# Water Supply Administration For Better Management of Water Supply Services Course (B)

### **Country Reports**

Japan International Corporation of Welfare Services (JICWELS)

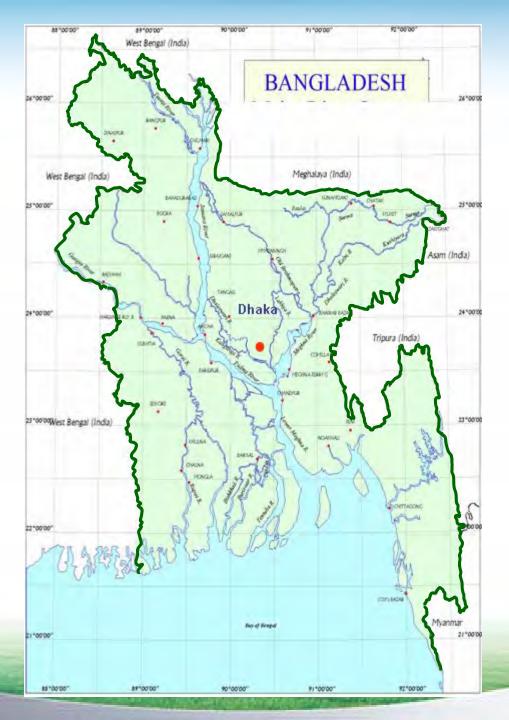
### **Contents**

1.	Bangladesh	1
2.	Cambodia	22
3.	Iran(1)	69
4.	Iran(2)	93
5.	Guyana	127
6.	Timor Leste	138
7.	Indonesia	179
8.	Sri Lanka	200
9.	Nepal	223
10.	Myanmar	249
11.	Brazil	297

# Water Supply Administration For Better Management of Water Supply Services Course (B)

### Bangladesh





### **General Country Profile**

Official Name: The People's Republic of

Bangladesh

Population: More than 160 Million

Area: Total 147,570 sq km

Land 133,910 sq km Water 10,090 sq km

Location: Latitude 20° 34' to 26° 38'

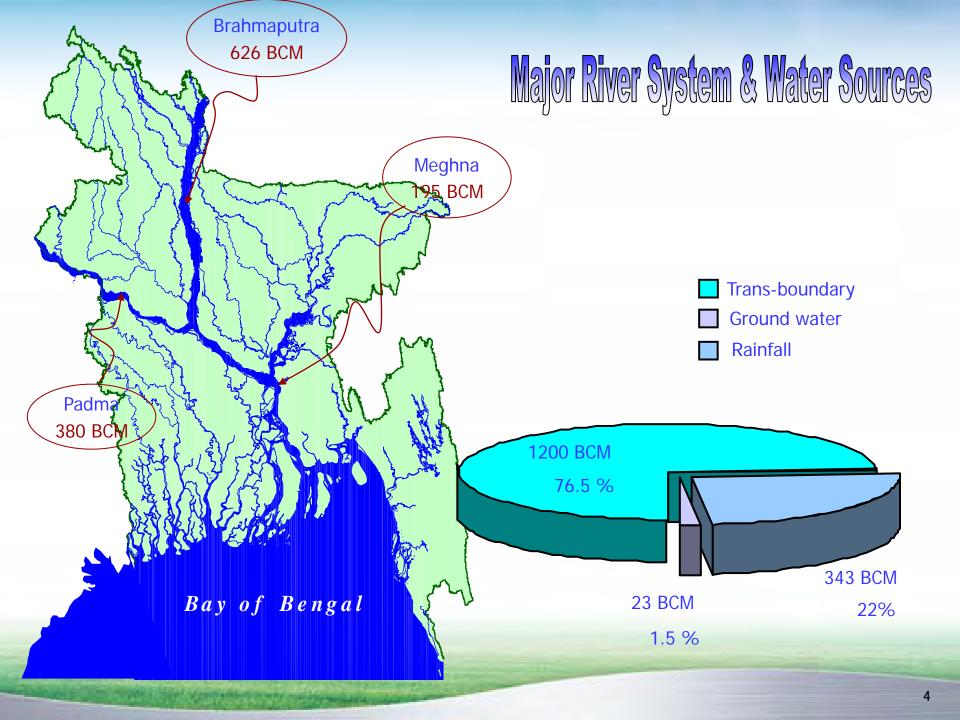
Longitude 88° 01' to

92° 41'

Coverage Water supply (whole country): 80%

DWASA Service Area: 360 km2 Population Served:125 million

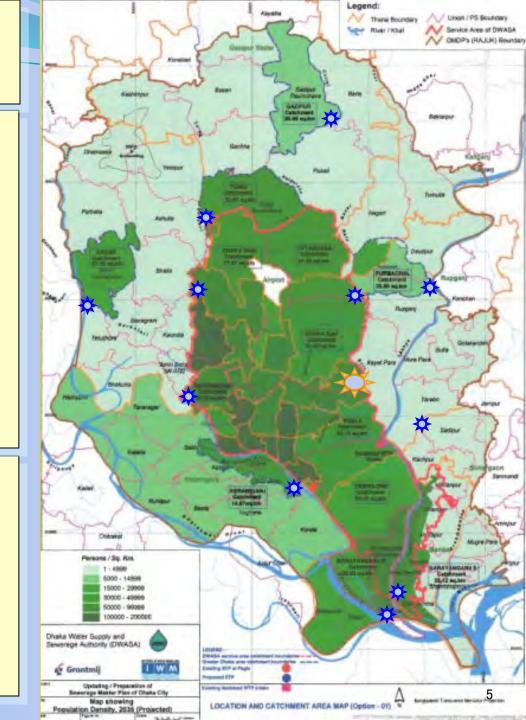
Rainfall: Lowest 47" and highest 136"



Current Coverage 25%(Dhaka)

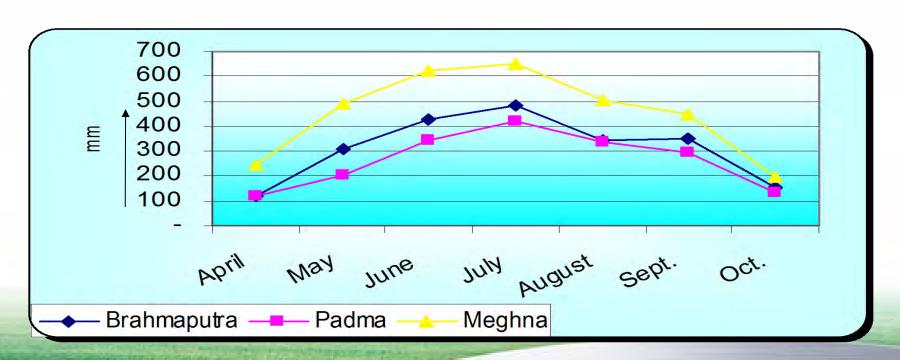
11 new sewage treatment plants along with pipelines and ancillary structures in DAP area required

People in areas outside DWASA coverage are using septic tanks in most cases



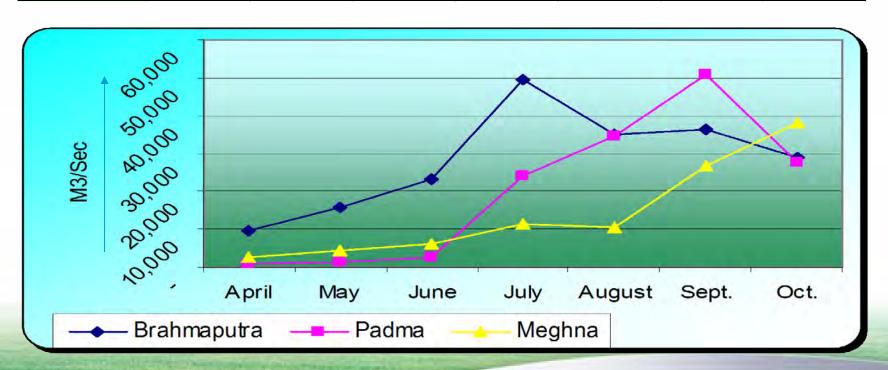
### Average Rainfall In Different Basin

	April	May	June	July	August	Sept.	Oct.
Brahmaputra	121.59	311.30	425.21	484.93	339.64	353.40	154.55
Padma	118.20	204.80	340.28	416.55	337.76	291.90	129.83
Meghna	243.63	491.04	621.03	650.45	503.58	449.20	194.7

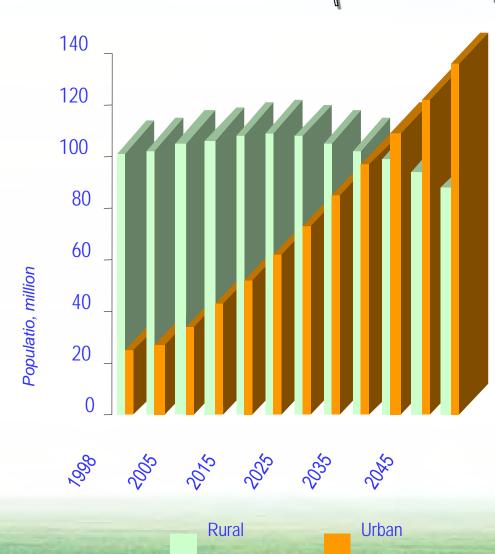


### Average Discharge of River Water

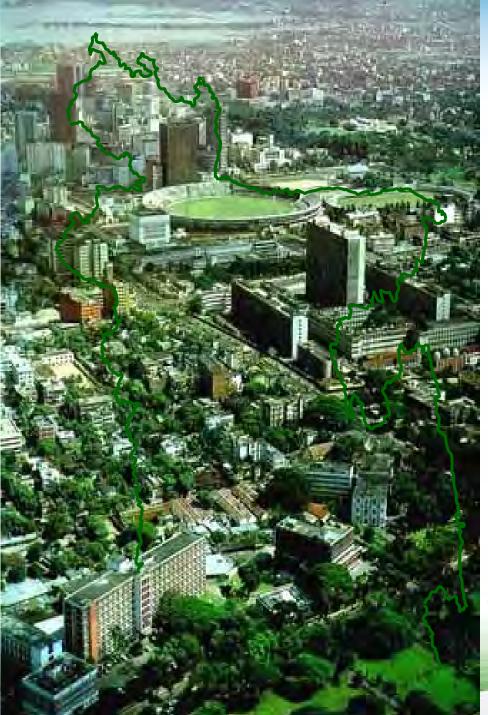
	April	May	June	July	August	Sept.	Oct.
Brahmaputra	9,499	15,857	23,146	49,702	35,204	36,527	28,718
Padma	996	1,361	2,783	24,268	34,610	50,651	27,425
Meghna	2,825	4,578	6,248	11,562	10,464	26,759	37,979



# National Water Demand (Urban & Rural)



- ☐ Urban population will increase to 73 million by 2025, and 136 million by 2050. Major migration to Dhaka city and adjoining areas
- ☐ Urban Water supply, sanitation and drainage will be major issues confronting the nation





# Dhaka Water Supply Sewerage Authority

# My Wission

- The mission of the Local Government Division is improving the standard living of the people by strengthening local govt. systems and institutions and implement activities for social, economic and infrastructure development.
- As Joint Secretary is the Chief of the Water Supply & Sanitation Wing, my role is to formulate & Implementation of the formulated policy, monitoring of supervision of the implementation of the policies.

### Organizational Wilestones & Mandate

Dhaka WASA, an autonomous body, started its journey with the mandate to effect (EP Ordinance No. XIX, 1963):

- Supply of Water
- Disposal of Sewage (Wastewater)
- Storm water Drainage and
- Solid Waste management.

## Dhaka WASA Reorganized to Introduce Corporate Mgt. Under WASA Act '96

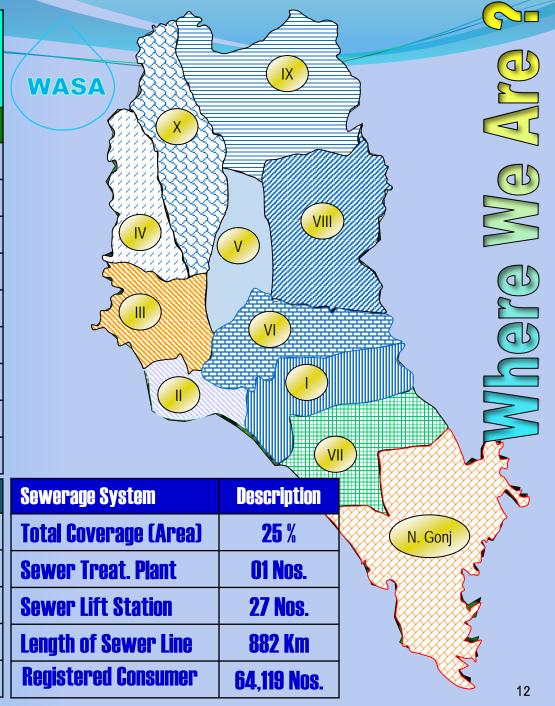
Mandate: To ensure Water Supply, Treatment & Disposal of wastewater (sewage) & Storm Water Drainage. Area : Dhaka & N'ngonj City With Peripherals

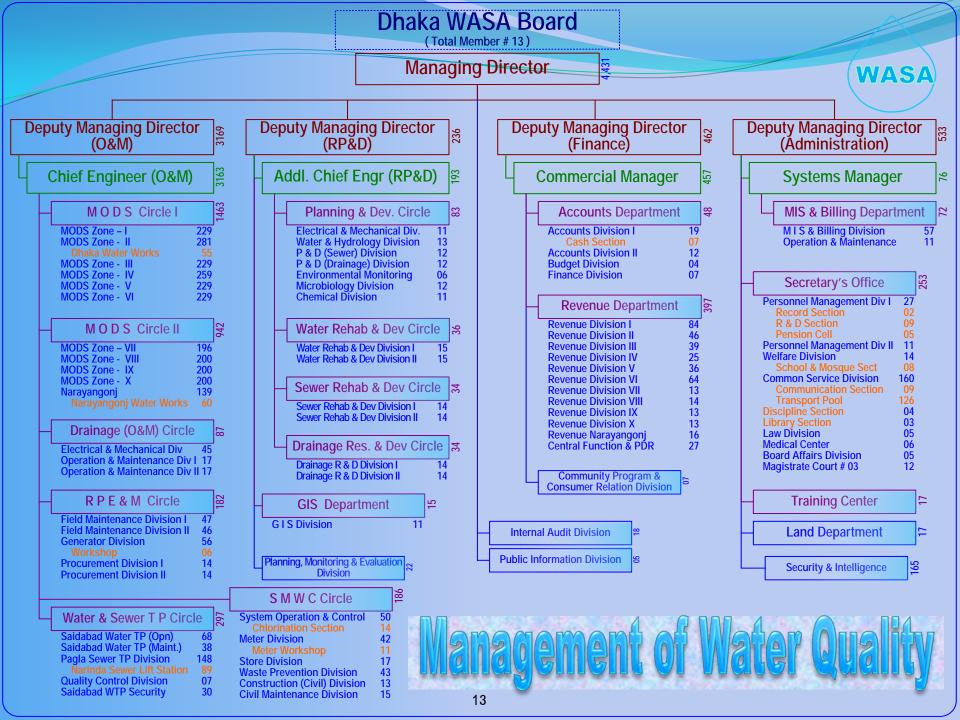
Currently Served : Dhaka & Narayangonj City

**Population : 12.5 Million** 

Water Supply	Description
Total Coverage (Population)	93.0 %
<b>Demand Quantity</b>	<b>2,250 MLD</b>
<b>Production Capacity</b>	2,450 MLD
Supplied Quantity	2,367 MLD
Deep Tube Well	651 Nos.
<b>Surface Water Treat. Plant</b>	<b>05 Nos</b> .
Length of Water Line	<b>3,036 Km</b>
Registered Consumer	<b>328,031 Nos.</b>
Public Standpipes	<b>1,727 Nos.</b>

Drainage System	Description
Total Coverage (Area)	38 %
Length of Box-Culvert	10 Km
Strom Sewerage Line	<b>295 Km</b>
Open Channel	<b>26 Nos.</b>
Length of Open Channel	65 Km



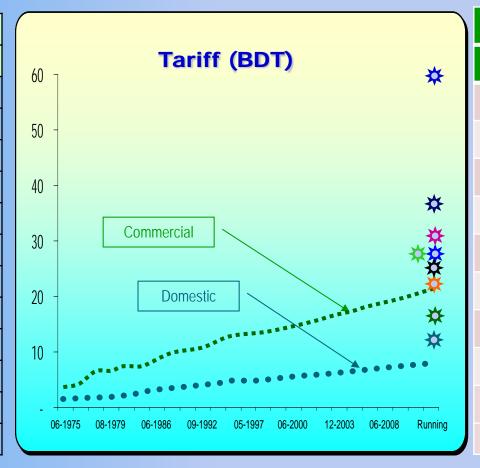


### Tariff Structure

#### WASA

# ☐ Two rates for 5 types of consumer ☐ Does not recover full cost of production ☐ Lowest in the world

Upto The	Tariff @ M3		
Month	Dom	Comm	
06-2000	4.13	13.39	
06-2002	4.30	14.00	
12-2002	4.50	15.00	
12-2003	4.75	15.75	
06-2005	5.00	16.54	
05-2007	5.25	17.50	
06-2008	5.50	18.25	
06-2009	5.75	19.15	
06-2010	6.04	20.11	
06-2011	6.34	21.12	
06-2012	6.66	22.17	
Running	7.34	24.44	



Tariff In Other Cities				
City	BDT/M3			
Delhi	25			
Chennai	25			
Hyderabad	20			
Lahore	22			
Karachi	12			
Bangkok	26			
Nairobi	18 to 35			
Kampala	60			
Dhaka	6.04			
Statistics FY 2010-'11				

Generally Increased Around 5.0% Per Year, Which Is About 50% of Inflation.

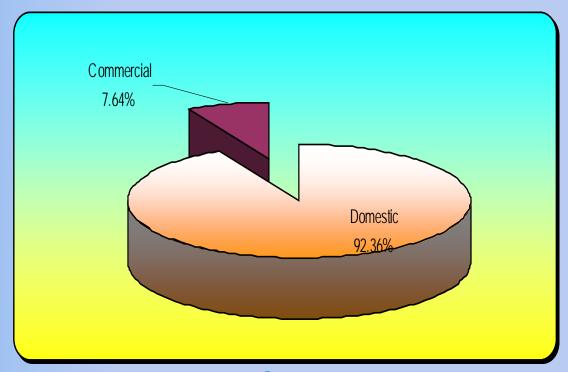
Tariff Type	Consumer
Domestic	302,969
Commercial	25,062
Total	328,031

Domestic Community

WASA

Commercial Industrial Office

Consumer Statistics

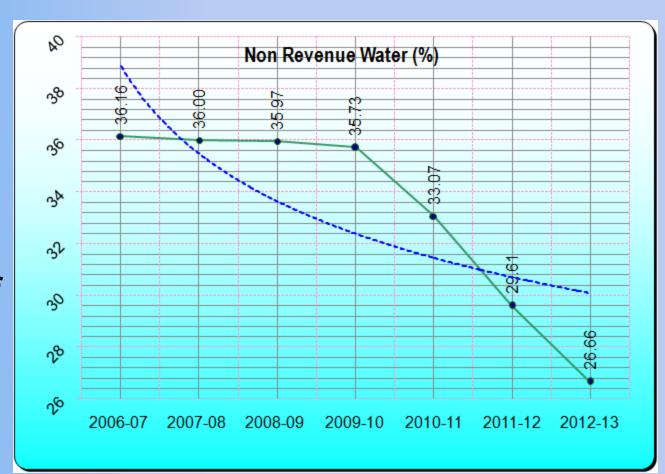


One Consumer Is One Household (5-50 Members & More)

# Non Revenue Water (NRW)

WASA

- NRW has been decreasing over the years
- Cover 9 %
  decrease of
  NRW within
  last 4 years



### **Key Performance Indicators of WSS**

WASA

SL	Subject Area	Performance	Benchmark	Achievements Dhaka WASA (Fin. Year)		
		of 2008	Standard	2010-'11	2011-'12	2012-'13
1	NRW	40.38	25.00	33.07	29.57	26.66
2	Bills Sent Out	93.00	99.50	97.56	98.86	98.02
3	Revenue Collection	64.50	95.00	94.96	93.36	94.57
4	Debt Age / Receivable	14.58	3.00	7.54	5.78	5.65
5	Manpower per 1000 Conn	16.20	12.00	9.11	8.86	9.16
6	Operating Ratio	0.90	0.65	0.78	0.66	0.67
7	Metered Connection	78.90	95.00	83.34	85.56	85.16

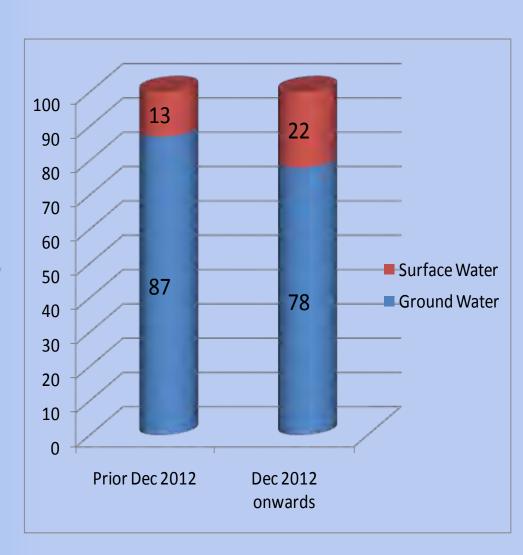
# Major Recent Achievement



Indicators	2012-'13
Staff / 1000 Connection	9.16
<b>Production Capacity</b>	2,450 MLD
<b>Water Quality</b>	WHO Standard
Coverage	93.0 %
<b>Supply Duration</b>	24 x 7
Average Supply Pressure	1 Bar
Nr. Of Connections	<b>328,031 Nos.</b>
NRW	26.66 %
Collection Ratio	94.57
Total Staff Number	3,576

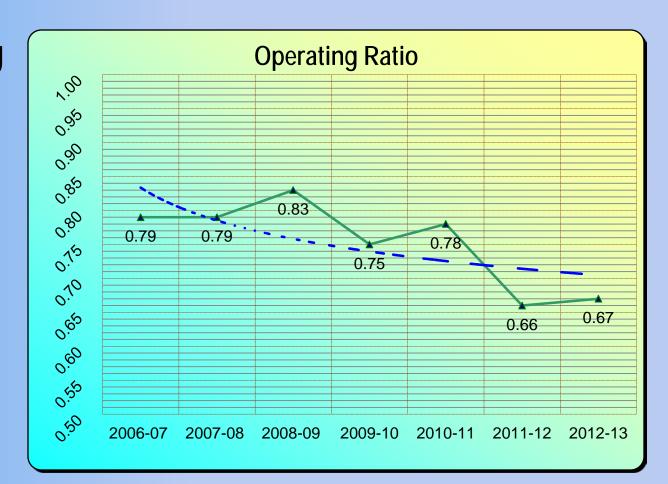
### Major Recent Achievement

- □ Supply of surface water has increased by 09% by the introduction of a new treatment unit at SWTP
- 22% water is now supplied from surface sources
- ☐ This significantly reduces the pressure on ground water



### Major Recent Achievement

- □ Operating ratio has been in reducing trend
- □ 17%
  reduction
  in
  operating
  cost in
  last 4
  years





# Water Supply Administration For Better Management of Water Supply Services Course (B)

### Cambodia







#### 1-Background

- Kampong Cham water works (KCWWS) started its service on 1942:
- Two water production stations
- The productions are about 1,000cu.m / day
- Total pipes in town are about 12,000 meters

#### KCWWS Establishments:

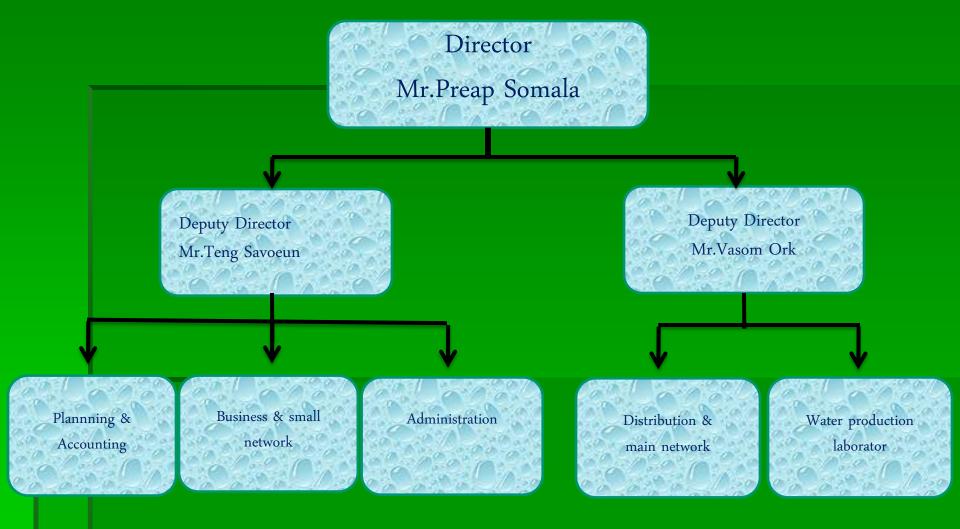
- 1942-1953 on the Kingdom of Cambodia called the services Water Machine
- 1970 the stations were called Kampong Cham waterworks
- 1970-1975 on the Khmer Republic : Kampong Cham waterworks.
- 1975-1979 Pol Pot's regime: the services were stopped
- 1979 to now the Kingdom of Cambodia: Kampong Cham waterworks

#### 1.1 General Statistics

- The town area is 20,651 meter squares.
  - The agriculture land is 187 hectares
- > The length of Mekong river in town.....: 7,698 m
- Numbers of communes: 4 and 231 villages
- $\rightarrow$  Total of households (09/2013): 9,698 and total population: 51,432
- Population Density /Km² ...... 2,120 Persons / Km²
- Population occupations: businessmen 40%, producer 1%, farmer 13% and general worker 46%.



### 2 - Organization Chart of Kampong Cham Water Supply



Type of organization is local public corporation.

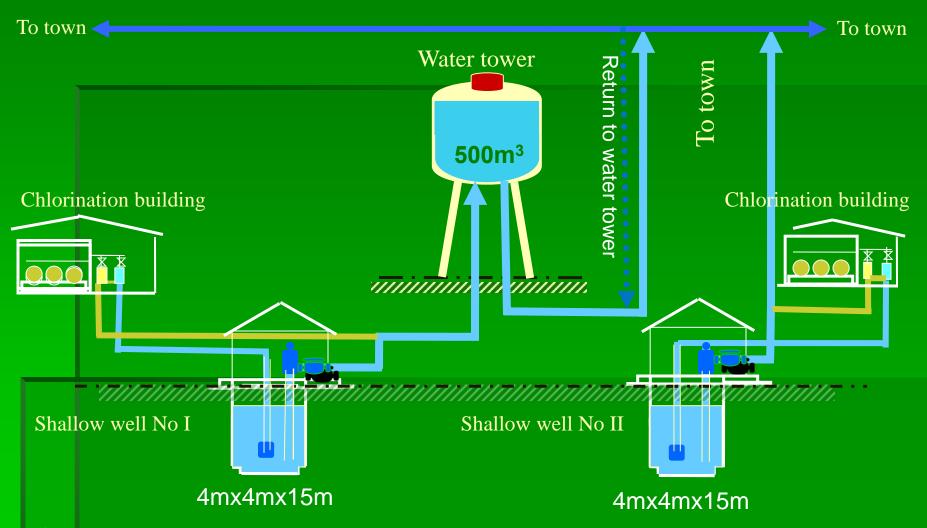
### 3-Goal and Objective for Provincial Water Works

Government Goal: 80% of urban area will be covered with safe potable water by the year 2015.

- Goal : To supply safe portable water with affordable price.
- Objective :- Production with good quality.
  - Water supply service to every population in town.
  - Poverty reduction.

### 4. Production Systems

The profile of water treatment system and supply networks



The operating of the production method is the direct pump from the well to the water tower by mixing with Chlorination treatment then supplied to the town.

### **5-Current Situation**

Number of employee : 29

Production : 6,674m³/day ;

In year  $2012 = 2,205,586 \text{ m}^3$ 

Supply : 24h/day

Water tank : 500 m³

Total length of pipe line : 81,737 m

Population in service area : 47,379 person

Total water meter : 5,714

• Total user : 5,714 household = 31,127

Persons

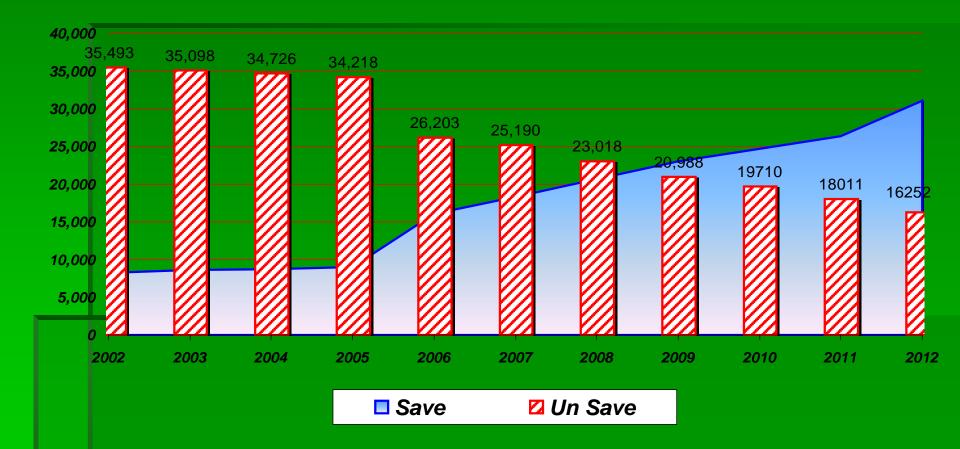
Service coverage : 65,70 %

Non revenue water : 11.74 %

#### A- Water Supply Coverage

Population have accessed water from waterworks in December 2012 = 31,127 persons of total population 47,379 persons in equal rate of 65.70%.

#### The population have accessed safe water (2002-2012)





### b. Water Supply Level of Service

#### 1.) Raw Water Quality

Water Sources from two shallow wells and both are in dimension

 $4 \text{ m x } 4 \text{ m and } 15 \text{ m depth ,in two different stations, where are clear, non-color, non-smell, non-taste, including high quality water . Each shallow well has water yield = <math>220 \text{ m}^3 / \text{h}$ 

Water turbidity are -0.14

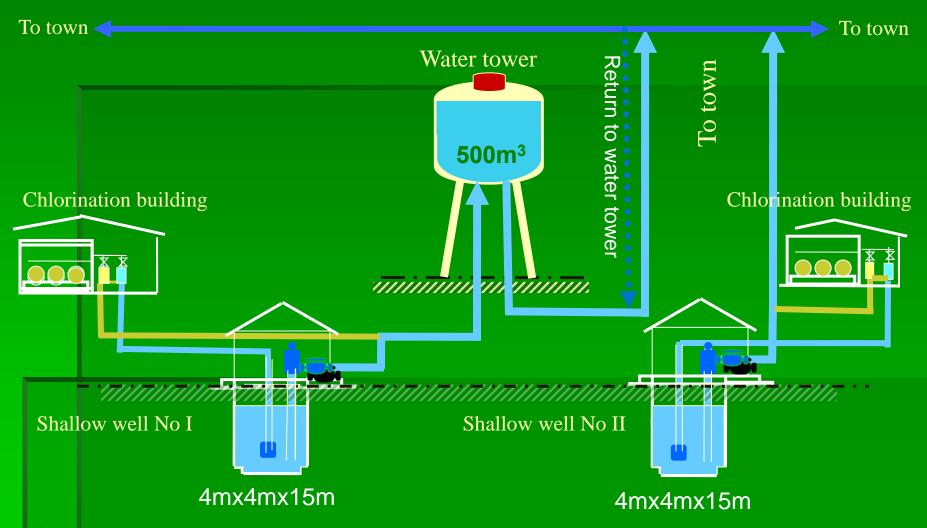


#### Raw water are clear



#### 2.) Existing Treatment System

The profile of water treatment system and supply networks

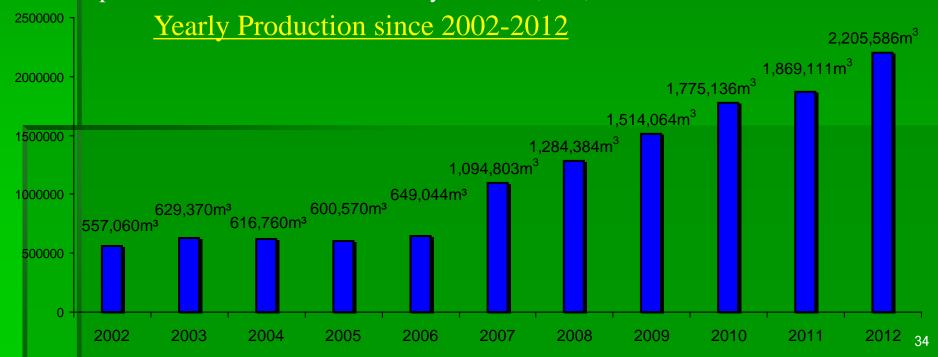


The operating of the production method is the direct pump from the well to the water tower by mixing with Chlorination treatment then supplied to the town.

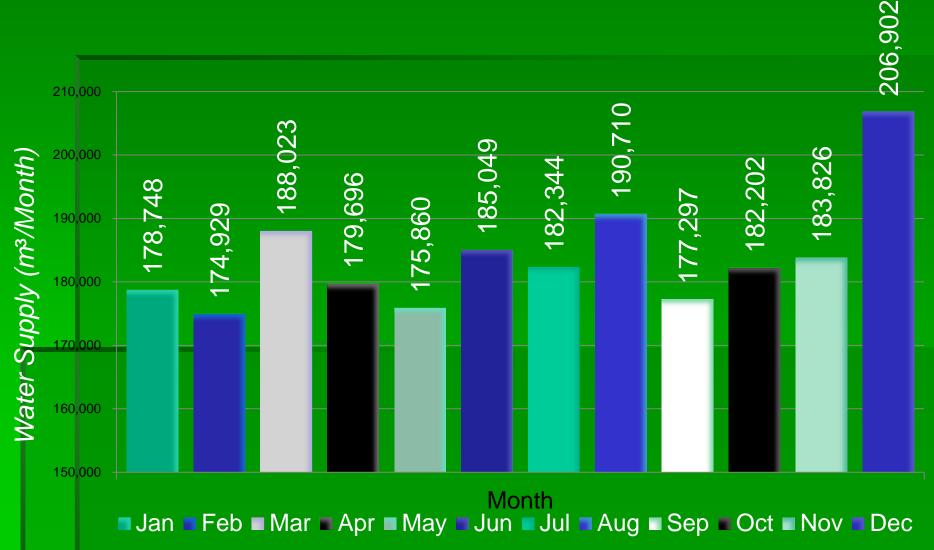
#### 3.) Existing Treatment System (Cont.)

#### WATER PRODUCTION

- ✓ Supply capacity of the two stations  $= 7,200 \text{ m}^3 / \text{day}$
- ✓ Water supply production  $= 6,674 \text{ m}^3 / \text{day}$
- ✓ Production duration for each station = 23 h / day
- ✓ The duration of water supply = 24 h / day
- ✓ Supply Pressure = 2.5Bar/ 25 meters
- ✓ Water productions for 9 months in this year are 1,922,663 m³.



#### **WATER PRODUCTION REPORT ON YEAR 2012**



#### **Actuals production report on 2012**

Water productions in this year are 2,205,586 m<sup>3</sup>.

. 9 9	0		0 0	All the second second
ដល់គតមនិតស្អាត	- 500005-	8225G125122225	555557857	ක්ල ටලා

8.5	ধরুর্ত্ত	JAN	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	បរមាណទកផលតប្អូន	31 178,748	29 174,929	31 188,023	30 179,696	31 175,860	30 185,049	31 182,344	31 190,710	30 177,297	31 182,202	30 183,826	31 206,902	2,205,586
2	បរិមាណទឹកលក់បាន :	156,961	153,829	165,288	158,448	155,788	164,053	160,843	169,380	157,270	160,532	161,791	182,378	1,946,561
	🌣 អតិថិជនធមិតា :	111,078	112,233	116,924	113,860	112,588	113,865	104,183	111,904	102,108	106,686	107,208	121,639	1,334,276
	លក់អោយក្រោម១០ :	40,168	40,452	41,195	41,475	41,234	41,773	40,675	41,633	40,498	42,255	42,837	44,861	499,056
	លក់អោយលើសពី១០ :	70,910	71,781	75,729	72,385	71,354	72,092	63,508	70,271	61,610	64,431	64,371	76,778	835,220
	💙 អតិថិជនអាជិវិកម្	25,580	26,370	27,686	26,273	24,984	31,164	38,780	39,917	38,226	37,854	38,639	43,537	399,010
	🤝 អតិថិជនស្ថាចិន	20,303	15,226	20,678	18,315	18,216	19,024	17,880	17.559	16,936	15,992	15,944	17,202	213,275
3		12.19%	12.06%	12.09%	11.82%	11.41%	11.35%	11.79%	11.18%	11.30%	11.89%	11.99%	11.85%	11.74%
4	ចំណូលពីការលក់ទឹក :	139,387,900	133,423,500	146,747,750	139,075,950	136,706,900	144,441,550	141,250,450	148,405,850	137,530,300	139,284,750	140,185,350	158,760,050	1,705,200,300
	🌣 អតិថិជនធម្មតា	85,911,400	86,851,500	90,813,350	87,957,750	86,897,300	87,857,950	79,528,450	86,142,050	77,722,900	81,228,150	81,494,250	93,773,750	1,026,178,800
	អតថិជនអាជិវិកម្ម	23,022,000	23,733,000	24,917,400	23,645,700	22,485,600	28,047,600	34,902,000	35,925,300	34,403,400	34,068,600	34,775,100	39,183,300	359,109,000
	🌣 អតិថិជនស្ថាប័ន	30,454,500	22,839,000	31,017,000	27,472,500	27,324,000	28,536,000	26,820,000	26,338,500	25,404,000	23,988,000	23,916,000	25,803,000	319,912,500
5	ចំនួនមុខដំណសរុប :	4,914	4,957	5,039	5,099	5,132	5,241	5,290	5,323	5,362	5,476	5,600	5,714	875
	🌣 អតិថិជនធម្មតា	4,560	4,591	4,670	4,723	4,747	4,804	4,778	4,800	4,837	4,937	5,056	5,148	5,148
	🤝 អតថិជនអាជិវិកម្ម	308	314	314	316	325	375	450	459	462	474	480	502	502
	🤝 អតិថិជនស្ថាប័ន	46	52	55	60	60	62	62	64	63	65	64	64	64
6	អត្រាអាននាឡិកាសរូប	96.87%	96.51%	96.31%	95.55%	95.97%	96.47%	96.28%	96.58%	96.14%	96.51%	96.04%	96.41%	96.30%
7	មធ្យមភាគថ្លៃលក់សំរាប់អតិ.ធម្មតា	773.43	773.85	776.69	772.51	771.82	771.60	763.35	769.79	761.18	761.38	760.15	770.92	769.09
8	មធ្យមភាគថ្លែលកសរុប	888.04	867.35	887.83	877.74	877.52	880.46	878.19	876.17	874.49	867.64	866.46	870.50	876.01
9	អត្រាល់ក៏អោយអតិថិជនធម្មតា :	70.77%	72.96%	70.74%	71.86%	72.27%	69.41%	64.77%	66.07%	64.93%	66.46%	66.26%	66.70%	68.55%
	<b>★</b> លកអោយក្រោម ១០ម៣	36.16%	36.04%	35.23%	36.43%	36.62%	36.69%	39.04%	37.20%	39.66%	39.61%	39.96%	36.88%	37.40%
	★លកអោយលើសពី ១០ម៣	63.84%	63.96%	64.77%	63.57%	63.38%	63.31%	60.96%	62.80%	60.34%	60.39%	60.04%	63.12%	62.60%
	អត្រាលក៏អោយអាជីវកម្ម	16.30%	17.14%	16.75%	16.58%	16.04%	19.00%	24.11%	23.57%	24.31%	23,58%	23.88%	23.87%	20.50%
	អត្រាលកអោយស្ថាប័ន	12.94%	9.90%	12.51%	11.56%	11.69%	11.60%	11.12%	10.37%	10.77%	9.96%	9.85%	9.43%	10.96%
10	រថយន្តលពអគ្គិភ័យ				·····		***************************************			***************************************				
11	លក់អោយព្រោម១០ម៣ខែបរិមាណទឹកលក់សរុប	25.59%	26.30%	24.92%	26.18%	26.47%	25.46%	25.29%	24.58%	25.75%	26.32%	26.48%	24.60%	25.64%
12	ជ្រើ[ជាសុខឥទព្វឃ/ជ្រុសវ៍ជ(ឝយ)	1.03	1.11	1.06	1.04	0.98	1.04	0.98	1.03	0.98	0.95	0.96	1.03	1.01
13	ការប្រើប្រាស់សំរាប់អតិ.ធម្មតា	0.79	0.84	0.81	0.80	0.77	0.79	0.70	0.75	0.70	0.70	0.71	0.76	0.76
14	ការប្រើប្រាស់សំរាប់អតិ.អាជីវ.	2.68	2.90	2.84	2.77	2.48	2.77	2.78	2.81	2.76	2.58	2.68	2.80	2.74
15		14.24	10.10	12.13	10.18	9.79	10.23	9.30	8.85	8.96	7.94	8.30	8.67	9.89
16	**-	59,115.90	59,905.90	60,265.90	61,235.90	62,521.00								
17	កើនឡើង (M)	260	790	360	970	1,285								

#### **WATER PRODUCTION REPORT ON YEAR 2013**



#### **Actuals production report on 2013**

- Water productions for 9 months in this year are 1,922,663 m<sup>3</sup>.

	0	S 7	0 0		
ដល់ត្រង់ខេត្តស	200000	concrecesones	000000000	mana	
ನಾಡಿದ ಚಿತ್ರವಾಗು ನಾತ್ರವಾದ	- 200000 .	- 5243615215465	122333	2000	

\$.53	អគ្គន័យ	JAN	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
๘		31	28	31	30	31	30	31	31	30	31	30	31	365
1	បរមាណទកផលតបាន	210,621	219,636	224,272	211,641	220,008	210,076	207,369	213,975	205,065	-	(-)	-	1,922,663
2	បរិមាណទឹកលក់បាន :	186,344	194,150	199,318	188,577	197,642	188,765	183,983	192,308	183,615	-	-		1,714,702
	🤝 អតិថិជនធម្មតា :	118,682	127,074	129,353	123,762	127,652	120,692	117,934	120,814	111,968		2	*	1,097,931
	លក់អោយក្រោម១០:	45,437	46,838	47,362	47,428	38,906	47,000	46,699	46,850	45,595	-			412,115
	លក់អោយលើសពី១០ :	73,245	80,236	81,991	76,334	88,746	73,692	71,235	73,964	66,373	-	-	-	685,816
	🤝 អតិថិជំនិអាជិវិកម្ម	45,222	45,053	46,388	45,509	49,967	47,608	47,113	50,288	51,694	-	-	-	428,842
	🤝 អតិថិជនស្ថាប័ន	22,440	22,023	23,577	19,306	20,023	20,465	18,936	21,206	19,953	-	-	-	187,929
3	អត្រាបាត់បង់	11.53%	11,60%	11,13%	10.90%	10.17%	10.14%	11.28%	10.13%	10.46%	#DIV/0!	#DIV/0!	#DIV/0!	10.82%
4	ចំណូលពីការលក់ទឹក :	165,270,650	171,555,500	176,955,700	164,703,100	176,274,500	165,717,500	160,601,650	169,403,300	161,267,050	-	-	*	1,511,748,950
	🤝 អតិថិជនធម្មតា	90,910,850	97,973,300	99,841,000	94,786,000	101,269,700	92,172,800	89,795,950	92,335,100	84,812,950	-	-		843,897,650
	🤝 អតថិជនអាជីវិកម្ម	40,699,800	40,547,700	41,749,200	40,958,100	44,970,300	42,847,200	42,401,700	45,259,200	46,524,600	-	-	-	385,957,800
	🤝 អតិថិជនស្ថាប័ន	33,660,000	33,034,500	35,365,500	28,959,000	30,034,500	30,697,500	28,404,000	31,809,000	29,929,500	-	-	-	281,893,500
5	ចំនួនមុខដំណស់រុប :	5,855	5,907	5,958	6,000	6,058	6,098	6,124	6,148	6,179	-	-	-	0
	🤝 អតិថិជនធម្មតា	5,275	5,316	5,345	5,387	5,435	5,472	5,488	5,509	5,449	-			0
	🤝 អតិថិជនអាជីវិកម្ម	513	524	547	547	557	560	572	573	664	-	-	+	0
******	🤝 អតិថិជនស្ថាចិន	67	67	66	66	66	66	64	66	66	-	-	-	0
6	អត្រាអាននាឡីកាសរុប	96.33%	96,60%	96.98%	96.73%	96.76%	96.75%	96.47%	96.57%	96.52%	0.00%	0.00%	0.00%	72.48%
7	មធ្យមភាគថ្លៃលក់សំរាប់អតិ.ធម្មតា	766.00	770.99	771.85	765.87	793.33	763,70	761.41	764.27	757.47	#DIV/0!	#DIV/0!	#DIV/0!	768.63
8	មធ្យមភាគថ្លៃលកសរុប	886.91	883.62	887.81	873.40	891.89	877.90	872.92	880.90	878.29	#DIV/0!	#DIV/0!	#DIV/0!	881.64
9	អត្រាលកអោយអតិថិជនធម្មតា :	63.69%	65.45%	64.90%	65.63%	64.59%	63.94%	64.10%	62.82%	60.98%	#DIV/0!	#DIV/0!	#DIV/0!	64.03%
	★ លកអោយក្រោម ១០ម៣	38.28%	36.86%	36.61%	38.32%	30.48%	38.94%	39.60%	38.78%	40.72%	#DIV/0!	#DIV/0!	#DIV/0!	37.54%
	★លកអោយលើសពី ១០ម៣	61.72%	63.14%	63,39%	61.68%	69.52%	61.06%	60.40%	61.22%	59.28%	#DIV/0!	#DIV/0!	#DIV/0!	62.46%
	អត្រាលកអោយអាជីវកម្ម	24.27%	23.21%	23.27%	24.13%	25.28%	25.22%	25.61%	26.15%	28.15%	#DIV/0!	#DIV/0!	#DIV/0!	25.01%
	អត្រាលកអោយស្ថាប័ន	12.04%	11.34%	11.83%	10.24%	10.13%	10.84%	10.29%	11.03%	10.87%	#DIV/0!	#DIV/0!	#DIV/0!	10.96%
10	លក់អោយព្រោម១០មពាខែបរិមាណទិកលក់សរុប	24.38%	24.12%	23,76%	25.15%	19.69%	24.90%	25.38%	24.36%	24.83%	#DIV/0!	#DIV/0!	#DIV/0!	24.03%
11	ព្រើ[ជាសុខគំនព្វហា/ជ្រៃសារព(គយ)	1.03	1.06	1.08	1.01	1.05	1.00	0.97	1.01	0.96	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
12	ការប្រើប្រាស់សំរាប់អតិ.ធម្មតា	0.73	0.85	0.78	0.77	0.76	0.74	0.69	0.71	0.68	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
13		2.84	3.07	2.74	2.77	2.89	2.83	2.66	2.83	2.60	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
14	ការប្រើប្រាស់សំរាប់អតិ.ស្ថាប័ន	10.80 59,116	11.74 59,116	11.52 59,116	9.75 80,947	9.79 81,347	10.34 81,347	9.54 81,497	10.36 81,737	10.08 81737	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

### Future Population for each in Communes in the supply area

No	Description	Village	Family	Amount of people	Number of connection	Remark
1	Boeng kok	7	1,784	8,716	1,233	
2	Kapong Cham	9	1,261	7,443	1,330	Kampong
3	Sambour mease	9	2,532	14,977	812	Cham District
4	Veal Vong	6	3,117	15,752	2,579	
5	Ampil	8	3,130	13,381	-	Kampong
6	Kaok Roka	4	1,331	5,462	-	Seam
7	Roang	2	1,004	4,544	46	District
Α	Total Kapong Cham District	31	8,694	46,888	5,954	
В	Total Kampong Seam District	14	5,465	23,387	46	
	Total A+B	45	14,159	70,275	6,000	

# 6-water quality Control

# 1.) Supply Water Quality

Water Supply with good quality is the main object of waterworks and the Cambodia Millennium Development Goals (CMDGs) and MDGs. We control water quality every time in other to meet National Drinking Water Quality Standard(NDWQS) and follow by JICA programs.

# 2.) Water Quality Monitoring

- Daily treatment water Analysis ,
- Residual chlorine analysis in top water,
- □ All parameter analysis (pH, TDS, NTU, TCU, Akal., Cond, Organic Car, Mn, Zn, SO<sub>4</sub>, Cu, H<sub>2</sub>S, Al, Cl, Fe, NH<sub>3</sub>-N,.... .....etc

# 3.) Water Quality Monitoring (Cont..)

KAMPONG CHAM WATER WORK s											
Weekly	Chief										
Date			Wate	r Quality							
	Tem.	pH.	Turbidity	Color	Residual- Chlorine	Conduct.					
	٥C		NTU	TCU	mg/l	µs/ <sub>cm</sub>					
Standard	-	6.5-8.5	<5	<5	0.2-0.5	<1600					
1	27.7	6.58	1	<2	0.9	439					
2	27.4	6.6	1	<2	0.85	440					
3	27.1	6.84	1	<2	0.61	447					
4	27.6	6.81	1	<2	0.68	449					
5	28.6	6.56	1	<2	0.85	444					

# 4.) Water Quality Monitoring (Cont..)

Month)			Year/Month	: 10 / 2010
	Items	DWQS	Date: / 09 / 2010	
	- Items	Maximum	Raw Watre	Treated Water
	Taste	Acceptable		
	Odor	Acceptable		
	Color	5 TCU	0.045	0.018
Quality Standards Drinking Water (QSDW)	Turbidity	5NTU	0.001	0.014
<u> </u>	Residual Chlorine	0.2-0.5 mg/L		0.87
	рН	6.5-8.5	7.74	7.22
שר ביים	Total Dissolved Solids	800 mg/L		
ֻ ל	Manganese (Mn)	0.1 mg/L		
<b>&gt;</b>	ZINC (ZN)	3 mg/L	0.18	0.5
Standards /ater (QSD	Sulfate (SO4)	250 mg/L	12	11
<u>e</u> 9	Copper (Cu)	1 mg/L	0.013	<0.002
7 7	Hydrogen Sulfide (H2S)	0.05 mg/L	0.002	<0.005
	Hardness	300 mg/L	200	200
7 =	Aluminum (Al)	0.2 mg/L	0.004	0.007
S	Chloride (CI)	250 mg/L	21.33	22.78
<b>Š</b>	Iron (Fe)	0.3 mg/L		
	Ammonia (NH3-N)	1.5 mg/L		
	E.Coli	0		
	Total Coliform	0		
	Alkalinity	mg/L (as CaCO <sub>3</sub> )	218	214
	Conductivity	μs/cm	467	456
	Organic Carbons	mg/L	0.8	1



#### 7. <u>Distribution System</u>

- ✓ Pipe networks in Kampong Cham waterworks are 52,709 meters as follow:
- ✓ Distribution pipes ( $\emptyset$  400mm 110 mm) are 15,546 meters
- Service pipes (Ø 63mm) are 37,163meters
- The types of pipes are DI, HDPE and PVC.
- $\checkmark$  Pipe Diameter: the biggest ones are Ø 400 mm and the smallest ones are Ø 63 mm.
- ✓ Supply 4 Sangkat (Communes) in the town.
- ✓ Supply pressure 20-25 meters in daytime and 30-40 meters at midnight.

#### 8. Operation and Maintenance Issues

Checking in cycle program: Daily, weekly, monthly and yearly operations due to manual documents.

Maintenance: Daily clean-up, installing the new equipment or replacing,.....etc. Inscribe and reports.







## 9-Institutional Arrangements

1.) Legislations

KCWWs "Supply safe portable water and with affordable price to every population in coverage areas".

- Official Government of Common Statue.
- Governance :-
  - . Inner compliance .
  - . Inspection office (Dismissal, demote, pay-cut, fine )
  - . Salary increase.
  - . Customers Contract .
  - . Law No.32 about water application.
- 2.) Government and Participation
- CMDGs & MDGs, Goal 7, "Ensure environmental sustainability". Target
- 10: Have by 2015 proportion of without sustainable access to safe drinking water and sanitation ...
- The 2<sup>nd</sup> point on water supply policy "The budget from private sector could improve water supply".
- In town areas: 5 water supply private sectors in active, and to begin of the UN-HABITAT projects in years 2011 to operate WATER & SANITATION projects in town areas.

#### **10-Bill Collection system**

#### 1.) Tariff Structure and Collection Systems

#### Tariff Structure

#### **Cost Per Unit Sold**

Descriptions	Riel / m³	Percent
Power	297.75	34.65 %
Salaries, Wages & Allowances	117.12	13.62 %
Chemicals	10.97	1.28 %
Other Operating Expenses	101.81	11.84 %
Depreciations & Amortization	321.02	37.35 %
Non- Operating Expenses	10.3	1.26 %
Total Unit Cost	858.96	100%

#### Water Block Tariff: (2006 - 2012)

The home Users: -0 to  $10 \text{ M}^3 = 550 \text{ Riels per cube meters.}$ 

-  $10 \text{ M}^3 \text{ Up} = 900 \text{ Riels per cube meters.}$ 

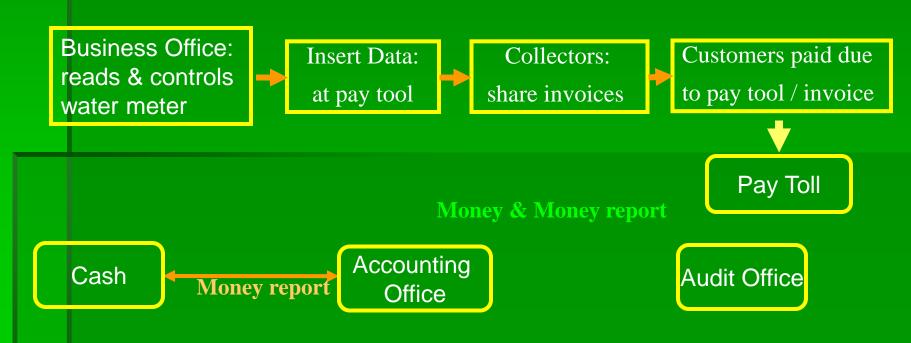
The business  $-0 \text{ M}^3 \text{ up} = 900 \text{ Riels per cube meters.}$ 

Organization - 0 M3 up = 1,500 Riels per cube meters.

#### 2.) Tariff Structure and Collection System (cont.)

- The Collection Systems
- 5 localities divided for the collection system so that we could settle our account every month,
- Customer water meter read and monitored,
- Data with billing system inserted,
- The customers required to pay at the waterworks units controlled by networks computer,
- Customers that overdue for15 days penalized, and 20 days more still without pay-off, the audit office agents will cut off their temporary use,
- Approximately 99 % customers of KCWWs pay on time .

#### Graph of Collection System



#### 11-Proposal Strategic Business Plans

#### a. Water Demand

#### 1.) Population growth:

The people growth rates are 0.4 % and the end of the year 2015 are 70,275 persons.

2.) Regional development and growth

The growth rate population of 0.4% are in the town area, Thus, the development object of KCWWs are town areas: Boeung Kok and Sambuormeas Communes, where today have been distributed such as Boeung Kok: 47.37% and Sambuormeas are 10.92%.

#### 3.) The need of water supply: Lesson of experience

- The correct managements, right structure & good responsibility, and professional experts,
- Good operations & maintenances with the correct techniques,
- The employees with codes of ethics: morality, personality, and customer cares,
- The propagation to population in service area about water use & sanitation.

#### **B** - <u>Strategic Proposals</u>

- 1.) Proposal Plans
- Rehabilitation of Existing Scheme: The new infrastructure

Average water production for one connection is 1,030 liters per day, therefore, for the year 2015 KCWWs we need water production for 80% of service coverage 11,500 m³ per day, but our capacity of water production now 7,200 m³ per day and in dry season (March-June of 2012) was 4,800 m³ per day so the lacking of 2,400 m³ per day we encounter.

- 2.) Potential Performance Improvement in 2015 Water Quality & Monitoring
  - To upgrade on water quality control with approximate 50 parameters.
  - To maintain water quality in accord with National Drinking Water Quality Standard (NDWQS).

#### ✓ Level of Services

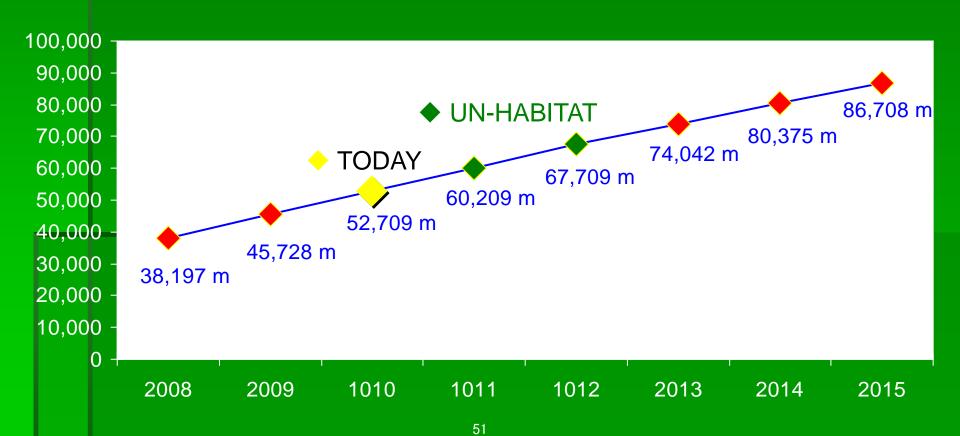
- **★** To increase of service water with distribution expand.
- ★ Securing stable water quality.
- ★ High reliability to customers.
- ✓ Coverage: Until the years 2015: 80% of population in town will have accessed safe water: Sambuormeas Commune to increase 60%
  - Boeung Kok Commune to increase 90%

The comparison CMDGs with KCWWs application.



#### **✓** Distribution Networks :

- To add more expansion pipe networks: 15,000 meters on the year 2011-2012 under UN-HABITAT Project, and the years 2013-2015 will add 15,000 meters .



# **✓**O&M management service

- Maintenances: To be divided into two parts:
  - A / The operation with condition control
  - B / The procedures of maintenance in accordance with standards
- Good maintenance to bring us along with:

SAFETY DURABILITY PROFIT

#### 3.) Human Resource Needs and Development Plans:

# Community Training Education and Capacity Building Commune Training Education

- To provide community the training courses about "High Quality Water Advantages".
- To propagate widely during any conference organized by the Town-Commune Authority.
- To collaborate with the national and international organizations to sustain water interest, water use, water saves.

#### **Capacity Building**

- To develop staff personalities, capacity in accordance with the technology.
- To select on the young staff generation to train and strengthen them in our work.
- To develop the existing staff the new skills the rough a technician expert.
- To instruct directly and practically the junior staff by the senior expert in unit.

## 4.) Management Arrangements

- Restructure the management :
  - ◆ To promote young dynamic staff towards the responsibility,
  - ◆ To streamline job responsibility and empower the high management,
- Changing of cultures :
  - Leadership by real exemplifications,
  - Effective works, success, better revenues,
  - Team work theme: One for all & All for one,
- Self-reliance Program:
  - To train all staff the human resource,
  - ♦ To reduce NRW,
  - ◆ To improve water bill collection,
  - ◆ To revise the tariff to cover the cost,

## 5.) New Tariff Structure and Mode of Collection Cost Per Unit Sold

Descriptions	Riel / m³	Percent
Power	380.65	42.83 %
Salaries, Wages & Allowances	166.51	18.74 %
Chemicals	21.99	5.47 %
Other Operating Expenses	97.13	9.93 %
Depreciations & Amortization	212.69	21.93 %
Non- Operating Expenses	9.80	1.10 %
Total Unit Cost	888.77	100%

#### Water Block Tariff:

The home Users: -0 to  $05 \text{ M}^3 \text{ Up} = 550 \text{ Riels per cube meters}$ .

-  $05to10 \text{ M}^3 \text{ Up} = 680 \text{ Riels per cube meters.}$ 

-  $11\text{to}15 \text{ M}^3 \text{ Up} = 990 \text{ Riels per cube meters.}$ 

-  $16 \text{ M}^3 \text{ Up}$  = 1,100 Riels per cube meters.

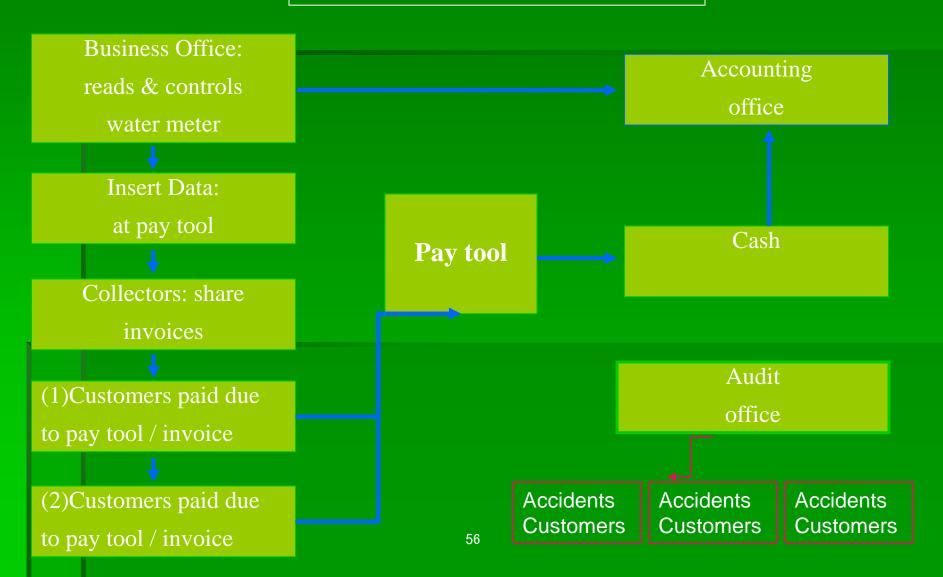
The business -  $0 \text{ M}^3 \text{ Up}$  = 950 Riels per cube meters.

-  $10 \text{ M}^3 \text{ Up}$  = 1,200 Riels per cube meters.

Organization - 0 M³ Up = 1,500 Riels per cube meters.

C - <u>Mode of Collection</u> (Like what I have just mentioned earlier), but in the plans, we will create another new bill tool at Sambuor Meas commune,

#### **The Mode Of Collection Diagram**



## **C- Expected Challenges**

## I – O & sM Management Issues

- Lack of capital investment,
- Traditional operations practiced by the old-aged technicians,
- Lacking of human resource knowledge,
- Low quality of equipment,
- Less efficiency of water meters for customers,
- Uneven evolvement with the new technology.

## II - Process Efficiency Targets:

- To supply population efficiency including qualities and quantities in order to increase revenues towards more service expansions,
- To upgrade the new technology to our employees through long-and-short term courses,
- To limit the expenses for better equipment,

#### III - Cost Involved

- \* The world crisis economic affected the power prices and the monetary rates,
- \* For the poverty reduction, the water tariff must be in low limitations
- The customers growth rate at the town area with the little water uses to cause the water price favor,
- \* The law of well water in dry season (Rain season less networks and dry season less water),
- \* The maximal O & M expenses with the low equipment.

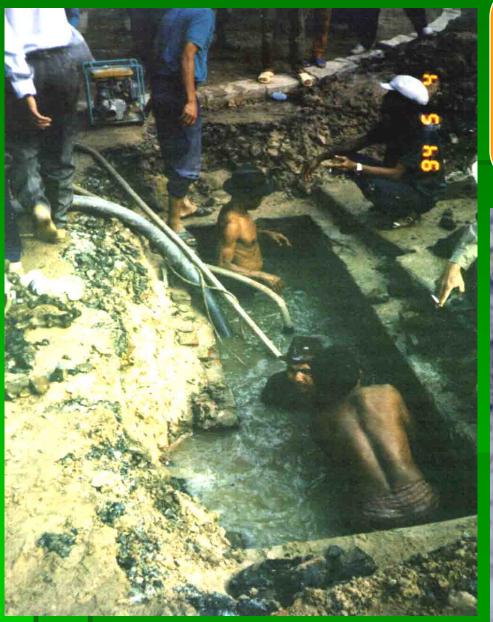
#### 12 - Conclusions

- High quality, safe and sufficient quantity water supply with reasonable price to people lessen poverty
- Water prices shall sustain the constant finances

As the two reversed conditions mentioned above, KCWWs have chosen the neutral operations to process and improve the units along with the water supply service expansions:

# Less Profits Quantitative Sales Sharp Increasing Profits The above successes come from:

"All impacts of good facilities, human resources and governances restrict the steadiness inside the units."



Water Leaked on 2012 loss 11.76% and compare with last year lower than 0,83%







# TaMgenHkµankarRtYtBinitüKuNPaBehlyCaTUeTAK Wmins¥atgayRbQmnwgCm¶W.













# Rain Water



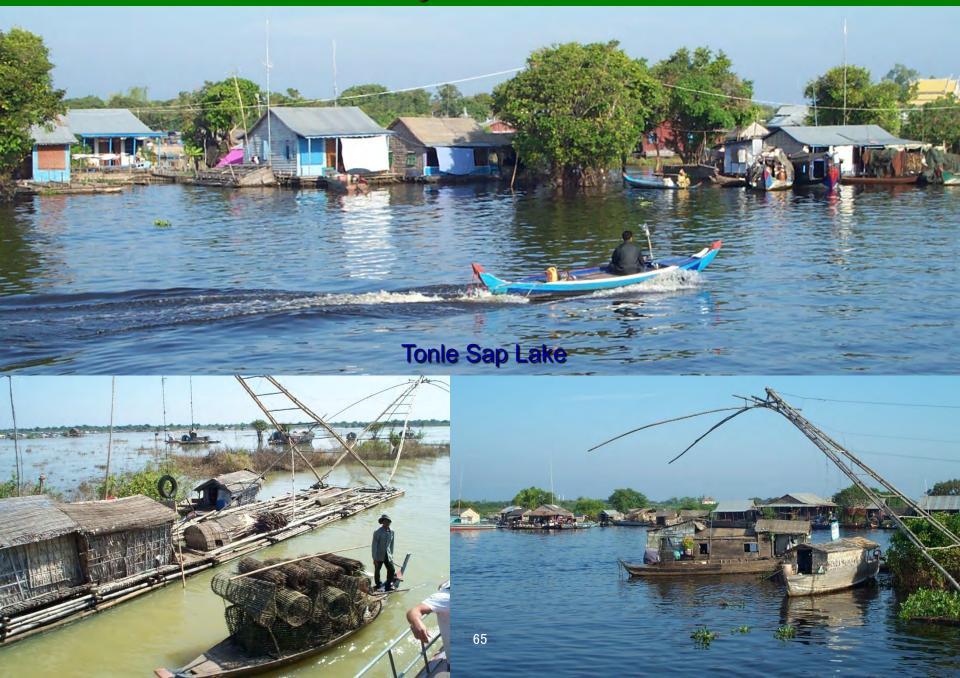








#### CANCEOD1A



















# Thank for your Attention!







# Water Supply Administration For Better Management of Water Supply Services Course (B)

# Iran (1)

# In the name of God





#### **Country Report**

Official name: National Water And Waste Water Company(NWWEC)

The work of my organization and the service it provides is:

My organization is a National government company in <u>IRAN</u> that organize the official activities of Ministry of Energy in water & wastewater affairs including the correct management, supervision and evaluate the performance, guidance and governance, increase the efficiency and operation and the optimal use of resources of subsidiaries companies in the policies of Ministry of Energy and also doing the supervision and compile the programs.

My official position : operation sector

My Own Job: Expert of Bureau for Supervision on Consumption Management and Reduction of non revenue water in urban sector

#### The Organization of the Ministry of Energy

#### **Minister of Energy**

**Executive Deputies** 

(Water Resource) & (Water and Wastewater) Power &Energy

National Water & Wastewater Co. WATER
RESOURCES
MANAGEMENT

Generation, transmission and distribution of electricity

65 COMPANIES 30 COMPANIES

86 COMPANIES





# National Water & Waste water Engineering Company

Deputy for Planning and Development Deputy for Supervision of Operations Deputy of Human Resources and Improving the Management Deputy of Coordination and Support

Urban water & waste water companies

35 companies

Rural water & waste water companies

30 companies



# National Water & Wastewater Engineering Company of Iran



Deputy of Human

Resources and

Improving the

Management

#### **Managing Director**

Deputy for Planning and Development

Management of Planning and Development

Management of Procurement of Funds and Development of NGO Participation

Management of Supervision of Water and Wastewater projects

> Management of Technical Affairs

Deputy for Supervision of Operations

**Crisis Management** 

Bureau for Improvement of Water Operations

Bureau for Improvement of Wastewater Operations

Bureau for Safety and Health for Water and Wastewater

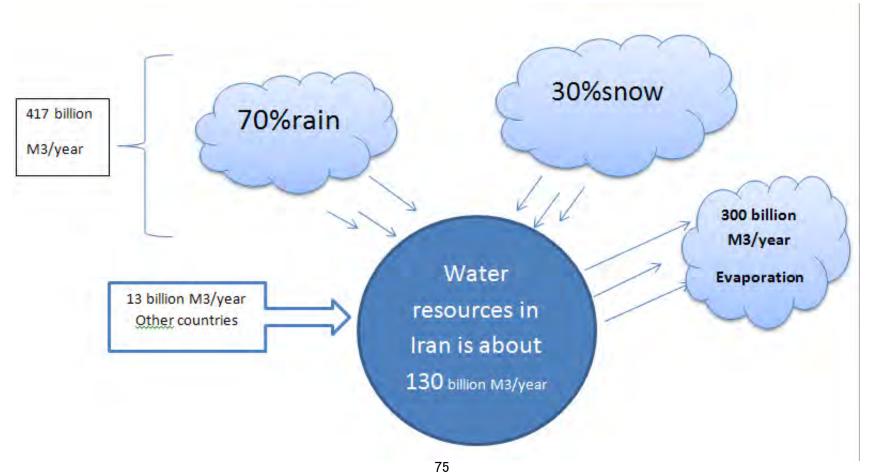
Bureau for Consumption
Management and Reduction of NRW

Deputy of Coordination and Support





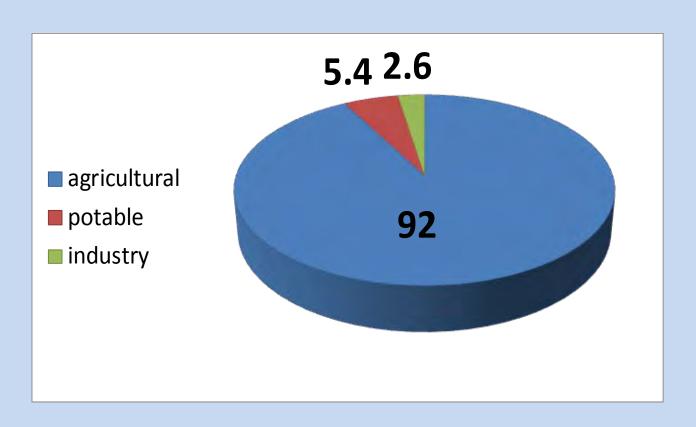
#### Water recourses in IRAN







#### Water use in iran

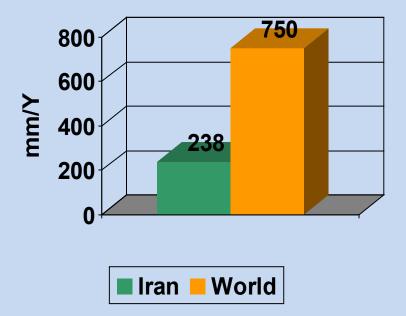




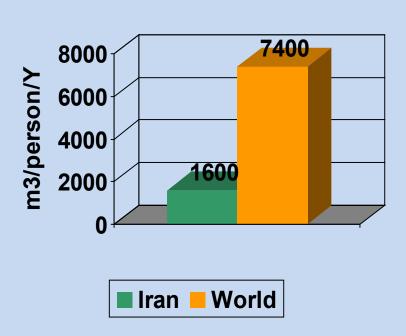


#### **Precipitation and Availability of Water**

#### **Avg. Annual Precipitation**



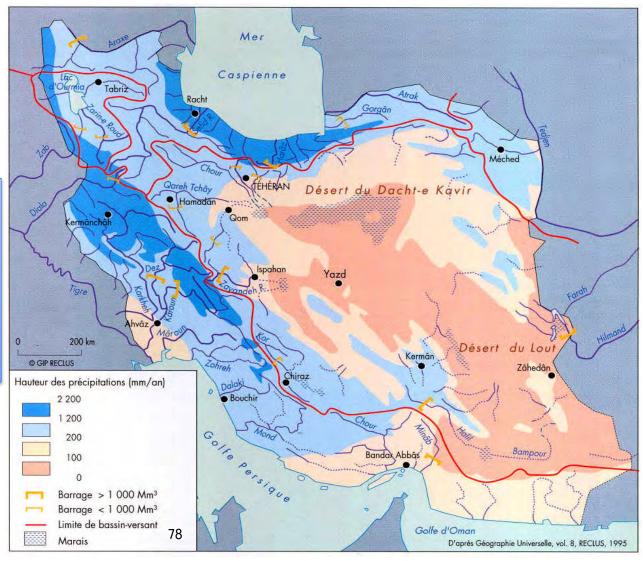
#### **Availability of Water**







Over 70% of the total precipitation occurs on 30% of Iran.







#### Water availability & consumption Variation in Iran

#### Trend of Water availability (1955-2020)

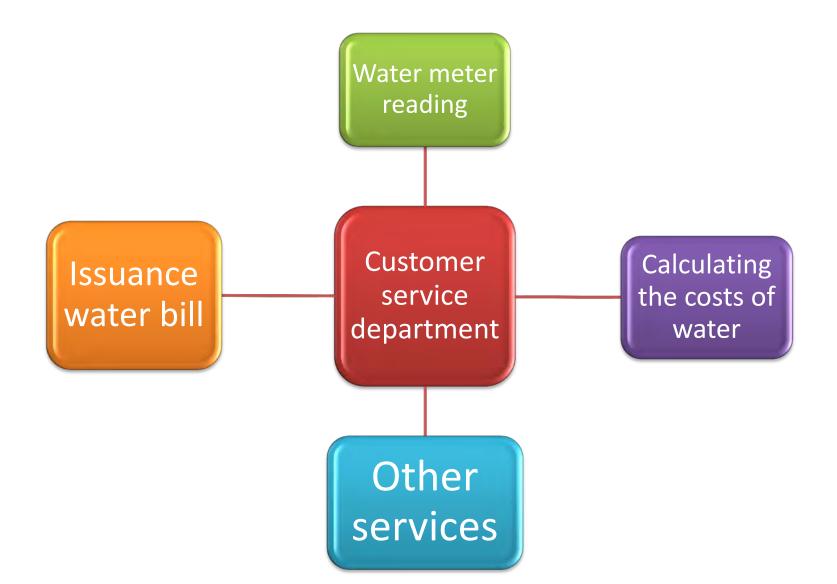
Year	Per Capita(m³)		
1955	7000		
2000	2160		
2012	1600		
2020	1300		

#### Water consumption Variation (1960-2020)

Sector Same (percent)	1960	1995	2012	2020
Agriculture	98.6	93.3	92	87
Potable	1.3	5.2	5.4	7.4
Industry	0.1	1.5	2.6	5.6
Total	100	100	100	100











#### Average price of water

- ✓ For domestic consumptions: 0.07\$ M3/month
- ✓ For non domestic consumptions : 0.1 \$ M3/month
- water meter reading is manually and performed by human staff





#### water quality management

Water quality control is monitoring the changes in the physical, chemical and microbial qualities of water from the sources of supply to the consumption point and the sites of discharging effluents to admitting waters or the delivery points to other consumption sectors.

There is 330 laboratories in the urban water and wastewater companies and 280 others in the rural water and wastewater companies .also there is 2 national standards for control water quality in iran

1:microbial standard no 1011

2:physical, chemical standard no 1053





#### Water quality management

In the year 2011, the indicators for percentage of microbial and free residual chlorine desirability, which show the sanitary conditions of water in the distribution networks, with a defined minimum of 95 percent in urban and 90 percent in rural areas, were measured as 99.1 and 99 percent respectively in urban areas and 94.1 percent and 95.1 percent in rural regions





#### water supply services

1-The population ratio to be served drinking water: 97% urban population

And 77% rural population(70million person)

2-average number of hours per day of water availability to most people : currently all of hours per day water is available for most people.

3-non revenue water is 25.5 %





#### **Private Sector Participation**

In Iran private companies are very active in providing water and wastewater services. Most of these companies are as a producer, consultant and contractor in the following sections

- 1. Production of related equipment for water industry like (pipes and fittings, water meters, water pumps ant etc.)
- 2. Study, design and Construction of water and waste water treatment plants
- 3. Water distribution
- 4. Bill collection, leakage repair
- 5. Reducing of non revenue water
- 6. Construction of pipe lines
- 7. Maintenance and Operation
- 8. Etc.





#### **Privatization**

Privatization is one of the major policies in water and waste water industry in Iran.

Measures in this regard to provide funding for projects include:

1-getting loan from world bank

2-getting loan from Islamic Development Bank(IDB)

3-getting loan from ECO Trade And Development Bank

Type of Privatization: BOT-BOO-Buyback contract-Internal and external financing





#### biggest problems

Limitation of resources, droughts and excessive extraction from groundwater basins

Expansion of urban areas and the inclusion of water resources within their limits

Inadequacy of financial resources for implementation of plans

The worn-out condition of water systems

The shortage of specialized manpower



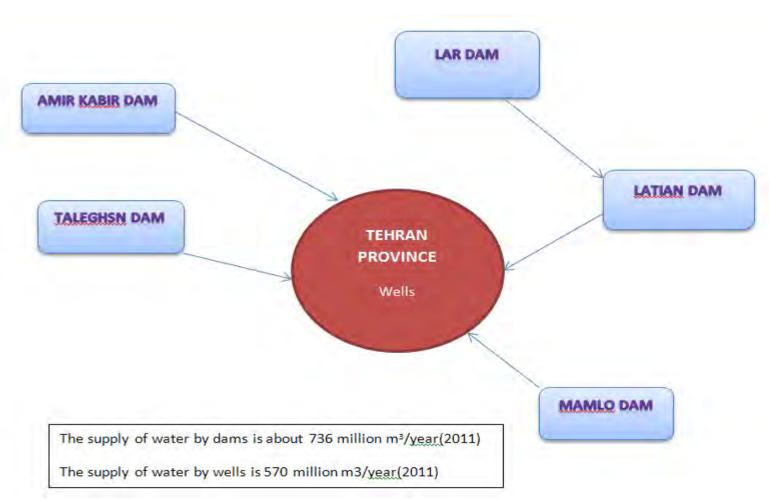


# Thank You For your Kind Attention



# National Water & Wastewater Engineering Company of Iran





#### **Tasks**

#### <u>water and wastewater</u> <u>companies</u>

- Water supply & execution of water networks and treatment and sewage disposal systems;
- Water distribution in urban and rural areas;
- Monitoring the drinking water quality in rural and urban areas;
- Water demand management.



#### **About IRAN**





- Geographic coordinates: 32° 00′ N, 53° 00′ E
- Region: Middle East
- Area: total: 1.648 million sq km
- Average annual precipitation: 250 mm (World average: 750mm)
- Arid and Semi arid
- Population: 75 million (2011)
- Languages Persian
- Capital City: Tehran (pop10.5 Million)
- Government: Islamic Republic

## Water Supply Administration For Better Management of Water Supply Services Course (B)

### Iran (2)



#### **General Country profile**

- Iran or Persian: also known as Persia (/ˈpɜrʒə/ or /ˈpɜrʃə/), officially the Islamic Republic of Iran since 1980, is a country in Western Asia, The country is bordered on the north by Armenia, Azerbaijan and Turkmenistan, with Kazakhstan and Russia to the north across the Caspian Sea. Iran is bordered on the east by Afghanistan and Pakistan, on the south by the Persian Gulf and the Gulf of Oman, on the west by Iraq and on the northwest by Turkey. Iran is a country with great history
- The 18th-largest country in the world ,It is a mountainous country of particular <u>geopolitical</u> significance owing to its location in three spheres of Asia. Iran is <u>the third largest</u> oil producer in the world <u>and the second largest</u> gas producer in the world.
- <u>Tehran</u> is the capital, the country's most populous city and the political industrial center of the nation

#### **Whole Country:**

Area: 1648195 km<sup>2</sup>

Population: 77,176,930 Habitants

Coverage Water Supply: 97% urban area-77% rural area

**Selected Water Supply System/City:** 

Service Area in urban sections: 10420 km<sup>2</sup>

**Population Served: 77 million person** 

Water connections: 13000000 connections

95









# Official name: National Water And Waste Water Company(NWWEC) The work of my organization and the service it provides is:

My organization is a National government company in <u>IRAN</u> that organize the official activities of Ministry of Energy in water & wastewater affairs including the correct management, supervision and evaluate the performance, guidance and governance, increase the efficiency and operation and the optimal use of resources of subsidiaries companies in the policies of Ministry of Energy and also doing the supervision and compile the programs.

My official position : operation sector

My Own Job: Expert of Bureau for Supervision on Consumption Management and Reduction of non revenue water in urban sector

## Official organization which are responsible for water supply and quality in Iran are as follows:

- Ministry of energy is responsible for management, supply and distribution of water for all sectors as well as the collection, treatment and disposal of urban and rural wastewater.
- Department of Environment is the official body responsible for protecting the quality of water resources
- Ministry of Health, Treatment and Medical Education is in charge of monitoring the drinking water quality in rural and urban areas

#### The Organization of the Ministry of Energy

#### **Minister of Energy**

**Executive Deputies** 

(Water Resource) & (Water and Wastewater) Power &Energy

National Water & Wastewater Co. WATER
RESOURCES
MANAGEMENT

Generation, transmission and distribution of electricity

65 COMPANIES 30 COMPANIES 86 COMPANIES





# National Water & Waste water Engineering Company

100

Deputy for Planning and Development Deputy for Supervision of Operations Deputy of Human Resources and Improving the Management Deputy of Coordination and Support

Urban water & waste water companies

35 companies

Rural water & waste water companies

30 companies



## National Water & Wastewater Engineering Company of Iran



Deputy of Human

Resources and

Improving the

Management

#### **Managing Director**

Deputy for Planning and Development

Management of Planning and Development

Management of Procurement of Funds and Development of NGO Participation

Management of Supervision of Water and Wastewater projects

> Management of Technical Affairs

Deputy for Supervision of Operations

**Crisis Management** 

Bureau for Improvement of Water Operations

Bureau for Improvement of Wastewater Operations

Bureau for Safety and Health for Water and Wastewater

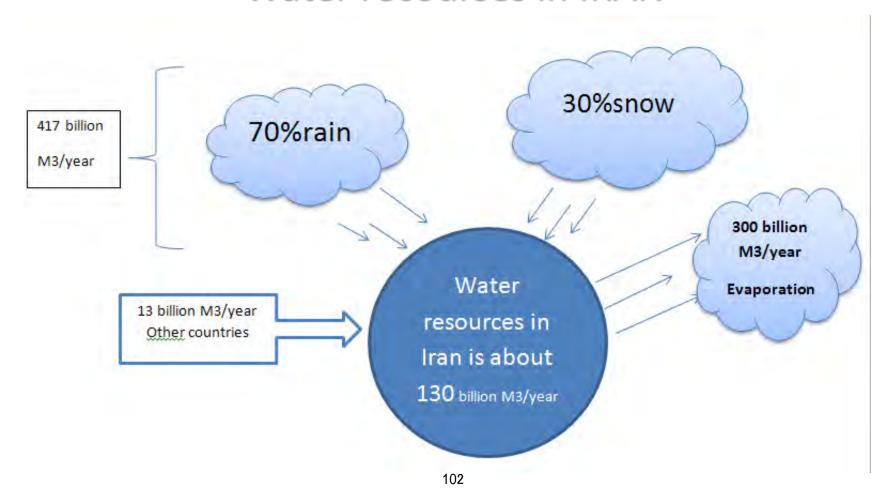
Bureau for Consumption
Management and Reduction of NRW

Deputy of Coordination and Support





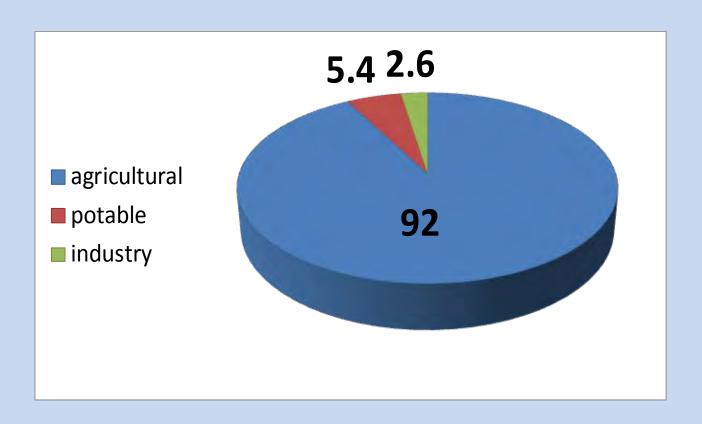
#### Water recourses in IRAN







#### Water use in iran

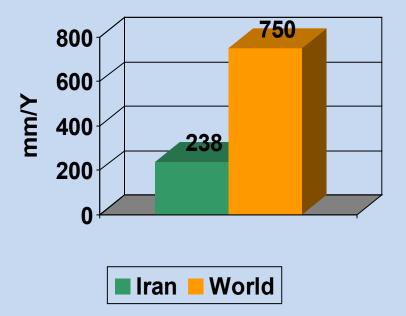




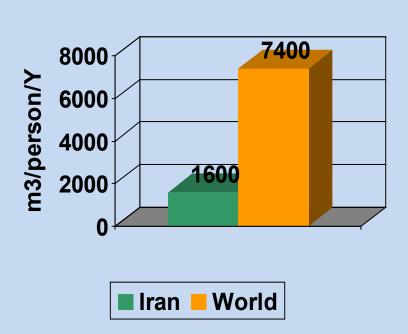


#### **Precipitation and Availability of Water**

#### **Avg. Annual Precipitation**



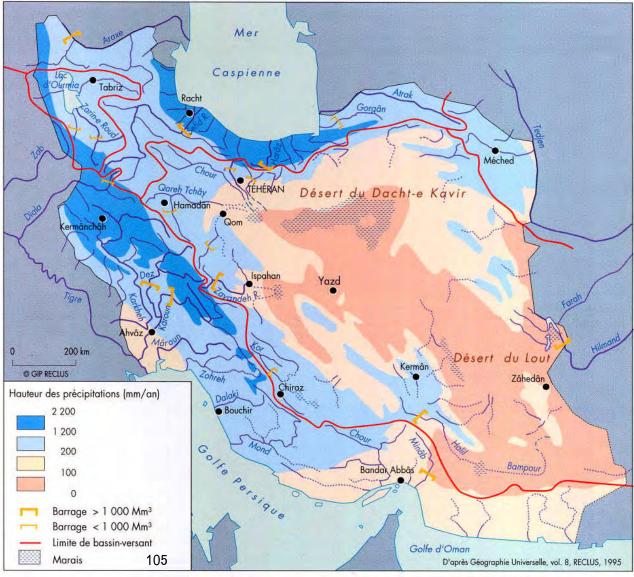
#### **Availability of Water**







Over 70% of the total precipitation occurs on 30% of Iran.







In Iran rainfall is highly variable. In the north is more than 2113 mm. in desert areas is about 15 mm. in West and North West, North East and southern Alborz is about 500 mm. and Not more than 200 mm of rainfall in other areas. Iran is grappling with water shortage problems, and May be Encounter with water stress status in 2025





### Water availability & consumption Variation in Iran

### Trend of Water availability (1955-2020)

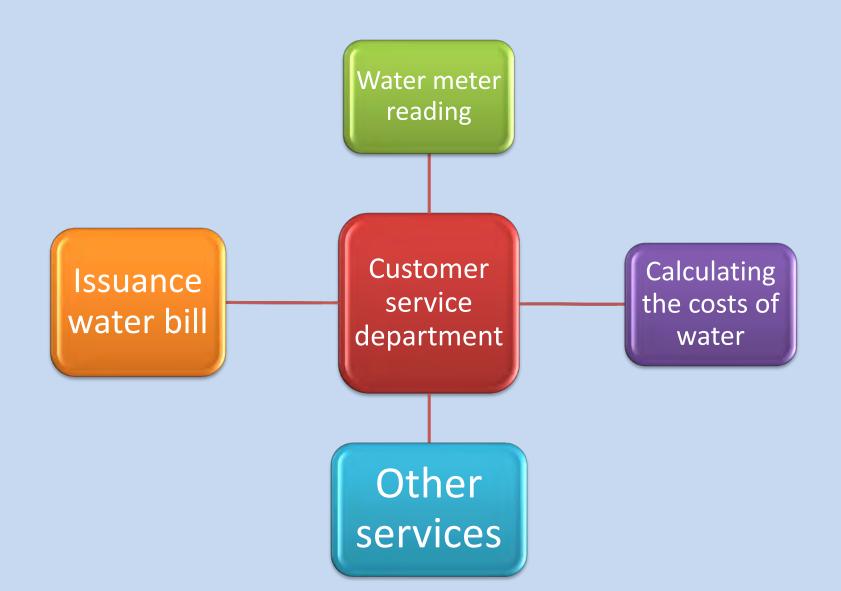
Year	Per Capita(m³)
1955	7000
2000	2160
2012	1600
2020	1300

### Water consumption Variation (1960-2020)

Sector Same (percent)	1960	1995	2012	2020
Agriculture	98.6	93.3	92	87
Potable	1.3	5.2	5.4	7.4
Industry	0.1	1.5	2.6	5.6
Total	100	100	100	100











# Average price of water Water sales rate is low compared to other countries

- ✓ For domestic consumptions: 0.07\$ M3/month
- √ For non domestic consumptions: 0.1 \$ M3/month
- water meter reading is manually and performed by human staff





### water quality management

Water quality control is monitoring the changes in the physical, chemical and microbial qualities of water from the sources of supply to the consumption point and the sites of discharging effluents to admitting waters or the delivery points to other consumption sectors.

There is 330 laboratories in the urban water and wastewater companies and 280 others in the rural water and wastewater companies .also there is 2 national standards for control water quality in iran

1:microbial standard no 1011

2:physical, chemical standard no 1053





### water supply services

1-The population ratio to be served drinking water: 97% urban population

And 77% rural population(70million person)

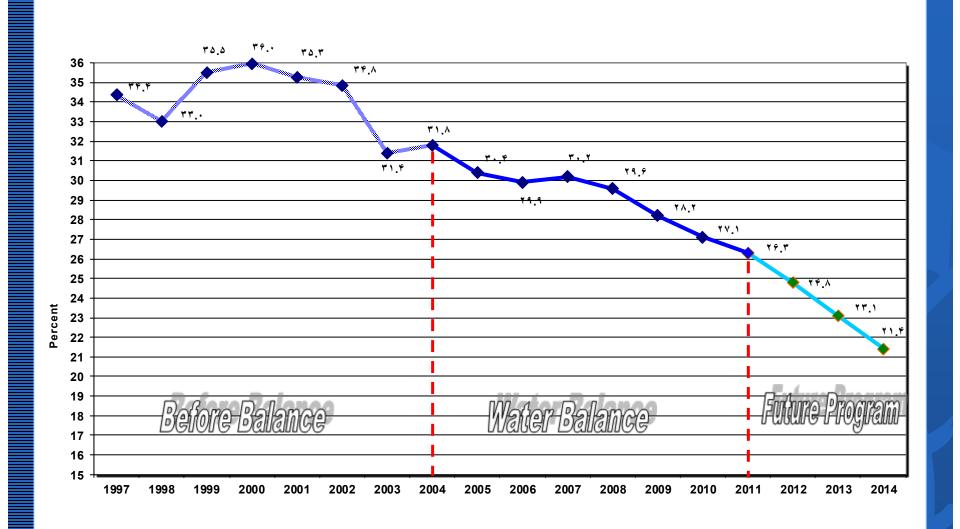
2-average number of hours per day of water availability to most people : currently all of hours per day water is available for most people.

3-non revenue water is 25.5 %

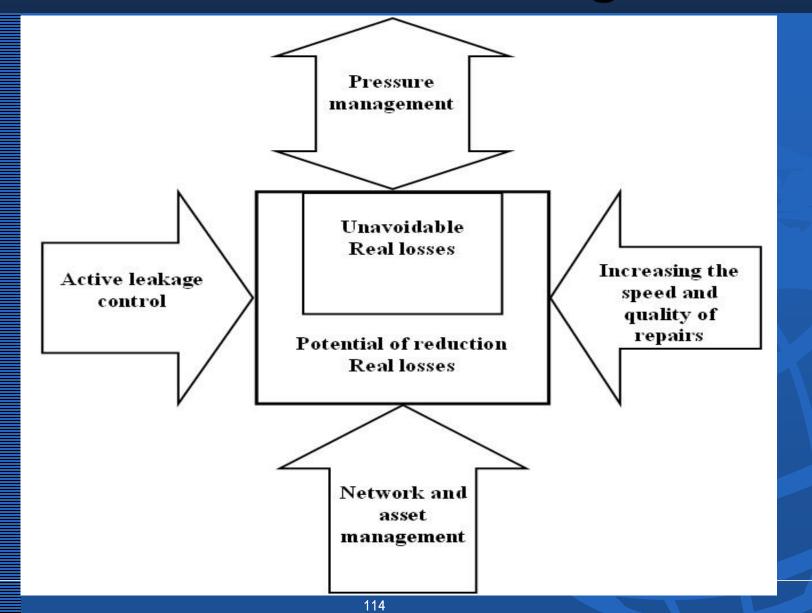
### Reduction of non-revenue water1

System input volume 5422056 095 (m3/year)	Authorized consumption n 4135343382	Revenue water 4041555403	Billed authorized consumption	xx m³/year ( 74.5 %)
		n ·	Unbilled authorized consumption (ex. fire fighting, cleaning)	xx m³/year ( 1.8%)
	losses		Apparent losses ( Unauthorized     consumption (i.e. Illegal use), Customer metering     inaccuracies)	xx m³/year (9.7 %)
			Real losses (Leakage)	xx m³/year ( 14%)

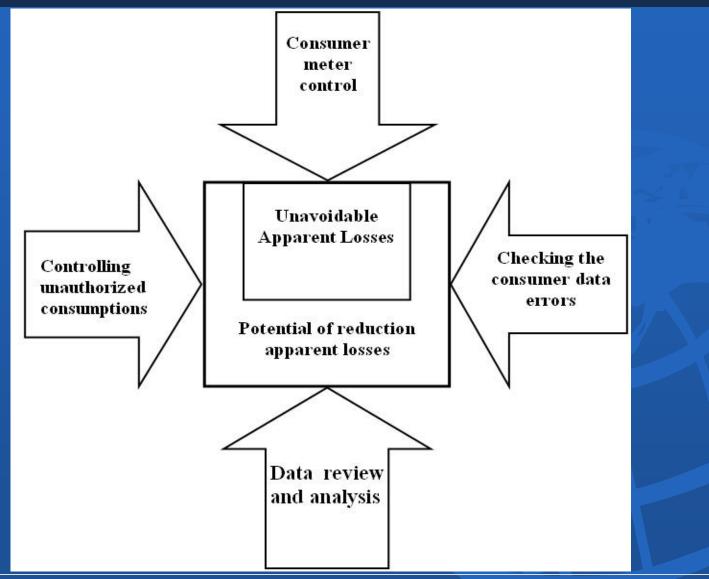
### Comparison of NRW in Iran



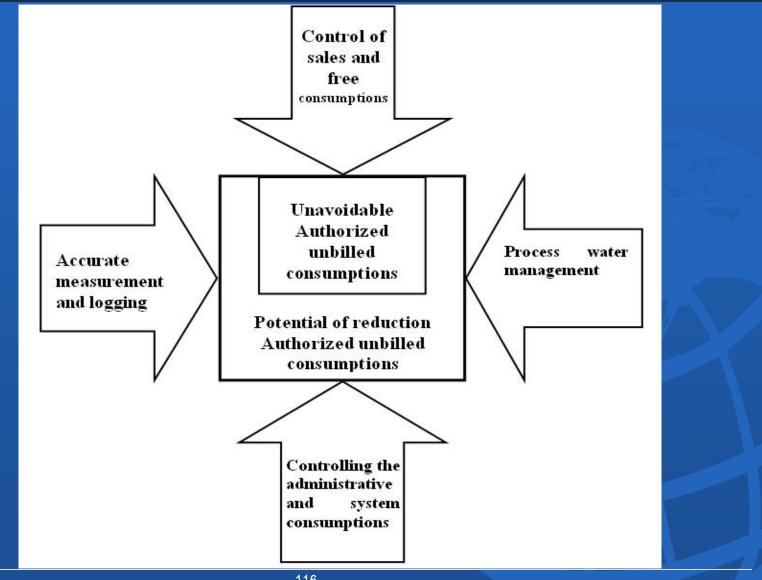
### **Real Losses Strategies**



### **Apparent Losses Strategies**



### **Unbilled Authorized Consumptions Strategies**







### **Private Sector Participation**

In Iran private companies are very active in providing water and wastewater services. Most of these companies are as a producer, consultant and contractor in the following sections

- 1. Production of related equipment for water industry like (pipes and fittings, water meters, water pumps ant etc.)
- 2. Study, design and Construction of water and waste water treatment plants
- 3. Water distribution
- 4. Bill collection, leakage repair
- 5. Reducing of non revenue water
- 6. Construction of pipe lines
- 7. Maintenance and Operation
- 8. Etc.





### **Privatization**

Privatization is one of the major policies in water and waste water industry in Iran.

Measures in this regard to provide funding for projects include:

1-getting loan from world bank

2-getting loan from Islamic Development Bank(IDB)

3-getting loan from ECO Trade And Development Bank

Type of Privatization: BOT-BOO-Buyback contract-Internal and external financing





### biggest problems

Limitation of resources, droughts and excessive extraction from groundwater basins

Expansion of urban areas and the inclusion of water resources within their limits

Inadequacy of financial resources for implementation of plans

The worn-out condition of water systems

The shortage of specialized manpower

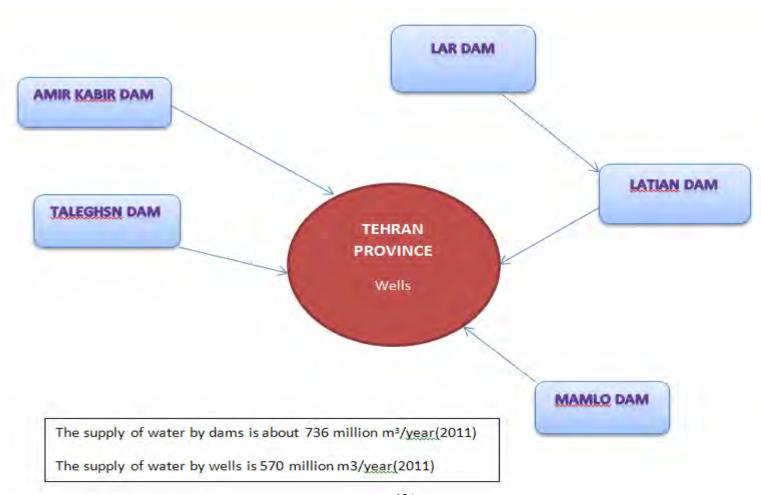












### **Tasks**

# water and wastewater companies

- Water supply & execution of water networks and treatment and sewage disposal systems;
- Water distribution in urban and rural areas;
- Monitoring the drinking water quality in rural and urban areas;
- Water demand management.



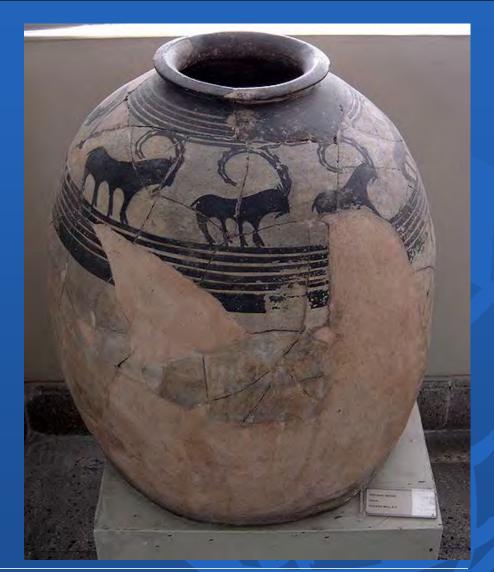
### **About IRAN**





- Geographic coordinates: 32° 00′ N, 53° 00′ E
- Region: Middle East
- Area: total: 1.648 million sq km
- Average annual precipitation: 250 mm (World average: 750mm)
- Arid and Semi arid
- Population: 75 million (2011)
- Languages Persian
- Capital City: Tehran (pop10.5 Million)
- Government: Islamic Republic

# Pottery vessel, fourth millennium B.C



### Long history of Iran

A painting discovered at about the eighth millennium BC



pottery vessel was discovered in about 4500 BC



## Water Supply Administration For Better Management of Water Supply Services Course (B)

### Guyana

# COUNTRY REPORT Guyana Water Incorporated



Project Development Manager
Capital Investment & Planning Dept. -GWI

### General Country Profile: Background

 Guyana is located on the North East shoulder of South America. Our country neighbours are Venezula, Brazil and Suriname.

• Guyana is mostly covered with forest, approximately 80%. The other 20 % is made up of hills and flat lands (coastal plains). Most of the population lives on the flat lands

(below sea level – 2 metres)

### Whole Country

Area : 215,000 km<sup>2</sup>

Population: 750,000

Coverage Water Supply: 98 %

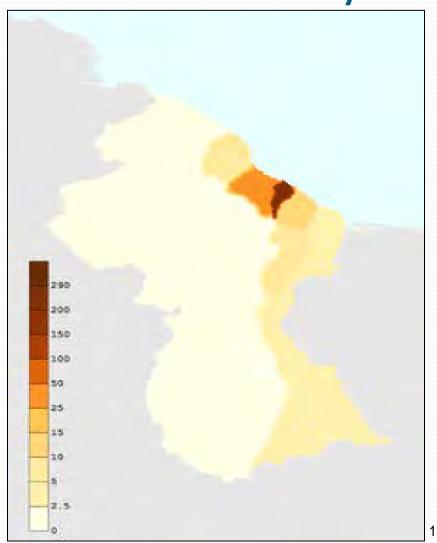
Selected Water Supply System: Georgetown

Service Area: 30 km<sup>2</sup>

Population Served: 240,000



### General Country Profile: Background



Guyana's population density in 2005 (people per km<sup>2</sup>).

Guyana – Surrounded by Atlantic Ocean -North, Venezuela - South, Suriname – East, Brazil – West.

### Management of Water Quality

- The management of water quality is done by the Scientific Services department who utilises the WHO standards for safe drinking water. All official testings are done at the central lab. We usually use 10 testing parameters on a regular basis. Should the need arise for other testing to be done, this can be arranged.
- **Deep wells** Official tests are done every 3 months. Test include Fecal and Total coliforms, turbidity, dissolved iron, pH. Never had any contamination of aquifer except for treats from flooding.
- Surface water Inlet water to the plants are normally tested every 2 weeks for fecal and total coliforms, colour, turbidity, ph, dissolved iron.
- Water Treatment plants Official tests are done every 2 weeks. Test are done during the different stages of treatment and include the final water to consumers. Test include Fecal and total coliforms, residual chlorine, iron, turbidity, colour, ph. Each plant is equipped to test residual chlorine, dissolved iron and ph at any one time.

### Reduction of Non Revenue Water

- Our company currently operates at a loss, however, with the reduction of NRW we can be able to break even operational cost once the value is below 35%.
- In 2012, it is estimated at a high value of 69%.
- Less than 40 % of customers are metered (Accounts for approximately 60% of total billings)
- High leakage rate due to aged pipe network
- High wastage by customers who do not have meters
- Inaccurate data in billing system

### Water Supply Service Standards/ Performance Indicators

#### **Supply Pressure**

In accordance with the company's license, we are required to supply a service pressure of no less than 5 meters to our customers. To date, approximately 50 % of customers enjoy this pressure.

#### **Challenges:**

- Old network with high losses
- High leakage level in pipe network
- High wastage by other customers
- Low water pressure in network
- Optimization of transmission and distribution network needed

### PERFORMANCE INDICATOR – LEVEL OF SERVICE MAPS Quality Standards

We utilise the WHO standards for safe drinking water. Most of the parameters (8) we considered are maintained except for turbidity. Our well water is high in dissolved iron, when precipitated, it increases the Turbidity.

### Managing of Water Supply Service on a Self Supporting Basis

Due to the high losses in our company, it cannot manage itself on a self supporting basis. The financial losses are subsidized on a yearly basis by the government.

For us to manage ourselves on a self supporting basis, we have to:

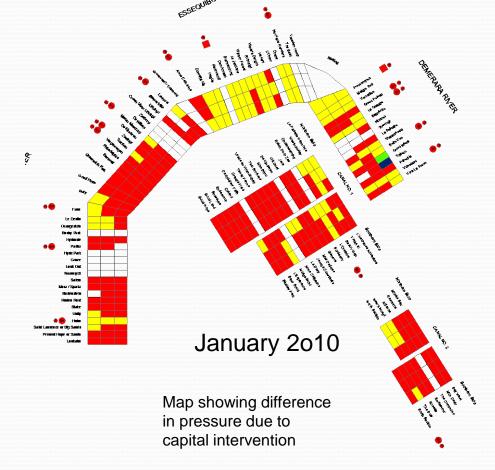
- Reduce NRW to 35 % and below
- Reduce our energy cost
- Collection efficiency (current year) must be above 85 %

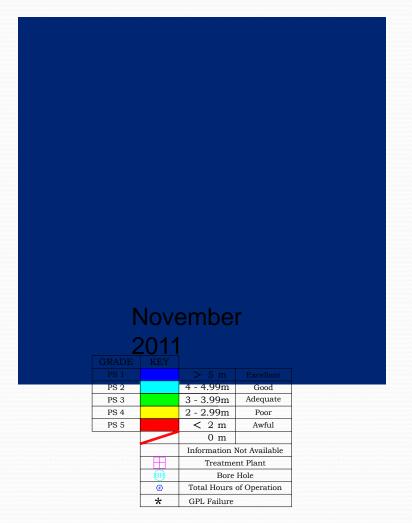
# Major recent achievement in improvement of water supply services/management (Part 1)

2000	Indicators	2012
3.62	Staff per 1000 connection	3.23
230,000	Production capacity m <sup>3</sup> /day	430,000
WHO guidelines	Water Quality	WHO Guidelines
85 %	Coverage area	98 %
16	Supply duration	16
Less than 2 metres	Supply pressure	Average 3 metres
135,000	No. of connections	177,832
56	NRW	6o
70 %	Collection Ratio	63 % (Including Arrears 98%)
490	Staff Number	574

135

# Major recent achievement in improvement of supply services/management Part 2





# Expectation for the Japanese private Companies & Water Supply Utilities

 We would appreciate any form of assistance from Japan so that our company can sustain itself without any more government subsidies in the next five years.

#### These include

- Reduction of non revenue water
- Reduction of energy usage
- Improve quality of water from existing treatment plants
- Improved meter reading techniques
- Improve the billing system
- Possible assistance with water meters to install on customers

## Water Supply Administration For Better Management of Water Supply Services Course (B)

### Timor Leste

### **COUNTRY REPORT 2013**

WATER SUPPLY ADMINISTRATION FOR BETTER MANAGEMENT OF WATER SUPPLY SERVICES"B"

**FROM** 

**TIMOR LESTE** 



# DEMOCRATIC REPUBLIC OF TIMOR LESTE (RDTL)



**Full name** : Democratic Republic of East Timor

Population: 1,066.582 Million (Sencus, 2010)

Capital : Dili

**Area** : 14,609 sq km (5,641 sq miles)

Major languages : Tetum and Portuguese (official),

Indonesian and English (working languages)

Major religion : Catholic

Life expectancy : 60 years (men), 62 years (women) (UN)

**Monetary unit** : 1 US dollar = 100 cents

Main exports : Coffee, marble, potential for oil exports

**GNI per capita** : \$750 (World Bank, 2006)

Internet domain : .tl

International dialling code: +670

## GEOGRAPHICAL STATUS, POPULATION, SOCIAL AND ECONOMIC CONDITION, CLIMATE, ETC.

#### **CHARACTERISTIC OF Timor-Leste**

Located in south pacific 400 km north of Australian Continent

8500 km2, altitude 8° and 9° 30' south, longitude 124° and 127° 30' east

Generally mountainous characterized by rugged terrain & small narrow valleys

Rainfall average about 1,600 mm per year. August as driest month average monthly rainfall of 20 mm, January has highest precipitation average of 243 mm.

#### EAST TIMOR AVERAGE RAINFALL DISTRIBUTION

Figure. 1 Dili °C (°F). (elevation: 0 metres) 35 (95)30 (86) TEMPERATURE Max AVERAGE RAINFALL (68)Min mm (in) 15 150 (59)(5.9)100 (50)(3.9)50 (41) (2.0)Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (0) 76 77 75 70 67 67 67 66 68 68 72

HUMIDITY (%)

Figure. 2 East Timor Average Rainfall Distribution Bacau Los Palos Liquica Manatutu • Ermera Bobonaro Same Viqueque Ainaro Over 2 000 mm Between 1 500 and 2 000 mm Between 1 000 and 1 500 mm Below 1 000 mm



#### POPULATION



Population of Dili : 243.331 (Sencus,2010)

National Population growth : 2.41 % per year

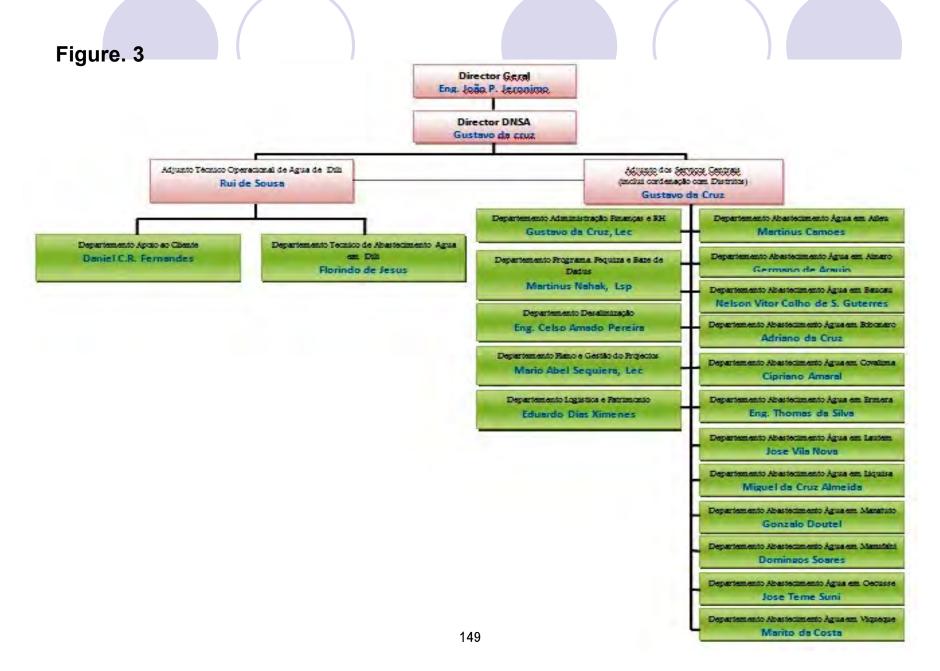
Dili population growth : 33.3% since 2004



# OUTLINE OF DILI WATER SUPPLY SYSTEMS

- DNSAS organization was founded: 2000
- Structure organization:
   Part of Government Department
- Governmental Control, subject to governmental instruction:
- (a) Staff Number (✓)
- (b) Staff salaries (✓)
- (c) Tariff (✓)

#### NATIONAL DIRETORATE OF WATER SERVICES



♦ Total population served : **78.729** 

♦ Service area ( km² ) : 372 km²

♦ Number of staff members of the organization

(a) Clerical Staff : 33

(b) Engineer : 4

(c) Technical Staff : 178

(d) Laborer : 3

(e) Total : **221** 

Type of the management : Government-owned

Cost for operation/management :

(a) Personnel : **254,000** 

(b) Power/Fuel : **300,780** 

(c) Chemicals : **143,400** 

(d) Other materials : 501,422

(e) Transport : **105,336** 

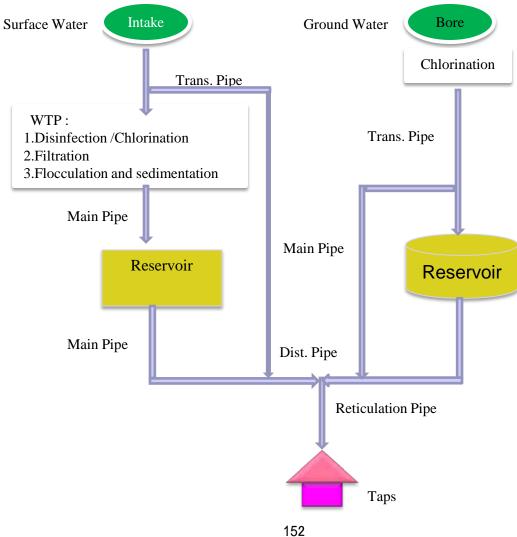
(f) Others (M&E) : **73,000** 

(g) Total O&M cost : **1,377,938** 

#### I. SERVICE AREA

#### **Dili Water Supply Flow Chart**

#### Figure. 4



- Area of responsibility
- Present service area
- Population of present service area
- Population served by the piped
- Water Services Zones

**Map of Zones Water Supply** 

: 372 sq.km

: 29.52 sq.km

: 11,247 Connection

: 78729 People

: 10 Zone

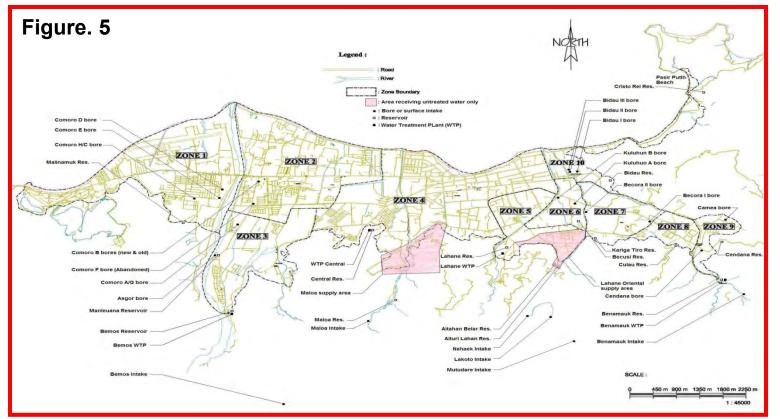
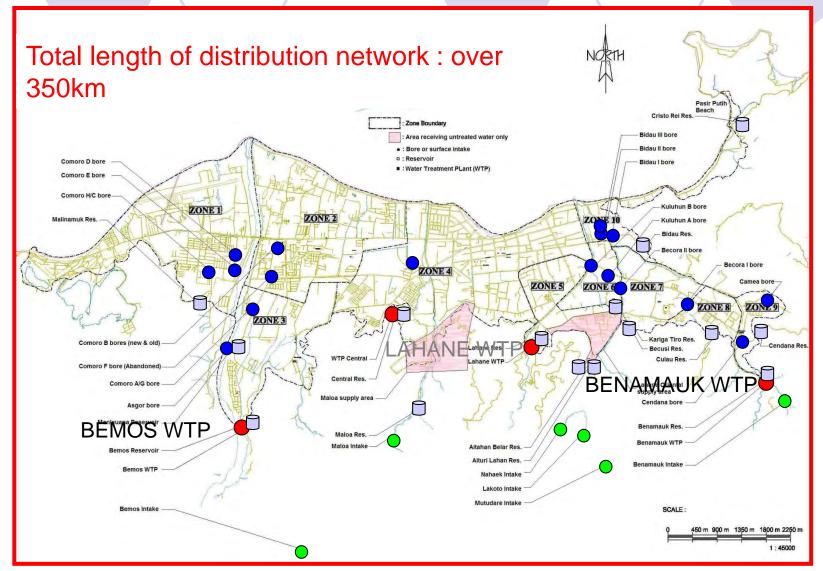


Figure. 5.1



#### II. Infrasrtucture:

Water Treatment Plant Facility Figure. 6

#### **Central Water Treatment Plant:**







Figure. 7
Bemos Water Treatment Plant







156

Figure. 8 Lahane Water Treatment Plant







Figure. 9
Benamauk Water Treatment Plant



Figure. 10
Bores and Treatment Facility



#### Piped water supply connection

#### Tabel. 1

Domestic (Households)	Non Domestic (Industrial,	TOTAL
	commercial, institutional, other)	
10,646	601	11,247

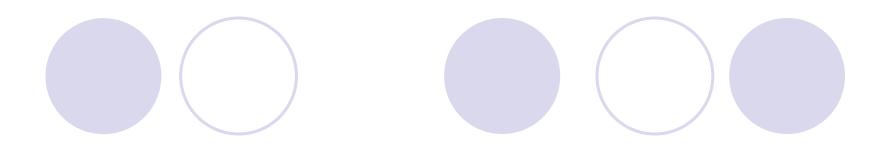
#### III. Water Consumption and production

- •Volume of water produced by the utility (12,992,461 million m³/year)
- •Volume of water metered : (1, 417,092 million m³/year) in the partial area
- •Estimated un-metered consumption; (11,575,369.05 million m³/year) in the partial area

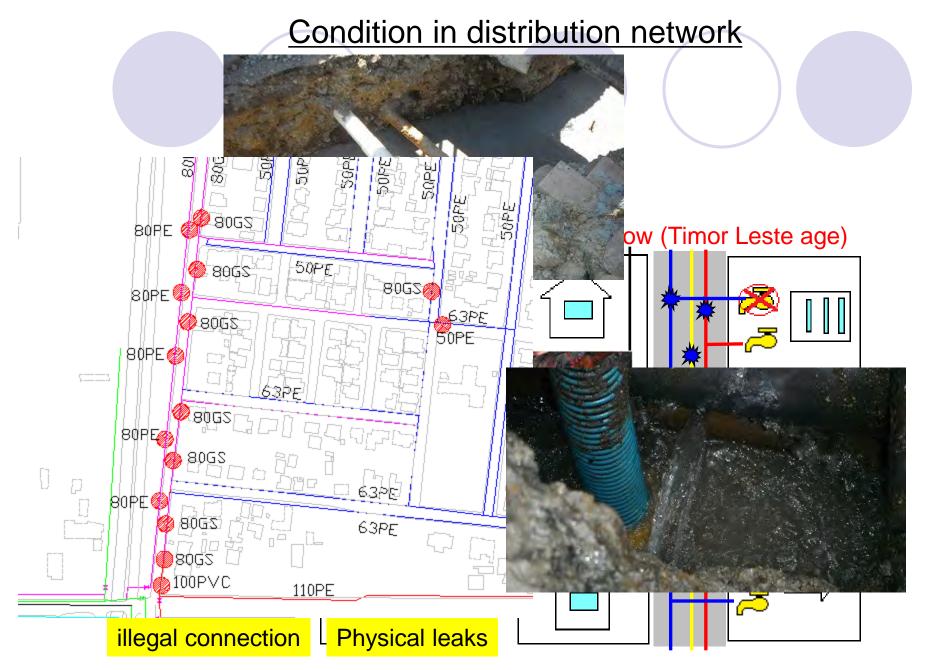
#### Capacity of Production in Timor Leste

Tabel. 2

Name	Maximum Production (m3/day)	Maximum Production (m3/year)	Intake
Comoro C, D, E	2,652	954,828	Bore
Comoro B, A	6,226	2,241,231	Bore
Comoro Asgor	697	250,776	Bore
Bemos	3,500	1,260,000	Bemos
Central	6,600	2,376,000	Bemos
Untreated	1,900	684,000	Maloa
	2,600	936,000	Nahaek
Lahane			Lakolo
Lanane			Mutudare
			Benamauk
Culuhun A,B	5,484	1,974,240	Bore
Becora I,II	3,607	1,298,592	Bore
Cendana	390	140,400	Bore
Benamauk	900	324,000	Benamauk
Bidau I,II,III	1,665	599,554	Bore
Total	36,090	12,992,461	



IV. Water supply system performance (intermitents)



#### Material of pipe in Timor Leste

ACP **PVC** 









DIP

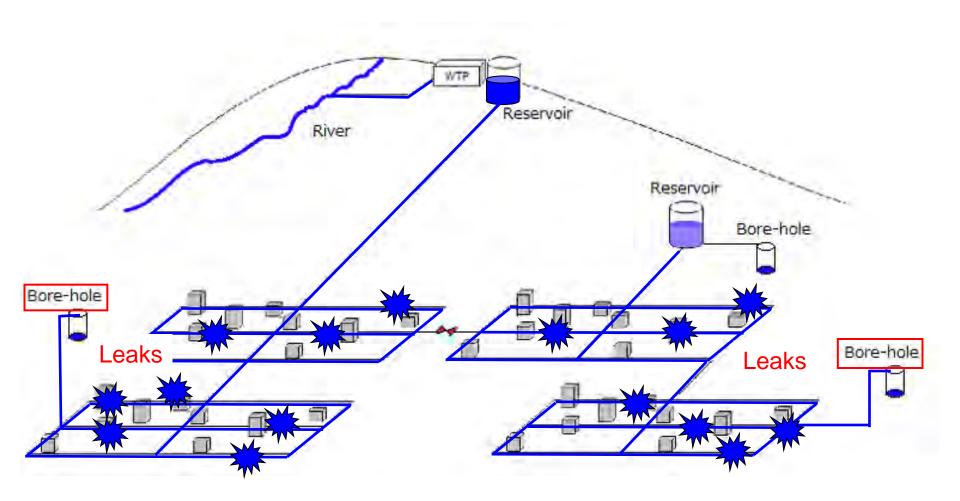


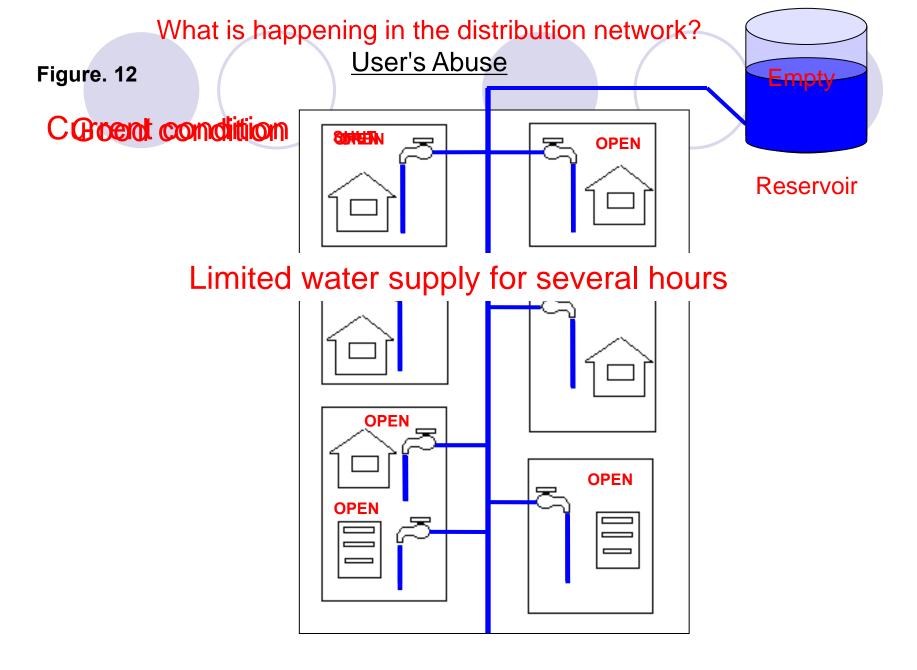
PE



#### Situation in the distribution network

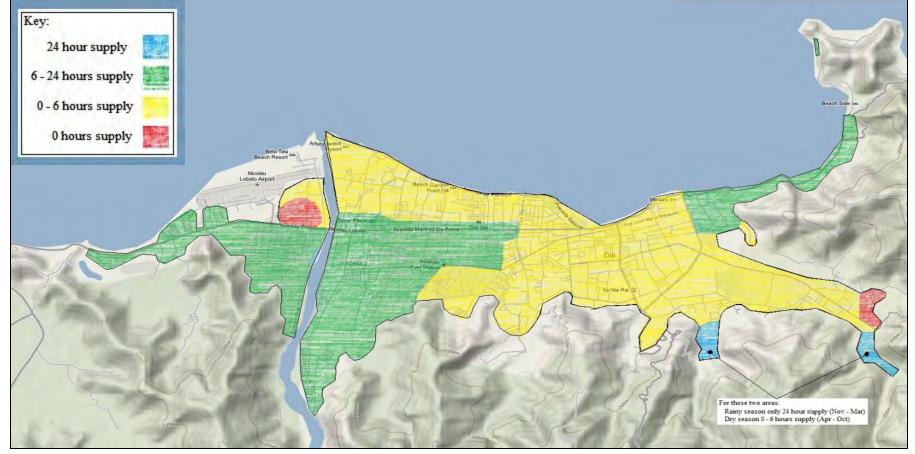
Figure. 11





- Typical mains water pressure in pipe network; (2 meters)
- Number of water pipe breaks in the distribution network : ( 800/year)
- Required number of test of treated water for residual chlorine: ( 365 /year)
- Number of customers who received intermittent supply; ( > 90%)

Figure. 13. Intermittent Supply



#### Reduction of Non Revenue Water and water Supply Standard

#### Action

Beside the help from donors, DNSA has established 5 Years action plan in 2012, by which many facilities such as reservoirs, distribution pipes and connection will be rehabilitated further reduce NRW to 40%. Activities in the action plan are now in progress.

#### Achievement

- 1. Since 2007, DNSA sets 150 liter as a daily water supply to customers, However, current condition of the distribution network; leaking pipe, illegal connections NRW up until August 2013 was almost 100%. But now, DNSA has resumed billing in selected areas. And NRW is now estimated to be around 80%
- 2. DNSA could evaluate it as 40% and will try to extend whole Dili. Activities in the action plan are now in progress.

#### ☐ Current action against the problem

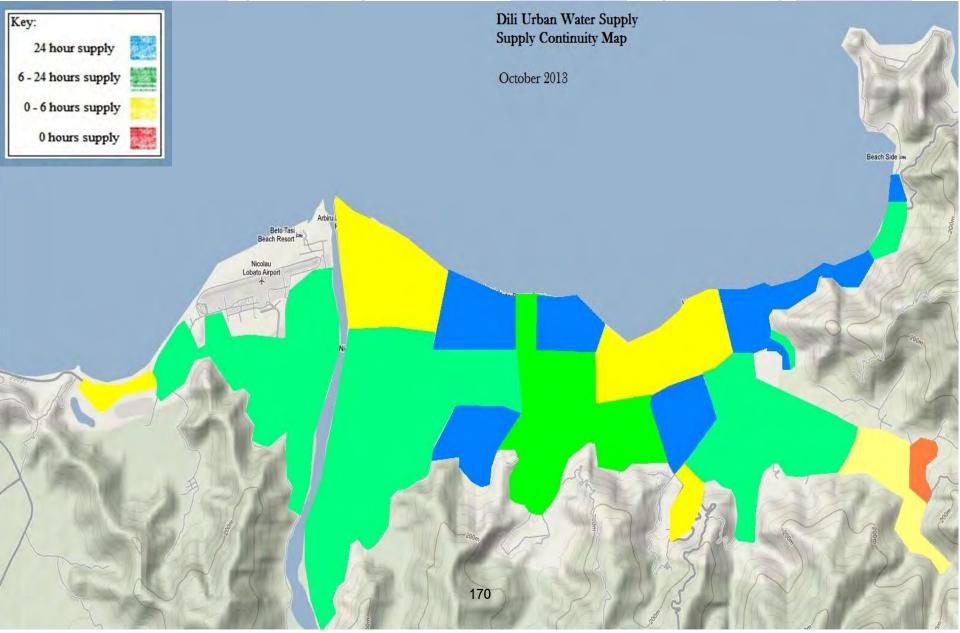
- Caretaker appointed in sub zones
- 2. Improved planning and detail design with Technical assistance from JICA and ADB
- 3. Public Private Partners (PPP) is being evaluated

#### Major achievement in improvement of water supply services

- 1. Has installed new pipes (PE: 118km, DIP: 23km), respond Customers complaint
- 2. Introduce issue bill of tariff and
- 3. 10.975 Customers registration 0n 2012 up to 11,247 Customers for this year (August 2013).
- 4. GMF involvement has increased their confidence to speak and ability to make decisions on implementation water system, Woman (28.10%), Man (71.90%) of period 2010-2013.

With ADB and JICA supported to DNSA with a Zonal Approach. Three subzones have been rehabilitated

Figure. 13.1. Intermittent Supply

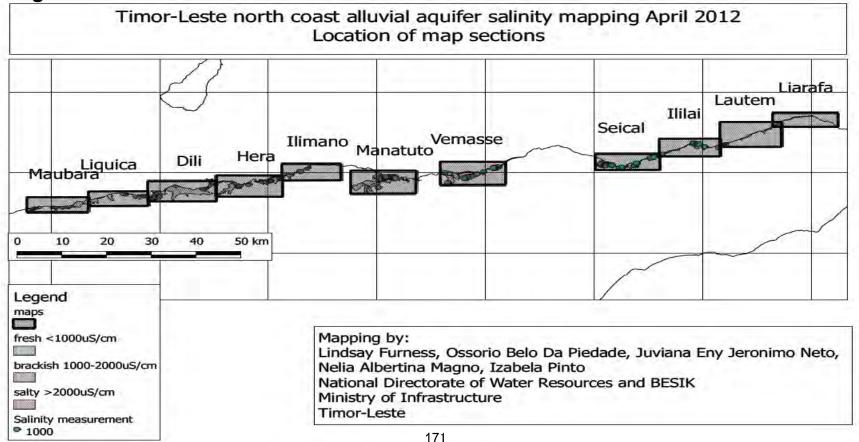


#### Water resource management

Has scheduled to monitor and control water quality for twice per year;

- with conductivity of less than 1000 uS/cm, suitable for drinking, cooking and
- Brackish water 1000 2000 uS/cm, suitable for cooking and washing
- Salty water > 2000 uS/cm, suitable for washing only

Figure. 14



#### Monitoring system

#### DNSA has commenced a regular monitoring activity such as;

- Water quality monitoring by laboratory staff on monthly basis for regular test
- Water quality monitoring by operator WTP staff on regular basis
- Dedicated staff to supervise the condition in intake on regular basis

Figure. 15



**Tabel. 5 Parameters and Frequency of monitoring** 

SI	Parameters	frequency of  Monitoring	Remarks		
	Physical				
1	Colour	Daily	for water system which have treatment plants. Without treatment plants, monitor every quarter.		
2	pH value	Daily	for water system which have treatment plants. Without treatment plants, monitor every quarter.		
3	taste & Odour	Daily	for water system which have treatment plants. Without treatment plants, monitor every quarter.		
4	total dissolved solids (TDS)				
5	Turbidity	Daily	for water system which have treatment plants. Without treatment plants, monitor every quarter.		
	Chemical				
			only for groundwater source before selection of the water		
6	Arsenic (As)	Once	source		
7	Flouride (as F-)	Yearly	only water systems which use gournd water source		
8	Hardness (as CaCO3)	Quarterly			
9	Iron (as Fe +2)	Quarterly			
10	Manganese (Mn+2)	Yearly			
11	Nitrate as NO3-	Monthly	for Dili water supply system		
12	sulphate (SO42-)	Quarterly			
13	Residual Chlorine	Daily	for water system which use chlorination		
	Bacteriological				
14	E. Coli	Monthly	More frequently during monsoon		
15	Total Coliform	Monthly 173	More frequently during monsoon		

#### Drinking water quality Standard/norms/regulation in Timor Leste

#### Tabel. 6

National Drinking Water Quality Standard

	J	-	Maximun	
No	Parameter	Unit	permissible	Remarks
			limit	
A	Physical			
1	Colour	TCU	5	TCU is True Colour unit
2	pH value		> 6.5  and < 8.5	> = lessthan and < = more than
3	Taste & Odour		Unobjectionable	
	Total Dissolved Solid			
4	(TDS)	Mg/L	1000	
5	Turbidity	NTU	<5	NTU is Nephelometric Turbidity Unit
В	Chemical			
6	Arsenic (As)	Mg/L	0.01	
7	Flouride (as F')	Mg/L	1.5	
8	Hardness (as CaCO3	Mg/L	200	There is no signicant helath impact known
9	Iron (as Fe +2)	Mg/L	0.3 mg/L	There is no signicant helath impact known No limit for drinking watr supplied from public Source
10	Manganese (Mn+2)	Mg/L	0.4 mg/L	
11	Nitrate as NO3-	Mg/L	50	
12	Sulphate (SO42-)	Mg/L	250	no limit for drinking water supplied from public sources
13	Residual Chlorine	Mg/L	0.1 - 0.2	in water system where chlorination is used
C.	Bacteriological			
14	Total Caliform Bacteria	must not be 100 ml samp	detectable in any ole	in case of large supplies, where sufficient samples are examined, must not be present in 95% of samples taken through out any 12 months periiod
	E. Coli or Thermotolerant	must not be	detectable in any	
15	bacteria	100 ml samı	ple	174

#### Situation of policy and regulation in Timor Leste

#### Tabel. 7

	Legislative requirement/Guideline	
Status	Water Services Decree 2004	
	Enviromental base law	
	Environmental licensing law	
	• Water resource law (Draft)	
National and Regionla Plan	Prime Minister and Cabinet Timor Leste Government National	
	Development Plan 2020	
	DNSA Five Year Action Plan	
	Timor Leste infrastructure Asset management plan 2003-2022	
	water supply system assest.	
Guidelines, Codes and Standards	National drinking water quality standards and monitoring	
	guidelines(2011)	
	• Timor Leste National Water Supply Policy (DRAFT) 2012	
	Timor Leste water resource policy	

#### Water billed / sold

#### Tabel. 3

Domestic (Household)	Non Domestic (Industrial,	Bulk water sales	TOTAL
	commercial, institutional, other)		
Just Start on August 2013	Just Start on August 2013	5400	1, 422,492

#### VI. Customers

#### The water rate system.

#### Tabel. 4

Type of Customers	Consumption	Tariff (US\$/1000 liter)	
Domestic (Households)	= 14.00 Liters	US\$ 0.20	
	> 14.00 liters	US\$ 0.40	
Social (Public Taps)	a few liters	US\$ 0.10	
Social (Church, Masjid,	a few liters	US\$ 0.15	
Hospital, School, etc)	a few fiters		
General/Commercial	a few liters	US\$ 0.60	

#### The bill collection system.

- 1. Billing was prepared
- 2. Cosumers come to DNSA to obtain Bill
- 3. Consumers pay bill at the Bank
- •Number of new customers connected to water supply system during the year; (80 HH/year)
- •Number of customer complaints recorded during the year; (1368 /year)

#### Connection charge for new customers

- •Domestic (Household) = \$25.00
- •Non Domestic (Industrial, Commercial, institutional, other) = \$ 100.00

# -END-

### -OBRIGADO-

# Water Supply Administration For Better Management of Water Supply Services Course (B)

### Indonesia

Water Supply Administration for Better Management of Water Supply Services (J13-00786)

# Country Report Jakarta Water Supply Enterprise Indonesia







### Indonesia & Jakarta overview





#### Republic of Indonesia

- 240 million total population;
- Archipelago of 17,508 islands, stretch along the equator with 2 distinct monsoonal wet and dry seasons
- Total land area is 1,919,317 sq. km and 93,000 sq. km of inland seas
- Time zone GMT +7 to +9
- Major economic sectors: industry, service & commerce, agriculture

#### Jakarta as Capital City of Indonesia

- 9,2 million total population
- 661 sq. km of total area
- On the north side of Jakarta lies Java Sea which bordered by 35 km long of coastline, where estuaries of 13 rivers and 2 flood canals located.
- Water Supply Service Authority: Jakarta Water Supply Enterprise (PAM JAYA)

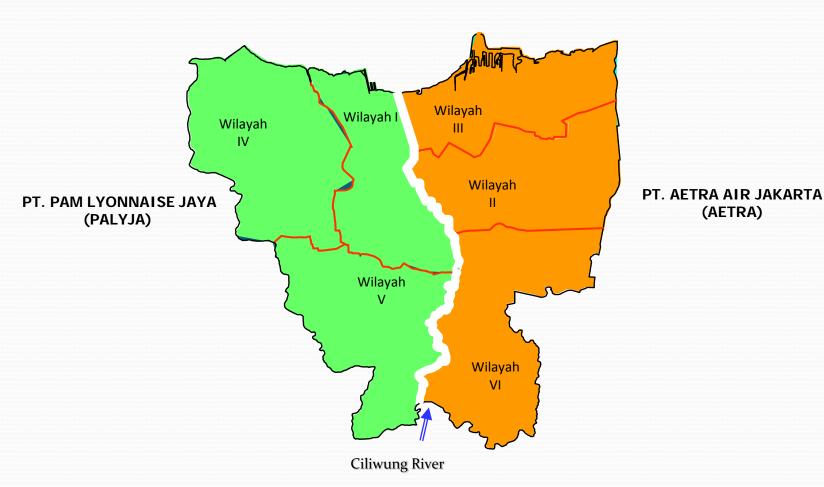


### Jakarta Water Supply Authority

- On February 1998, Cooperation Agreement was signed between PAM JAYA and two Private Companies which marked the handing over of Water Supply Service operation in Jakarta for the period of 25 years, with each company being handed over full operation of Water Supply Service in West side region of Ciliwung River (PT. PALYJA) and East Side region of Ciliwung River (PT. Aetra).
- while PAM JAYA act on behalf of Jakarta Government as the Supervisor of the Cooperation Contract with main responsibility to supervise the water supply service activities carried out by the Private Companies and ensuring targets met

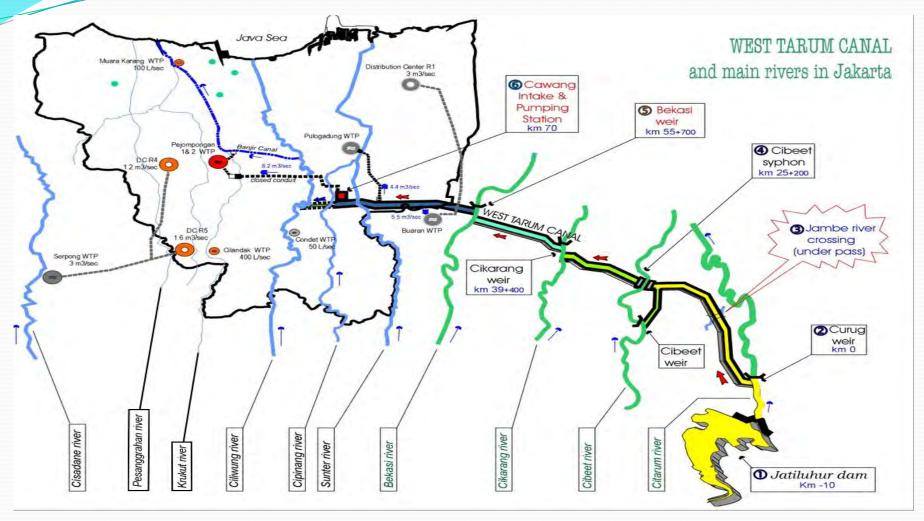


# **Cooperation Service Area**



### Raw water resources





#### Raw Water

- 15,000 lps from Jatiluhur Dam (81%)
- 400 lps from Krukut River (2%)
- 150 lps from Cengkareng Drain(1%)

### Bulk Treated Water (16%)

- 2,800 lps from Cisadane
- 75 lps from Cikokol



### Water source management

#### **Current problems:**

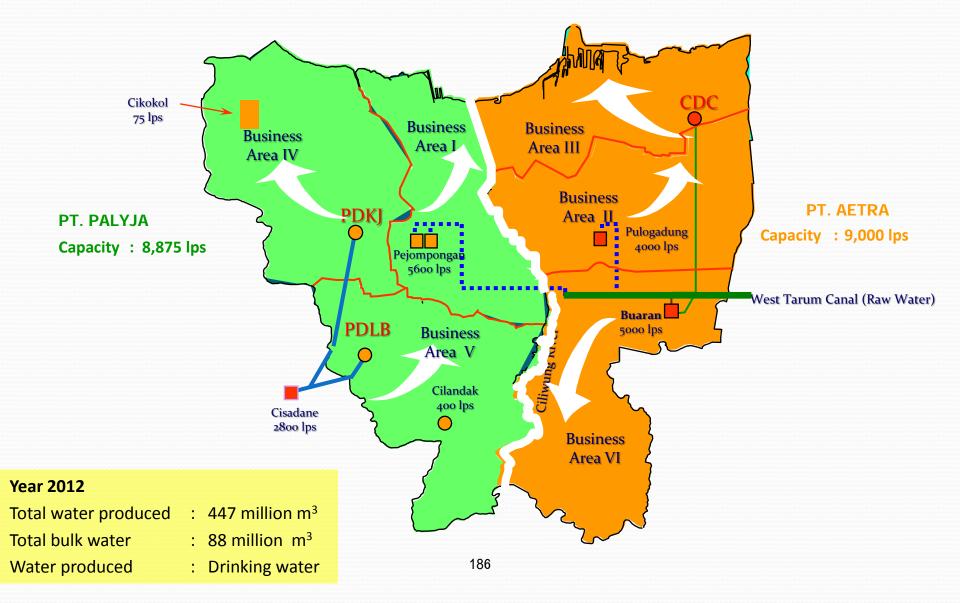
- Limited availability of raw water resources, both in terms of quality and continuity
- Heavily dependent on external water resources (97%)

#### **Current efforts:**

 Conducting studies on utilizing new raw water resources, particularly internal water resources, with the aim of using the rivers as raw water source for new small WTPs or reactivate old small WTPs



# **Production capacity**





### Water treatment management

#### **Current problems:**

Worsening raw water quality → increasing production cost

parameters exceeding raw water standards

Organic matters, Pb, coli form, Manganese, Ammonium

#### **Current efforts:**

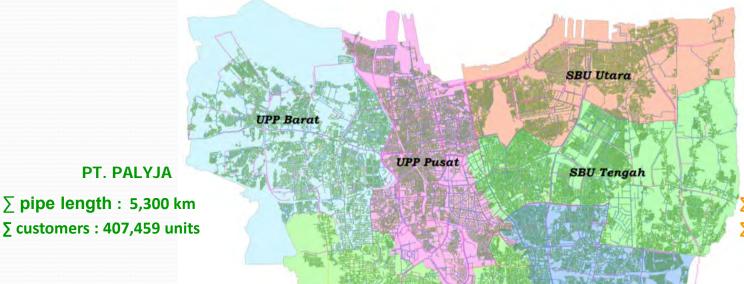
- Optimizing water treatment process
- Upgrading with new equipments (online analyzers, chlorine automatic dosing)

#### **Achievements:**

- Increased production capacity
- Improved reliability of WTP



# Distribution capacity



UPP Selatan

188

SBU Selatan

Year 2012

Total pipe length : 12,000 km

Total Customers : 800,093 units

Service Coverage Ratio: 60.16 %

NRW : 42.19 %

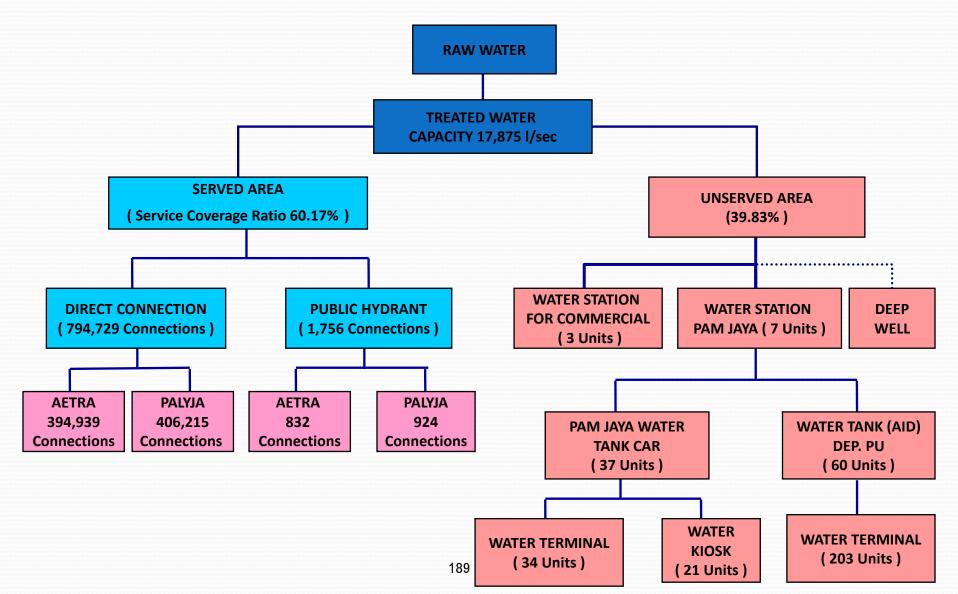
PT. AETRA

∑ pipe length: 6,700 km

∑ customers : 392,634 units



# Water supply distribution





#### **Current problems:**

- High level of NRW, caused by physical loss and commercial loss, i.e.:
  - Illegal connection
  - illegal consumption
  - Poor meter condition
  - Poor and aging pipe network -> prone to leakage
  - Illegal settlement > prone to illegal connection
- Intermittent supply due to inadequate pressure in certain area (house connection standard pressure is ≥ 7.5 m)



#### Water distribution balance:

vater distribution building.					
	Consumption  Unbilled Authorize consumption  Commercial losses  Losses	Billed authorized consumption	Billed Metered Consumption	Revenue water	
Volume Input System			Billed Unmetered consumption		
		Unbilled Authorized consumption	Unbilled Metered consumption Unbilled Unmetered consumption		
		Commercial losses	Unauthorized consumption Inaccurate Customer meter Reading accurary and data processing error	Non Revenue	
		Physical losses	Leakage on transmission and distribution mains Leakage and overflows from utilities storage tanks Leakage on service connection up to	Water	
		191	customer meter		



#### **Current Efforts:**

- Pipe network area metering -> smaller monitoring areas
- Leakage detection with JD7 and Sound Sense
- Pipe network rehabilitation
- Pressure management system on distribution network using PRVs
- Water meter replacement > improve accuracy
- Law enforcement against illegal connection
- strict control of pipe laying works to comply with standards











# Customers profile as per 2012

#### By connection numbers:

Domestic (households)	Non domestic (industrial, commercial, institutional, other)	TOTAL
689,152	110,941	800,093

#### By water consumed volume:

Domestic (households)	Non domestic (industrial, commercial, institutional, other)	TOTAL
184 million m <sup>3</sup>	125 million m <sup>3</sup>	310 million m <sup>3</sup>



# Water rates system

- The water rate tariff is divided by customer group type with each group is progressively charged based on consumption volume block.
- Jakarta Water Supply Enterprise (PAM JAYA) operates under the authority of the Governor of Jakarta; this includes Water tariff setting which needs approval by the Governor of Jakarta



# Water Tariff as of 2007

		Consumption block per m <sup>3</sup>			
No.	Customer group	0 – 10 m <sup>3</sup>	11 – 20 m <sup>3</sup>	> 20 m <sup>3</sup>	
		USD	USD	USD	
1.	Group I	0.09	0.09	0.09	
2.	Group II	0.09	0.09	0.14	
3.	Group IIIA	0.31	0.41	0.48	
4.	Group IIIB	0.43	0.52	0.65	
5.	Group IVA	0.60	0.71	0.85	
6.	Group IVB	1.09	1.09	1.09	
7.	Group V / Port	1.27	1.27	1.27	

### **Problem Analysis Matrix**



	Management, finance, tariff	Water purification	Water distribution, water supply, water service	Pipe materials or types, equipment	Water quality control
Cause of the vicious cycle Detail of the cause	Low coverage area	Ineffective water treatment process	High occurrence of physical loss and commercial loss which cause a high level of NRW	Old and fragile pipes in the network, i.e. GIP and DCIP	Contaminated-prone pipe network
Measures taken / solutions	Expanding service coverage area	<ol> <li>Optimization and up-rating of water treatment process,</li> <li>Online analyzer on parameters of water quality during water treatment process</li> </ol>	<ol> <li>Pipe network area metering,</li> <li>Leakage detection and repair,</li> <li>Pressure management system on distribution network and pumps,</li> <li>Law enforcement against illegal connection / consumption</li> </ol>	<ol> <li>Replacing old pipes with HDPE and PVC pipes,</li> <li>strict control of pipe laying works to comply with standards</li> </ol>	Water quality monitoring in the network and water taps
Results of the action taken	<ol> <li>Increasing volume sold</li> <li>Increasing revenue</li> </ol>	<ol> <li>Upgraded production capacity of WTPs,</li> <li>Improved reliability of WTPs</li> </ol>	Reducing the NRW level to 40%-43% during the last decade (the previous NRW level was > 55%)	Reduced numbers of pipe breaks	Development of drinking water area

# **Problem Analysis Matrix**



#### For future activity:

	Management, finance, tariff	Water resources, intake, water transmission	Water purification	Water distribution, water supply, water service	Human resources
Cause of the vicious cycle Detail of the cause	Failure to achieve full cost recovery mechanism as a whole, particularly caused by the improper ratio between subsidized and subsidizing tariff groups	Limited availability of raw water resources, both in terms of quality and continuity	Worsening raw water quality	<ol> <li>intermittent supply to some of our customers due to inadequate pressure,</li> <li>High level of NRW (&gt;40%)</li> </ol>	Inadequate supervising capability, and lack of awareness and sense of belonging among employees in preserving the water supply system
Priority High, Mid, Low	High priority	Medium priority	Medium priority	High priority	Medium priority
Challenges, activities necessary to change into virtuous cycle	Limitation for large investment funding	currently we are heavily dependent (97%) on external water resources from other companies	Increased production cost	<ol> <li>Illegal connection,</li> <li>Inaccurate metering,</li> <li>Pipe leakage,</li> <li>Pipe breaks caused by other utilities works</li> </ol>	Improving supervising capability and system
Target (expected outcome) & Due date	Convincing the government to make a proper regulation regarding water tariff adjustment to adapt with current conditions	Conducting studies on utilizing raw water resources particularly internal water resources	Optimized and refurbished WTPs with new technology which is more efficient and reliable	<ol> <li>NRW level reduced to economic level of water losses,</li> <li>24 hour continuous supply to all areas</li> </ol>	Reliable human resources
Monitoring method (indicator) of activity	Full cost recovery system achieved	Additional raw water resource for existing WTPs or newly built WTPs	Production costs are kept at a favorable rate		198



Jakarta Water Supply Enterprise - PAM JAYA

Jl. Penjernihan II – Pejompongan - Jakarta 10210

Indonesia

# Water Supply Administration For Better Management of Water Supply Services Course (B)

### Sri Lanka

# COUNTRY REPORT PRESENTATION

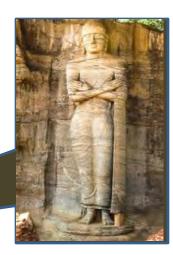
BY SRI LANKA

### **COUNTRY REPORT**

- About Sri Lanka
- About NWS&DB
- Geography & water resources
- Water quality
- Chronic Kidney disease unknown (CKDu)
- Other factors in water sector
- Current problems & analysis
- Improvement plan

### **About Sri Lanka**







### About Sri Lanka - -



Capital - Colombo

Official Language — Sinhala

& Tamil

Legislator – Parliament

Area – 65,660 Sq.Km

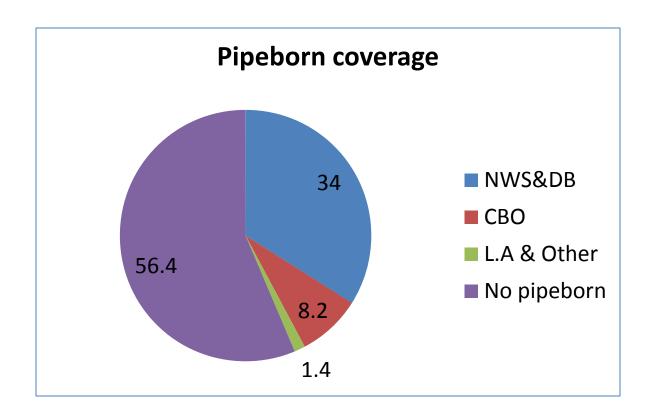
Population – 20.27 Mlns

Religions 
Buddhism Hinduism

Buddhism, Hinduism, Islam, Christianity

### **About NWS&DB**

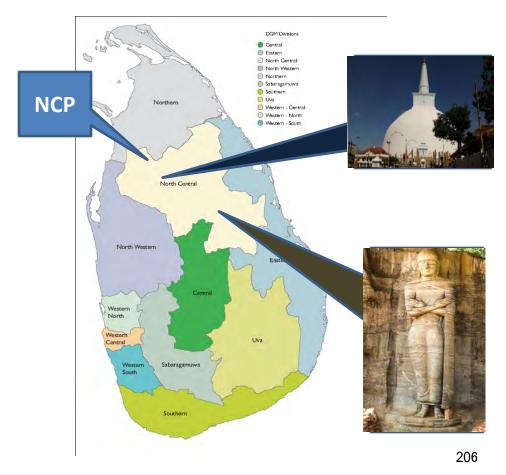
National Water Supply & Drainage Board (NWS&DB) is the National Organization responsible for providing sustainable water & sanitation solutions to the people in Sri Lanka.

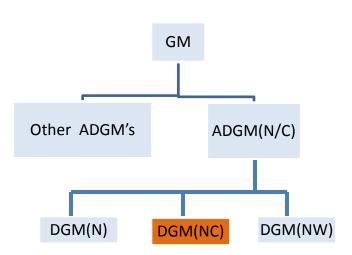


### About the working area . . .

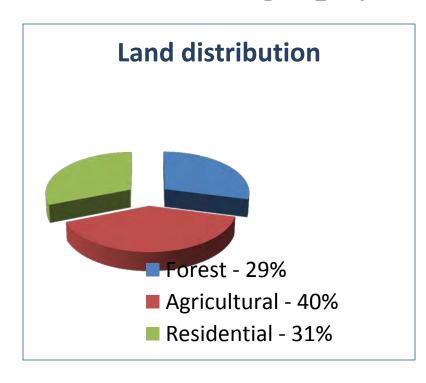
#### **North Central Province (NCP)**

### Position as DGM(NC)



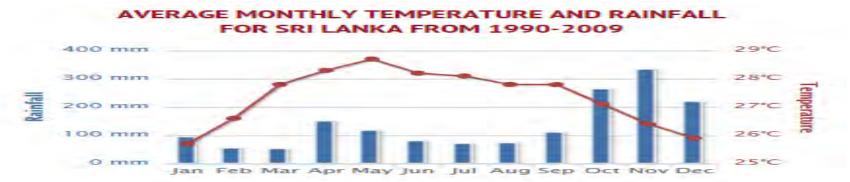


### Geography and water resources



Water sources: Rivers, Lakes, Deep & Shallow GW

River	Length (Km)		
Mahaweli	335		
Aruviaru	164		
Kala Oya	148		
Kelani	145		
Yan Oya	142		
Deduruoua	142		
Walawe	138		



### Water quality management

- Central laboratory equipped for advanced tests & 11 regional laboratories for routine tests.
- Water quality monitoring (Physical, Chemical & bacteriological parameters) in each NWS&DB scheme on a routine program.
- Testing of water samples of community based organizations (CBO's) and local authorities (LA's) on demand.
- Special W.Q monitoring programs in CKDu affected areas.
- WSP's just started and a pilot project in NCP

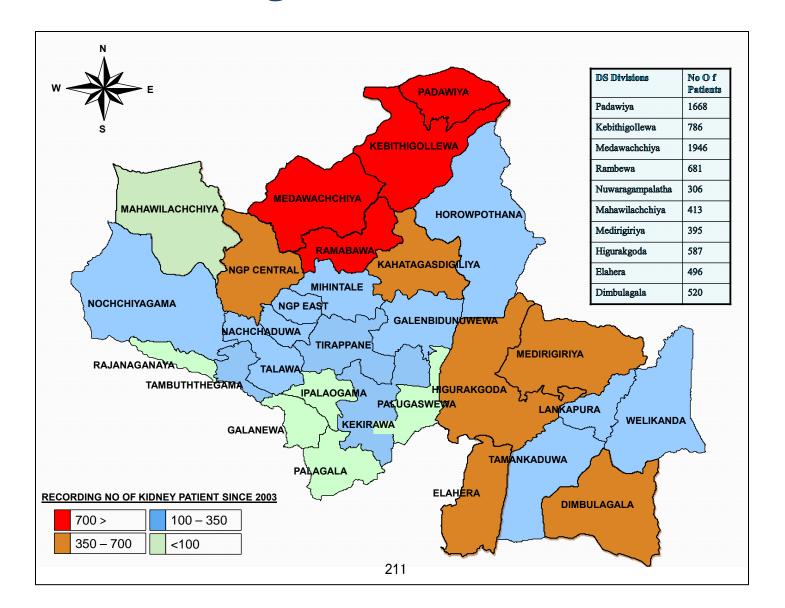
# Water quality problems in unprotected catchments . . .

- Turbidity peaks due to unprotected catchments.
- Deterioration of bacteriological quality of raw water due to groundwater pollution.
- Growth of algae as a result of groundwater pollution.
- Accumulation of heavy metals due to various human activities.
- High fluoride, iron and hardness levels in groundwater.

# Chronic Kidney disease – Unknown (CKDu)

- One of major health issues in Sri Lanka.
- Named as CKDu as exact cause is still unknown.
- Area specific and highest in NCP.
- High fluoride & hardness levels and existence of arsenic, heavy metals, algal toxins etc. in ground water are suspected.

### **According to Health Officials...**



### What we have planned . . .



### Other factors - -

- Number of connections
- Billing Vs collection
- Tariff
- Others in water sector
- Sewerage
- PS involvement
  - o D&B Projects funded by foreign agencies
  - o Local contractors involved with Govt. funding

- 1,592,411
- 95%
- Stepped type
- LA's, CBO's,NGO's
- In Colombo

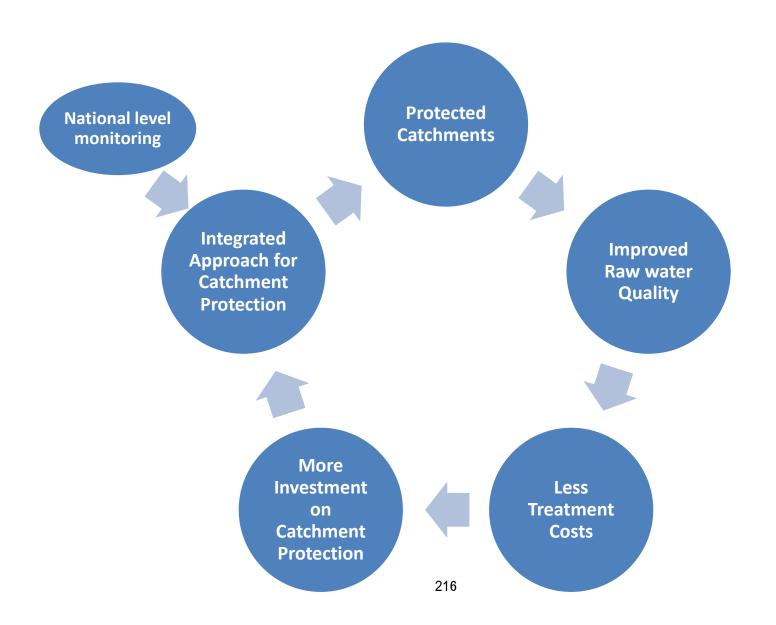
# Current problems considered in the Report..

- Deterioration of catchments due to human activities
- Poor asset management in water supply systems
- Problems towards sustainability of CBO systems

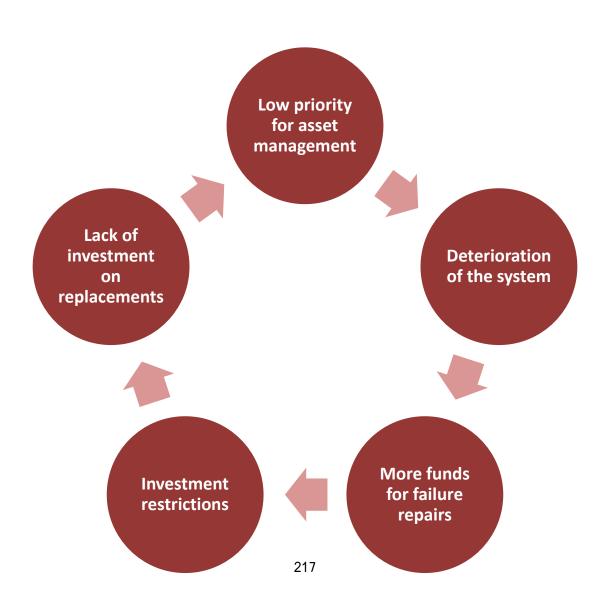
#### **VICIOUS CYCLE ON WATER SAFETY**



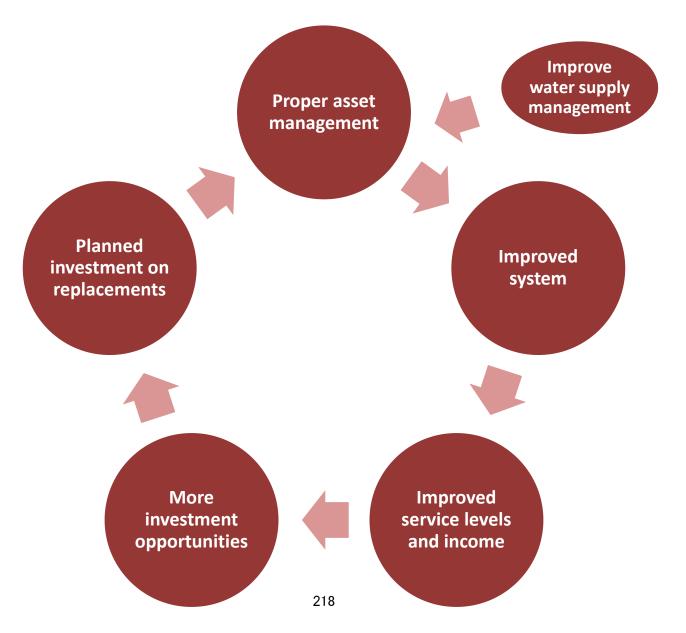
#### **VIRTUOUS CYCLE ON WATER SAFETY**



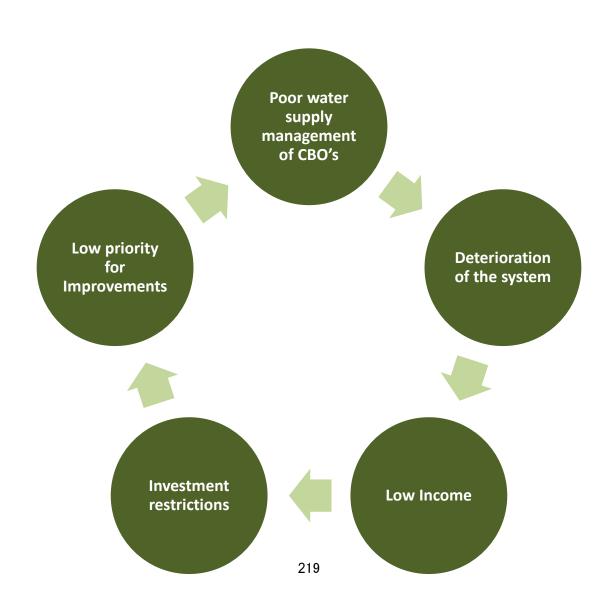
#### VICIOUS CYCLE ON ASSET MANAGEMENT



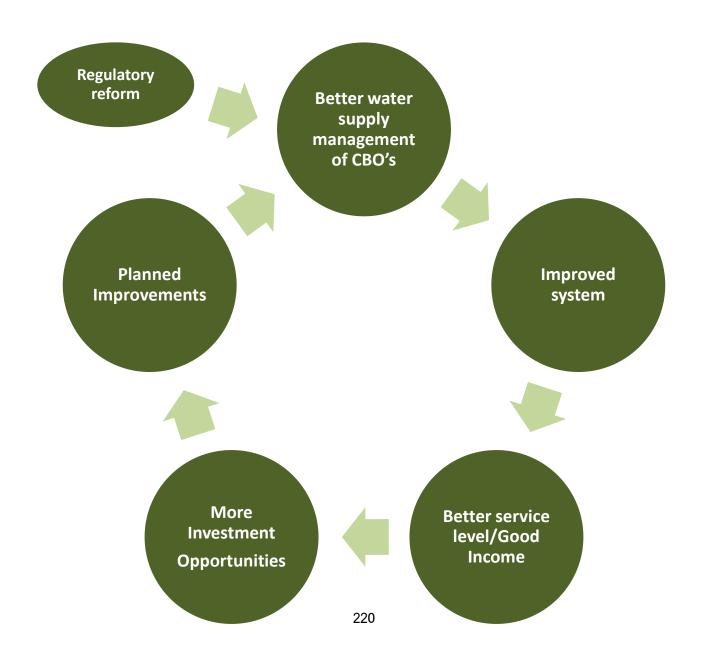
#### VIRTUOUS CYCLE ON ASSET MANAGEMENT



#### VICIOUS CYCLE ON SELF SUPPORTING SYSTEMS



#### VIRTUOUS CYCLE ON SELF SUPPORTING SYSTEMS



#### **IMPROVEMENT PLAN**

No:	Activity	Resources	Responsibility	<b>Due Date</b>	Cost	Expected	Indicator
					?	Outcome	
1	Identify critical areas	Field staff	Health Dept	Dec 2013		Mapping	Map area
2	Initial awareness	Staff	L.A	Feb 2014		Gathering	Number
3	Establish CBO,s	Sociologists	NWS&DB	Aug 2014		CBO.s	Number
4	Establish WS option	Tech. Staff	NWS&DB	Sep 2014		Units	Number
5	Train CBO	Tech. Staff	NWS&DB	Dec 2014		CBO.s	Number
6	Assist to Develop rates	RWS unit	NWS&DB	Sep 2014		Tariff	Number
7	Maintenance agreement	RWS unit	NWS&DB	Sep 2014		Agreement	Number
8	Assess the Impact	Doctors	Health Dept	Dec 2014		Report	Number
9	Advising & corrective actions	Committee	Committee	Routine		Report	Recommendns

### Thank You!

# Water Supply Administration For Better Management of Water Supply Services Course (B)

## Nepal



## Country Report: Nepal

Water Supply Administration for Better Management of Water Supply Services

Tokyo, Japan 20 November 2013

Director General,

DWSS

#### Country Brief

- Location 26<sup>o</sup> 22' N to 30<sup>o</sup> 27' N and 80<sup>o</sup> 4'
   E to 88<sup>o</sup> 12' E, total area 1,47,181 sq km
- Mountains-35%, Hills-23%, Plain-23%
- Population 26.49 million (CBS 2011)
- Nominal GDP(2012) \$17.92 billion
- Per capita \$624.0, Annual average rainfall 1000-4000 mm, Temp -2.4°C to 42°C
- 14 administrative zones, 75 districts, 3914
   VDC, 58 municipalities
- Water supply (2013) 85%, sanitation 62%

#### DWSS Profile

- Department of Water Supply & Sewerage (DWSS) is under Ministry of Urban Development
- Vision: contribute to poverty reduction by improving the health of all citizens by increased sustainable access to safe drinking water, and appropriate sanitation facilities
- Goal: provide basic level water supply services & sanitation coverage to all the populations by the end of year 2017

#### DWSS Profile

- Mission: the mission of DWSS is to implement the policies and programs of the Government to provide safe drinking water & sanitation services to all the people of the country
- Objective: the objectives of DWSS are to facilitate beneficiaries to improve access to safe, adequate and sustainable water supply and sanitation services, and to assist in attaining the sector goals set by the Government

#### Water Sanitation Sector

- Service Delivery Modalities
- Community Participation (20%+80%) District level rural projects
- 2. Cost recovery & cost sharing(50%+50%)-Urban projects
- 3. Co-financing(40%+60%)- selected district level projects

#### Sector Achievement

Indicators	1990	2000	2010	2012	MDG 2015	GoN 2017
Population having basic level drinking water facilities(%)	36	73	80	85	73	100
Population having basic level drinking water facilities(%)	6	30	43	62	53	100

### Services Provided by DWSS

- Facilitate implementation of WASH projects
- Extensive sanitation campaigns (ODF)
- Technical support, capacity building
- Awareness, WSPs, WQ improvements
- Regulation of Water supply services
- Implement technically complicated & large projects (in urban settlements)
- Provide coordination & collaboration
- Ensure budgetary allocation for programs
- Prepare standards, norms, guidelines, etc

#### **Current National Scenario**

#### Prevailing Problems in Water Sector

- Available financial resource is inadequate
- Existing water sources being depleted due to climate variability
- Lack of in-house technical expertise (WTP, WWTP, consumer services, business idea)
- Growing water demand and Urbanization
- High leakages (40%) in the system

For better assessment of the above problems a typical WS Project has been considered here which comprise of representative & specific problems

### Surunga WS Project Situation

#### **Current Status**

- Deep boring 2 nos, OHT 450m³, pressure filter-2 units, aerator unit-1, transmission 325 m, distribution pipe line 25.85 km
- Recently completed WASMIP Project Cycle under JICA assistance
- Ever expanding demand for connections
- Service area not divided into blocks
- Pipe network is branched and only partially looped, Pressure in pipes not regulated
- Pipe networks are more than 7 yrs old

### Surunga WS Project Situation

- Metered domestic connectins 1822 nos, populations served 11650 (2013)
- Average daily demand- 1165 m³/day
- Production capacity of well 2160m³/day
- Annual water bill collection US\$ 32000
- Total annual income US\$ 43500
- Annual operating cost US\$ 19000
- Gross annual profit US\$ 17900
- Domestic connection charge US\$ 75
- Average water charge US\$ 1.64/unit

## Surunga Tariff Structure

(Domestic Use)	In US\$ (Institutional		In US\$	Government	In US\$	
		(Se)		(Domestic Use)		
0 to 8	0.80	0 to 8	1.10	0 to 10	1.00	
9 to 15	0.12	9 to 15	0.15	For every extra 1 unit	0.32	
16 to 25	0.15	16 to 25	0.18	Lump sum/ month	7.85	
26 to 40	0.17	26 to 40	0.21	Tanker, 10 m <sup>3</sup>	34.35	
41 to 55	0.19	41 to 55	0.24	For each 1 m <sup>3</sup>	1.34	
> 55 unit	0.22	> 55 unit	0.28			
		233				

### Prevailing Challenges

- Fe, Mn content in water is high (1.56 & 0.38 ppm respectively)
- Frequent leakages in pipelines >200/yr
- Quality awareness during household storage and handling inadequate
- Absence of in-house water testing labs
- Limited financial resources for WQ improvement plans
- Need more storage (1 unit 450m³OHT), service area extension, ultrasonic water meter, standby pump 25 HP

### Prevailing Challenges

- Pressure filter units and aerator tower needs rehabilitation
- Replacement of butterfly valve needed
- Extra 9 km distribution network needed to meet current demand
- Transformer capacity to be increased from 50 to 100KVA
- Quality of customer service delivery has to be improved
- Estimated NRW 26%, number of Water bill collection counters be increased

### Problem Analysis Matrix

	Management, finance, tariff	Water Resources, intake, water transmission	Water Purification	Water Distribution, water supply, water service	Pipe materials or Types, equipments	Water Quality Control	Human Resources
Cause of the vicious cycle Details of the	Lack of investments 300 mil US\$ is	Sources are depleting May be due to	Purification mostly done in urban water	Inadequate supply Due to high	HDPE pipes used mostly DI or other metal	WQ during monsoon is not satisfactory	Always lacking trained personnel User operated
cause	needed/yr, only UD\$ 30 mil/yr is available	climate variability, global effect	supply High cost of WTP	demand,	pipes are expensive	Lack of coagulation, laboratories, and WTPs	system have few such personnel
Priority – High, Mid to Low	High	High	High	Mid	Low	High	Mid
Challenges, Activities necessary to change into virtuous cycle	Besides government fund, water users and partners must increase investment	Water conservation, climate resilient strategies should be adopted	Install more WTPs with water user's cost sharing	Demand side management, proper leakage detection and repairs	Replacement of older pipes with metal pipes	Adopt advance technology, set up laboratories at all districts, application of WSP	Carry out training need, and O&M assessment, provide capacity building training
Target (expected outcome) and Due date	By the end of 2017	After 5 years	Continuous	Continuous	As needed	Phase wise 5 years	Phase wise 5 years
Monitoring method (indicator) of	Water supply and sanitation coverage will	Source yields measurement	Increment in service coverage by WTPs	Increased water production, reduction in	Less number of leakages	Significant increase in Water Quality	Increased personnel capacity, efficient staff
Activity	increase			leakage and NRW			236

### Required Technology

- Submersible water pumps
- Ultrasonic water meters, transformer
- Portable water quality test kits
- Customer service delivery trainings
- Leak detectors and associated trainings
- Computer, printers, software for computerized billing & records

#### Remedial Measures

- Provide management support and technical backstopping through district level offices
- DWSS will provide training on preparation of business plan for the WUSC
- Future O&M need assessment will be carried out through CHRDU
- WUSC will receive management capacity development trainings by DWSS
- Implementation of Water Safety Plan in progress
- Setting out Performance Indicators is done

#### Remedial Measures

- Replace the pressure filter materials and aerator packed materials to reduce Fe, Mn
- Follow WSP to increase QW awareness in user community
- WSP will reduce chances of contamination
- Train personnel & strengthen regional labs
- Provide portable water test kits
- Adopt computerized billing systems
- Implement civil works for project extension( 1unit OHT450m³,9km distribution pipe line, maintenance works)

### Proposed Organogram

Project Manager Engineer-1

Block Supervisor
1-Sub-engineer for two blocks

Field Technicians
Meter readers-2,tecnicians 2

Mobilizers -2 Social mobilizer, WSP

### **Expected Outcomes**

- Tangible increase in water quantity
- Marked difference in quality of service (quantity, pressure, <u>WQ</u>, reliability, billing, collection, complaints handling, etc.)
- Reduction in water leakage losses by 10%
- Enhanced monitoring mechanism for distribution due to efficient database, training, mapping, block service
- Discourage illegal use of water
- Increase in revenue collection











#### Conclusion

Surunga Water Supply Project was built on cost recovery & cost sharing basis (50%+50%) and is being operated by WUSC who is fully responsible for O&M of the project.

It has undergone management support trainings and is receiving technical support from DWSS. It is now a successful and self-sustaining project having annual profit of US\$ 19000.

#### THANK YOU

### Arigato gozaimasu

# Water Supply Administration For Better Management of Water Supply Services Course (B)

## Myanmar



# UNION OF MYANMAR CHINA INDIA CHINA BANGLADES LAOS Bay of Bengal THAILAND Andaman Sea Gulf of Thailand

#### **Seven States**

- 1) Kachin State
- 2) Kayah State
- 3) Kayin State
- 4) Chin State
- 5) Mon State
- 6) Rakhine State
- 7) Shan State

### **Eight Region**

- 1) Naypyidaw Region
- 2) Sagaing Region
- 3) Thnintharyi Region
- 4) Bago Region
- 5) Magway Region
- 6) Mandalay Region
- 7) Yangon Region
- 8) Ayeyarwaddy Region

## **City Testimony**

Location : E Long; 96 06'

N Lat; 21'59'

• Area : 117.86 km<sup>2</sup>

Population: 10,48941

❖ Population growth :  $\approx$  1.2 %

Nos. of Township : 5

Nos. of Ward : 88

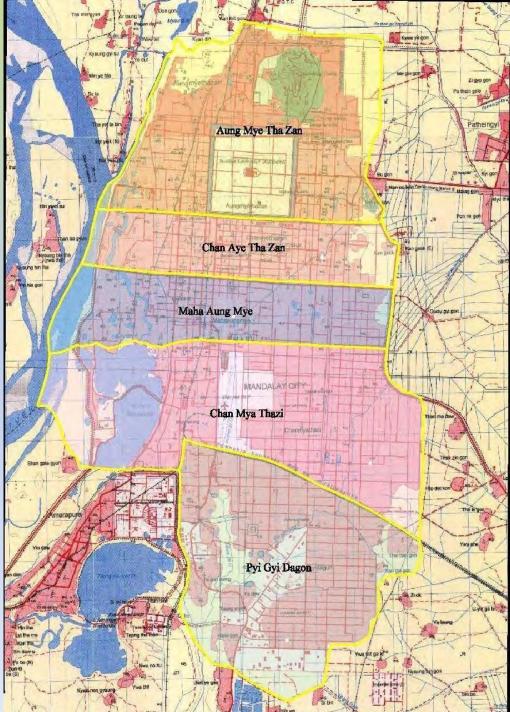
## Expansion of committee area

Name of township : Amarapura

\* Area : 207.45 sq miles

\* Population : 202666

Nos. of Ward: 51 in 2011



## City Area

### **Numbers of Wards**

≥54Nos

## **Numbers of Townships**

**>**4Nos (up to 1993)

## **Numbers of Townships**

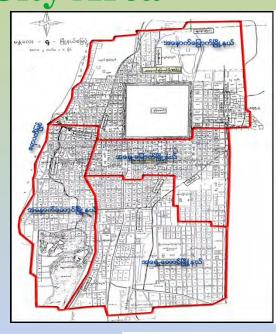
>5Nos (1993-2011)

## **Numbers of Townships**

**≻**6Nos (2011-Now)

#### **Numbers of Wards**

>96Nos (Now)







## I. Organization profile



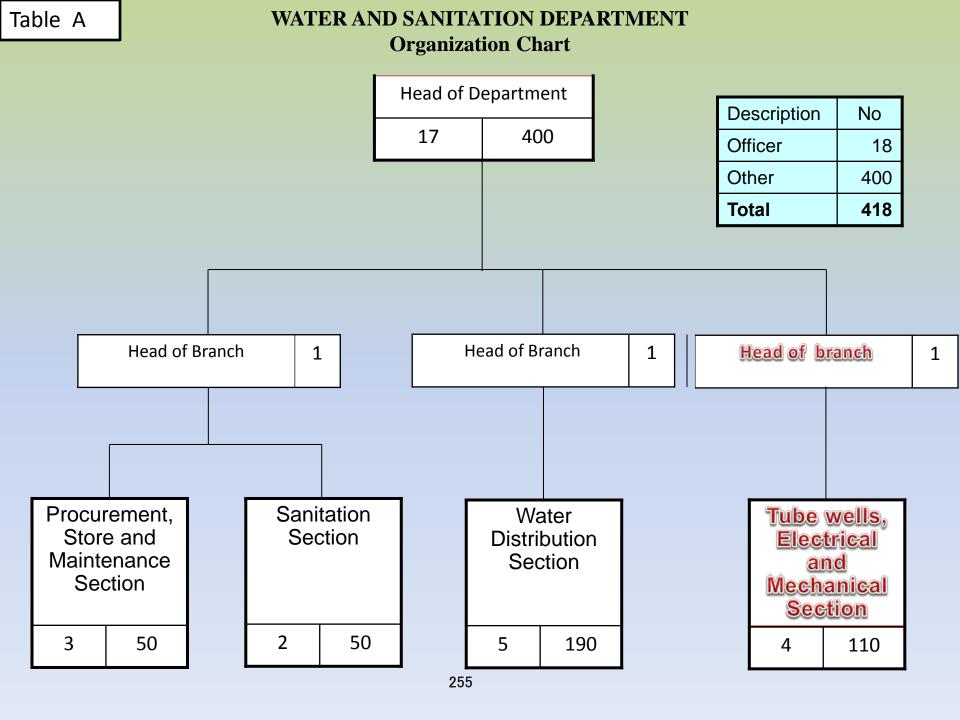
#### MANDALAY CITY DEVELOPMENT COMMITTEE

- 1. Name of Applicant's Organization
- 2. Work of Organization and Service
- 3. Type of the applicant's organization
- 4. Applicants occupation

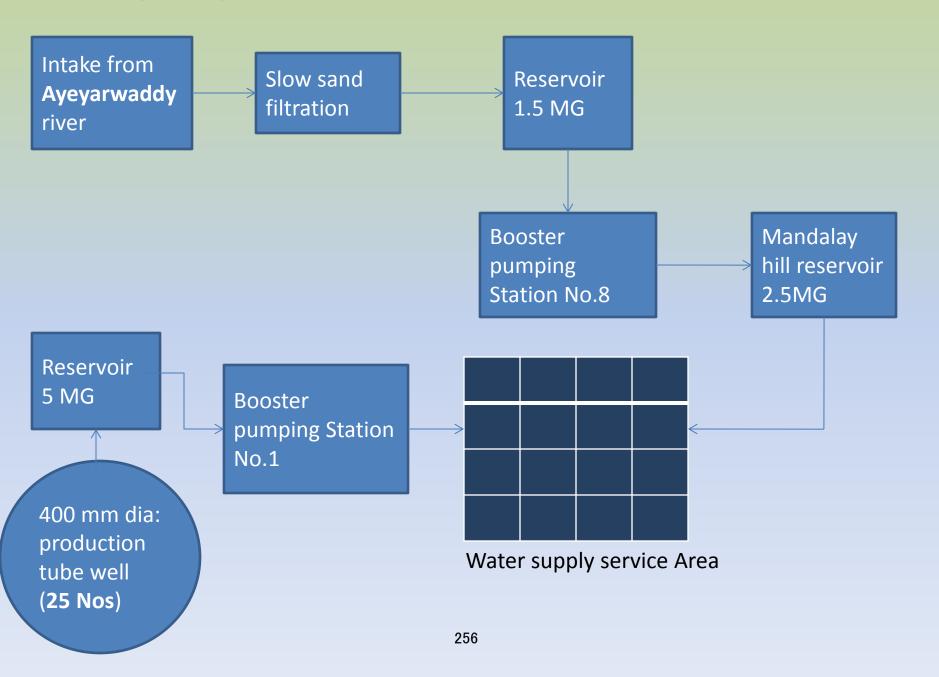
•

5. Organization chart of water and sanitation Department

- Water and Sanitation Department
- Water supply and Sanitation work
- Local Government
- Assistant Engineer (supervise for tube well drilling &operation, booster pump operation and maintenance
- Table A



#### **II.** Flow Chart



#### **III. Water Resources**

1. The geographical background

-Forest 65%, Residential land 35%

2. The precipitation per one year

-Table B

- 3. Type of available water resource
- Groundwater

.

-Surface water

4. The intake water per one day

- -about 30 million gallon
- 5. The type of water resources for future -Surface water / Ground water

## Comparative of Rain fall per years 2004 to 2012

year	rain fall	total days of raining	maximum rain fall		
yeai	rain raii	total days of railing	date	inches	
2004	28 inches	72 days	10.9.2004	2.83	
2005	23.54inches	74 days	14.8.2005	2.2	
2006	60.71 inches	97 days	5.10.2006	3.9	
2007	46.57 inches	87 days	13.6.2007	10.19	
2008	29.91 inches	75 days	24.7.2008	4.14	
2009	26.85 inches	71 days	10.5.2009	2.91	
2010	40.82 inches	93 days	8.10.2010	5.12	
2011	49.02 inches	104 days	16.8.2011	5.87	
2012	24.84 inches	59days <sup>258</sup>	30.9.2012	6.34	

### IV. Policy and Regulation

- Formulation of water supply policies in Mandalay City
- Preparation, allocation and control of budget for water supply
- Supply of enough clean water to meet the water demand
- Control of water quality
- Operation and maintenance of the existing water supply system
- Formulation and execution of plans for improvement including extension of the existing water supply system and facilities
- Procurement of pumps, equipment and materials related to Water Supply
   System

	Name of policy and Regulations	Legislated Year	Purpose / Description
1	The Yangon Water Works Act	1885	To carry out development of the city, to control, supervise and implement the water works concerned.
2	The Canal Act	1905	
3	The Underground Water Act	1930	
4	The Union of Myanmar Public Health Law	1992	
5	The Development Committee Law	1993	
6	Committee Law	8/2002 10/92	260

### V. Water rates and Bill collection system

#### **Water rates**

- Kyats 5/m³ (1990-1996) (up to 90m³/3months)
- Kyats 10/m³ (Above 90m³/3months from 1996)
- Kyats 10/m³ (up to 90m³/3months)
- Kyats15/m³ (above 90m³/3months)
- Kyats 25/m³ (up to 90m³/3months(Dec, 2005)
- Kyats 30/m³ (above 90m³)
- Kyats 55/m³ (March 2007)
- Kyats 55/m³ (Dec, 2010)
- Kyats 77/m³ (Commercial use, Restaurant, Hotel, Shopping Mall and Other Institutional Buildings)

#### Water billing

1. Estimated unaccounted for water

 $-36818 \text{ (m}^3/\text{day)}$ 

2. Percentage of metered water

-72%

3. Annual number of meters repaired

-1000 no

4. Name of authority which determined the water rate

-MCDC

5. Year of the implementation of the current water rate

-2009

6. Name of the system used for the calculation of water rate

-Water charges per one unit x volume of water used by meter

7. Water rate against the amount of consumption

- Progressive

8. Frequency of reading of water meter

-every 90 days

9. Billing period

-3 months

7. Water rate against the amount of consumption

- Progressive

8. Frequency of reading of water meter

-every 90 days

9. Billing period

-3 months

### V. Water quality management

#### **Water Source management**

The water lab of water& sanitation department in Mandalay City Development Committee has been established since the project of water supply system started in 1987. After the project, testing of water quality control has been conducted in 1988-99 and since that time water has been distributed in 4 township in Mandalay region.

### Water quality standard-

	WATER QUALITY DATAS OF EIGHT BOOSTER PUMPING STATIONS										
	Sampling Point	B.P.S 1	B.P.S 2	B.P.S 3	B.P.S4	B.P.S 5	B.P.S 6	B.P.S 7	B.P.S.8	W.H.O S	tandard
	Date	15.5.13	15.5.13	15.5.13	15.5.13	16.5.13	16.5.13	16.5.13	21.5.13		
Sr. No	PARMETER									Desirable	Imperative
1	pH (Scale)	7.4	7.6	7.6	6.8	7.6	7.6	7.6	6.8	7-8.5	6-5-9.2
2	Colour (Units)	less	< 5	5	50						
3	Turbidity (N.T.U)	Nil	3.21	5	25						
4	Conductivity (micromhos/cm)	330	630	580	180	650	560	480	100		
5	Calcium as Ca (mg/l)	32	32	4	20	4	4	8	8	75	200
6	Hardness, Total (CaCo <sub>3</sub> ) (mg/l)	100	120	8	60	8	16	28	40	100	500
7	Magnesium as Mg (mg/l)	5	10	1	4	1	1	1	5	30	150
8	Chloride as Cl (mg/l)	12	58	10	8	15	12	20	8	200	600
9	Total Alkalinity (CaCO <sub>3</sub> ) (mg/l)	220	300	360	80	360	360	240	60	200	500
10	Iron, Total (Fe) (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.1	1
11	Manganese (Mn) (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.5
12	Sulphate (SO <sub>4</sub> ) (mg/l)	<200	<200	<200	<200	<200	<200	<200	<200	200	400

				WA	TER QUAL	ITY DATA	OF 36 TUE	BEWELLS						
	Sampling Point	TW - 1	TW - 2	TW - 3	TW - 4	TW - 5	TW - 6	TW - 7	TW - 8	TW - 9	TW - 10	TW - 11	W.H.O	Standard
	Date	2.5.13	2.5.13	2.5.13	2.5.13	2.5.13	6.5.13	6.5.13	6.5.13	6.5.13	6.5.13	9.5.13		
Sr. No	PARAMETER												Desirable	Imperative
1	р <sup>н</sup> (Scale)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7-8.5	6.5-9.2
2	Colour (Units)	less	less	less	less	Less	less	less	less	less	less	less	5	50
3	Turbidity (N.T.U)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	5	25
4	Conductivity (micromhos/cm)	360	340	330	330	320	330	330	330	340	360	370		
5	Calcium as Ca (mg/l)	16	20	14	16	22	24	28	28	28	24	30	75	200
6	Hardness, Total (CaCo <sub>3</sub> ) (mg/l)	40	40	40	40	68	60	80	88	88	80	88	100	500
7	Magnesium as Mg (mg/l)	1	5	1	1	3	1	3	5	5	5	3	30	150
8	Chloride as Cl (mg/l)	10	10	10	10	10	10	10	10	10	10	10	200	600
9	Total Alkalinity (CaCO <sub>3</sub> ) (mg/l)	210	208	200	208	200	200	200	200	208	220	220	200	500
10	Iron, Total (Fe) (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.1	1
11	Manganese (Mn) (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.5
12	Sulphate (SO <sub>4</sub> ) (mg/l)	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	200	400

#### **WATER QUALITY DATA OF 36 TUBEWELLS** Sampling Point TW-12 TW-13 TW-16 TW - 17 TW - 18 TW - 19 TW - 20 TW - 21 TW - 22 W.H.O Standard TW-15 Date 9.5.13 9.5.13 9.5.13 13.5.13 13.5.13 13.5.13 13.5.13 13.5.13 16.5.13 16.5.13 Desirable Imperative **PARAMETER** No pH (Scale) 7.4 7.5 7.5 7.5 7.4 7.5 7.4 7.5 7.5 7.4 7-85 6.5-9.2 Colour (Units) less 5 50 less less less less Less less less less less Turbidity (N.T.U) Nil 5 25 Conductivity (micromhos/cm) 380 420 420 480 480 420 340 420 400 380 Calcium as Ca (mg/l) 60 58 56 40 48 58 350 60 48 48 75 200 Hardness, Total (CaCo<sub>3</sub>) (mg/l) 180 180 180 180 180 180 120 200 180 160 100 500 Magnesium as Mg (mg/l) 10 10 10 15 15 8 8 12 15 10 30 150 Chloride as CI (mg/l) 20 10 10 10 10 10 10 10 10 10 200 600 Total Alkalinity (CaCO<sub>3</sub>) (mg/l) 240 260 200 240 260 260 260 220 260 260 240 500 10 Iron, Total (Fe) (mg/l) 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.1 1 Manganese (Mn) (mg/l) 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01. 0.01 0.05 0.5 Sulphate (SO<sub>4</sub>) (mg/l) <200 <200 <200 <200 <200 <200 <200 <200 <200 <200 200 400

	Sampling Point	TW – 34	TW - 35	TW -36	W.H.O S	tandard
	Date	23.5.13	23.5.13	23.5.13		
Sr. No	PARAMETER				Desirable	Imperative
1	pH (Scale)	7.5	7.4	7.4	7-8.5	6.5-9.2
2	Colour (Units)	Less	less	less	5	50
3	Turbidity (N.T.U)	Nil	Nil	Nil	5	25
4	Conductivity (micromhos/cm)	580	480	460		
5	Calcium as Ca (mg/l)	12	8	8	75	200
6	Hardness, Total (CaCo <sub>3</sub> ) (mg/l)	36	28	24	100	500
7	Magnesium as Mg (mg/l)	1	1	1	30	150
8	Chloride as Cl (mg/l)	35	20	15	200	600
9	Total Alkalinity (CaCO <sub>3</sub> ) (mg/l)	260	240	220	200	500
10	Iron, Total (Fe) (mg/l)	0.01	0.01	0.01	0.1	1
11	Manganese (Mn) (mg/l)	0.01.	0.01	0.01	0.05	0.5
12	Sulphate (SO <sub>4</sub> ) (mg/l)	<200	<200	<200	200	400

#### WATER QUALITY DATA

	Sampling Point	Moat Water	Ayeyarwaddy River Water	Dohthawaddy River Water	Sadawgyi Dam Water	W.H.O	Standard
	Date						
Sr. No	PARAMETER					Desirable	Imperative
1	p <sup>H</sup> (Scale)	6.8	6.8	7.1	6.8	7-8.5	6.5-9.2
2	Colour (Units)	20	> 50	30	> 50	5	50
3	Turbidity (N.T.U)	9.64	38.1	3.5	63.3	5	25
4	Conductivity (micromhos/cm)	180	120	320	130		
5	Calcium as Ca (mg/l)	16	11	64	13	75	200
6	Hardness, Total (CaCo <sub>3</sub> ) (mg/l)	68	60	200	68	100	500
7	Magnesium as Mg (mg/l)	5	14	10	6	30	150
8	Chloride as Cl (mg/l)	8	8	8	5	200	600
9	Total Alkalinity (CaCO <sub>3</sub> ) (mg/l)	80	60	188	68	200	500
10	Iron, Total (Fe) (mg/l)	0.02	>0.2	0.04	> 0.2	0.1	1
11	Manganese (Mn) (mg/l)	0.02	0.03	0.03	0.05	0.05	0.5

<200

<200

200

400

<200

Sulphate (SO<sub>4</sub>)

(mg/l)

<200

#### **Laboratory Equipment & Instrument List**

#### **Test Parameter & Test Method**

No	parameter	Type of Instrument	Test Method	Test Range
1	D.O	Sension 378 (HACH)	Probe Method	
2	B.O.D	Sension 378 (HACH)	Winkler's Mehtod &	
			Probe Method	
	HEAVY METAL			
3	Arsenic as As	Test kit (HACH)	Strip/ Colour) Matching	0-500 ppb
4	Copper as Cu	Test kit (HACH)	Colour Disc &	0-100 mg/l
			Colour Matching	0-500 mg/l
5	Cyanide as CN	Test kit (HACH)	Colour Disc &	0-0.2 mg/l
			Colour Matching	
6	Lead as Pb	Test kit (HACH)	Digital	5-150 mg/l

	Laboratory Equipment & Instrument List								
	Test I	Parameter & Test Method							
No	Parameter	Type of Instrumetn	Test Method	Test Range					
	Physical Examination								
1	р <sup>Н</sup>	p <sup>H</sup> Meter/ Strip	Digital/ Coloar						
			Matching						
2	Colour	Test Kit (HACH)	Colour Matching	0-100,0-500					
3	Turbidity	Turbidity Meter	Digital	0-1000					
		(HACH 2100P)							
4	Conductivity	DREL/5 With							
		Conductivity (HACH)							
	Chemical Analysis								
5	Calcium as Ca		Titration Method						
6	Hardness, Total as CaCO <sub>3</sub>		Titration Method						
	Total (CaCO <sub>3</sub> )								
7	Magnesium		Titration Method						
	as Mg								
8	Chloride as Cl		Titration Method						
9	Total Alkalinity, Total as CaCO3		Titration Method						
10	Iron, Total (Fe)	Test Kit (HACH)	Colour Disc &	0-1.0 mg/l					
			Colour Matching	0-0.2 mg/l					
11	Manganese	Test Kit (HACH)	Colour Disc &	0-0.7 mg/l					
			Colour Matching	0-0.7 mg/l					
12	Sulphate	Test Kit (HACH)	Plat form TRB	0-200 mg/l					
13	Nitrate	Test Kit (HACH)	Colour Disc &	0-50 mg/l					
	Nitrogen (NO <sub>3</sub> - N)		Colour Matching						

## VI. Water quality management

**Drinking Water quality** (W.H.O Standard referring for Mandalay Water quality)

No	Parameter	Units	W.H.O Standard		
110	T at affected	Cints	Desirable	Imperative	
1	$p^{H}$	Scale	7-8.5	6.5-9.2	
2	Colour	Units	5	50	
3	Turbidity	N.T.U	5	25	
4	Conductivity	(micromho/cm)			
5	Calcuim	mg/l	75	200	
6	Total Hardness as Ca CO <sub>3</sub>	mg/l	100	500	
7	Magnesium as Mg	mg/l	30	150	
8	Chloride as Cl	mg/l	200	600	
9	Total Alkalinity as CaCO <sub>3</sub>	mg/l	200	500	
10	Iron as Fe	mg/l	0.1	1	

No	Parameter	Units	W.H.O Standard		
110	1 ar ameter	Omes	Desirable	Imperative	
11	Manganese as Mn	mg/l	0.05	0.5	
12	Sulphate as SO4	mg/l	200	400	
13	Nitrate Nitrogen (NO <sub>3</sub> -N)	mg/l	-	50	
14	Arsenic (As+)	mg/l	-	0.01	
15	Copper (Cu <sup>+</sup> )	mg/l	-	2	
16	Cyanide (CN <sup>-</sup> )	mg/l	-	0.07	
17	Lead (Pb)	mg/l	-	0.01	
18	Biochemical Oxygen Demand (Effunent)	mg/l	20		

#### **Laboratory Situations**

### Laboratory Equipment & Instrument List Test Parameter & Test Method

No	Parameter	Type of Instrument	Test Method	Test Range
1	D.O	Sension 378 (HACH)	Probe Method	
2	B.O.D	Sension 378 (HACH)	Winkler's Method & Probe Method	
	HEAVY METAL			
3	Arsenic as As	Test kit (HACH)	Strip/ Colour Matching	0-500 ppb
4	Copper as Cu	Test kit (HACH)	Colour Disc & Colour Matching	0-100 mg/l 0-500 mg/l
5	Cyanide as CN	Test kit (HACH)	Colour Disc & Colour Matching	0-0.2 mg/l
6	Lead as pb	Test kit (HACH)	Digital	5-150 mg/l

No	Parameter	Type of Instrument	Test Method	Test Range
	PHYSICAL EXAMINATION			
1	$p^H$	p <sup>H</sup> Meter/ Strip	Digital/ Colour Matching	
2	colour	Test Kit (HACH)	Colour Matching	0-100,0-500
3	Turbidity	Turbidity Meter (HACH 2100P)	Digital	0-1000
4	Conductivity	DREL/5 With Conductivity (HACH)		
	CHEMICAL ANALYSIS			
5	Calcium as Ca		Titration Method	
6	Hardness, Total as CaCO <sub>3</sub>		Titration Method	
7	Magnesium as Mg		Titration Method	
8	Chloride as Cl		Titration Method	
9	Total Alkalinity, Total as CaCO <sub>3</sub>		Titration Method	
10	Iron, Total (Fe)	Test Kit (HACH)	Colour Disc & Colour Matching	0-1.0 mg/l
11	Manganese	Test Kit (HACH)	Colour Disc & Colour Matching	0-0.7 mg /l
12	Sulphate	Test Kit (HACH)	Plat form TRB	0-200 mg/l
13	Nitrogen Nitrate	Test Kit (HACH)	Colour Disc & Colour Matching	0-50 mg/l

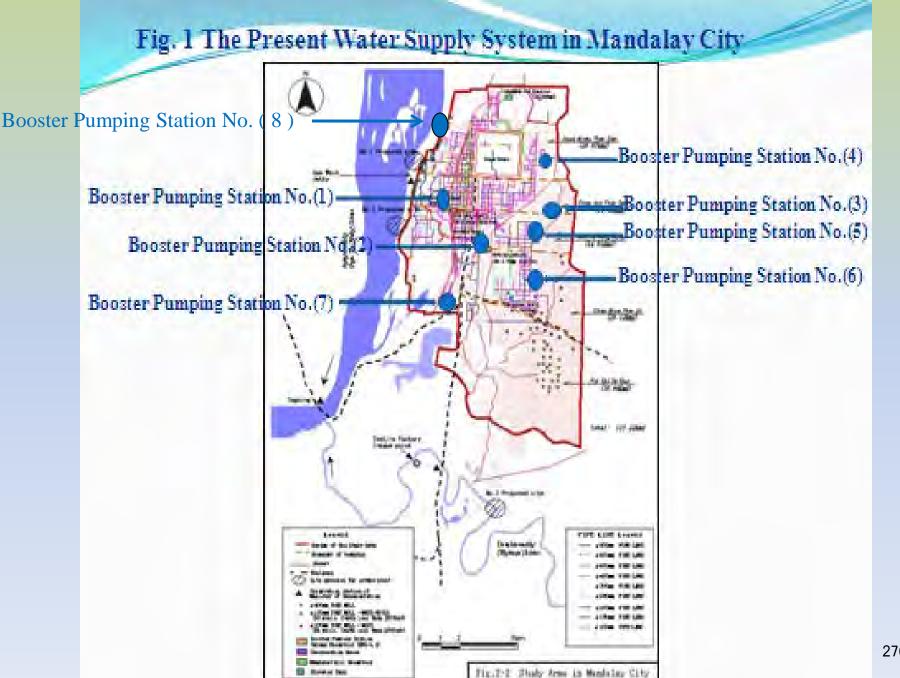
## **VII. Water Supply Service**

- population ratio to be served by the applicant's organization
- 2. Average number of hours per day of water availability to most people
- 3. The distribution water use

4. Non revenue water(NRW)

72 **: 28** 

- \_ 8hour/ day (depend upon electrical power )
- it is not directly used for the potable water
- 35%



#### VIII.Other

- If citizen cannot get sufficient water from public water supply system, they get from-
- The way of assuring secure water for the largest building

\_ private tube well

Public water supply system& private tube well

#### Existing Sewage system

Sewerage system

-no central sewerage system, Use septic tanks

ventilated pit latrine and pit latrine.

Septic Tanks

- Mostly use in urban area

Effluent

- Flow into the side drain

Sludge

-Removed by night soil truck and dispose

to the oxidation pond.

Apply for the permission of construction of septic tank.(Up flow filtration septic tank Activate sludge system-super market, hospital)

#### **Future plan for sewage system**

- -To install wastewater treatment plant for east part of city.
- -Domestic wastewater to be treated by activated sludge process before flowing to the
- . Taungtaman lake.
- -To install treatment system near Kawdawgyi
- -Entrance to treat Thingazar Creek wastewater before following to Kandawgyi lake
- -To install sewer lines in downtown area (Long Term Plan)

#### > Current situation of Solid Waste Management System

- The Householder carry the waste bag or basket or bin to the truck and disposal
- on the truck
- Collection Frequency in a week 3 to 4 times
- No Container System and No Dumping Site
- Direct dispose to refuse truck
- Total solid waste generation is 450-600 Ton/day

#### > Future Plans for Solid Waste Management System

- To implement refuse free zone in some ideal place and extension of refuse free zones gradually (2012) and the whole city.
- To organize the people not to dispose the waste to main drains and near by drains.
- To purchase more proper vehicles, compactor trucks, dust bins and to appoint more workers to get sufficient facilities for collecting and transportation of refuse.
- To organize the people to use3Rs (Reduce, Recycle, Reuse) and to use more proper or cloth bag for packing instead of thin plastic.

  279

### The biggest problems in Mandalay are-

- A. Leakage of Water Transmission pipe line
- B. Lack of central sewage plant and
- C. Cannot distribute enough water to fulfill the demand for water of the city.

#### Form on Present Situation of the Water Supply and Management

#### Instructions for completing the form

- 1. All information provided should be for the fiscal year 2012 or most recent data if 2012 year"s data is unavailable (please indicate the year of the data available).
- 2. Please ensure that all information is provided for the same period (e.g. financial year).
- 3. For all financial information, please specify in the local currency with equivalent US dollars.
- 4. When the answer to a question is unknown, please leave blank. Blank cells will be treated as "not available" data.
- 5. When a value is zero, please enter "0".

#### I. Service Area

- 1 Size of Utility"s area of Responsibility: ( 314.6 sq. km)
- 2 Size of Utility"s present service area: (119.58 sq. km)
- 3 Population of Utility"s area of responsibility: (100%)
- 4 Population of Utility"s present service area: (72%)
- 5 Population served by the Utility with piped water supply: (72%)
- 6 Number of towns served with piped water: ( 4 towns )

### **II. Infrastructure Description**

1 Source of raw water (please tick relevant boxes)						
□ bulk water from another utility / company						
□ storage reservoir / impoundment						
□ direct river abstraction						
□ groundwater						
□ other, please specify surface water						
2 What are the main methods of treatment used? (please tick relevant boxes)						
none						
□ disinfection						
□ filtration						
□ flocculation and sedimentation						
□ aeration						
□ desalination						
□ other, please specify slow sand filtration system						
3 Capacity of production systems: ( 122720 m3 / day)						
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2						
4 Length of water distribution network:(200 km)						
5 Capacity of storage in network ( <b>51360m3</b> )						

#### 6 Piped water supply connections: *please specify how many in each category*

Domestic (Households)	Non Domestic (Industrial, commercial, Institutional, other)	TOTAL
-	<del>-</del>	-

- 7 Number of connections with operating water meters: (86492 no)
- 8 Typical length of service connection from water main to water meter: (3-100 meters)

#### **III. Water Consumption & Production**

- 1 Volume of water produced by the Utility: ( 44million m3 / year)
- 2 Volume of water bought in bulk from other utility / company: ( NO)
- 3 Volume of water metered: (31.18 m3 / year)
- 4 Estimated un-metered consumption: (42.84 % of metered consumption)
- 5 Estimate of average meter inaccuracy at typical flows rates: ( \_ % of metered consumption)

# 6. Volume of water billed / sold: *please specify how much (million m3 / year) in each category*

	Non Domestic (Industrial, commercial, Institutional, other)	Bulk water sales	TOTAL
_	_	_	_

#### **IV. Water Supply System Performance**

- 1 Number of customers who received intermittent supply: ( 100%connections)
- 2 Typical duration of supply (planned and unplanned supply interruptions): ( 10hours /
- . day)
- 3 Typical mains water pressure in your pipe network: (\_)
- 4 Number of water pipe breaks in the distribution network: ( \_ )

- 5 Required number of tests of treated water for residual chlorine: ( / year)
- 6 Number of tests of treated water for residual chlorine carried out: ( / year)
- 7 Number of tests of treated water for residual chlorine passed: ( / year)

#### V. Staff

- 1 Who does the work in your company: (please tick relevant boxes)
- □ permanent staff . salaried Government employees
- □ permanent staff . with contract
- □ casual / part-time . contract staff
- □ casual / part-time . wages
- □ contracted out to outside company / agency
- □ other, please specify

\_\_\_\_\_

#### 2 Number of FTE\* staff in the company: *please specify how many in each category*

Corporate Services (Management, Admin, Finance, Technical, etc.)	Water Supply (O&M, Customer Services, Support Services, etc)	Other non water supply (e.g. wastewater, drainage, environment services)	TOTAL
_	_	_	_

- \* FTE = Full Time Equivalent staff (i.e. convert part-time and casual staff to equivalent full time staff)
- 3 Number of staff that participated in at least one training event during the year: (36 staff)
- 4 Total number of training days ( $\Sigma$ (participants x training event duration)) in the year: (30days)
- 5 Proportion of total operating budget used for Human Resource Development (HRD): (\_ %)

#### VI. Customers

□ other method

1 Number of new customers connected to water supply system during the year: ( 1000/ year) 2 Number of customer complaints recorded during the year: ( 300/ year) 3 Means by which customer can make a recorded complaint (please tick relevant boxes) □ in person by telephone □ by email □ by letter □ other method, please specify 4 How does the Utility find out the views of its customers? (please tick relevant boxes) ☐ from customer interactions (letters, telephone calls, enquiry counter, etc.) □ by responding to customer complaints ☐ from customer surveys , questionnaires, etc. □ by market research

# 5 Typically\* what is the connection charge for new customers? *Please specify how much in each category*

Domestic (Households)	Non Domestic (Industrial, commercial, Institutional, other)	Bulk water sales	AVERAGE of all categories
100 USD	200 USD	_	150 USD

# 6 Typically\* what is the fixed water supply charge / month? *Please specify how much in each category*

Domestic (Households)	Non Domestic (Industrial, commercial, Institutional, other)	Bulk water sales	AVERAGE of all categories
_	_	_	_

# 7 Typically\* what is the water tariff for metered consumption? *Please specify how much in each category*

Tariff Block	Domestic		Non Domestic			Bulk water sales			
	From	То	Cost/m3	From	То	Cost/m3	From	То	Cost/m3
1.									
2.									
3.**									

#### Notes:

8 What would be the monthly water bill for a household consuming 6 m3 of water / month? (0.35 USD )

<sup>\*</sup> Where the Water Utility supplies multiple towns each with their own water charge schedules, please specify the typical tariff schedule nominally for the principal town supplied by the company

<sup>\*\*</sup> Where there are more than 3 blocks in the tariff schedule please specify the approximate average tariff rates for consumptions above tariff block 2.

# **Questionnaire on Major Constraints in Water supply sector**

Constraints	Ranking of constraints			
	Very Severe	Severe	Moderate	
1. Lack of definite government policy for the sector			X	
2. Funding limitations			X	
3. Inadequate or Outmoded legal framework			X	
4. Inappropriate institutional framework				
5. Inadequate water resources			X	
6. Insufficient knowledge of water resources			X	

X

X

X

X

X

290

Inadequate cost-recovery framework

Insufficiency of trained personnel

9. Lack of planning and design criteria

Professional

(2) Sub-professional

10. Inappropriate technology

11. Intermittent water service

**(1)** 

Constraints	Ranking of Constraints			
	Very Severe	Severe	Moderate	
12. Operation and maintenance			X	
13. Logistics			X	
14. Import restrictions			X	
15. Non-involvement of communities			X	
16. Insufficient health education efforts			X	
17. Others (specify):				

#### Water Supply Administration for Better Management of Water Supply Services(B)

PROBLEM ANALYSIS MATRIX(for future activity)

				THOUSE IN THE TOTAL MINTER	tirtion latare delivity)			
	Management, finance, tariff	Water resources,intake	Water purification	Water distribution, Water	Pipe materials or types,	Water quality control	Human resources	other
	iviariagement,iiriance,tanii	Water transmission		supply,Water service	equipment	Water quality Control	Tidinai resources	Ottlei
case of the vicious cycle	reserve allotment for the	_Seasonal getting down	After Seasonal flood	Water supply system is	Necessary to use international	The more secure and safe the	Well practiced labour and	_
detil of the causes	unexpected situation	of the static water level	period leakage of the pipe	needed to be inspect after	standard pipe&equipment	better for the city dweller	technician are needed	
	is needed	_insufficient for the water	line system and mixing	seasonal flood period				
		distribution system	with flood water into the					
			distribution system					
Priority _ High,Mid to Low	MID	HIGH	HIGH	MID	HIGH	HIGH	HIGH	_
Challenges, Activities	Lack of investment,	Cause of deforestation,	Slower rate of surface	Amount of intake water is	-	Pay attention for water	Well practiced labour and	_
necessary to change into	earning those income for	surface water and static	water as river and creek	low down		quality control is needed	technician and administraction	
virtuous cycle	water distribution	water level is low down	sedimentation,so river				are needed	
	Services extended the		bed is risen					
,	water distribution system							
	as circling pipeline system							
Target (expected outcome)	Refunded for the	Preservation for the	Extended the water	Smooth water supply and	Sutible pipe material must	Daily monitoring system	Well practiced labour and	_
&Due dare	enveromental preservation	enveroment and water	purification system	services must be created	be full filled	is needed	technician and administraction	
		resouces					are needed	
Monitoring method	Funded for research	Maintaining the existing	Extended the water	Strong legislation is needed	Sutible pipe material must	Hourly monitoring system	Well practiced labour and	
	and area survey is	resources and looking	purification system	to protect the water	be full filled	is needed	technician and administraction	4
	needed	for new resources		distribution services			are needed	

#### Water Supply Administration for Better Management of Water Supply Services(B)

PROBLEM ANALYSIS MATRIX(for sharing experiences among participants)

			PROBLEM	I ANAL 1313 MATRIX (101 Shani	ng experiences among participa	nis)		
	IManagement finance tariff		Water purification	Water distribution, Water	Pipe materials or types,	Water quality control	Human resources	other
	g ,	Water transmission		supply,Water service	equipment	1 7		
case of the vicious cycle	limitation of the investment	mainly on underground	Sedimentation,	pipe line&Booster pumping	main distribution pipe lines	Monthly monitoringby 8	government employee	-
detil of the causes	for the hold system for	water and partially on	filtration,	system and metering system	are DI ,Sub distribution pipe	parametres		
	the city	surface water	chlorinaion		lines are DI&PVC			
Measures taken/Solutions	uprising of Municipal	Surface water(river)	Sedimentation,	Pumping up to the Hill	_	_	_	
	tax & tariff to get more	pumping up and	filtration,	reservoir and distribute by				
	allotment for water	transmission	chlorinaion	gravity flow to existing pipe				
	distribution			line system				
Date of actions taken	2010-2011 fiscal year	2009-2010 fiscal year	_	_	_	_	_	_
Results of the action	Full allotment for	_	_	_	_	_	_	_
taken	investment gain in							
	3 fiscal year							
Lessons (or) good practice	Good management	Using surface water as	Needed more	Extending for the distribution	_	_	_	_
	is needed to upgrade&	resources made up easy	sedimentation area	expending for the distribution				
	expension of water	collection of water	(or)pond	area is needed				
	distribution system		, ,					
	,							

## Format of the Improvement Plan

1.Title : The Project of Production and Distribution of More Drinking Water

. in Mandalay, Myanmar

Subtitle : Dia, 300 mm Production Tube well 3. Nos Drilling Works

Target group: People living in downtown area and new settlement area

2.Reason of: To provide the demand for water according to the increasing

. the plan population of the town

2.1. Background: Since 1990, Mandalay Water Supply Project has been distributing

and present 1,800,000 gallons of water a day with Dia, 400 mm Production

situations of Tubewell (19) Nos which can produce 50,000 gallons of water per

the problems hour, using underground water.

At present, besides Production Tubewell (36) Nos, using Boaster Pumping Station (8) Nos

together with two sets of slow sand filtration system Boaster Pumping Station, 2,700,000

gallons of water are being supplied daily. However, due to the increasing population,

demand for water supply is also increased.

2.2 Necessity of

:(i) Permission of Mandalay City Development Committee

the plan

(ii) Receiving enough budget

(iii) Related materials

(Tubewell Casing and Screen, Pump, etc...,)

(iv) Techniques

2.3. My role in this plan: Initiate the proposal of action plan of construction with the requirement, capacity, suitability of the process objective of proposal and submit to the senior management for approval and pursue the matter at all stages.

#### 3. Details of the plan

A. Choosing location :To choose along the Ayeyarwaddy River on the southern part of 35<sup>th</sup> . . .

Street of Mandalay as on the northern part, there has been Dia, 400 mm.

Tubewell (25) Nos already.

B. Building Tube well : Using Bourne 1500 RC Drilling Rig, Dia; 300 mm Tubewell will be built.

C. Getting electric :Installing 315 KVA Transformer

Power supply

D . Fixing Pump :Three set of Submersible Pump will be fixed.

E. Installation of :Putting on Dia; 200 mm Discharge Pipe Line

Pipeline

3.1. Overall goal :People living in the town will be able to use water more effectively.

3.2. Purpose of the plan : As one Dia; 300 mm Tube well can produce 50,000 gallons of water per .

hour, three tube wells may be able to produce more than 3,000,000  $\,$  . gallons per day

in average.

3.3 Organization and :(i) Mandalay City Development Committee

Responsibility :(ii) Water Supply and Sanitation Department

# **THANK FOR YOUR ATTENTIONS**



# Water Supply Administration For Better Management of Water Supply Services Course (B)

# Brazil

# Water Supply Administration for Better Management of Water Supply Services

**Country Report Outline** 

- 1. Country: Brazil
- 2. Position: Civil Engineer
- 3. Organization: Sanepar



# **General Country profile:**

**Brazil** is the world's **fifth largest** country, both in **geographical** area and in **population**. The Brazilian **economy** is the world's **seventh largest**.

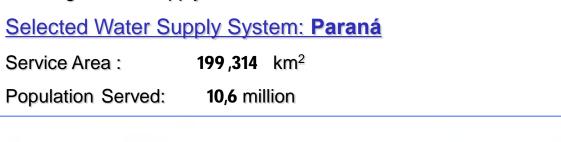
**Brazil** is composed of **26 States** and the capital city, Brasília, and Municipalities.

#### **Brazil**

Area : **8,5** million km<sup>2</sup>

Population: 193,9 million Habitants

Coverage Water Supply: 84.6 %





PR

The mission of my organization is to provide Environmental Sanitation services in a sustainable manner contributing to the improvement of life quality.

My mission in the organization is to contribute to the improvement of the operational efficiency in the water supply system.

My actual job to achieve the mission is developing methodologies and processes that result in an improved operational efficiency.





# 1. Management Of Water Quality

In 2012, **116,274** quality parameters were checked in monthly average and of those, about **250**, or **0.22%** weren't within the government regulation.

## **Major problems:**

- The management of water resources is deficient;
- The operational process presents failures;
- Degradation of many supply systems;
- The technology in the process of treatment is out-of-date;
- The waste disposal generated presents difficulties.



## **Challenges**

- To improve the water quality management;
- > To provide the technological adequacy of physical structures;
- > To supply technical training to operators;
- To promote sustainable development;
- To deploy the water safety plan.



### **Current Actions**

Monthly monitoring of nonconformities according to the Ordinance.

## Water safety plan:

Identification of risks of the source.



# 2. Reduction of non-revenue water

System input volume	Authorized	Revenue water	Billed authorized consumption	466,630,192 m³/year (65%)
	consumption	الم مرات مراك مراء المرايا	6,950,00 m <sup>3</sup> /year (1%)	
	Water losses	Non Revenue Water (NRW)	Apparent losses  ( Unauthorized consumption (i.e. Illegal use), Customer metering inaccuracies)	79,452,860 m <sup>3</sup> /year (11%)
			Real losses (Leakage)	159,722,469 m³/year (22%)



## 2. Reduction Of Non-revenue Water

SANEPAR uses a **Method of Analysis and Troubleshooting for losses** since 2006. It focuses on the analysis of processes to optimize and improve the results applying quality tools and the PDCA cycle.

#### **Main actions:**

- ✓ Renewal of water meters (replacing more than 400,000 meters)
- ✓Intensification of leak detection
- ✓ Installation of pressure reducing valves



## Index of non-revenue water (NRW)

- •In 2012 the index was 247 liters / connection / day, equivalent to 246.1 million m³ of water lost was not converted into revenue.
- •The projection for 2013 is 242 liters / connection / day.



# 3. Water supply service standards

## **Challenges:**

- ➤ Ensuring the protection and identifying the pollution sources;
- >Monitoring the water supply system with preventive actions against accidents;
- ➤ Performing preventive maintenance;
- ➤ Train personnel;
- ➤ Technological upgrading of equipment and processes;
- ➤ Developing a faster service and more accurate responses in case of lack of water.
- ➤ Maintaining and expanding the customers.

#### **Current Actions**

- ➤Inputs Management (electric power, chemical products, etc. ..);
- ➤ Water Quality Management;
- ➤ Losses Management;



## **Indicators For Water Process**

- ➤IPL Index of losses per connection per day (liters/connection/day);
- ➤ICP Index of Conformity with the Potability Standard (%);
- ➤ Cost of Chemical Products (\$/m3)
- ➤ Energy spent per m3 (KWH /m³)
- ➤IDP Relation between water demand and production capacity of the water supply system (%)
- Increasing of connections (#)
- ➤ New meters (#)
- ➤ Transported Volume (m3 / year)
- ➤ Produced Volume (m3 / year)
- ➤ Measured Volume (m3 / year)
- ➤Invoiced Volume (m3 / year)



# 4. Management Of Water Supply Service On A Selfsupporting Basis

#### **FAIR PRICE:**

- ➤ Covering the costs of services;
- ➤ Having socially acceptable tariffs;
- >Rates that contribute to the environment protection.



#### **CHALLENGES:**

- ➤ Guarantee the full recovery of services cost;
- ➤ Optimizing Operation Management and eliminating cost inefficiencies;



# 5. Major recent achievement in improvement of the water supply services/management (PART1)

2002	INDICATORS	2012
-	IPL - Index of losses per connection per day (liters/connection/day)	247
-	ICP – Index of Compliance with the Ordinance (%)	99.8
0.01	Cost of Chemical Products (\$/m3)	0.02
-	IDP - Demand X production (%)	84.3
78,980	Increase of connections (#)	73,749
-	New meters (#)	401,399
-	Transported Volume (m3 / year)	727.9 million
<u>-</u>	Produced Volume (m3 / year)	712.7 million
-	Measured Volume (m3 / year)	466,6 million
-	Invoiced Volume (m3 / year)	549.1 million



# 5. Major recent achievement in improvement of the water supply services/management (PART2)

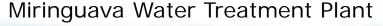
- Analysis laboratories are decentralized;
- ➤ Mobile laboratories were created;
- ➤ The system for the management of chemical products;
- ➤ New chemical products for the water treatment;
- ➤ Monthly monitoring of non-compliance with the ordinance.
- ➤ The implementation of the operational sectoralization;
- ➤ The technical registration applying the GIS technology.
- ➤Power management;
- ➤ Water meters management;
- ➤ Collection and disposal of solid waste is a new business at Sanepar



# 6. Expectation for the Japanese private companies & Water Supply Utilities

I hope that we exchange experiences, share knowledge and investigate technologies for a better management of the water supply administration.













Site: www.sanepar.com.br

Fone: + 55 41 3330 7219

出典:平成25 年度JICA 集団研修カントリーレポート

▶ 平成25 年度JICA 集団研修「水道管理行政(B)」

Japan International Corporation of Welfare Services (JICWELS) was established with the sanction of the Minister for Health, Labour and Welfare in July 1983 and implements international technical cooperation programmes with purpose of contributing to the promotion of health and social welfare activities in the friendly nations.

Japan International Corporation of Welfare Services (JICWELS) Toranomon YHK Bldg. 4F, 2-3-20, Toranomon Minato-ku, Tokyo 105-0001 JAPAN Phone: +81-(0)3-6206-1137

Fax: +81-(0)3-6206-1164 http://www.jicwels.or.jp

公益社団法人国際厚生事業団 (JICWELS) は、国際的な保健・福祉分野の国際協力に貢献することを目的として、1983 年 (昭和58 年) 7 月7 日に厚生省 (現厚生労働省) から社団法人の認可を受け設立されました。開発途上国の行政官研修や WHO フェローの受入れ、調査 企画や研究開発並びに情報の交換及び広報活動など、海外諸国との国際交流活動を推進して います。



〒105-0001

東京都港区虎ノ門2-3-20 虎ノ門YHKビル4 階 電話03-6206-1137(事業部) Fax03-6206-1164 http://www.jicwels.or.jp