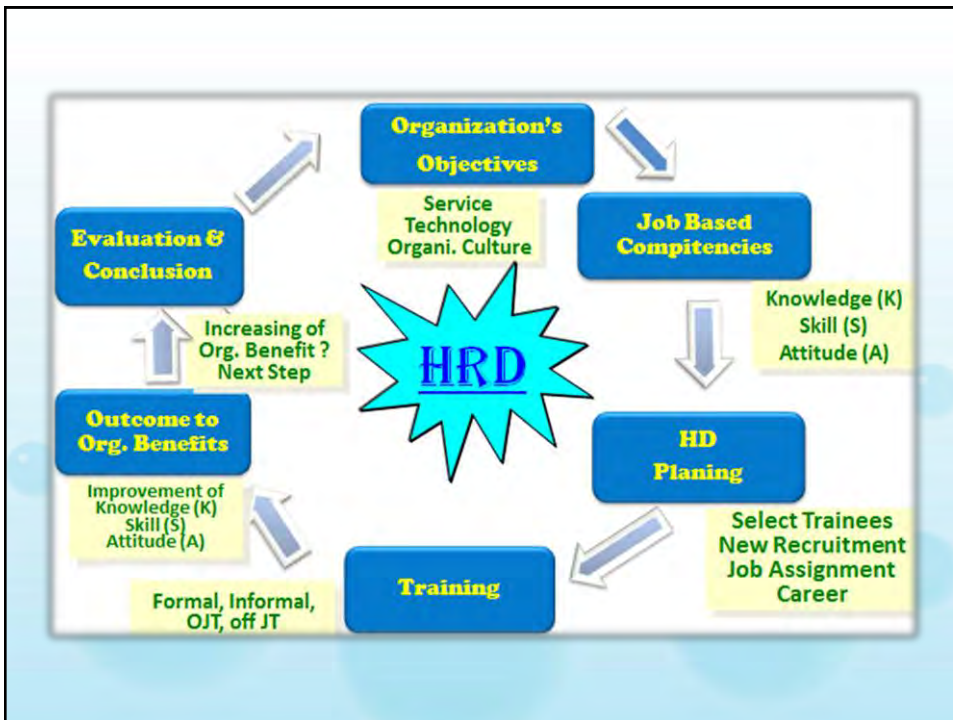
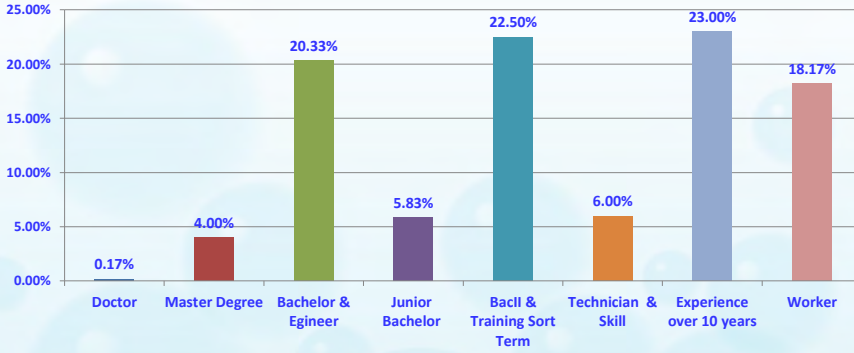
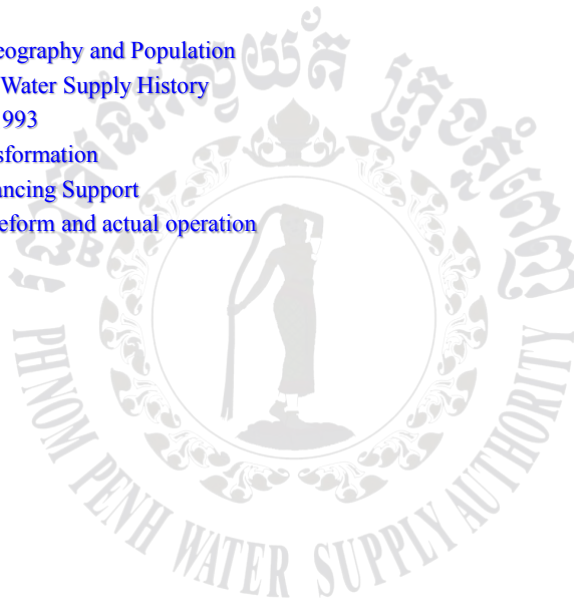


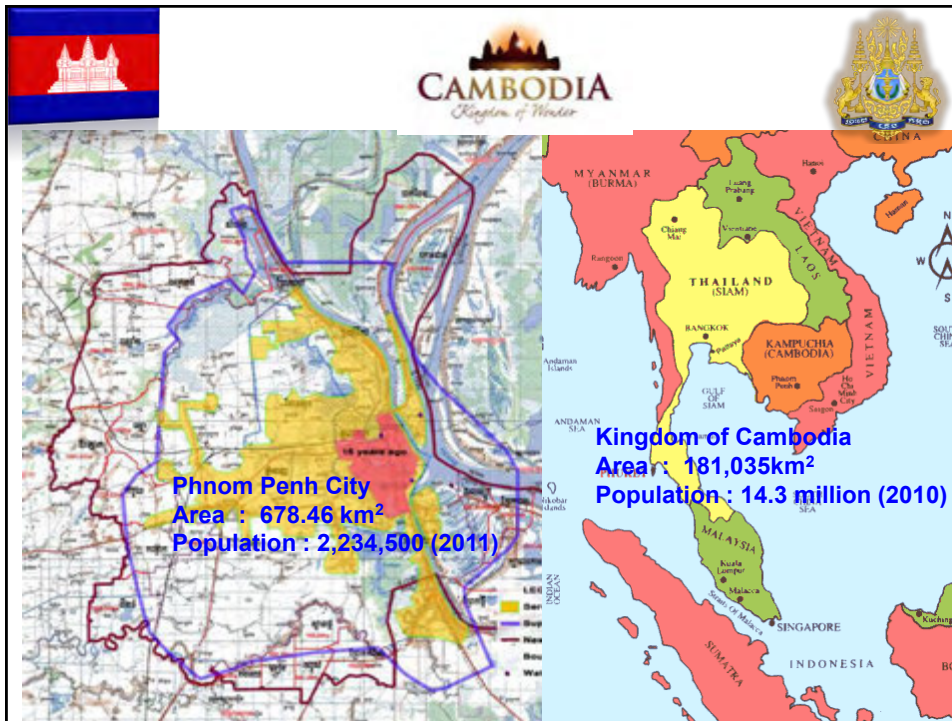




Table of Contents

1. Cambodia Geography and Population
2. Phnom Penh Water Supply History
3. Situation in 1993
4. PPWSA transformation
5. External Financing Support
6. Result after reform and actual operation





Phnom Penh's Water Supply History

- 1895 : First establishment of water supply system in Phnom Penh by the Compagnie des Eaux et Electricite' de l'Indochine (CEEI). Construction of Chrouy Chang War Water Treatment Plant with the capacity of 15,000 m³/day and distribution network of 40 kilometers. within the Daun Penh district.
- 1957 : Expansion of distribution network of 36 kilometers by Degremont
- 1958 : Construction of Chamkamorn water treatment plant with the capacity of 10,000m³/day by Degremont.
- 1959 : Expansion of Chrouy Chang War Water Treatment Plant with an additional 40,000 m³/day and network expansion of 32 kilometers.
- 1960 : Transferring from CEEI to Regie de Eaux de Phnom Penh (RdE) by the Royal degree of King Norodom Sihanouk with the network expansion of 165 kilometers.
- 1966 : Phum Prek Water Treatment Plant 1000,000m³/day by Pichchabal. Total capacity of 155,000 m³/day with distribution network of 233 kilometers.
- 1970-1979 : Civil war. Water Supply System was abandoned.



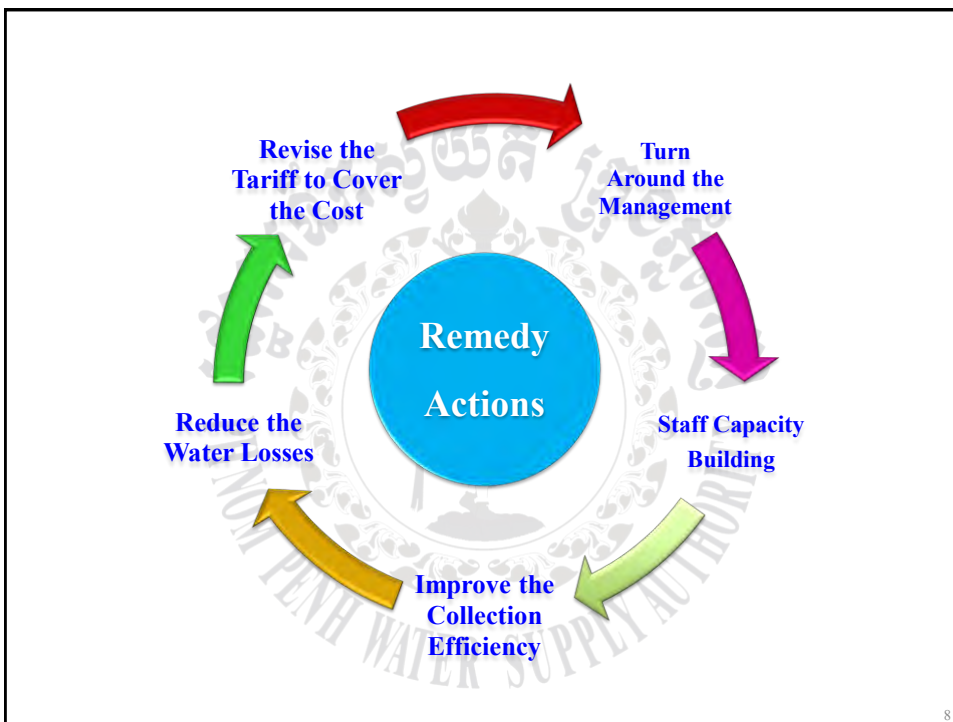
Situation in 1993

- Production below demand : 65,000m³ / 150,000
- Old & unrepaired network : 288km
- Coverage : 20% of PNH resident
- Supply duration : 8 to 10hr./day
- Unclear customer base : 25,960 / 26,881
- Collection efficiency : 50%
- Water losses (NRW) : 72%,
- Over-staff with low quality : 20 staffs / 1000 con.
- Organized corruption, dilemma, nepotism,
- Tariff below cost
- Heavily depended on Government subsidy.



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PPWSA's Transformation

A- Restructuring management

- **New Task force**

- ✓ Established new task forces by promoting young dynamic staff, with high education, empower and equipped with new mission before sending to the front line.
- ✓ Remove inefficient old timers to dormant roles.
- ✓ Motivated the staff to become team player for the authority

- **New Organization Structure**

- ✓ Established new organization chart with clear role, less structure, clear job description
- ✓ Standard operation procedure (SOP) has been set up to each staff of each task.
- ✓ Decentralize decision maker and give direct responsibility to manager.
- ✓ Manager must have enough knowledge, experiences, power, flexibility, and communication

- **Transforming**

Phnom Penh Water Supply Authority (PPWSA) has been transformed as a public enterprise with financial and administrative autonomy under the Law on the General Status of Public Enterprise (No.0696 of 17 June 1996) and by the Sub-Decree 52 of 19 December 1996. Since that time, PPWSA has been and is operating according to the Laws of Public Enterprise.

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B- Change of culture

- ✓ Manager must be a model for their subordinates,
- ✓ One standard apply to all (charismatic leadership)
- ✓ Collective make decision and individual is responsible.
- ✓ New vision by working for the profit of the people and be comparative with regional water utilities.
- ✓ Team work spirit, one for all and all for one.
- ✓ Establish the reward system and monitor the reward system in accordance to the appropriated ways and fairness.
- ✓ Establish the retirement system.
- ✓ Apply incentive and penalty role to the staff.

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C- Self-reliance program

We have to become self-reliance program through three critical programs :
Improving Collection Efficiency, Reducing NRW and Aggressively Expanding Service.

I. Improving Collection Efficiency through :

1. Updating the Customer Base to Increase Water Bill Collection.
 - . Comprehensive customer survey and customer classification.
 - . New customer file has been established.
2. Setting a Strong Example
 - . The model comes from the top (Public statement of the Prime Minister: Everyone including government employees must pay the water bill)
3. Installation Water Meter
 - . Established water meter policy (Classification, Replacement, Calibration and Sizing)
 - . Standardized water meter.
4. Applying Incentive and Penalty System
 - . Incentive to the staff with good result
 - . Penalty with bad intention.
5. Computerized Billing and Accounting
 - . Providing more information and deeper analysis
 - . Increasing customer confidence.



6. Regain the Public's Trust Program

- . Customer satisfaction by promoting convenient place for the customer to pay the water bill : Cashier Check, Bank Check, ATM and established of collection point.
- . Village to Village dissemination of information.
- . Information desk to deal with the customer complaints.
- . Water quality and water meter control at the customers request.
- . Response to customer calls classified into categories : one hour, one day, three day, and one week .



II. Reducing NRW through

1. Replacing old pipes
 - . Old cast iron pipes totally replaced by 1999.
 - . Procurement of pipe material , equipment must be ensured the quality (state of the art).
 - . Zero outsourcing for the construction of pipe network. PPWSA staffs carried out the works for economic and technical reason.
2. Metering all connection
 - . Each customer must have water meter
 - . Until today 100% metered with class C meter.
 - . SOP developed for water meter management.
3. 24/7 standby teams to repair leaks
 - . Set up repair team for leak repair
 - . Repair must be completed after receiving information from the customer
 - . Keeping enough stock of repair material.
4. Eliminate illegal connections
 - . Creation of inspection office
 - . Strictly disciplining internal staff
 - . Customer receive incentive fro reporting on irregularities/illegal connection.
 - . Penalty applied strictly

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5. Discourage wholesalers in coverage area
 - . Expanded pipe network to eliminate the wholesaler.
 - . Limitation the wholesaler
6. District metering area (DMA) Program
 - . Established zoning system by installing district metering area (DMA)
 - . Monitoring the flow and pressure through the DMA
 - . Analysis and comparing the data through telemetry
 - . Set up team for night test and step test
 - . Applying internal service contract



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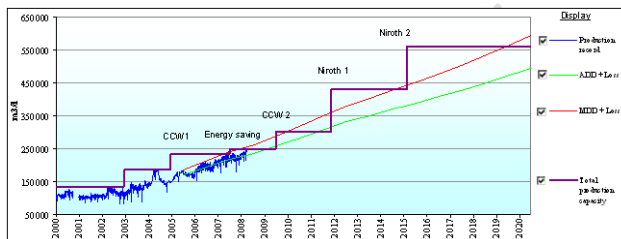
III. Aggressively Expanding Services through :

1. Aggressive expansion of surface coverage area

- . 1994 to 1999 emergency program for replacement of old pipe.
- . From 2000 onward transmission and distribution pipe is expanded every year.
- . Service coverage outreach to the area of high potential economic growth without overlooking the poor.
- . By 2020, coverage area should be reached 95% of Phnom Penh Metropolitan with the network over 3500 km

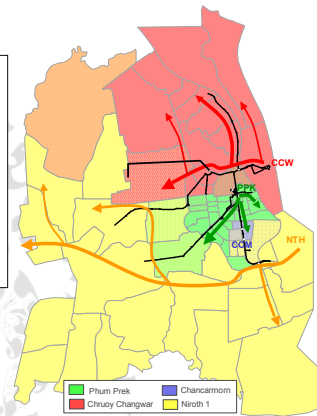


2. Increasing Production to Cover Demand



Master Plan Phase II Development of Water Supply 2020
Water Demand and Water Production in m3/day

Year	ADD	ADD+Loss	MDD+Loss	Total Production
2010	259,809	281,938	317,269	300,000
2013	316,790	349,898	401,586	430,000
2015	349,261	388,068	451,190	560,000
2017	385,060	427,845	503,828	560,000
2020	445,756	495,285	594,341	560,000



Expansion Water Production

- 2010-2013 : Nirothj Water Treatment Plant Phase I**
130,000m3/day
- 2014-2017 : Niroth Water Treatment Plant Phase II**
130,000 m3/day

3.Revising water tariff to cover the costs

Customer Category	Domestic		Administrative		Commercial	
	Volume (m ³ /month)	Tariff (Riels/m ³)	Volume (m ³ /month)	Tariff (Riels/m ³)	Volume (m ³ /month)	Tariff (Riels/m ³)
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D- Staff Capacity Building

- **Training**

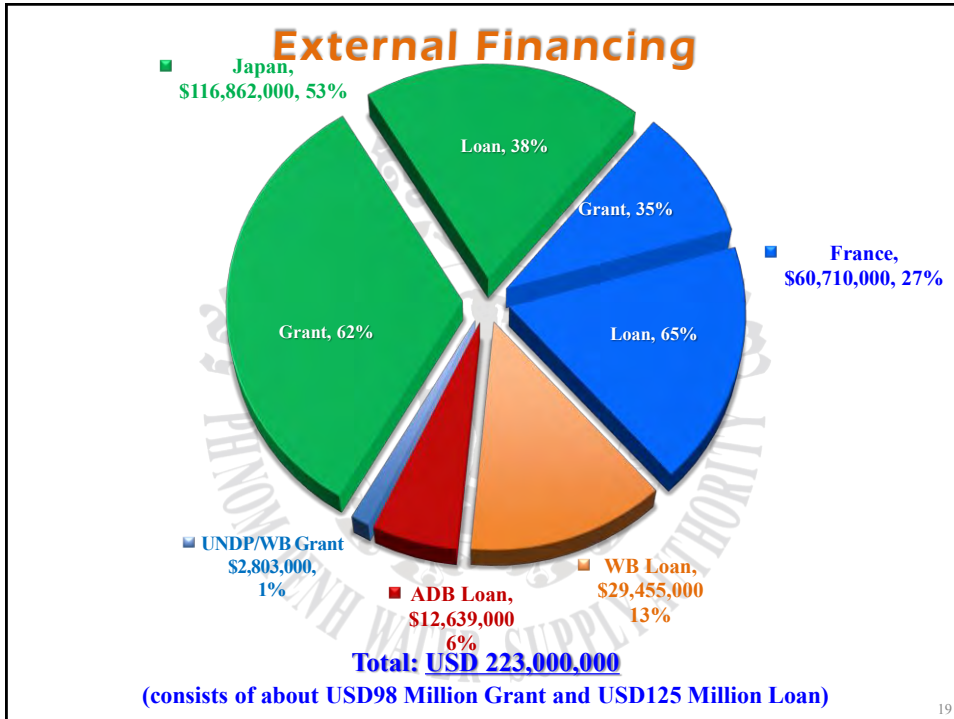
- ↳ Very basic training.
- ↳ Local and abroad.
- ↳ In house and academic.
- ↳ End of the year introduced training examination.


- **Living:**

- ↳ Eight years salary increase.
- ↳ Healthcare program.
- ↳ Social fund to alleviate difficulties of poorest staff






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Assistance from JICA (1993 to Now)

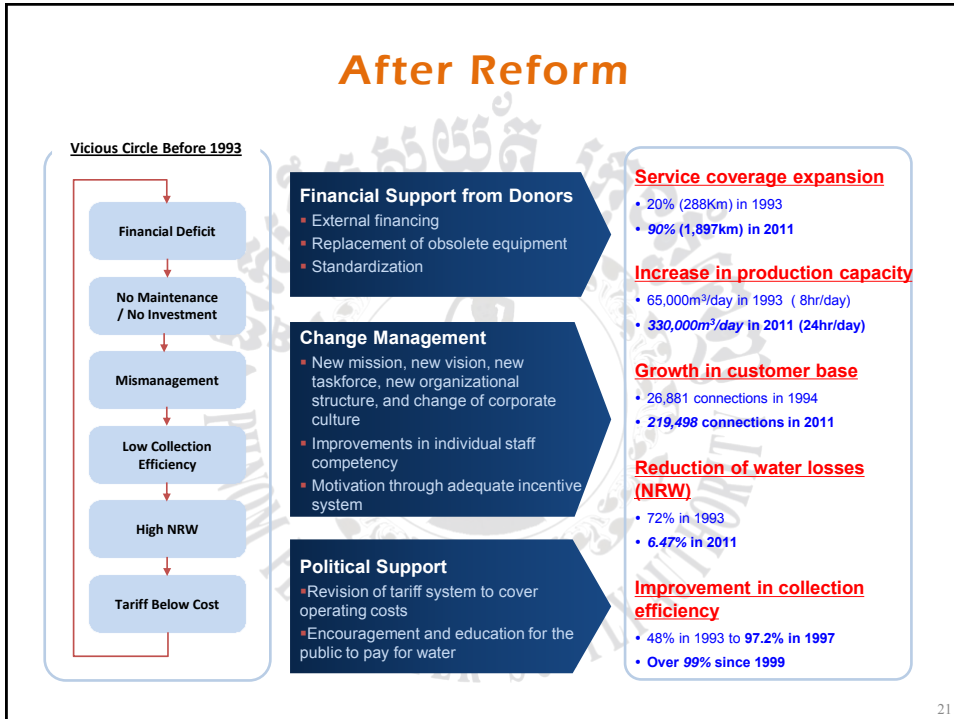


1-Master Plan - Phase I (1993-2010)	GRANT
2-Urgent Rehabilitation Works	GRANT
(1) Phase 1 (1994-1995)	
(2) Phase 2 (1997-1999)	
(3) Phase 3 (2001-2004)	
3-Capacity Building for Water Supply System in Cambodia (2003-2006)	GRANT
4-Master Plan - Phase II (2005-2020)	GRANT
5-Construction of Niroth WTP - 130,000 M3/day (2009-2014)	LOAN
6-Introduction of Clean Energy by Solar System (2010-2013)	GRANT





PPWSA Mission and Vision

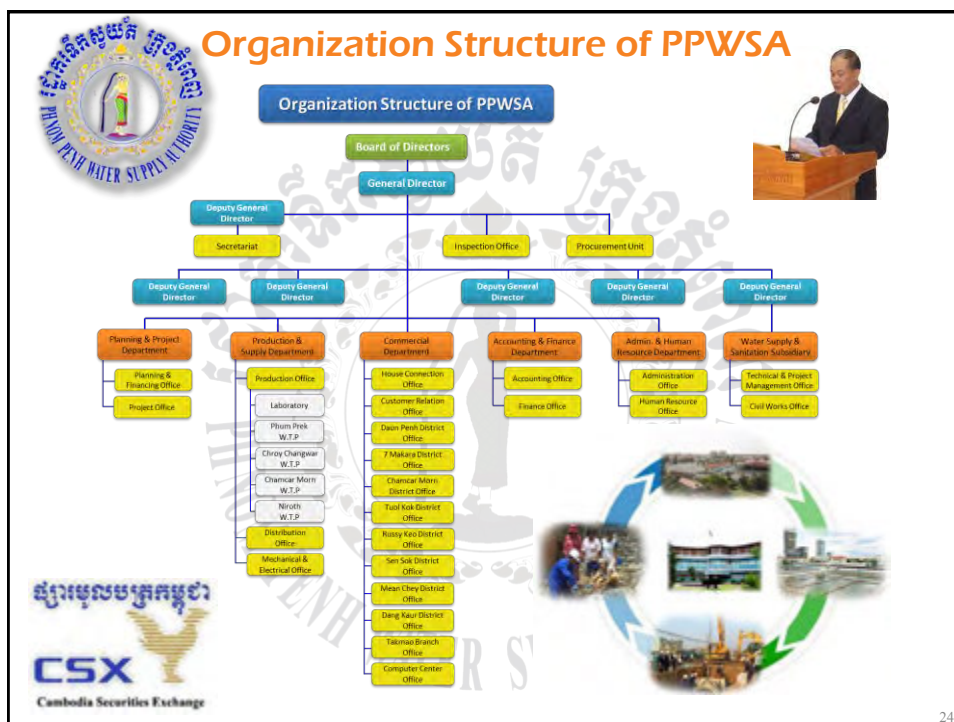
Vision

PPWSA is committed to the sustainable development of its potable water supply services, as well as providing services as a consultant and facilitator in order to ensure people in the other cities and provinces of Cambodia have access to potable water.

PPWSA is also committed to assisting other developing countries to supply potable water to their people.

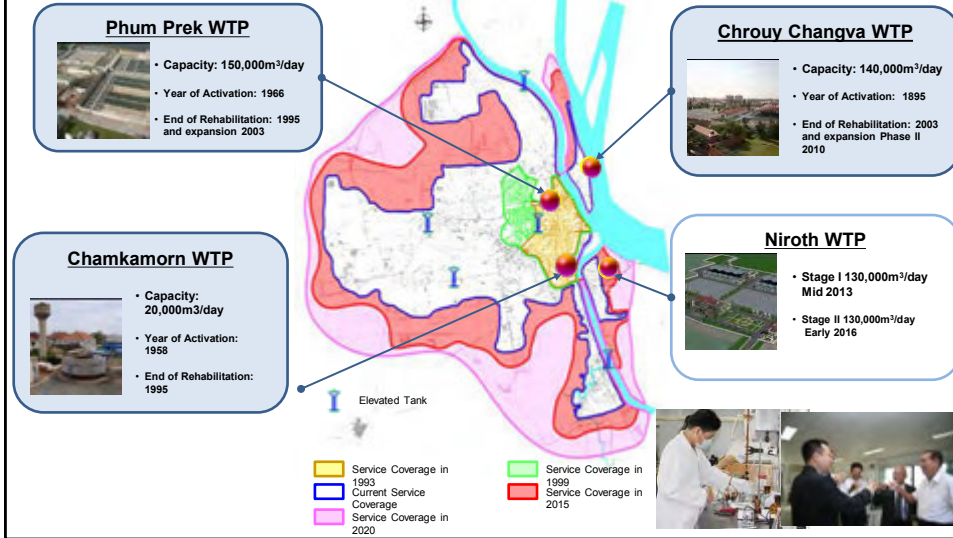
Mission

The mission of PPWSA is to ensure the supply of clean potable water 24 hours per day, 7 days per week, with adequate water pressure and at a reasonable price to the people of Phnom Penh and the urban areas of the Kandal province adjacent to Phnom Penh whilst also considering the needs of those people living in poverty. In addition, PPWSA has been sharing its experience with some provincial-city water authorities in the Kingdom of Cambodia, as well as in the region and the rest of the world.



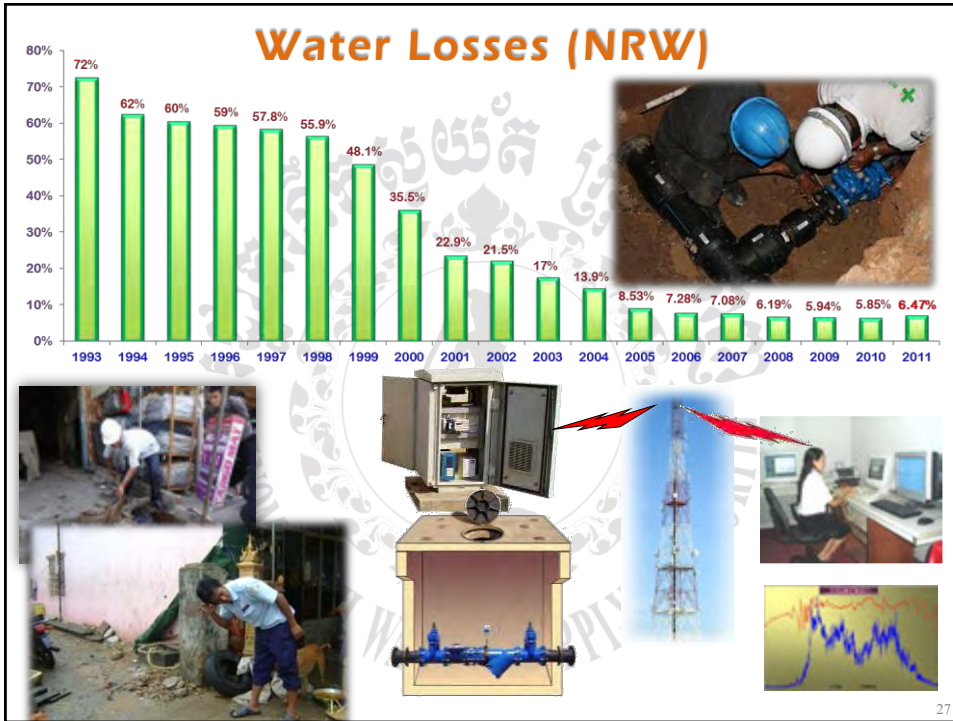
Production Capacity

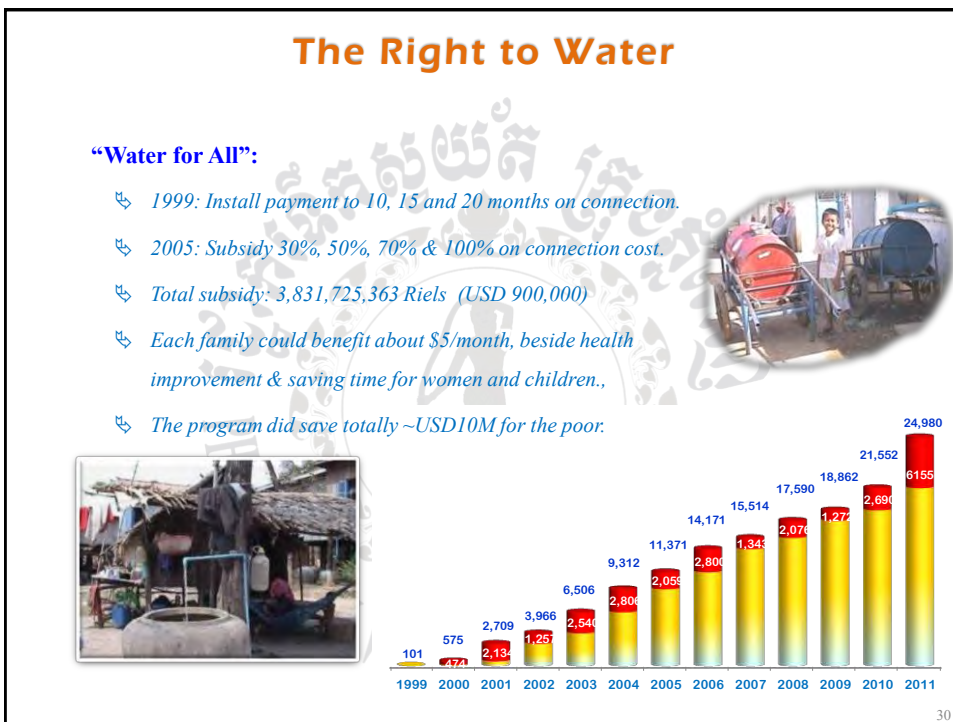
BY 2020, PPWSA WILL COVER WHOLE PHNOM PENH, TAKMAO AND SURROUNDING AREAS TO MEET INCREASING WATER DEMAND

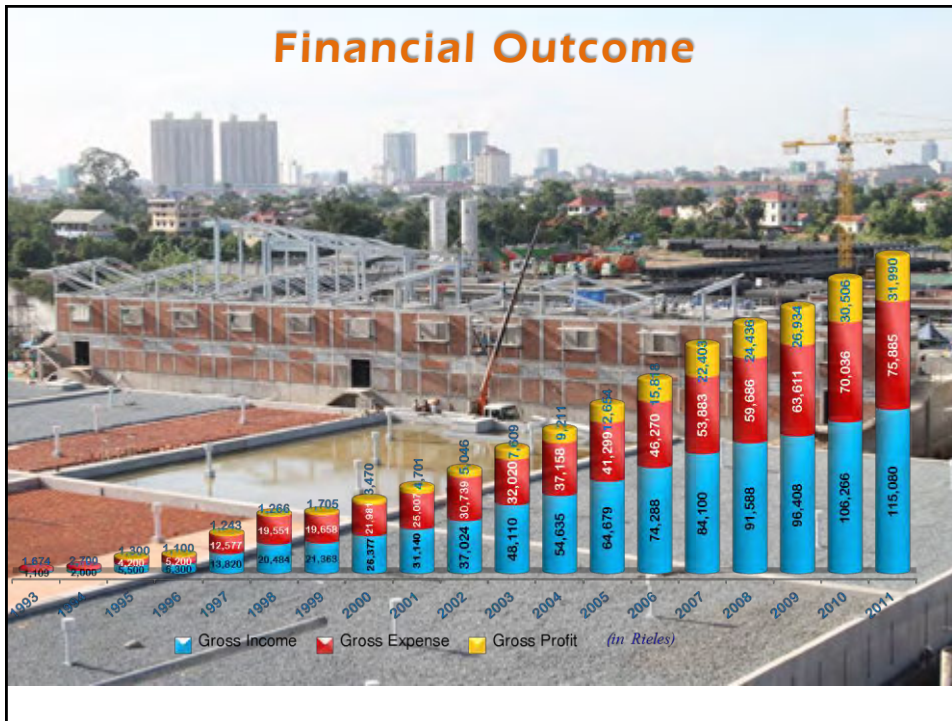


Distribution System









The Consolation

- ❖ **ADB Water Prize (to PPWSA)**
 - ↳ February 2004, for contribution to the achievement of MDGs under the Water for All initiative,
- ❖ **Ramon Magsaysay for Government Service**
 - ↳ 31 August 2006, for the success in the reconstruction of ruined water supply system, providing clean water to million people in a relatively short period,
- ❖ **Water Resource Hero**
 - ↳ June 2007, by Cambodian Prime Minister, for effectively running water utility,
- ❖ **Chevalier dans l'ordre de la Légion d'Honneur**
 - ↳ 01 February 2010, for great contribution to the nation,
- ❖ **Stockholm Industry Water Award 2010 (to PPWSA)**
 - ↳ 02 June 2010, for great contribution to the world environment sustainability.
- ❖ **8th JICA's Recognition Award 2012 (to PPWSA)**
 - ↳ 02 November 2012, for best organization in the region and world in operation and management of water supply service.








Partnership for Domestic and International Outreach

National Water Supply

(Capacity Building to 8 Provincial Capital)



International Water Supply



JICA Project (Domestic)	PPWSA Role
1-Capacity Building for Water Supply System in Cambodia II (2007-2012)	Trainer
2-Capacity Building for Water Supply System in Cambodia III (2012-2017)	Trainer
3-Replacement & Expansion of Water Distribution System in Provincial Capitals (2010-2013)	Sub-Contractor
4-Siem Reap Water Treatment Plant Expansion Project (2012-)	Support
JICA Project (International)	PPWSA Role
5-Providing Training for JICA project in Nepal (2012)	Trainer
6-Providing Training for JICA project in Myanmar (2012)	Trainer

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Comparison Indicator

1993	INDICATORS	2010
20	Staff / 1,000 connections	2.97
65,000	Production capacity, m ³ /day	300,000
???	Water quality	WHO
20%	Coverage area	92%
10 hr/d	Supply duration	24 hr/d
0.2 bar	Supply pressure	2.5 bar
26,881	Number of connections	210,000
288 km	Length of network	1,700 km
72%	NRW	5.85%
48%	Collection ratio	99.9%
150%	Operation ratio	37.11%
N/A	Return on revenue	26.89%
N/A	Return on net asset	7.39
N/A	Current ratio	3.04 times
N/A	Debt service coverage	3.35 times
N/A	Accounts receivable	21 days

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Phnom Penh Water Supply Authority

Water Treatment Plant

Mr. Tan Bunneth

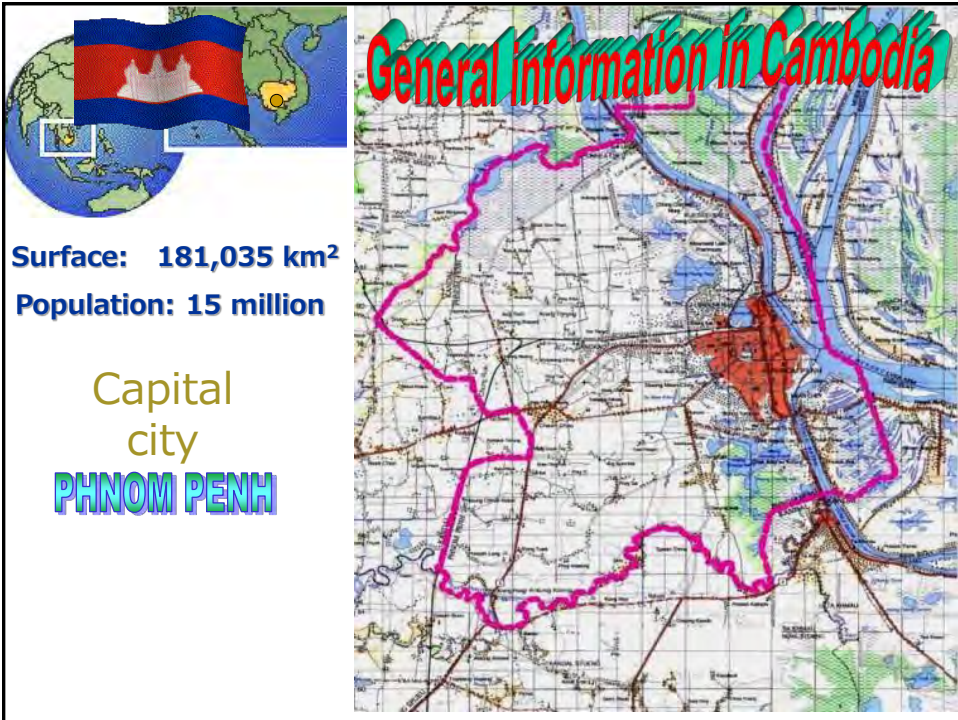
Chief of Cham karmorn Water Treatment Plant

2012



Content

1. Objective
2. Summary of Phum Prek WTP.
3. Summary of facilities and water flow
4. Summary of facilities and water flow
5. Maintenance manual of each facilities
6. Role of the staff
7. Check and maintenance of facilities

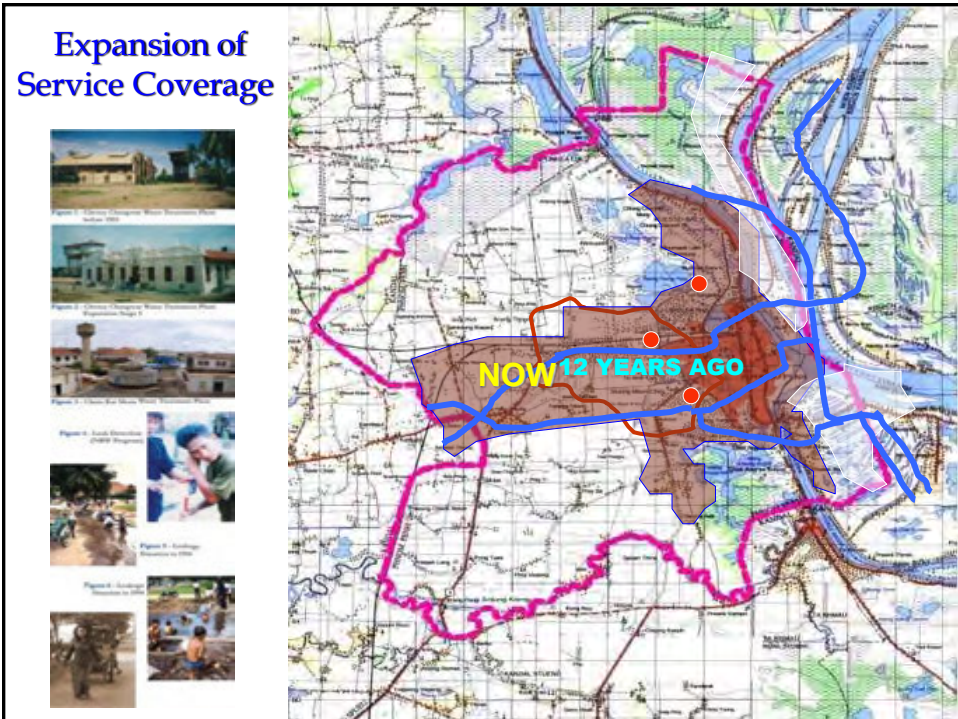


General information in Cambodia

Surface: 181,035 km²
 Population: 15 million

Capital city
PHNOM PENH

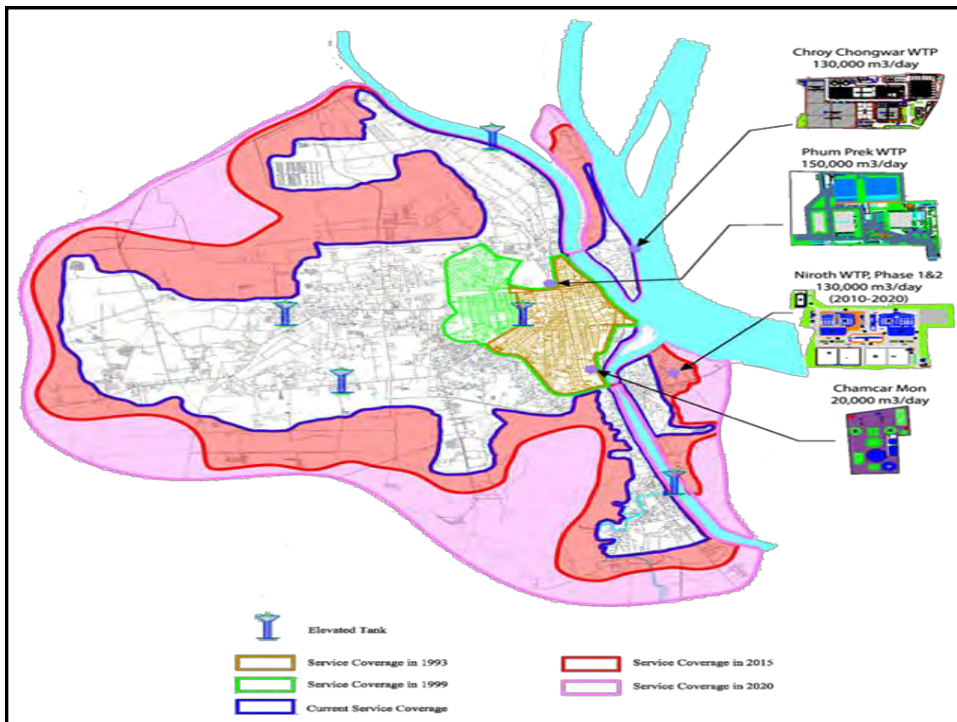
This slide provides general information about Cambodia. On the left, there is a globe with Cambodia highlighted in yellow and its national flag (red, white, and blue with a white crown) overlaid. Below this, the surface area is listed as 181,035 km² and the population as 15 million. The capital city is identified as Phnom Penh. On the right, a map of Cambodia is shown with a pink outline of the country's borders and a red shaded area representing the Phnom Penh metropolitan area.



Expansion of Service Coverage

NOW 12 YEARS AGO

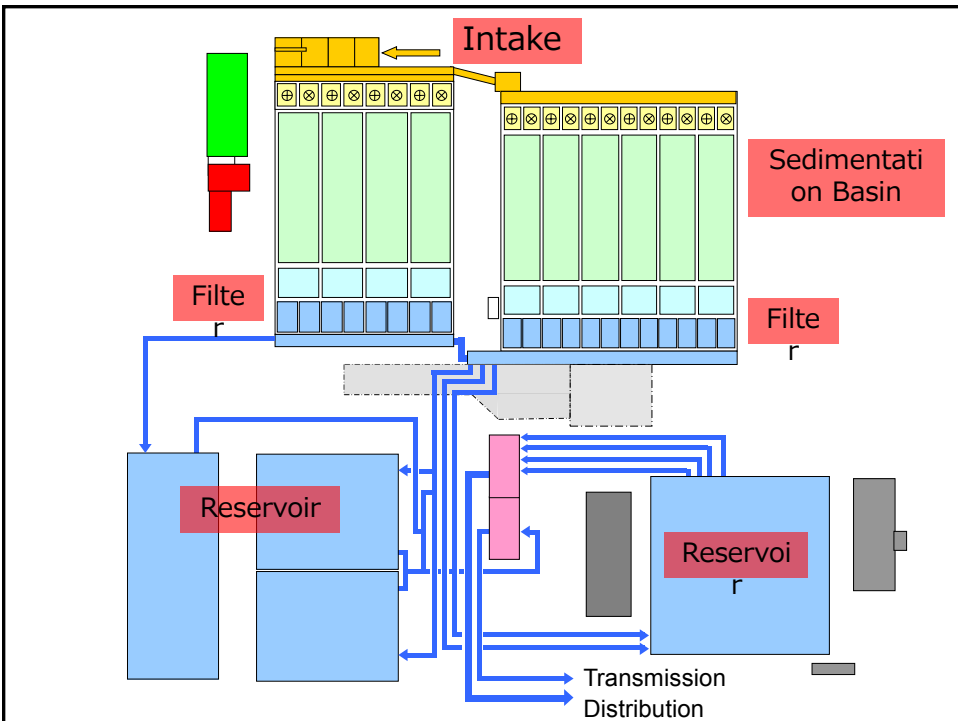
This slide illustrates the expansion of service coverage. On the left, a vertical column of eight small images shows various service-related activities: a building, a modern building, a water tower, a person in a blue uniform, a person in a white uniform, a person in a blue uniform, a person in a white uniform, and a person in a blue uniform. On the right, a map of Cambodia is shown with a pink outline of the country's borders and a blue shaded area representing the service coverage area. The text "NOW 12 YEARS AGO" is written in yellow on the map, indicating the time period of the service expansion.



1. Summary of Phum Prek WTP

- The Phum Prek water treatment plant,
Located on North of Cambodia Railway Station.
- The Phum Prek WTP was built in 1966 with a capacity of 100,000 m³/day. The plant was damaged during the civil war the plan capacity only 56,000m³/day.
- In 1993, the government of Japan has prepared the Master Plan.
- From 1994 to 1996, an urgent rehabilitation project to restore the initial production capacity of PPWTP from 56,000 to 100,000 m³/day.
- From 2001 to 2003, expansion of PPWTP with capacity 50,000 m³/day.





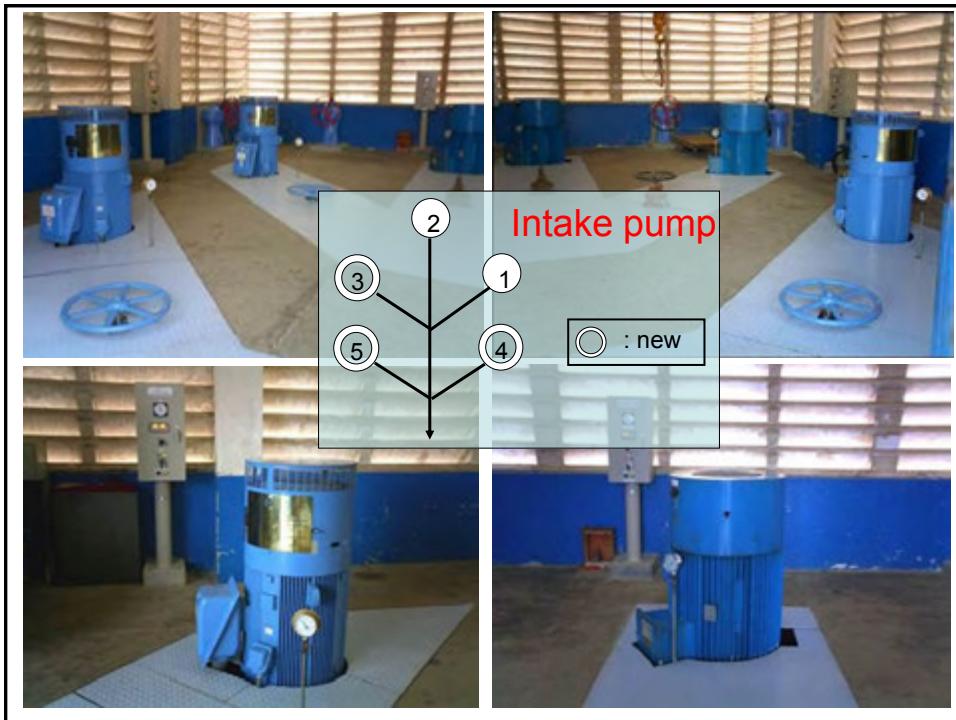
Maintenance Work in Phum Prek WTP

Facilities		Work	details	remarks
Intake pump		check	daily, weekly, monthly	include air compressor, vissel, line pump
		maintenance	lubricant, gland packing	
Disribution pump		check	daily, weekly, monthly	
		maintenance	lubricant, gland packing	
Chemical dosing	Chlorine	check	daily, monthly, yearly	
		maintenance	chlorinator	disassemble and clean
	PAC	check	daily, monthly	
		maintenance	lubricant,	
	Lime	check	daily, monthly	
		maintenance	lubricant,	
Flocculation	check	daily, monthly		
	maintenance	lubricant, gland packing		
Filter	Air Compressor	check	weekly	
	Compressor	maintenance	drain water, clean filter kit	
	Backwash Pump	check	weekly	
		maintenance	Noise, Vibration, gland packing	
	Air Blower	maintenance	oil, oil change, fanlet, Lubricant.	
	Siphon Regulator	maintenance	Cleaning of air inlet	
		check	weekly	
Pneumatic valve	maintenance	open-close operation, leakage of air		
Valve Controller	check	yearly		
	maintenance	open-close operation, limit switch		

Annex 1

Operation work for Phum Prek WTP				
Contents	work	Items		remarks
Chlorine	dosing	connecting drum		
		disconnecting drum		
		adjusting dosing volume		
PAC	dosing	making solution PAC		
		adjusting dosing volume		
		check tubility at night		
Lime	dosing	making lime milk		
		adjusting dosing volume		
Sedimentation basin	Cleaning	cleaning of surface		remove algae
		draining sludge		
		cleaning sludge		
Filter basin	Backwashing	cleaning in basin surface		remove algae
		backwashing		





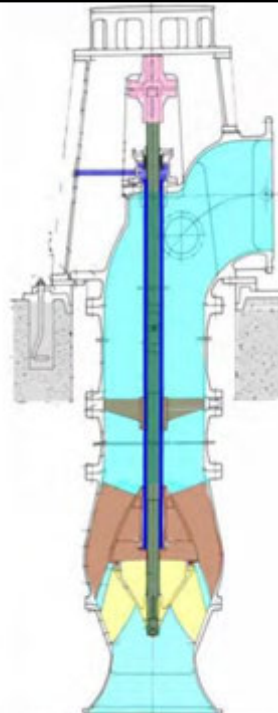
Intake (Pump)

Role of intake pump

- To send raw water to Receiving well.
- Regardless of water level of a river,

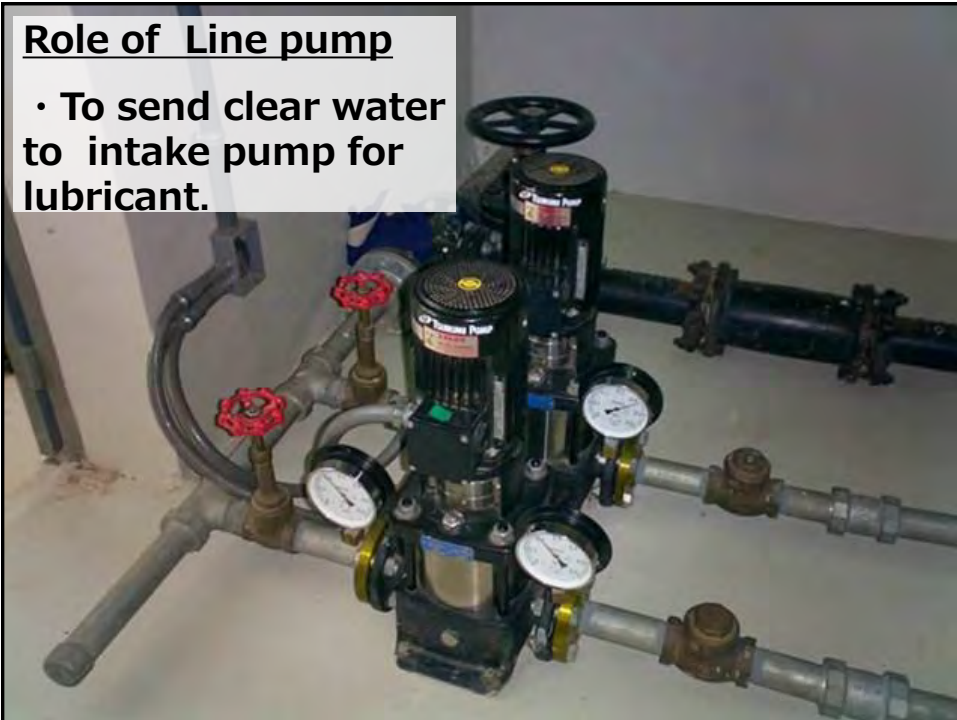
Specifications of intake of water pump

Type of pump	Vertical shaft mixed flow
Size	500 mm
Total Head	21 m
Capacity	36.7 m ³ /min
Stage	1
Speed	985 min ⁻¹
motor output	185 kw



Role of Line pump

- To send clear water to intake pump for lubricant.



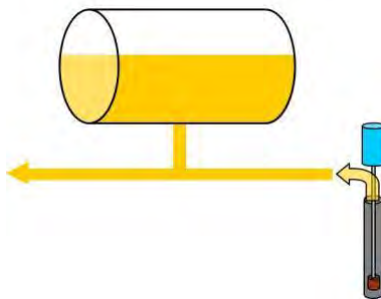
1-2. Intake (Air Vessel)

Role of Air Vessel

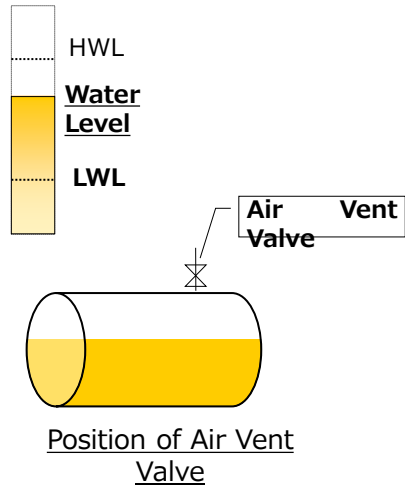
- To decrease water hammer of pipe by using flexibility of air.

Specifications of Air Vessel

Capacity	36 m ³
Size	φ 2,700 x 7,200L
Maximum Pressure	0.294 Mpa



Maintenance of Air Vessel



2.Receiving well



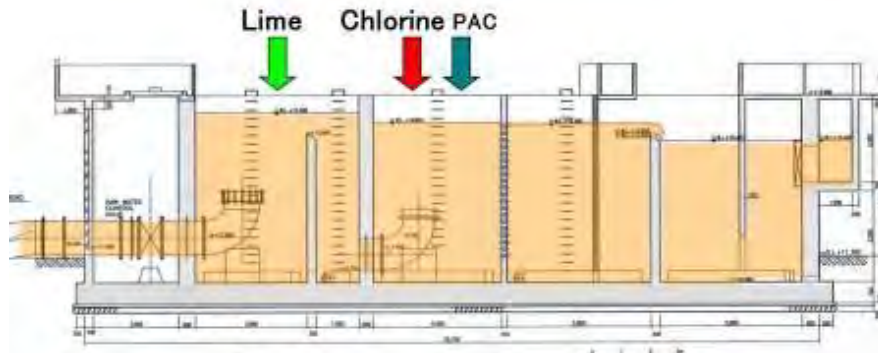
2. Receiving well

Role of Receiving well

- To stabilize water level of raw water.
- To measure the quantity of raw water.
- To mix dosed chemicals

Specifications of Receiving

Well	220m x 53mW x 56mD
Capacity	650m ³



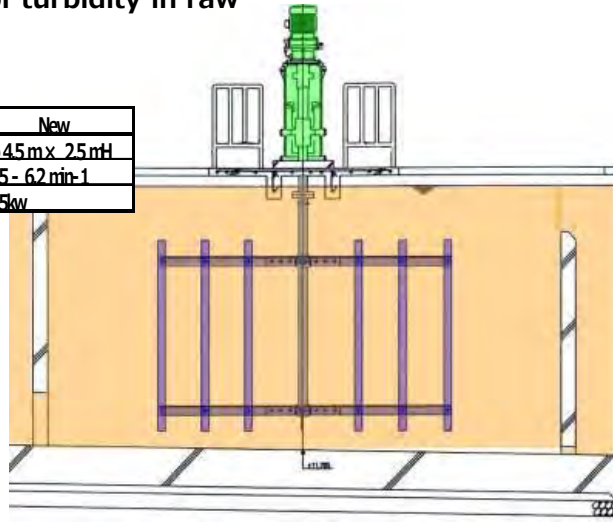
3. Flocculator

Role of Flocculator

- To stir water slowly to make floc big.
(Floc is aggregate of turbidity in raw water.)

Specifications of Flocculator

	Existing	New
Size	φ4.5m x 2.5mH	φ4.5m x 2.5mH
Speed	3.7min ⁻¹	1.5 - 6.2min ⁻¹
motor output	20kw	55kw



4. Sedimentation basin



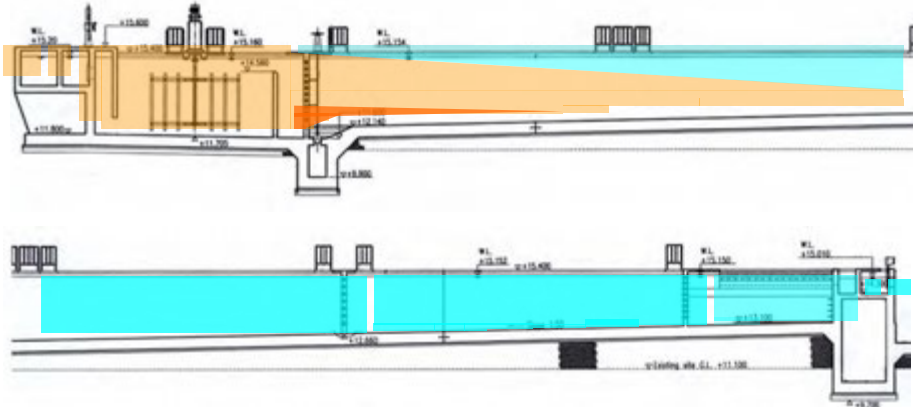
4. Sedimentation basin

Role of Sedimentation basin

- To sink floc.
- To drain sludge.

Specifications of Sedimentation basin

	Existing	New
Size	11.1mW x 53.2mL x 2.45mD	11.3mW x 50.0mL x 2.54mD
Number of basin	6	4
Capacity	8,680 m ³	5,740 m ³



5. Filter



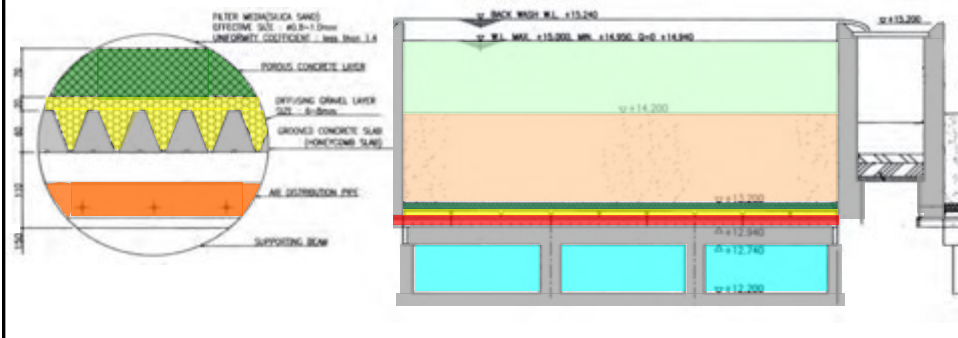


Role of Filter

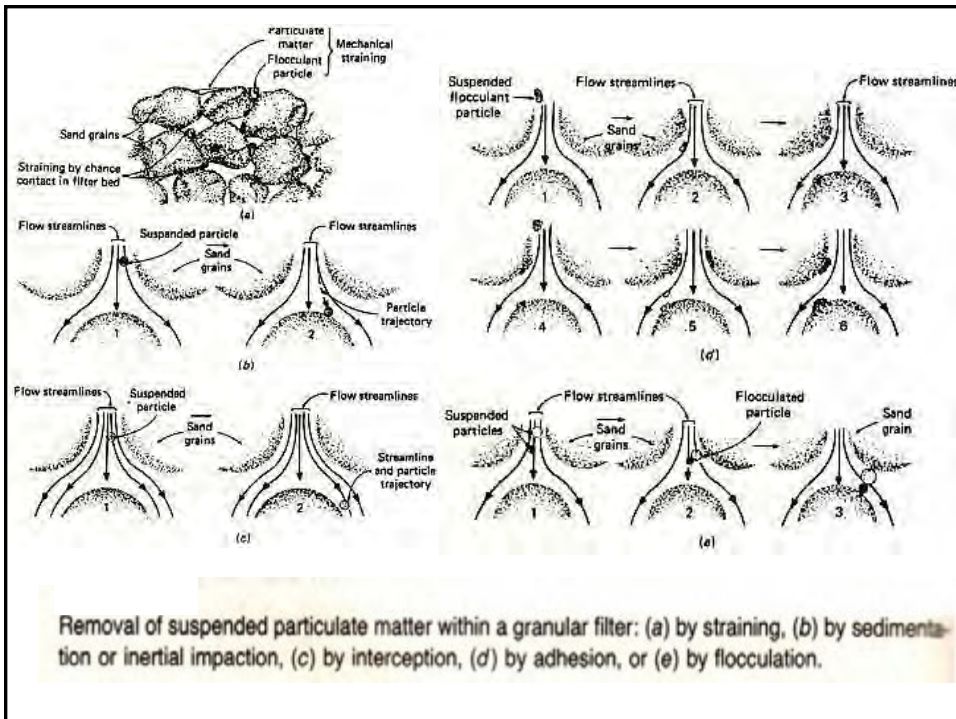
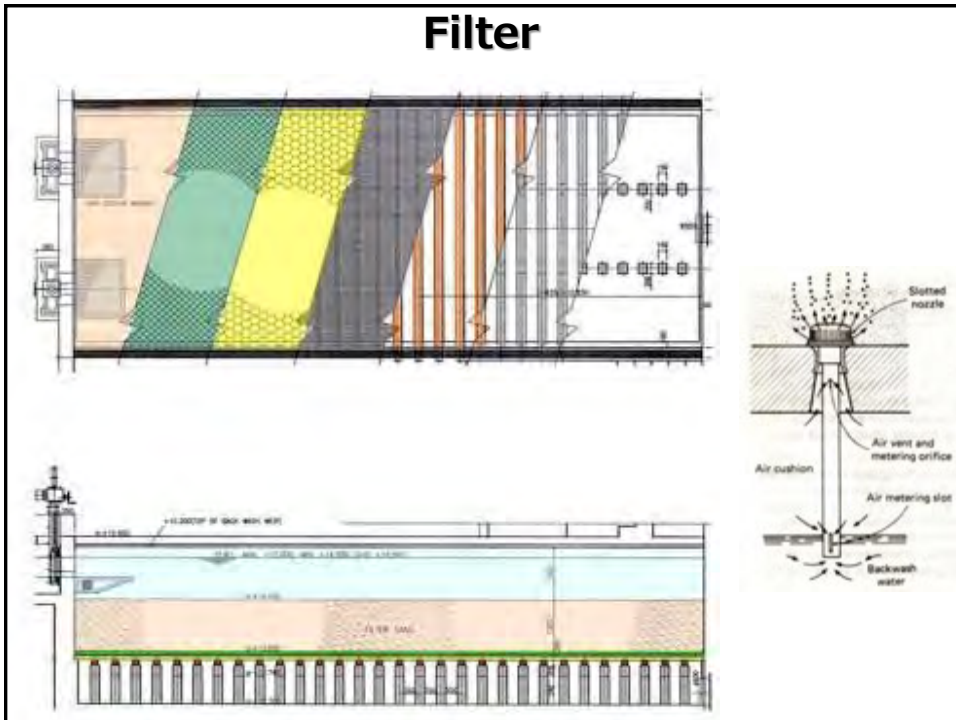
- To remove turbidity by letting water go through to sand.

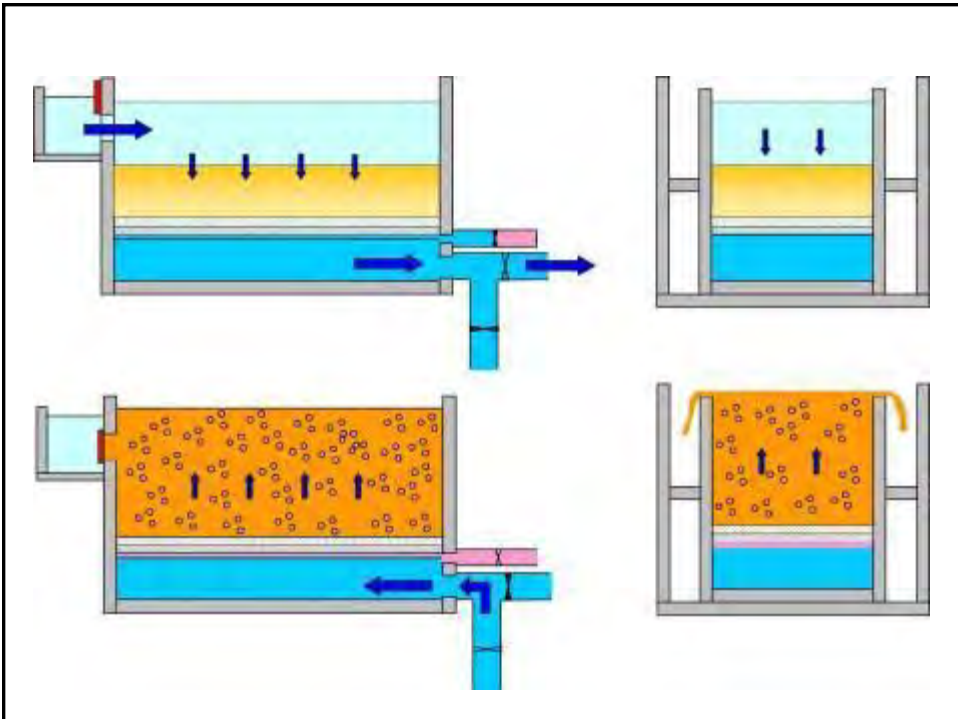
Specifications of

Filter	Existing	New
Size	45m x 11.9m = 5355m ²	45m x 10.85m = 48825m ²
Number of basin	12	8
filter media	silica sand	silica sand
filter layer	1.0m	1.0m
Effective size	1.0mm	1.0mm
Uniformity coefficient	<1.6	<1.5
filter media	silica sand	silica sand



Filter





6. Reservoir

Role of Reservoir

- To coordinate a difference of filtrated amount and distributed amount.
- To save water for an accident and abnormality of water quality.

Specifications of Reservoir

Reservoir	Size	Capacity	Construction
No.1	50.0m × 50.0m × 4.0m	10,000m ³	1959
No.2-1, No.2-2	31.4m × 39.4m × 4.06m	5,000m ³ × 2 = 10,000m ³	1995
No.3	24.8m × 66.8m × 3.1m	5,000m ³	2003



7. Distribution pump

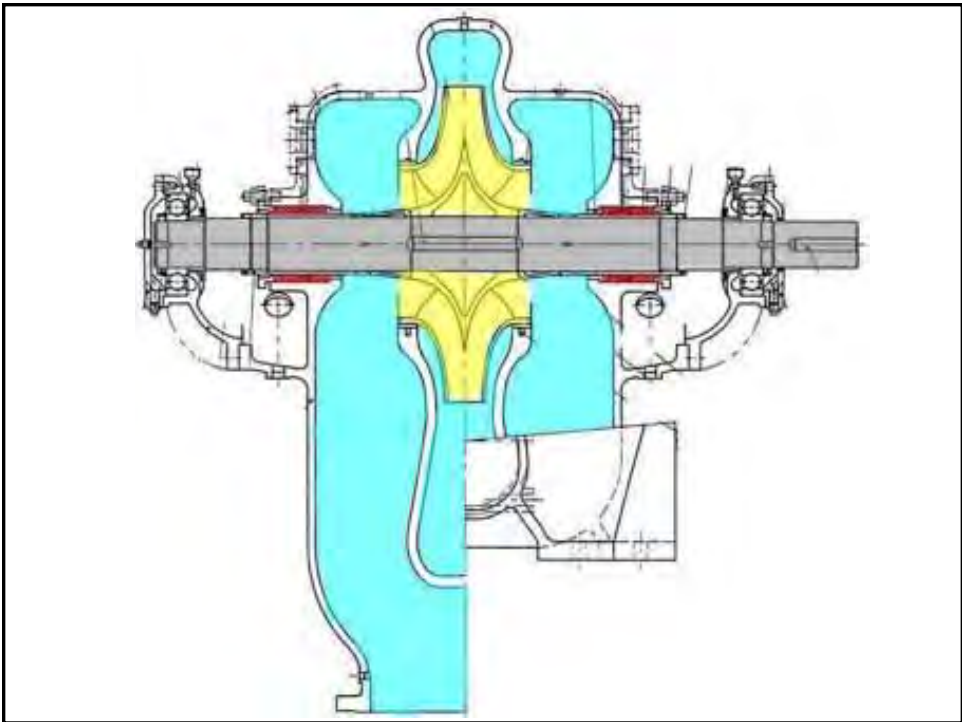
Role of Distribution pump

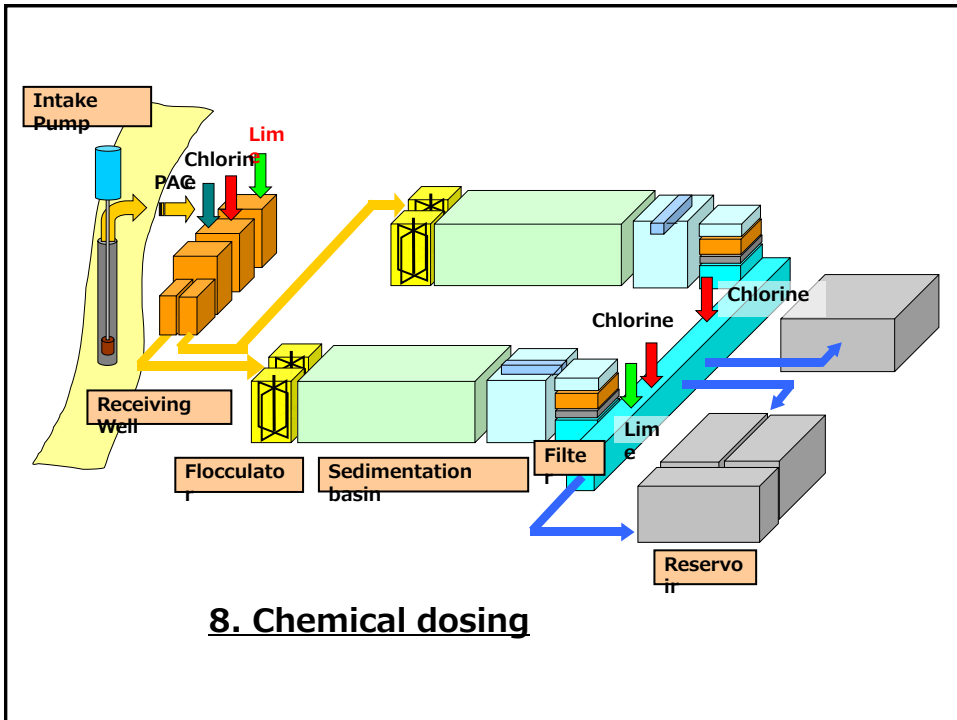
- To supply necessary quantity of water by reasonable pressure.

Specifications of Distribution

Pump	Specification	
DP-1, 2, 3	φ500/φ400 × 2,100m ³ /h × 42mH × 320kw × 3,000V	2003 kubota
DP-4	φ500/φ400 × 2,100m ³ /h × 42mH × 320kw × 3,000V	1997 ebara
DP-5, 6	φ350/φ200 × 1,050m ³ /h × 42mH × 180kw × 3,000V	1995 kubota
DP-7	φ350/φ200 × 1,050m ³ /h × 42mH × 180kw × 3,000V	2003 kubota
TP-1, 2	φ350/φ200 × 1,050m ³ /h × 42mH × 180kw × 3,000V	1995 kubota







9. PAC feeding facility

Role of PAC dosing

- To sink small dirt in water. PAC attracts small dirt and makes it big dirt (floc). Big floc is easy to be sunk.
- The PAC dosing rate is determined daily

from the results of a laboratory "Jar Test" facility

Solution Tank	φ 2,200 x 2,600L x 8mB FRP	4
Flow Control	Max 1,500 l/h	1
Alum Mixer	φ 300 x 2,500L x 295min ⁻¹ x 0.75kw	4

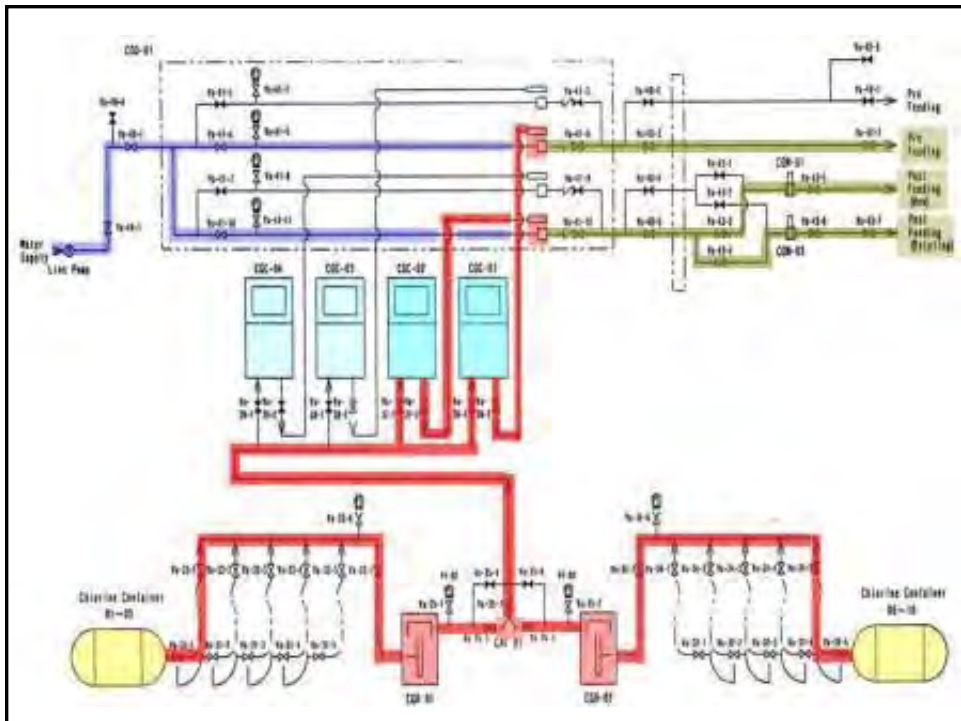
10. Chlorination facility

Role of

- **Chlorination** is required to pre-chlorinate raw water, primarily to suppress algae.
- Further, it is required to post-chlorinate filtered water for disinfection.
- Chlorine solution is injected at receiving well and filtered water respectively.

- **Oxidation** of chlorine in the end of plant must

Part	Equipment	Quantity
Pre-chlorination	Chlorine container (1ton)	10
	Vacuum regulator (MAX 40kg/h)	2
	Automatic switchover module (MAX 40kg/h)	1
	Feed rate control	4
	Factor (MAX 40kg/h 400l/min)	4



Role of Line

- To supply clear water to make vacuum pressure at ejector.



PAC Flow Control

