Water Supply Administration

For Better Management of Water Supply Services

Course（B）

Country Reports

Japan International Corporation of Welfare Services (JICWELS)

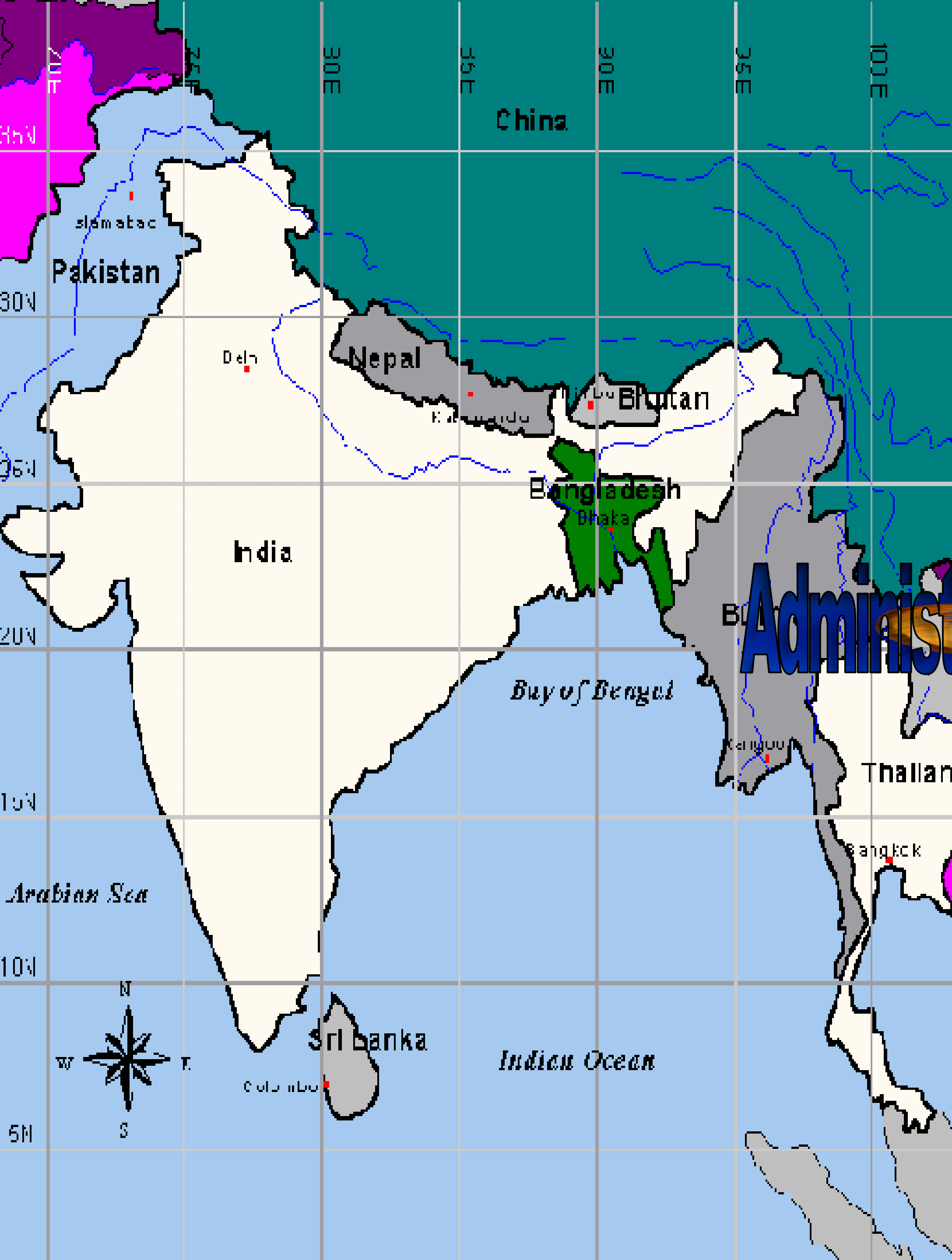
Contents

Water Supply Administration

For Better Management of Water Supply Services

Course（B）

Bangladesh



Administration for Better Management of Water Supply Service

Joint Secretary
Ministry of LGRD & Co-Opt
BANGLADESH

General Country Profile

Official Name : The People's Republic of Bangladesh

Population : More than 160 Million

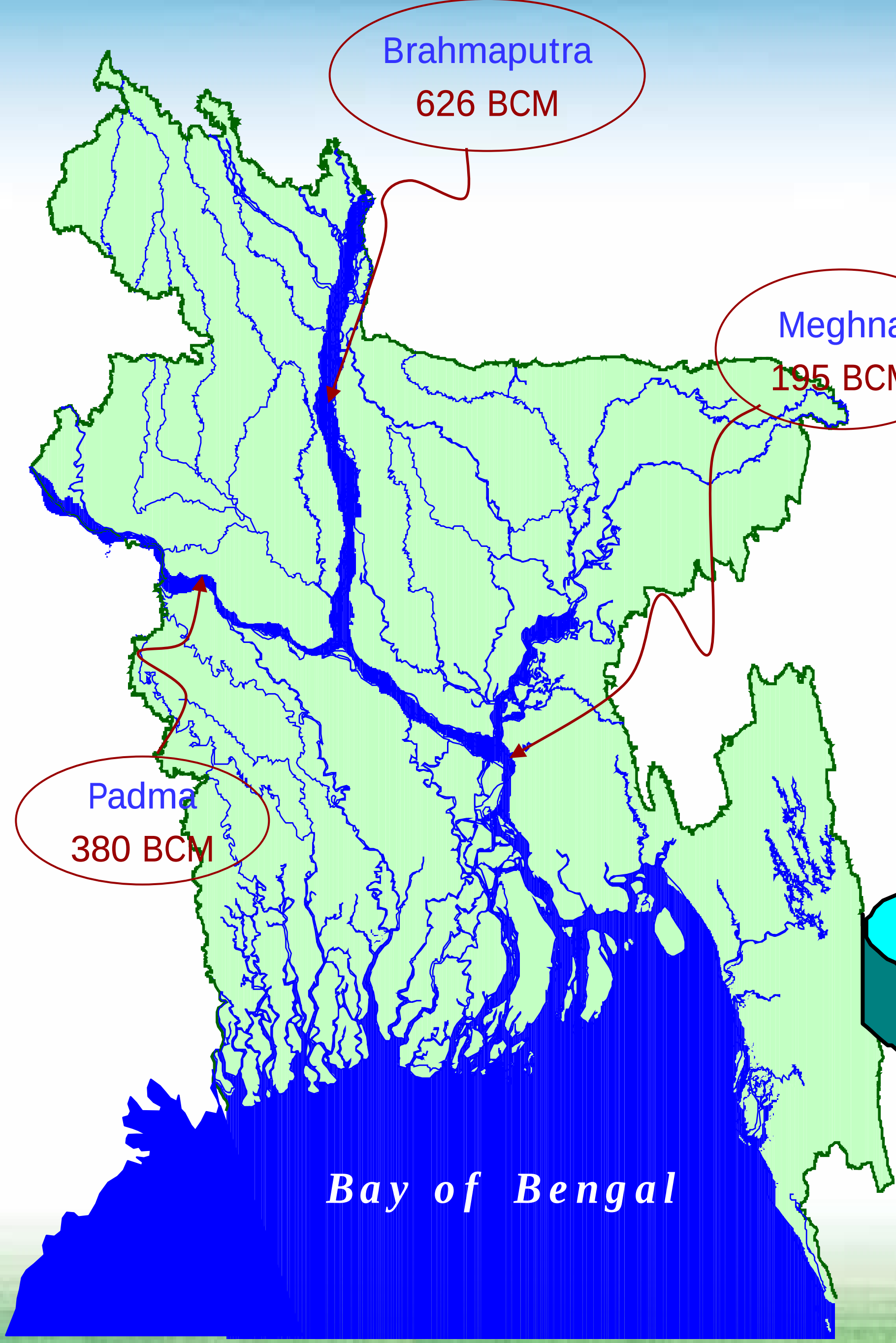
Area :	Total	147,570 sq km
	Land	133,910 sq km
	Water	10,090 sq km

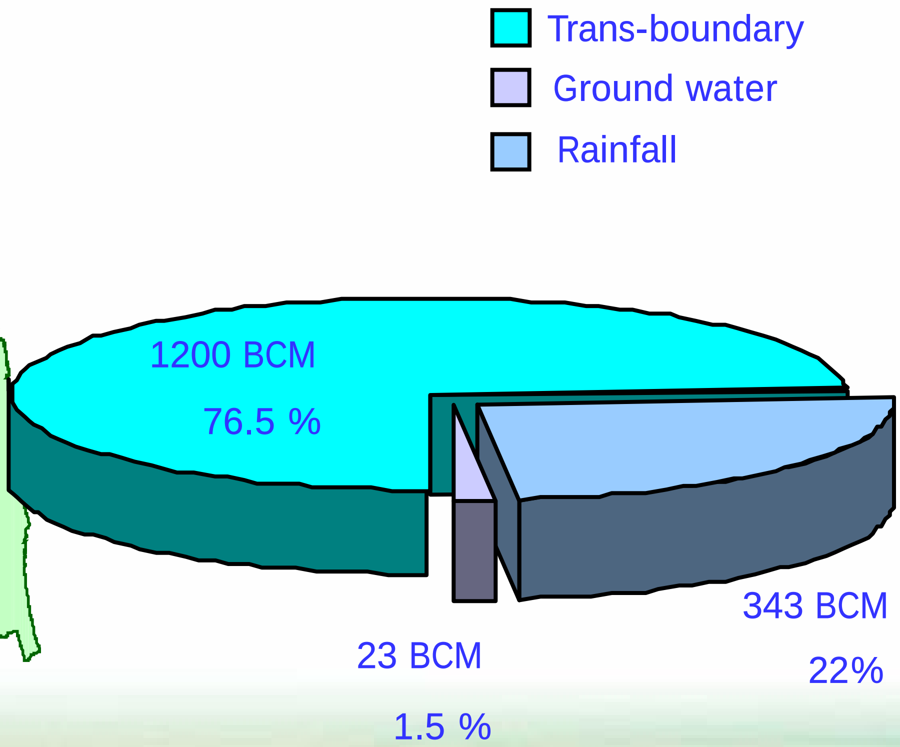
Location : Latitude 20° 34' to 26° 38'
Longitude 88° 01' to 92° 41'

Coverage Water supply (whole country): 80%
DWASA Service Area: 360 km2
Population Served:125 million

Rainfall : Lowest 47" and highest 136"

Major River System & Water Sources





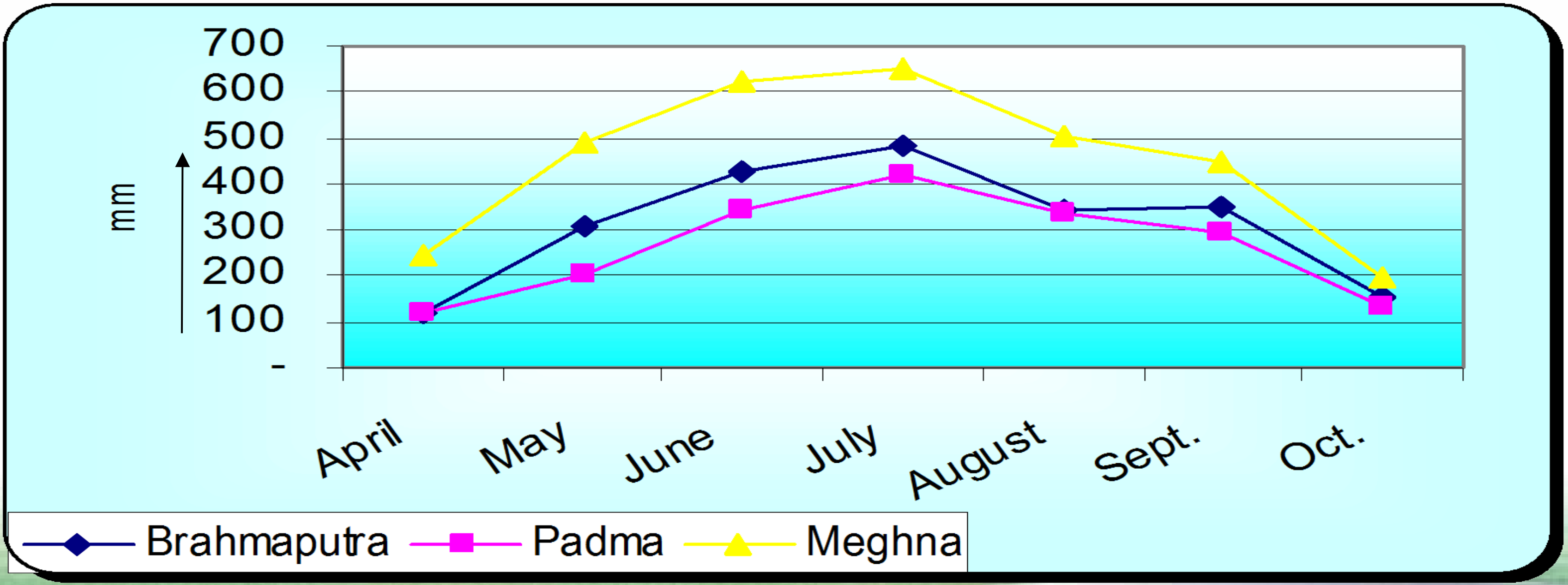
Current Coverage 25%(Dhaka)

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

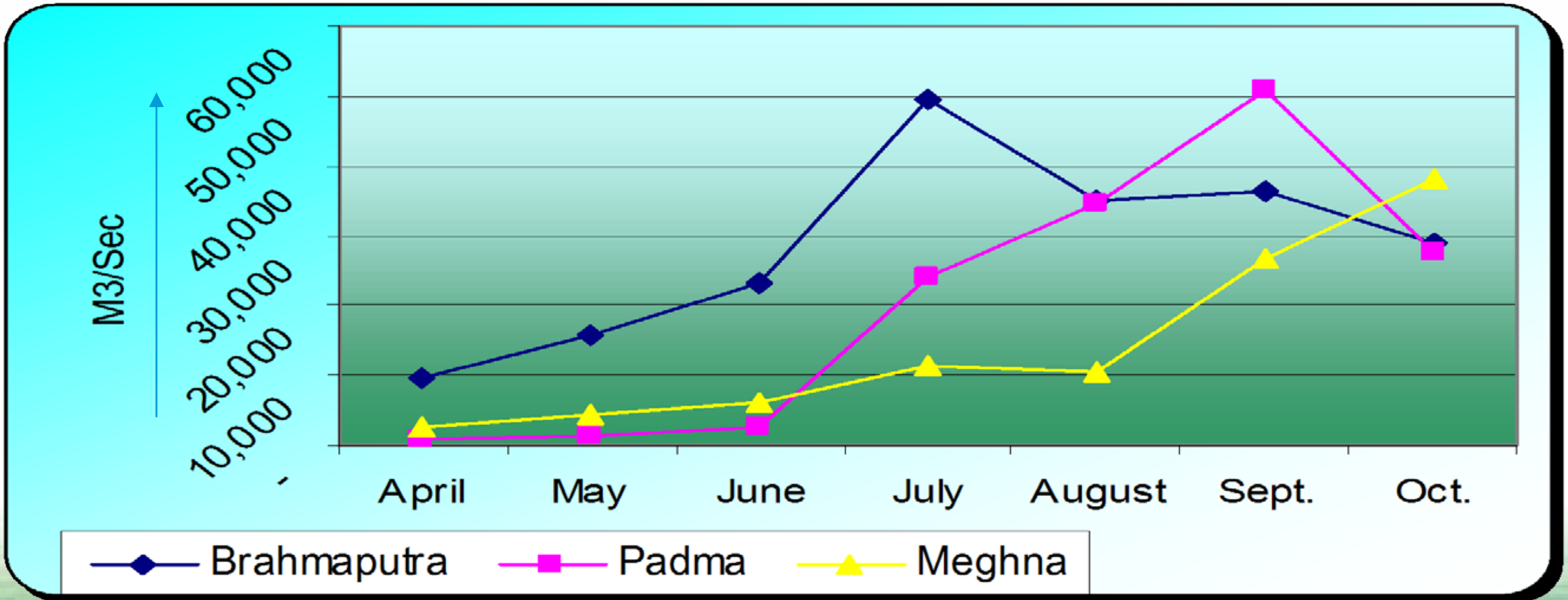
Average Rainfall In Different Basin

	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

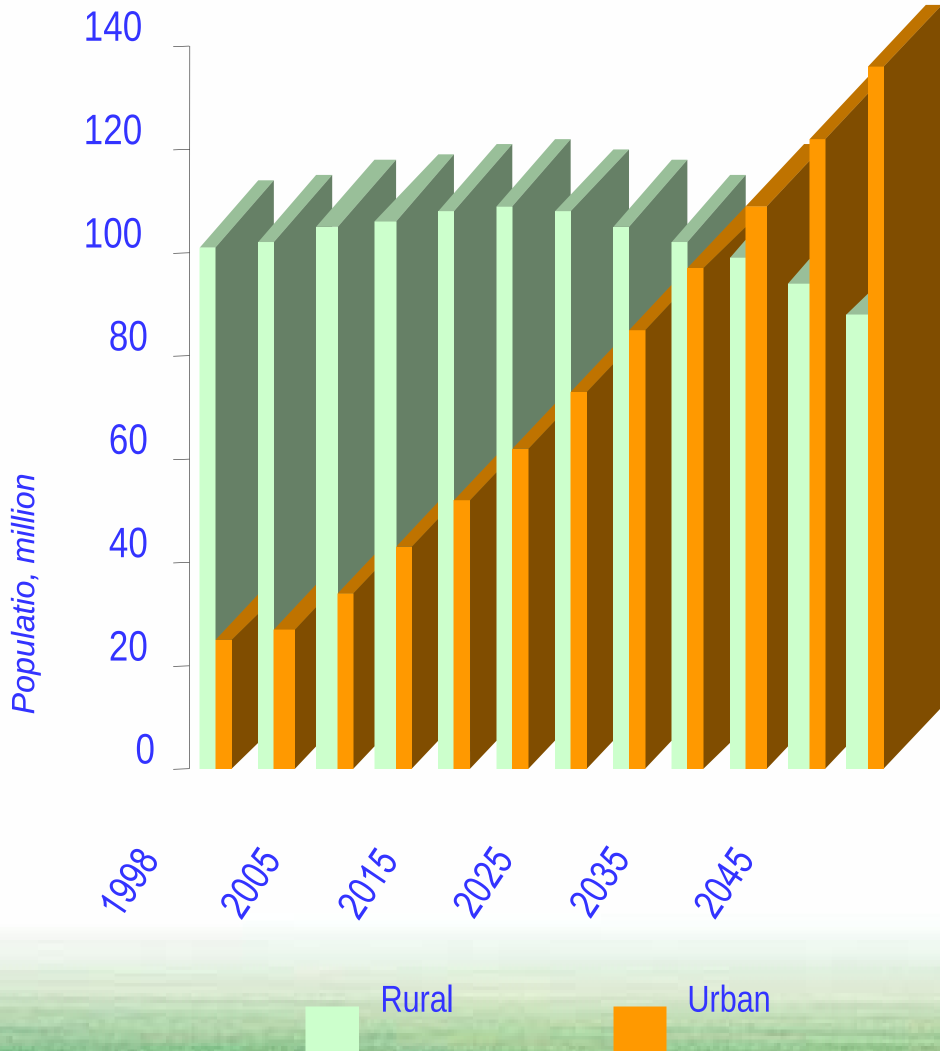


Average Discharge of River Water

	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

WASA

Dhaka Water Supply & Sewerage Authority

My Mission

- 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 Milestones & Mandate

WASA

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.

(sewage) & Storm Water Drainage.

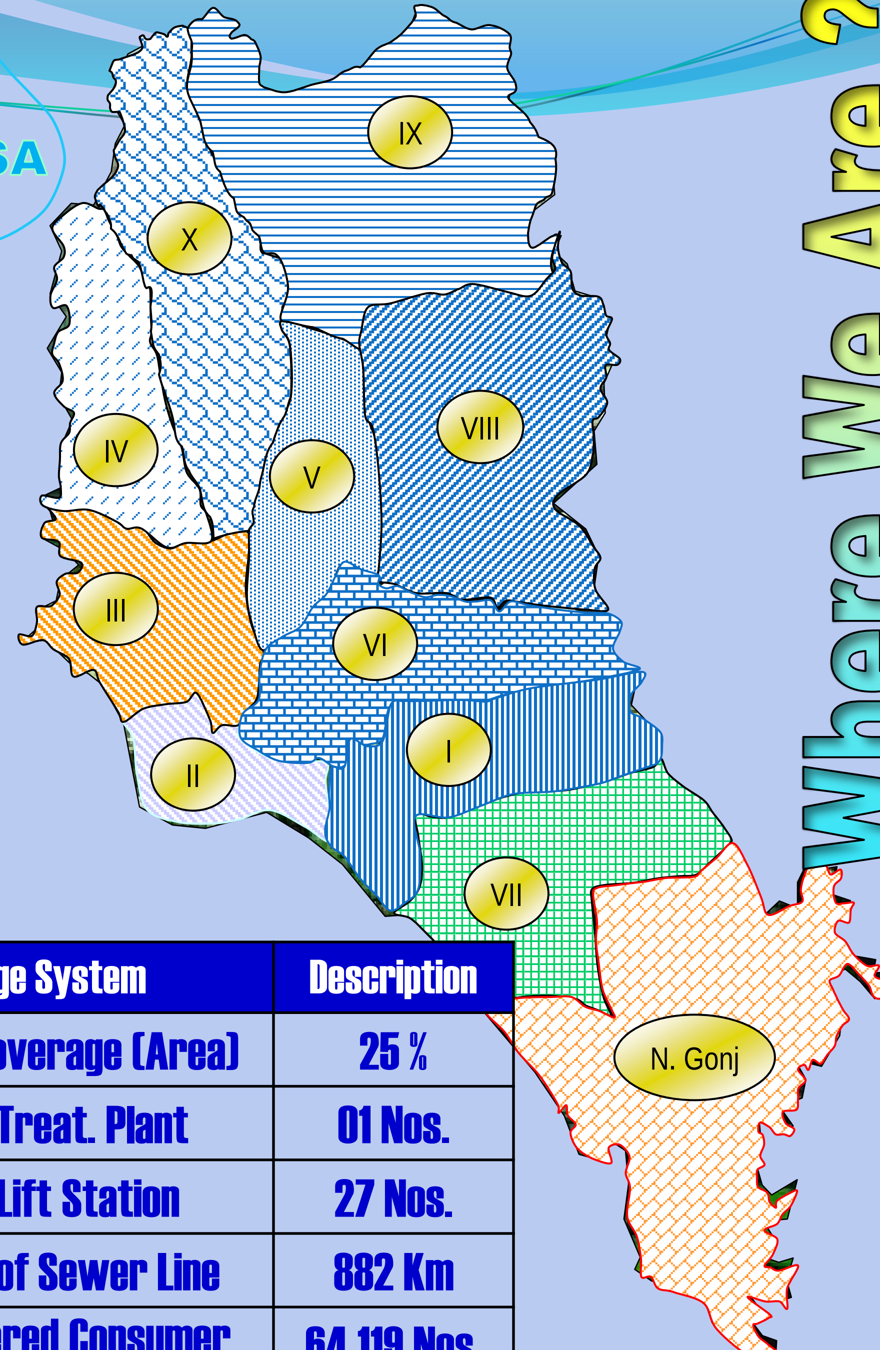
Where We Are?

Area : Dhaka & N'ngonj City With Peripherals	
Currently Served : Dhaka & Narayangonj City	
Population : 12.5 Million	

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

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

Sewerage System	Description
Total Coverage (Area)	25 %
Sewer Treat. Plant	01 Nos.
Sewer Lift Station	27 Nos.
Length of Sewer Line	882 Km
Registered Consumer	64,119 Nos.



Dhaka WASA Board

(Total Member # 13)

WASA

Managing Director 4,431

Deputy Managing Director (O&M) 3169

Chief Engineer (O&M) 3163

M O D S Circle I 1463
- MODS Zone – I 229
- MODS Zone - II 281
  - Dhaka Water Works 55
- MODS Zone - III 229
- MODS Zone - IV 259
- MODS Zone - V 229
- MODS Zone - VI 229

M O D S Circle II 942
- MODS Zone – VII 196
- MODS Zone - VIII 200
- MODS Zone - IX 200
- MODS Zone - X 200
- Narayangonj 139
  - Narayangonj Water Works 60

Drainage (O&M) Circle 87
- Electrical & Mechanical Div 45
- Operation & Maintenance Div I 17
- Operation & Maintenance Div II 17

R P E & M Circle 182
- Field Maintenance Division I 47
- Field Maintenance Division II 46
- Generator Division 56
  - Workshop 06
- Procurement Division I 14
- Procurement Division II 14

S M W C Circle 186
- System Operation & Control 50
  - Chlorination Section 14
- Meter Division 42
  - Meter Workshop 11
- Store Division 17
- Waste Prevention Division 43
- Construction (Civil) Division 13
- Civil Maintenance Division 15

Water & Sewer T P Circle 297
- Saidabad Water TP (Opn) 68
- Saidabad Water TP (Maint.) 38
- Pagla Sewer TP Division 148
  - Narinda Sewer Lift Station 89
- Quality Control Division 07
- Saidabad WTP Security 30

Deputy Managing Director (RP&D) 236

Addl. Chief Engr (RP&D) 193

Planning & Dev. Circle 83
- Electrical & Mechanical Div. 11
- Water & Hydrology Division 13
- P & D (Sewer) Division 12
- P & D (Drainage) Division 12
- Environmental Monitoring 06
- Microbiology Division 12
- Chemical Division 11

Water Rehab & Dev Circle 36
- Water Rehab & Dev Division I 15
- Water Rehab & Dev Division II 15

Sewer Rehab & Dev Circle 34
- Sewer Rehab & Dev Division I 14
- Sewer Rehab & Dev Division II 14

Drainage Res. & Dev Circle 34
- Drainage R & D Division I 14
- Drainage R & D Division II 14

GIS Department 15
- G I S Division 11

Planning, Monitoring & Evaluation Division 22

Deputy Managing Director (Finance) 462

Commercial Manager 457

Accounts Department 48
- Accounts Division I 19
  - Cash Section 07
- Accounts Division II 12
- Budget Division 04
- Finance Division 07

Revenue Department 397
- Revenue Division I 84
- Revenue Division II 46
- Revenue Division III 39
- Revenue Division IV 25
- Revenue Division V 36
- Revenue Division VI 64
- Revenue Division VII 13
- Revenue Division VIII 14
- Revenue Division IX 13
- Revenue Division X 13
- Revenue Narayangonj 16
- Central Function & PDR 27

Community Program & Consumer Relation Division 07

Internal Audit Division 18

Public Information Division 05

Deputy Managing Director (Administration) 533

Systems Manager 76

MIS & Billing Department 72
- M I S & Billing Division 57
- Operation & Maintenance 11

Secretary's Office 253
- Personnel Management Div I 27
  - Record Section 02
  - R & D Section 09
  - Pension Cell 05
- Personnel Management Div II 11
- Welfare Division 14
  - School & Mosque Sect 08
- Common Service Division 160
  - Communication Section 09
  - Transport Pool 126
- Discipline Section 04
- Library Section 03
- Law Division 05
- Medical Center 06
- Board Affairs Division 05
- Magistrate Court # 03 12

Training Center 17

Land Department 17

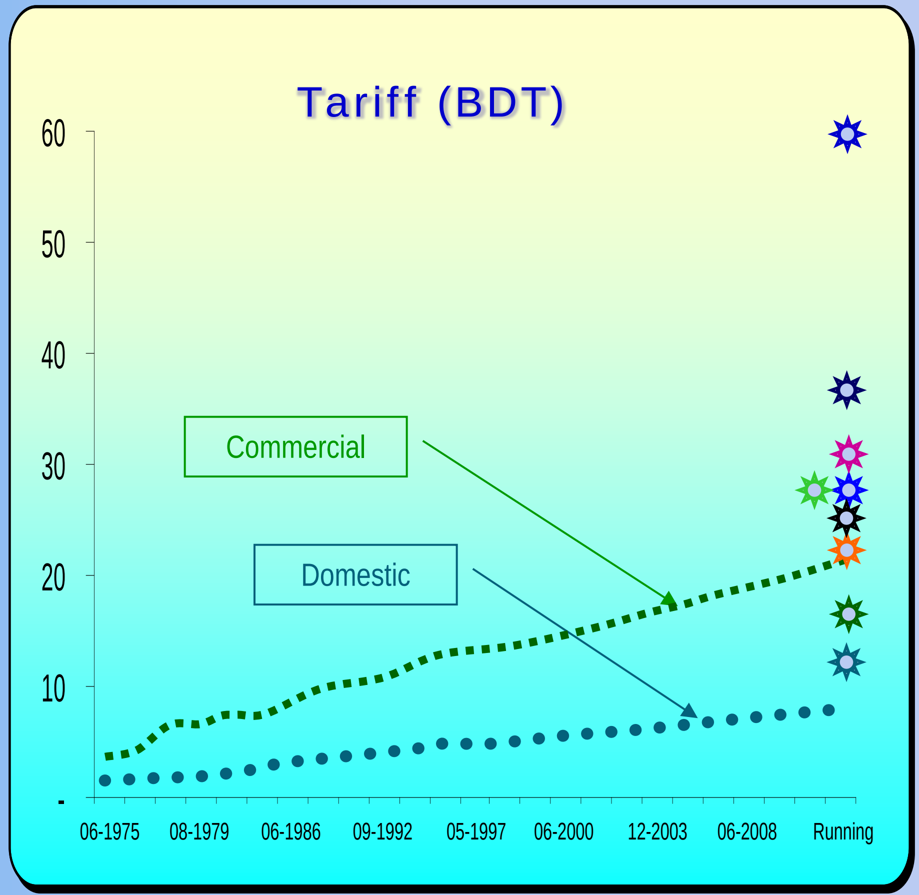
Security & Intelligence 165

Management of Water Quality

Tariff Structure

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

Upto The Month	Tariff @ M3	
	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

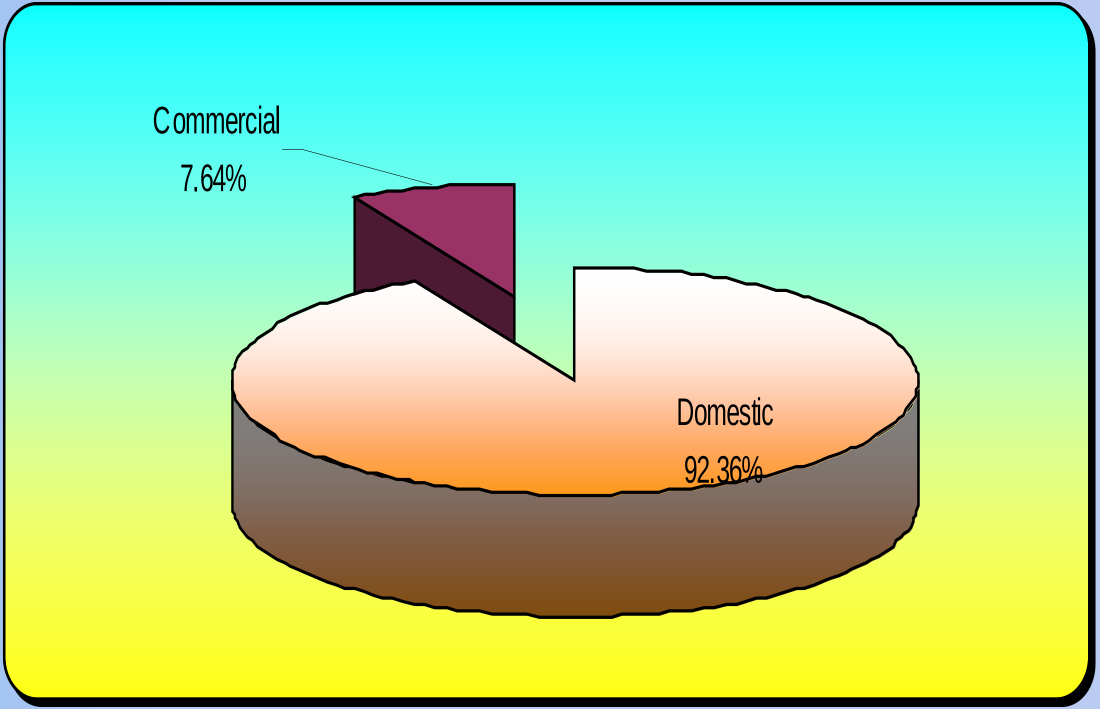
Tariff Type	Consumer
Domestic	302,969
Commercial	25,062
Total	328,031

Domestic
Community

Commercial
Industrial
Office

WASA

Consumer Statistics

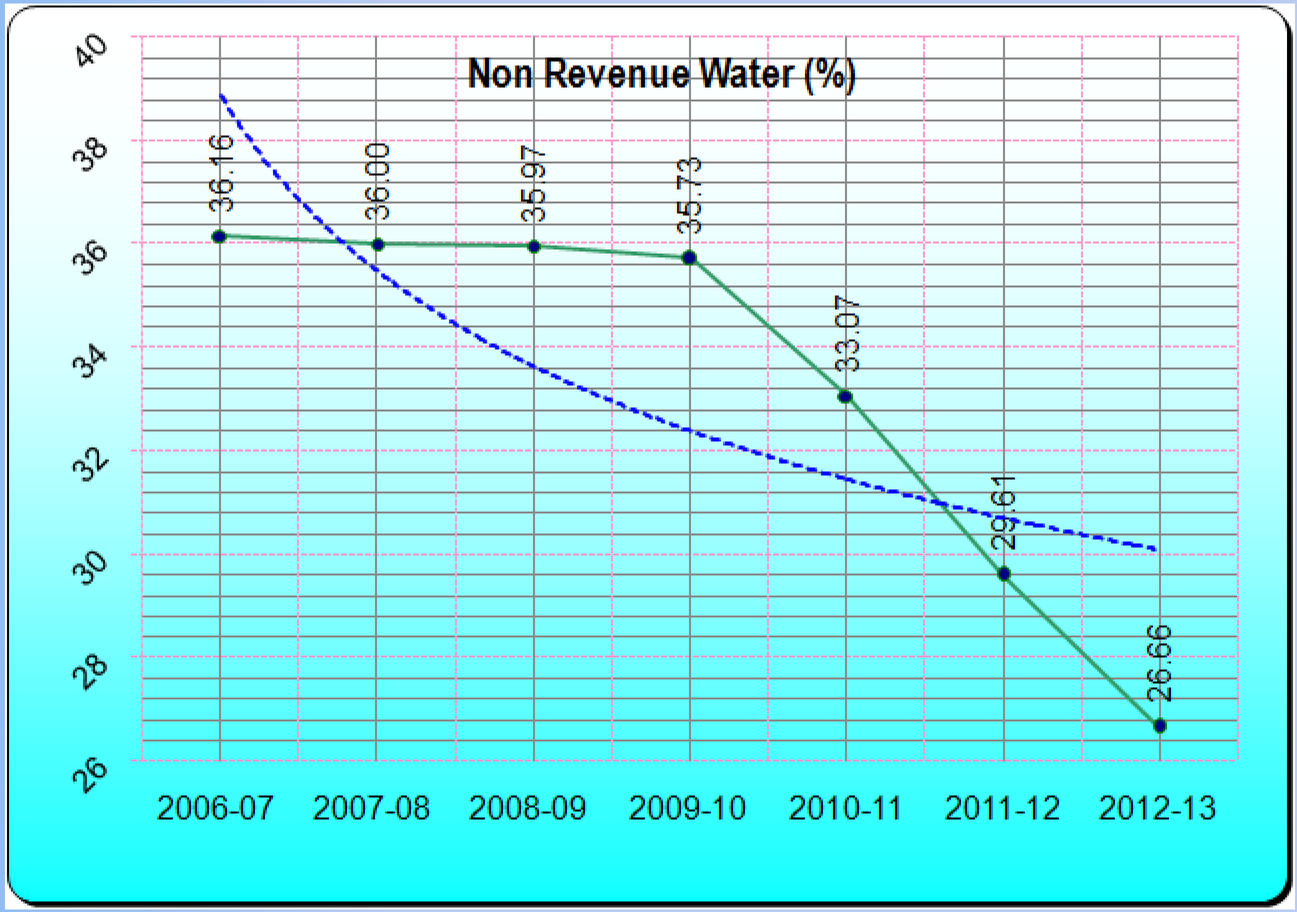


One Consumer Is One Household (5-50 Members & More)

Non Revenue Water (NRW)

WASA

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



Key Performance Indicators of WSS

WASA

SL	Subject Area	Performance of 2008	Benchmark Standard	Achievements Dhaka WASA (Fin. Year)		
				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

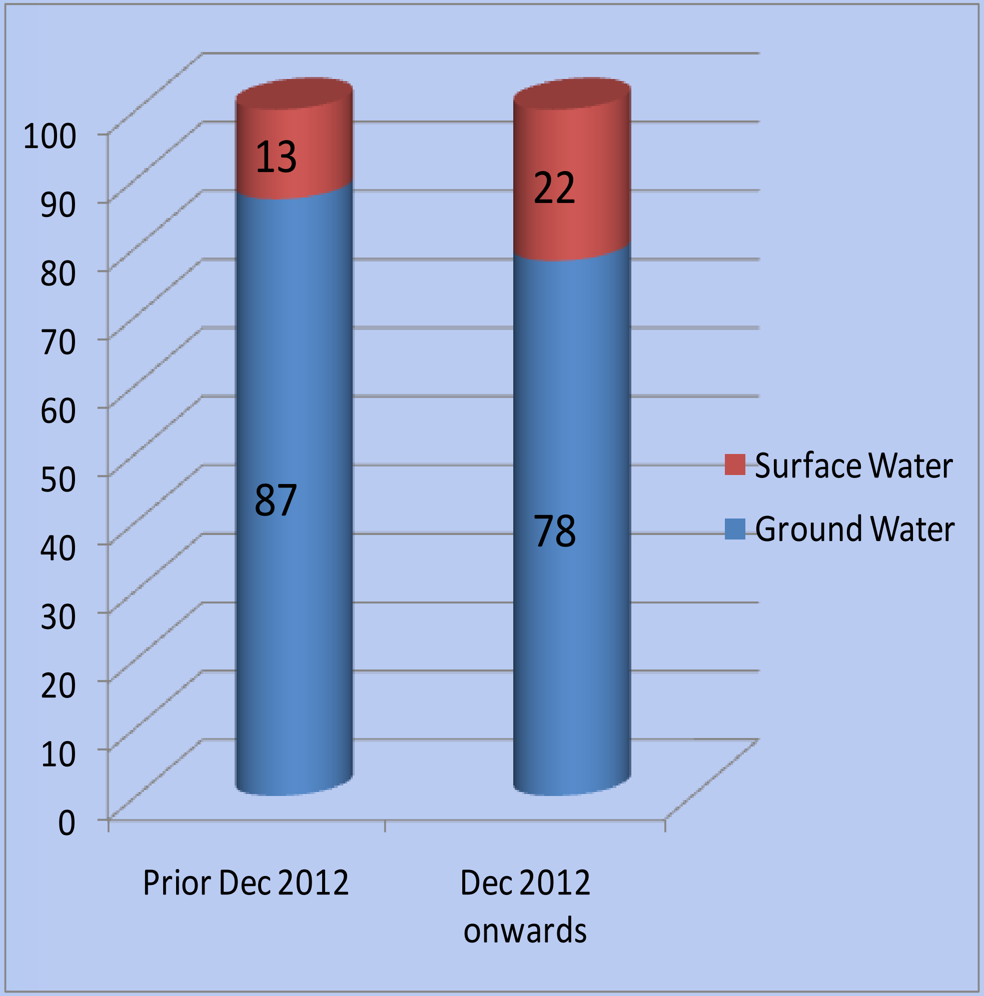
Major Recent Achievement

WASA

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

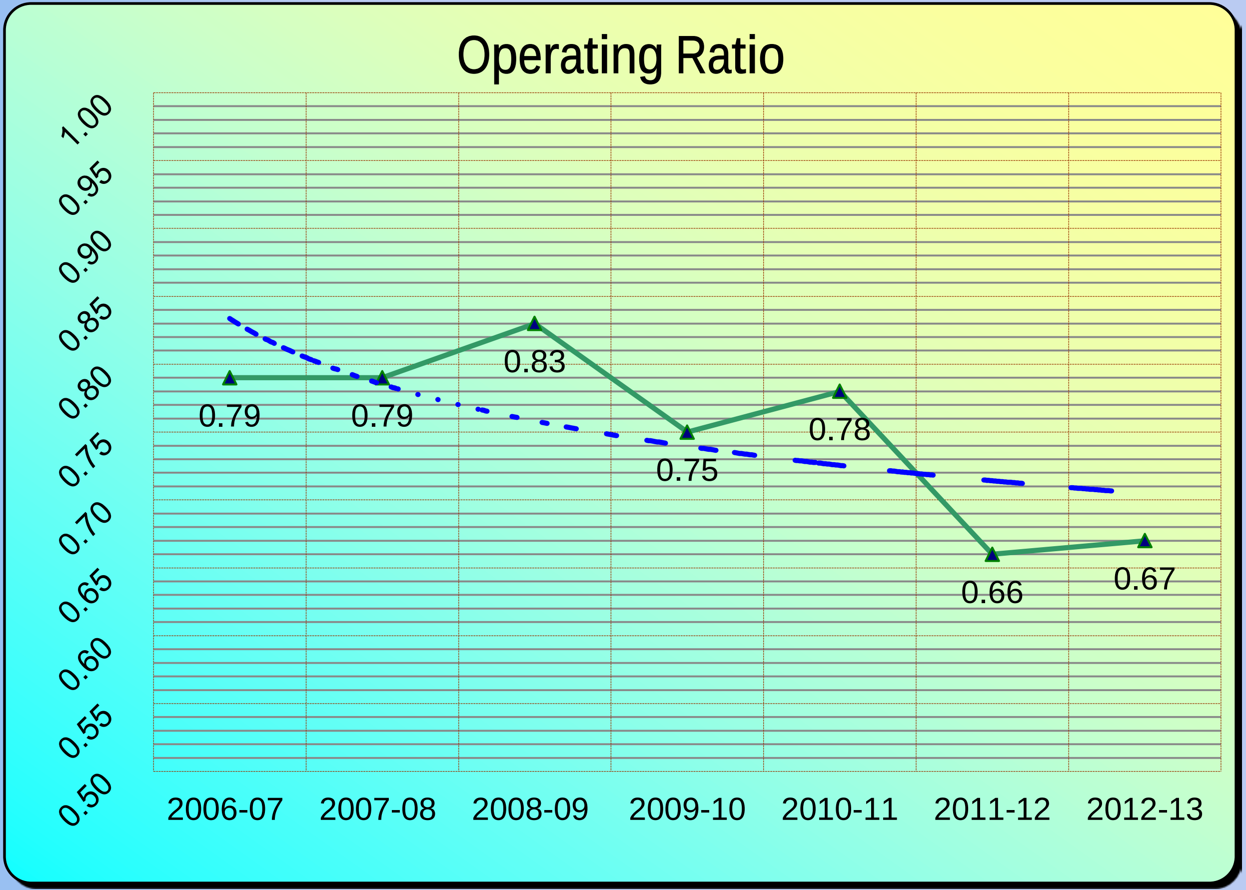
Major Recent Achievement

- 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




Q&A
Thank You All

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

Cambodia

Kingdom Of Cambodia

Ministry of Industry mines and Energy

Kampong Cham Province Water Works

Deputy Chief of Kampong Cham Water Works

Kampong Cham , 12 November 2013

CONTENTES

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

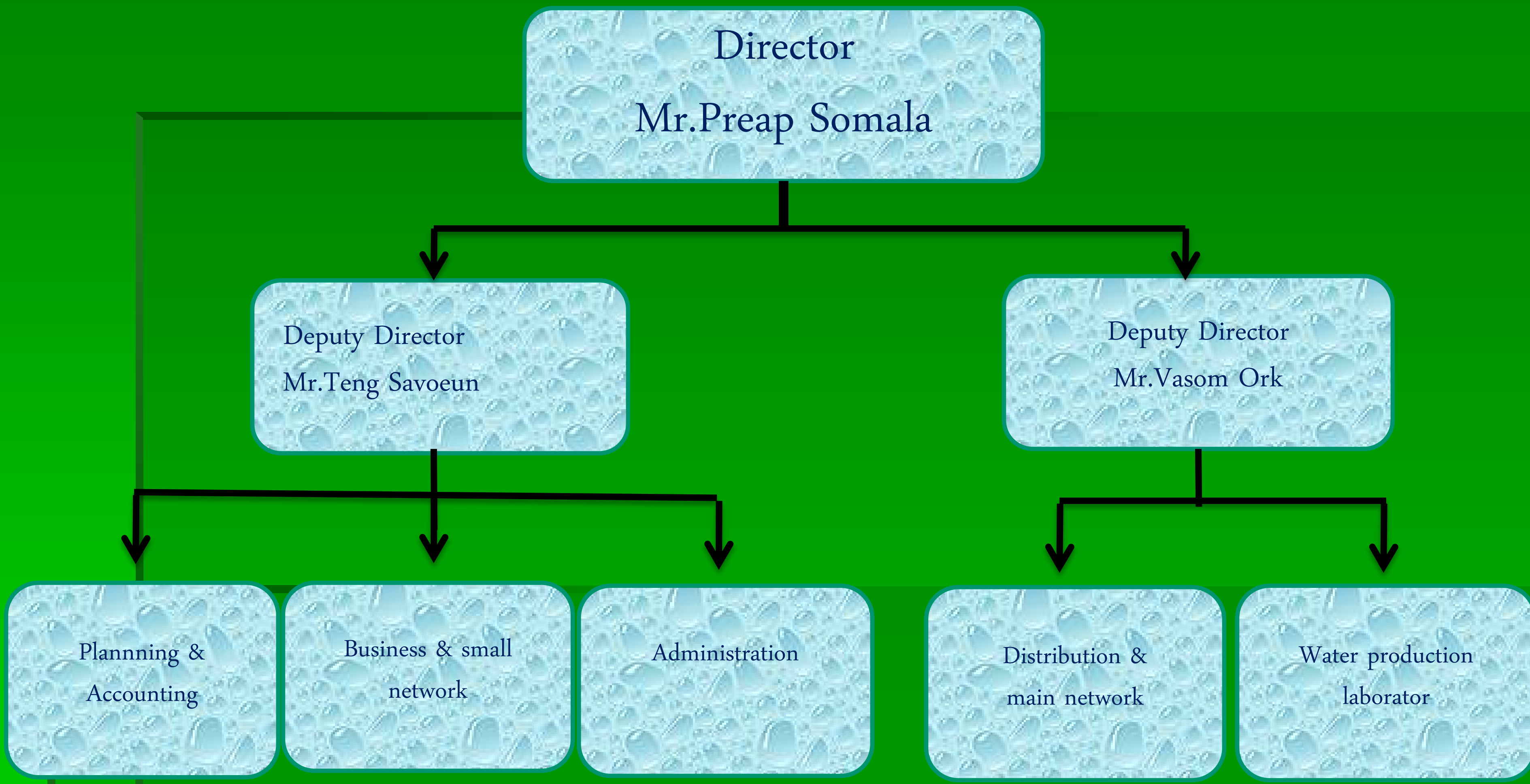
KCWWS Establishments :

- 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
- Total of households (09/2013) : 9,698 and total population : 51,432
- Population Density /Km^2 ....: 2,120 Persons / Km^2
- 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.

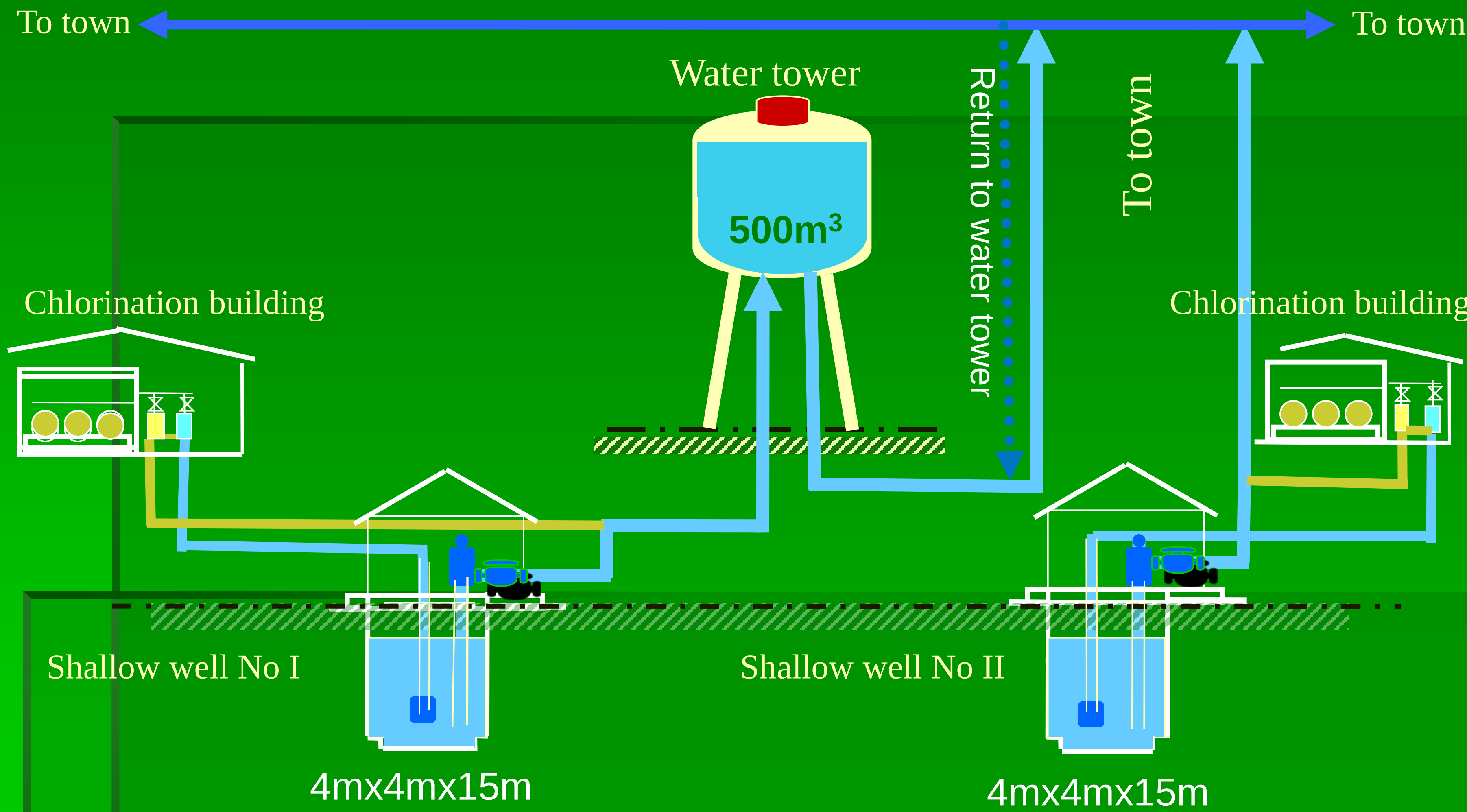
3-Goal and Objective for Provincial Water Works

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

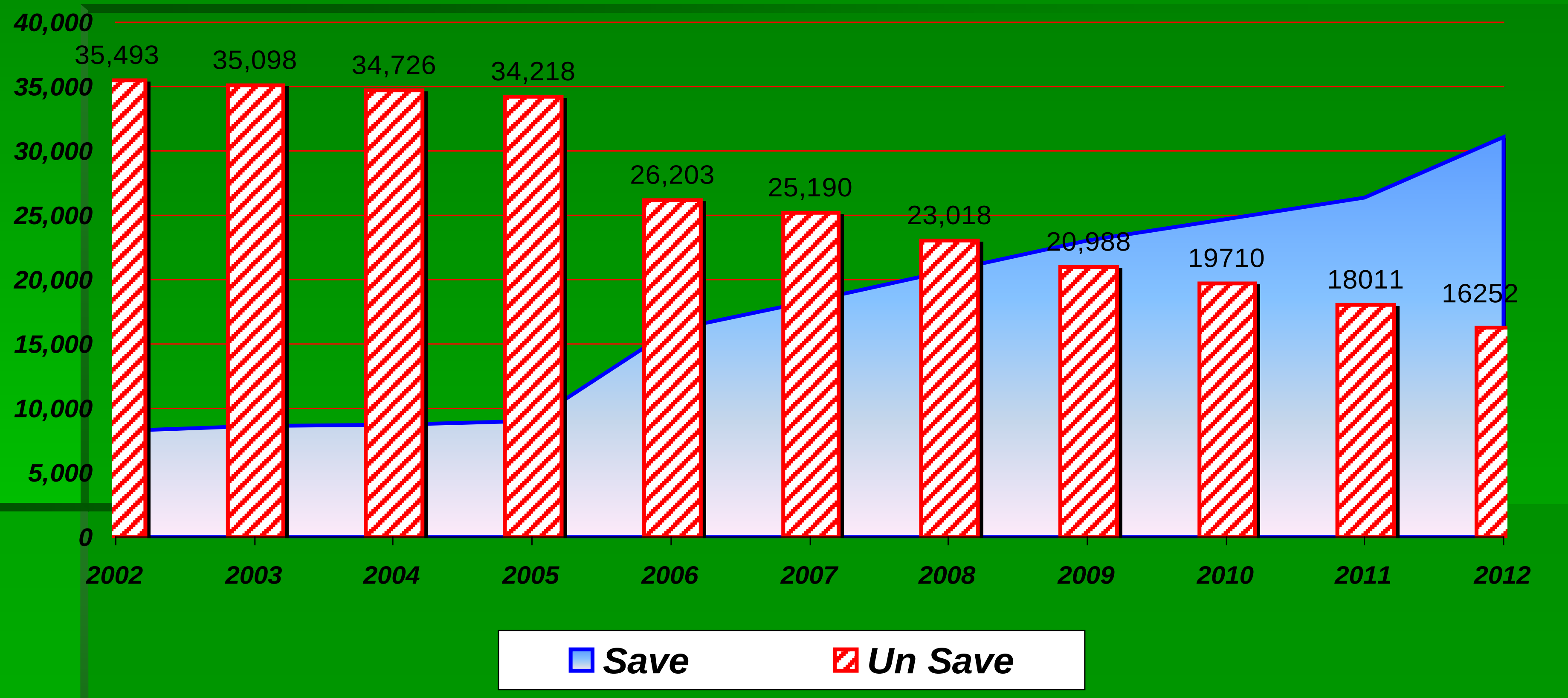
- Number of employee : 29
- Production : 6,674m³/day ;

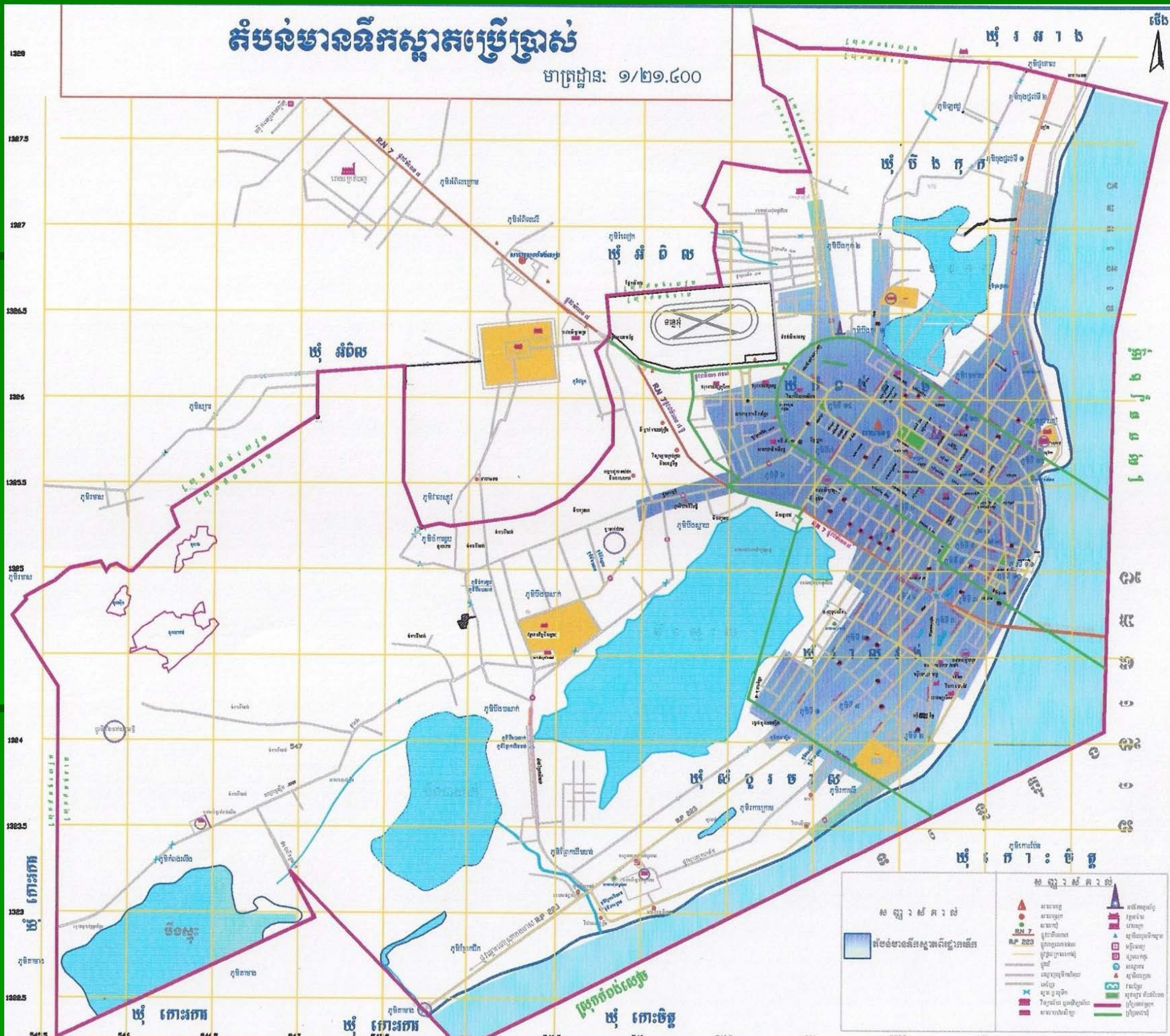
  In year 2012 = 2,205,586 m³
- Supply : 24h/day
- Water tank : 500 m³
- Total length of pipe line : 81,737 m
- Population in service area : 47,379 person
- Total water meter : 5,714
- Total user : 5,714 household = 31,127 Persons
- Service coverage : 65,70 %
- Non revenue water : 11.74 %

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)




តំបន់មានទឹកស្អាតប្រើប្រាស់
មាត្រដ្ឋាន: ១/២១.៤០០

b. Water Supply Level of Service

1.) Raw Water Quality

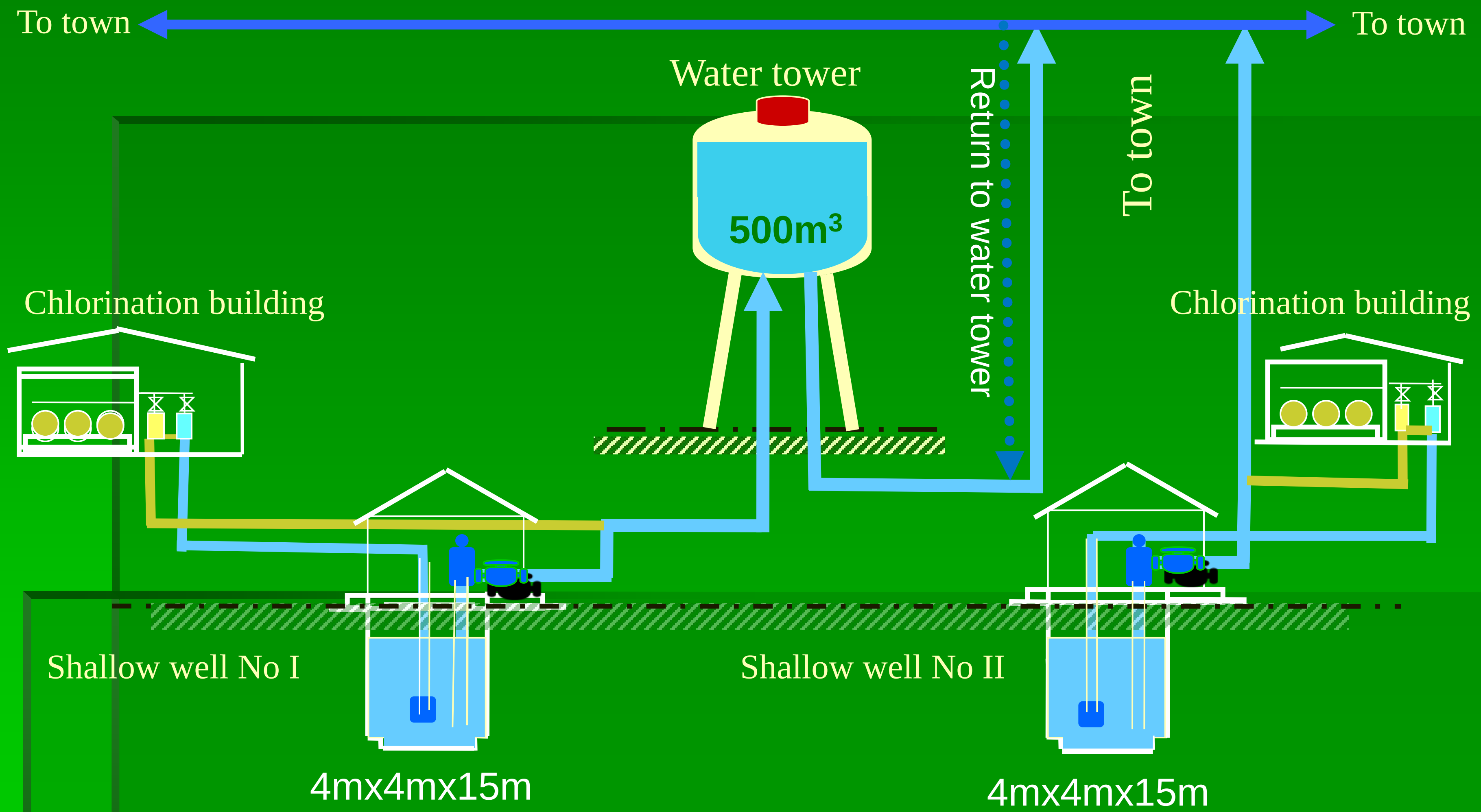
Water Sources from two shallow wells and both are in dimension 4 m x 4 m and 15 m depth ,in two different stations, where are clear, non-color, non-smell, non-taste, including high quality water . Each shallow well has water yield = 220 m^3 / h

Water turbidity are -0.14

Raw water are clear

2.) Existing Treatment System

The profile of water treatment system and supply networks



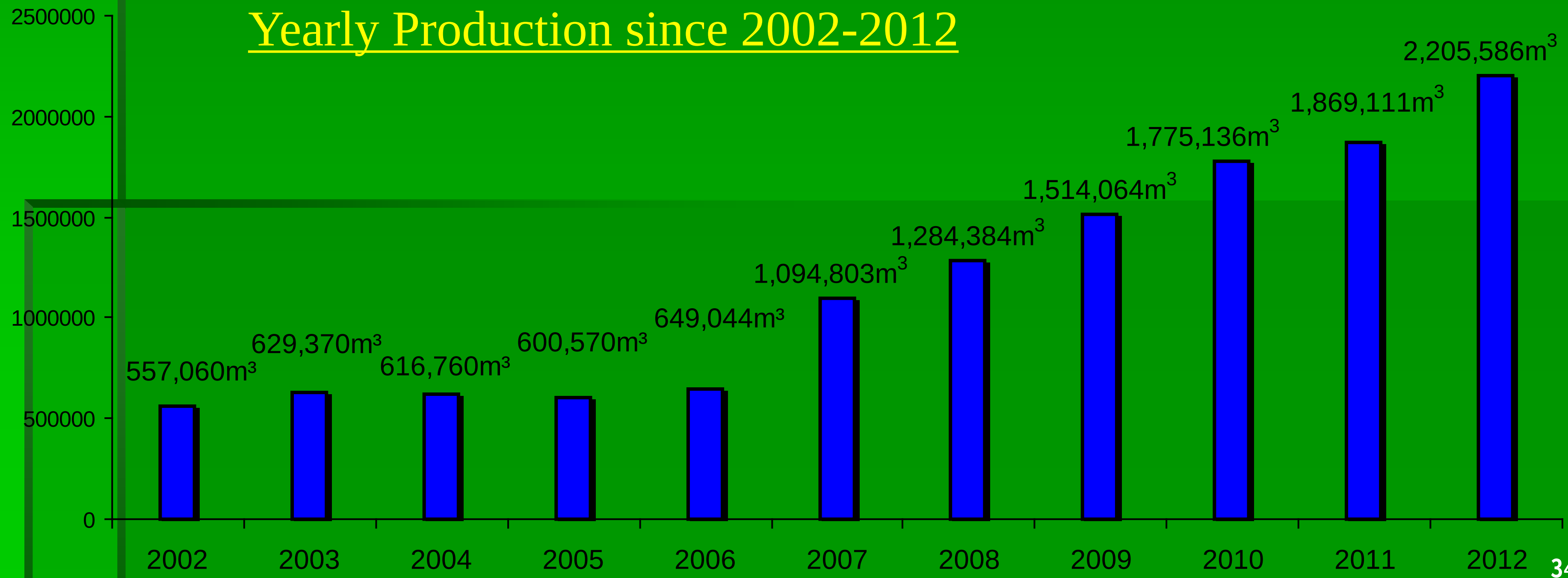
- The operating of the production method is the direct pump from the well to the water tower by mixing with Chlorination treatment then supplied to the town .

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

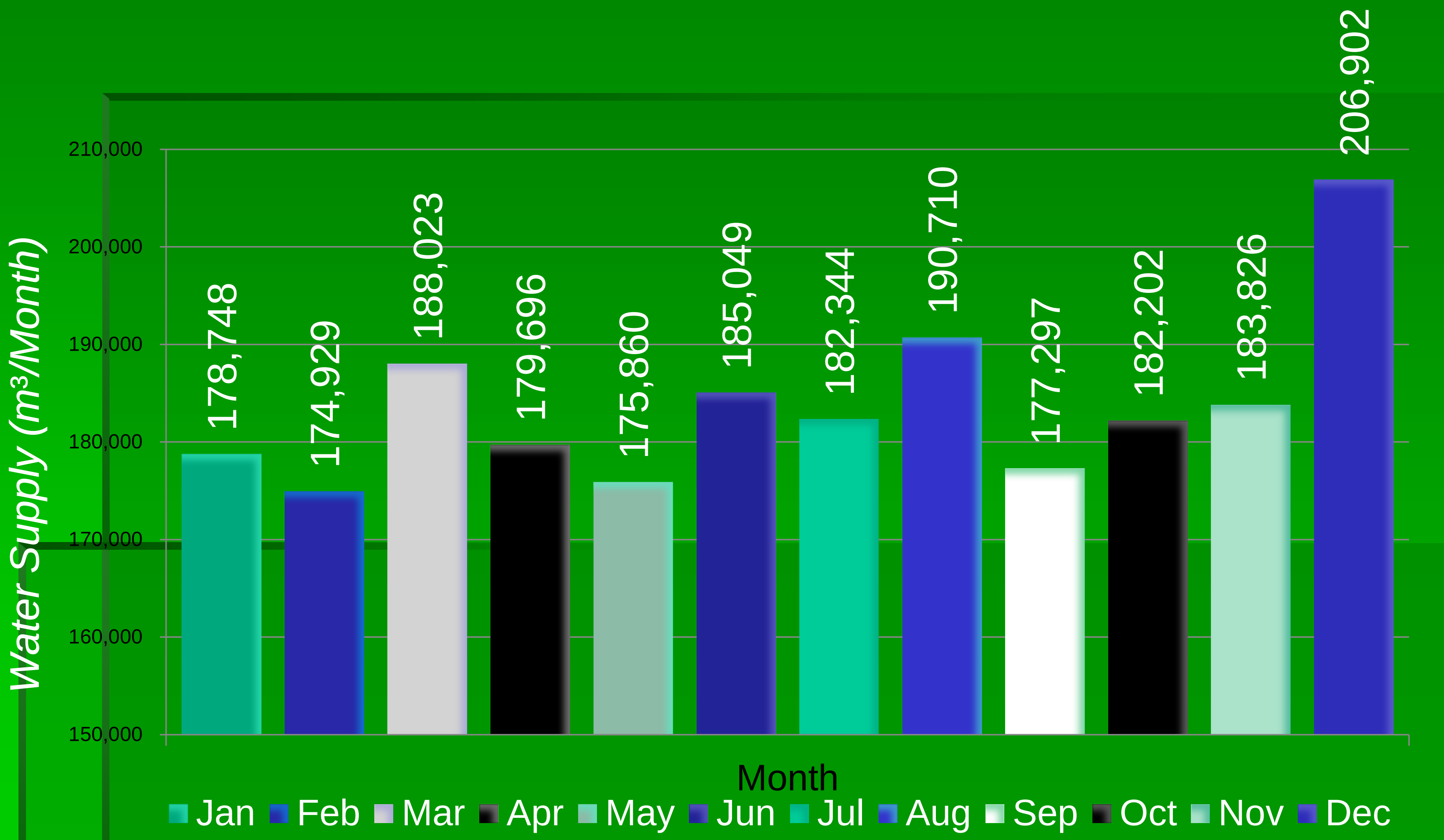
WATER PRODUCTION

- ✓ Supply capacity of the two stations = 7,200 m^3 / day
- ✓ Water supply production = 6,674 m^3 / 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 m^3 .

Yearly Production since 2002-2012



WATER PRODUCTION REPORT ON YEAR 2012



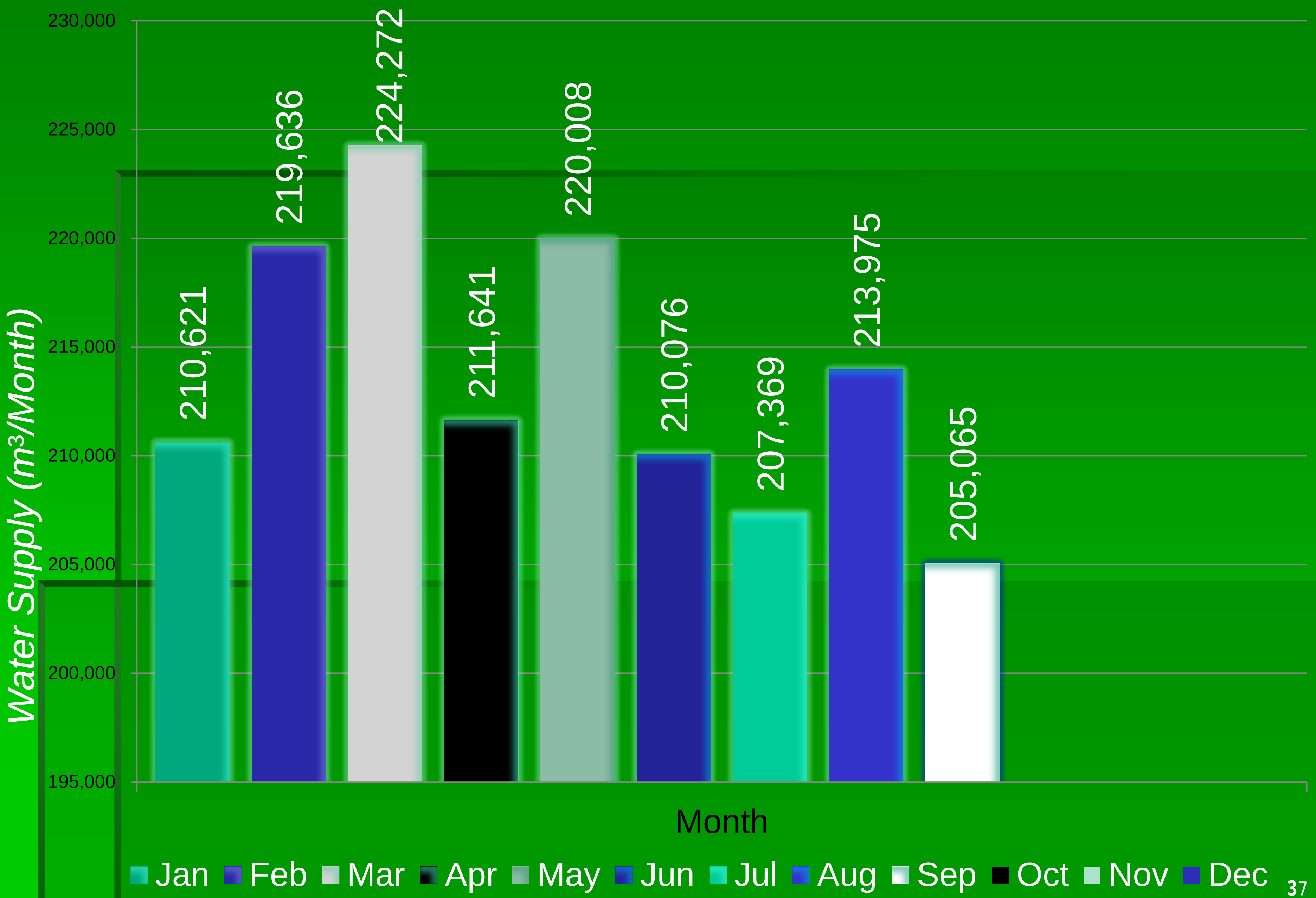
Actuals production report on 2012

Water productions in this year are 2,205,586 m^3 .

ផលិតកម្មទឹកស្អាត – ចំណូល – ការប្រើប្រាស់ ប្រចាំឆ្នាំ ២០១២

ល.រ	អត្ថន័យ	JAN	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		31	29	31	30	31	30	31	31	30	31	30	31	
1	បរិមាណទឹកផលិតបាន	178,748	174,929	188,023	179,696	175,860	185,049	182,344	190,710	177,297	182,202	183,826	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
	⇨ អតិថិជនធម្មតា :	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
	⇨ អតិថិជនអាជីវកម្ម	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
	⇨ អតិថិជនស្ថាប័ន	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	អត្រាបាត់បង់	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
	⇨ អតិថិជនអាជីវកម្ម	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	ចំនួនមុខដណាសរុប :	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
	⇨ អតិថិជនអាជីវកម្ម	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	អត្រាអាននាឡិកាសរុប	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	មធ្យមភាគថ្លៃលក់សរុប	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	អត្រាលក់អោយអតិថិជនធម្មតា :	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%
	★ លក់អោយក្រោម 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%
	★ លក់អោយលើសពី 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%
	អត្រាលក់អោយអាជីវកម្ម	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%
	អត្រាលក់អោយស្ថាប័ន	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	រថយន្តលត់អគ្គីភ័យ													
11	លក់អោយក្រោម១០ម៣នៃបរិមាណទឹកលក់សរុប	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	ប្រើប្រាស់១មុខជំណ/ថ្ងៃសរុប(ម៣)	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	ការប្រើប្រាស់សំរាប់អតិ.ស្ថាប័ន	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	ប្រវែងបណ្តាញសរុប (M)	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^3 .

ផលិតកម្មទឹកស្អាត – ចំណូល – ការប្រើប្រាស់ ប្រចាំឆ្នាំ ២០១៣

ល.រ	អត្ថន័យ	JAN	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		31	28	31	30	31	30	31	31	30	31	30	31	365
1	បរិមាណទឹកផលិតបាន	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	-	-	-	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
	⇨ អតិថិជនអាជីវកម្ម	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
	⇨ អតិថិជនអាជីវកម្ម	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	ចំនួនមុខដំណសរុប :	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
	⇨ អតិថិជនអាជីវកម្ម	513	524	547	547	557	560	572	573	664	-	-	-	0
	⇨ អតិថិជនស្ថាប័ន	67	67	66	66	66	66	64	66	66	-	-	-	0
6	អត្រាអាននាឡិកាសរុប	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	មធ្យមភាគថ្លៃលក់សរុប	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	អត្រាលក់អោយអតិថិជនធម្មតា :	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%
	★ លក់អោយក្រោម 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%
	★ លក់អោយលើសពី 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%
	អត្រាលក់អោយអាជីវកម្ម	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%
	អត្រាលក់អោយស្ថាប័ន	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	លក់អោយក្រោម១០ម៣នៃបរិមាណទឹកលក់សរុប	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	ប្រើប្រាស់១មុខជំណ/ថ្ងៃសរុប(ម៣)	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	ការប្រើប្រាស់សំរាប់អតិ.អាជីវ.	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	11.74	11.52	9.75	9.79	10.34	9.54	10.36	10.08	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
15	ប្រវែងបណ្ដាញសរុប	59,116	59,116	59,116	80,947	81,347	81,347	81,497	81,737	81737				

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	Kampong Cham District
2	Kapong Cham	9	1,261	7,443	1,330	
3	Sambour mease	9	2,532	14,977	812	
4	Veal Vong	6	3,117	15,752	2,579	
5	Ampil	8	3,130	13,381	-	Kampong Seam District
6	Kaok Roka	4	1,331	5,462	-	
7	Roang	2	1,004	4,544	46	
A	Total Kapong Cham District	31	8,694	46,888	5,954	
B	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_4, Cu, H_2S, Al, Cl, Fe, NH_3-N,.... ....etc

3.) Water Quality Monitoring (Cont..)

KAMPONG CHAM WATER WORK s						
Weekly Water Balance for The Month : September/2010						Chief
Date	Water Quality					
	Tem.	pH.	Turbidity	Color	Residual-Chlorine	Conduct.
	ºC		NTU	TCU	mg/l	$\mu s/_{cm}$
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..)

All Parameter Analysis (Analyze every 3month)

Water Treatment Plant : Kampong Cham Province Water Works

(3 Month) Year/Month : 10 / 2010

	Items	DWQS Maximum	Date: / 09 / 2010 Raw Watre	Treated Water
Drinking Water Quality Standards (QSDW)	Taste	Acceptable		
	Odor	Acceptable		
	Color	5 TCU	0.045	0.018
	Turbidity	5NTU	0.001	0.014
	Residual Chlorine	0.2-0.5 mg/L		0.87
	pH	6.5-8.5	7.74	7.22
	Total Dissolved Solids	800 mg/L		
	Manganese (Mn)	0.1 mg/L		
	Zinc (Zn)	3 mg/L	0.18	0.5
	Sulfate (SO4)	250 mg/L	12	11
	Copper (Cu)	1 mg/L	0.013	<0.002
	Hydrogen Sulfide (H2S)	0.05 mg/L	0.002	<0.005
	Hardness	300 mg/L	200	200
	Aluminum (Al)	0.2 mg/L	0.004	0.007
	Chloride (Cl)	250 mg/L	21.33	22.78
	Iron (Fe)	0.3 mg/L		
	Ammonia (NH3-N)	1.5 mg/L		
	E.Coli	0		
	Total Coliform	0		
	Alkalinity	mg/L (as $CaCO_3$)	218	214
	Conductivity	µs/cm	467	456
	Organic Carbons	mg/L	0.8	1

Water analyzed

Existing Chlorination Facility inspection

7. Distribution System

- Pipe networks in Kampong Cham waterworks are 52,709 meters as follow :
- Distribution pipes (Ø 400mm – 110 mm) are 15,546 meters
- Service pipes (Ø 63mm) are 37,163meters
- The types of pipes are DI , HDPE and PVC .
- 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 2nd 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 / m^3	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%

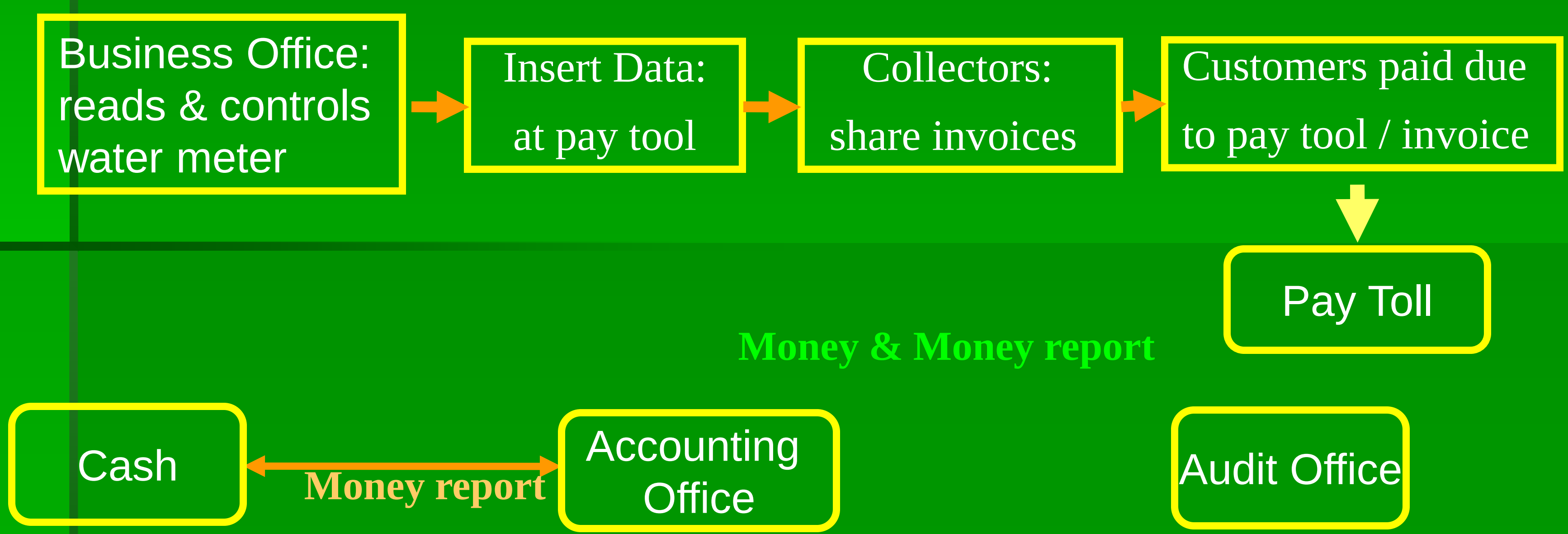
Water Block Tariff :(2006 - 2012)

- The home Users : - 0 to 10 M^3 = 550 Riels per cube meters.
  - 10 M^3 Up = 900 Riels per cube meters.
- The business - 0 M^3 up = 900 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 - Strategic Proposals

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 m^3 per day, but our capacity of water production now 7,200 m^3 per day and in dry season (March-June of 2012) was 4,800 m^3 per day so the lacking of 2,400 m^3 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 .

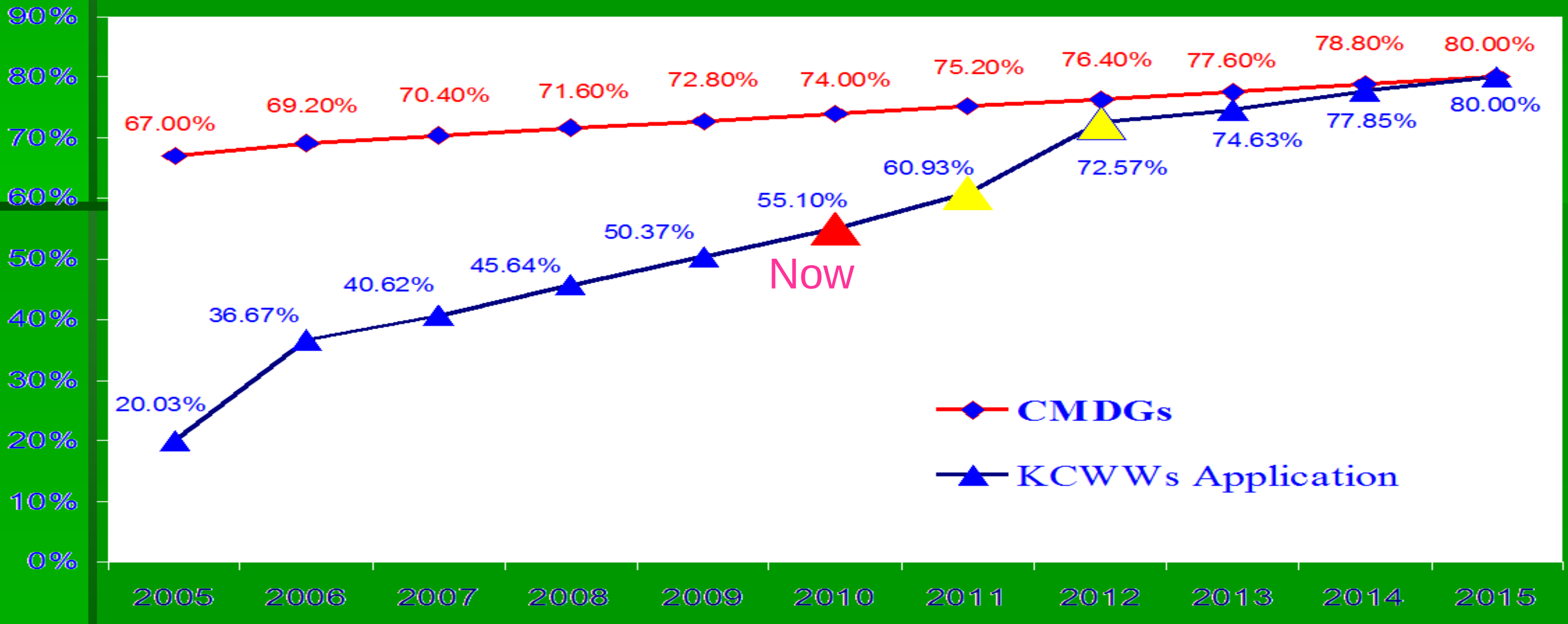
★Securing stable water quality.

★High reliability to customers.

✓ Coverage : Until the years 2015 : 80% of population in town will have accessed safe water : - Sambuormeas Commune to increase 60%

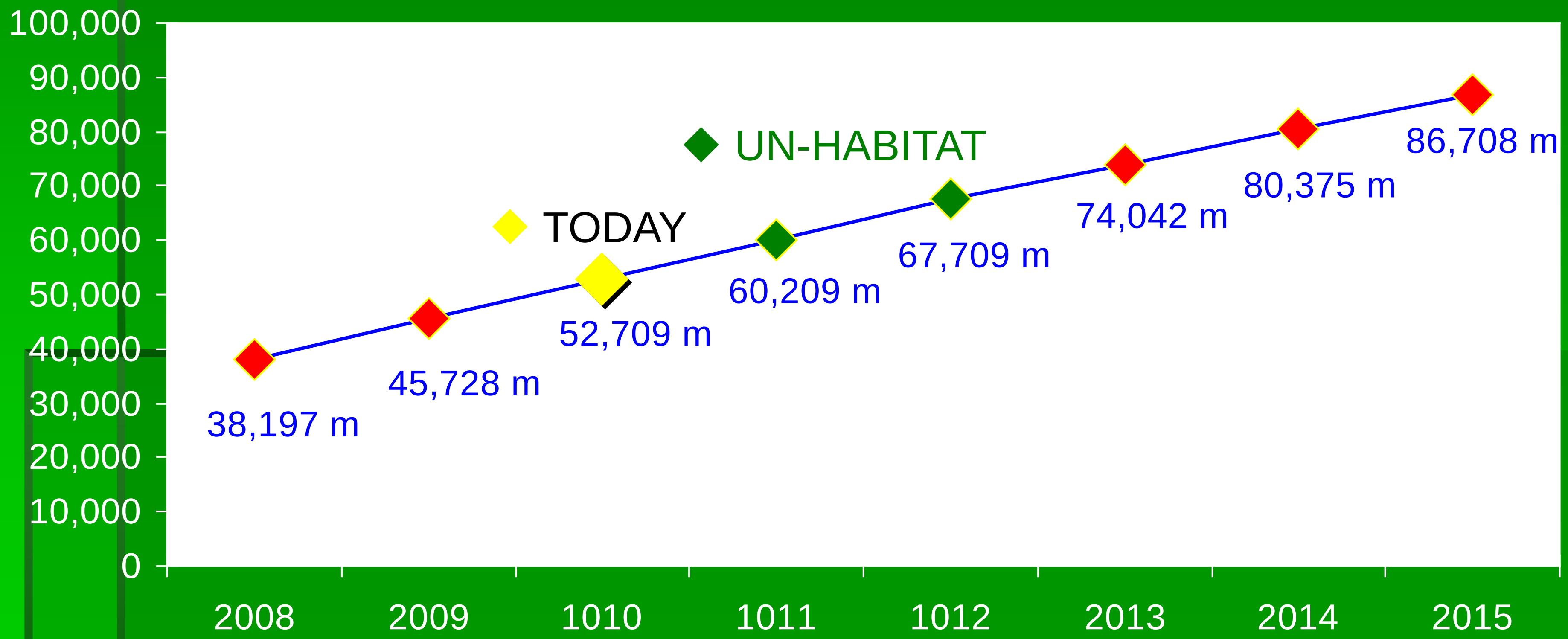
- Boeung Kok Commune to increase 90%

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

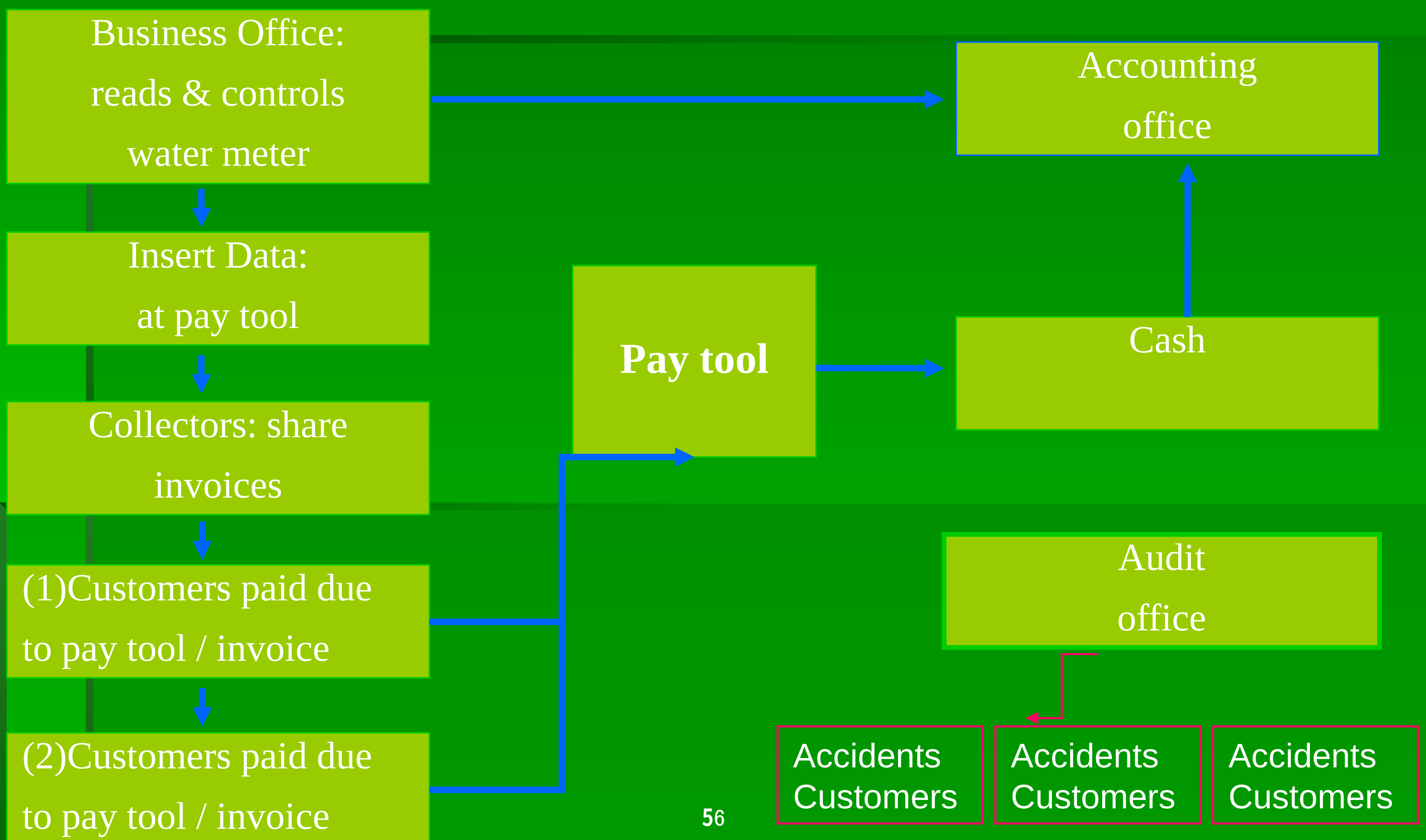
Descriptions	Riel / m^3	Percent
Power	380.65	42.83 %
Salaries, Wages & Allowances	166.51	18.74 %
Chemicals	21.99	5.47 %
Other Operating Expenses	97.13	9.93 %
Depreciations & Amortization	212.69	21.93 %
Non- Operating Expenses	9.80	1.10 %
Total Unit Cost	888.77	100%

Water Block Tariff :

- The home Users : - 0 to 05 M^3 Up = 550 Riels per cube meters.
  - 05to10 M^3 Up = 680 Riels per cube meters.
  - 11to15 M^3 Up = 990 Riels per cube meters.
  - 16 M^3 Up = 1,100 Riels per cube meters.
- The business - 0 M^3 Up = 950 Riels per cube meters.
  - 10 M^3 Up = 1,200 Riels per cube meters.
- Organization - 0 M^3 Up = 1,500 Riels per cube meters.

C - Mode of Collection (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%


대우굴삭기

TaMgenHkµankarRtYtBinitüKuNPaBehIyCaTUeTAK Wmins¥atgayRbQmnwgCm¶W.

Rain Water


បន្ទប់សិក្សាអំពីទឹក
Water Classroom

CAMBODIA

Tonle Sap Lake

Thank for your Attention !

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

Iran (1)

In the name of God

National Water
& Wastewater
Engineering Company of Iran

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 IRAN 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.

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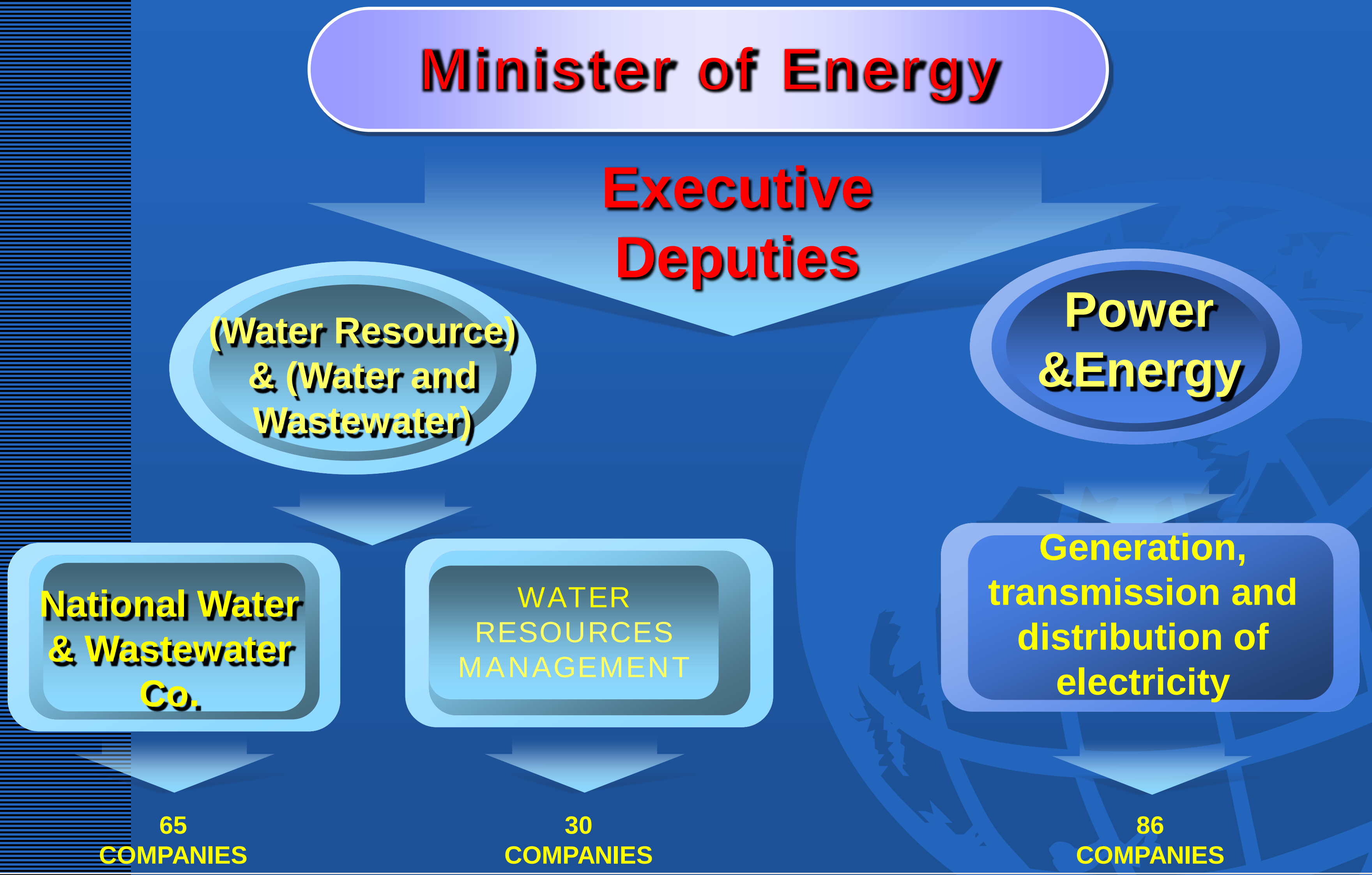
My Own Job: Expert of Bureau for Supervision on Consumption Management and Reduction of non revenue water in urban sector

The Organization of the Ministry of Energy



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

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
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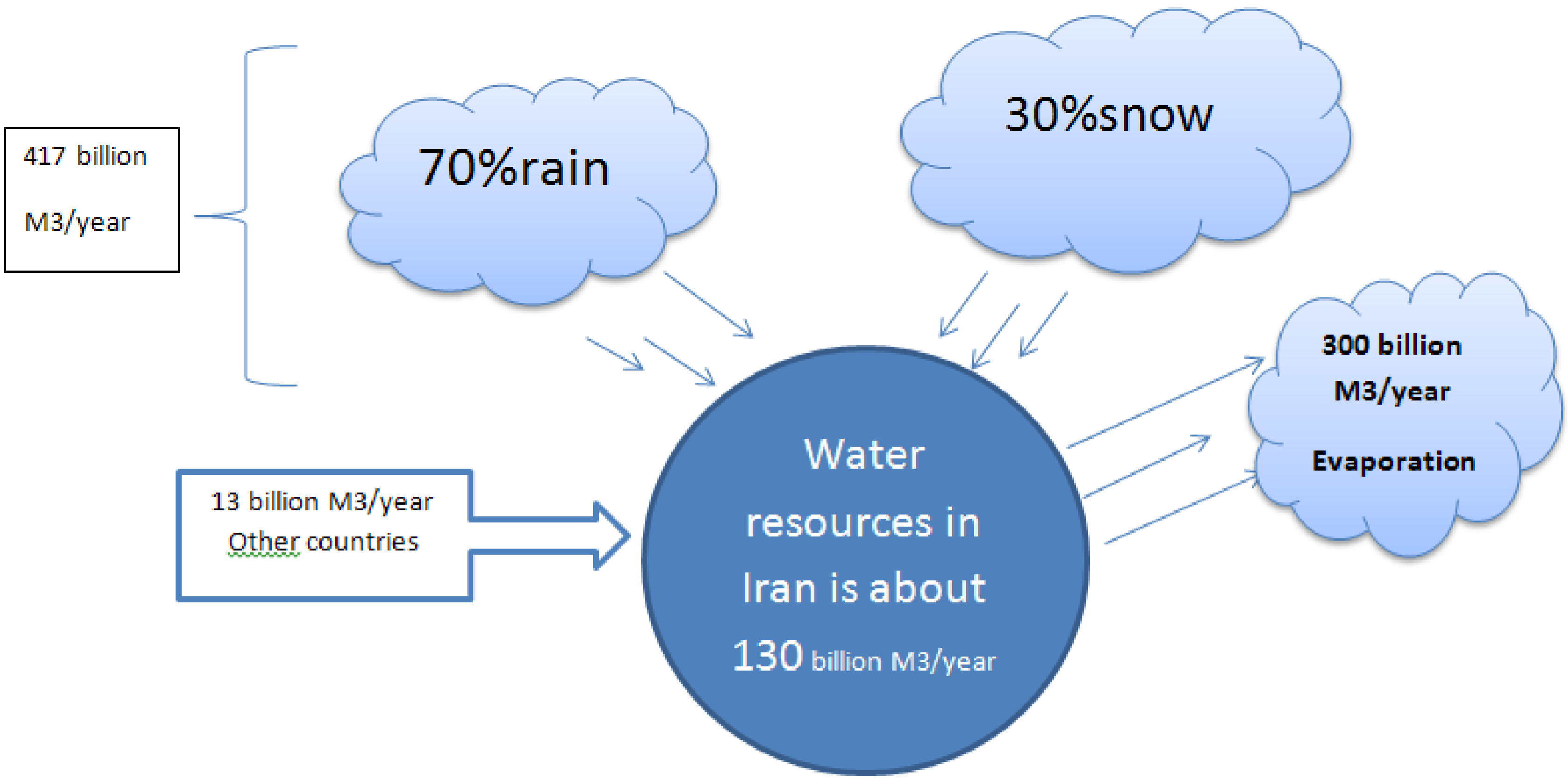
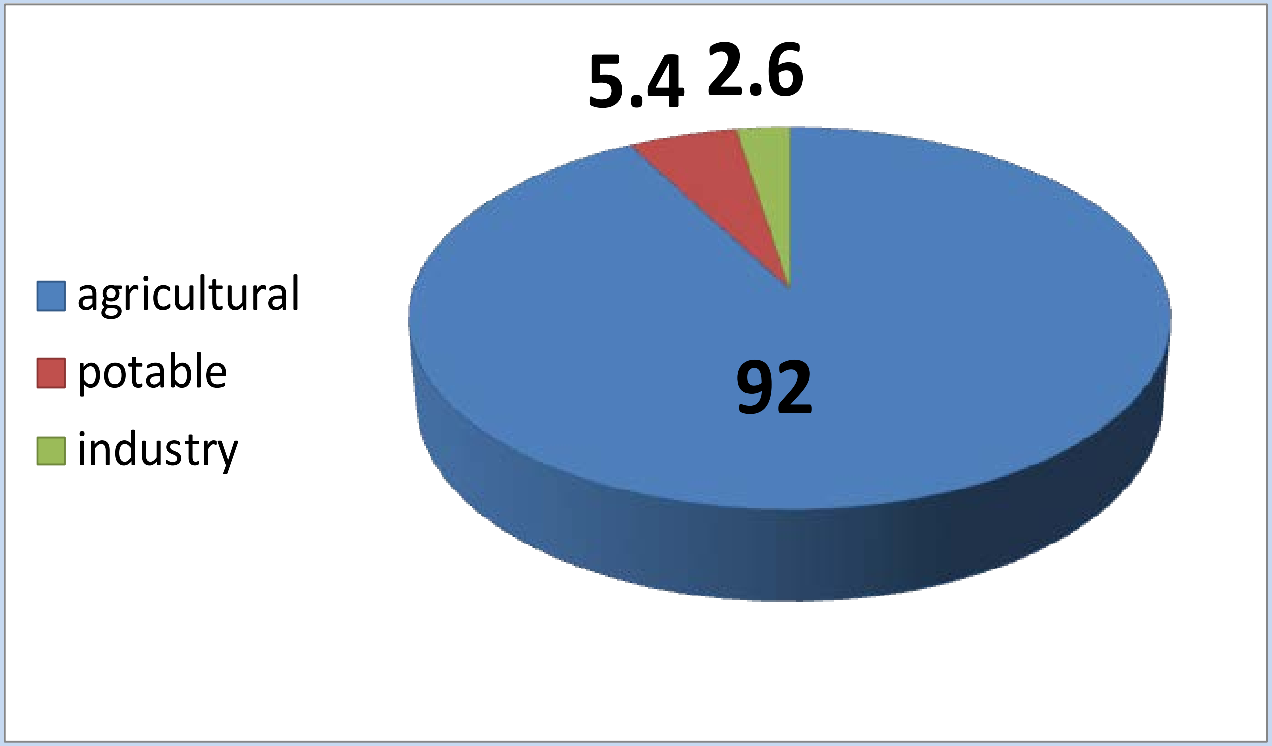
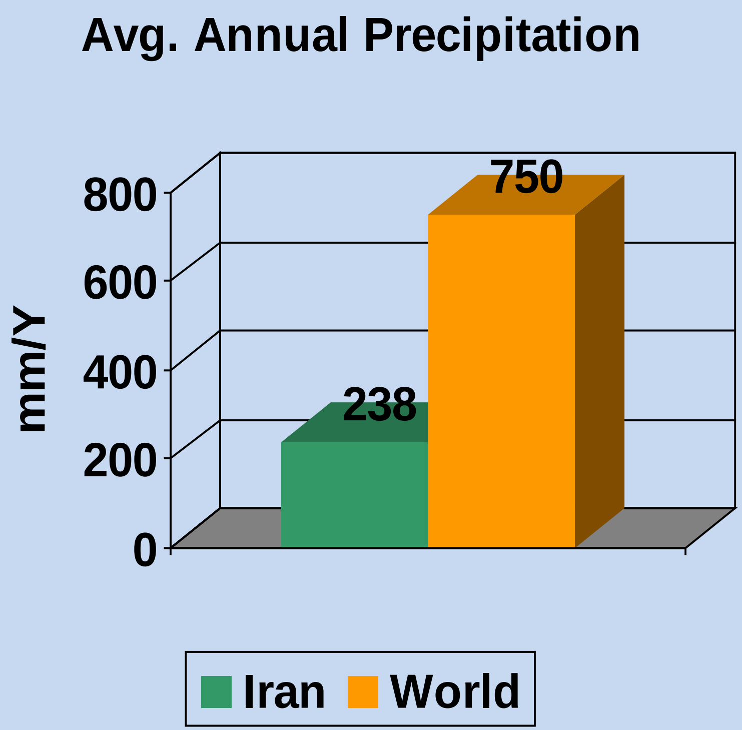
Water recourses in IRAN

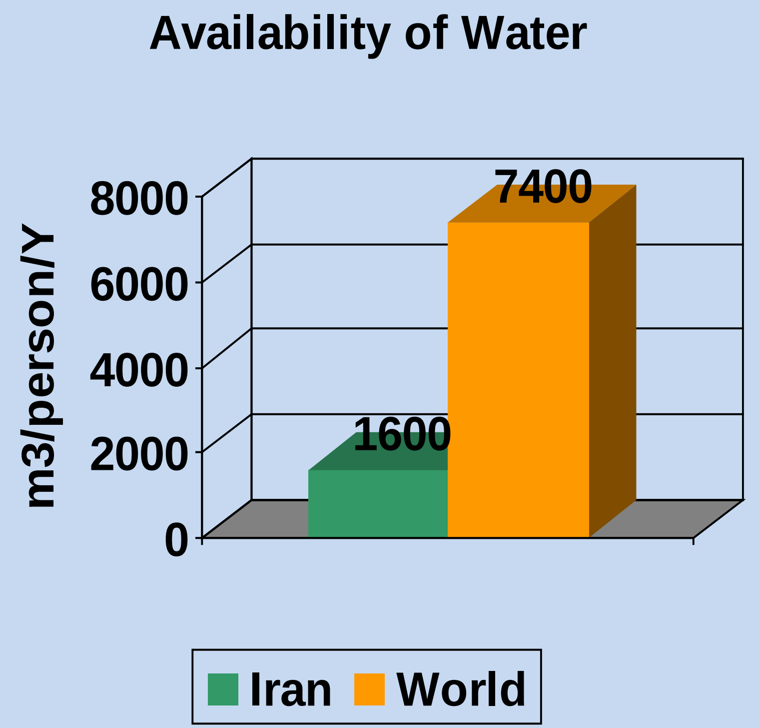


Water use in iran

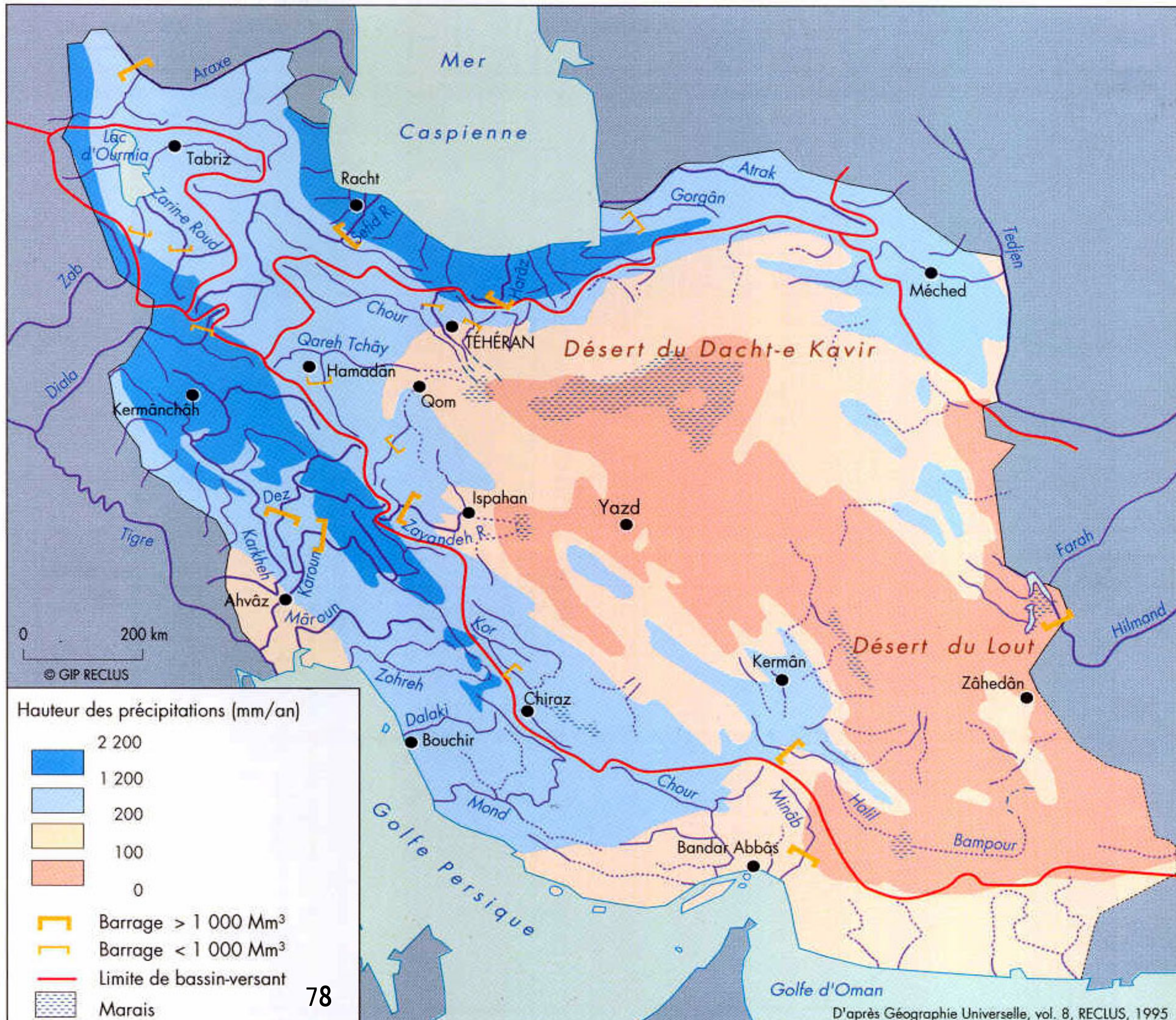


Precipitation and Availability of Water





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



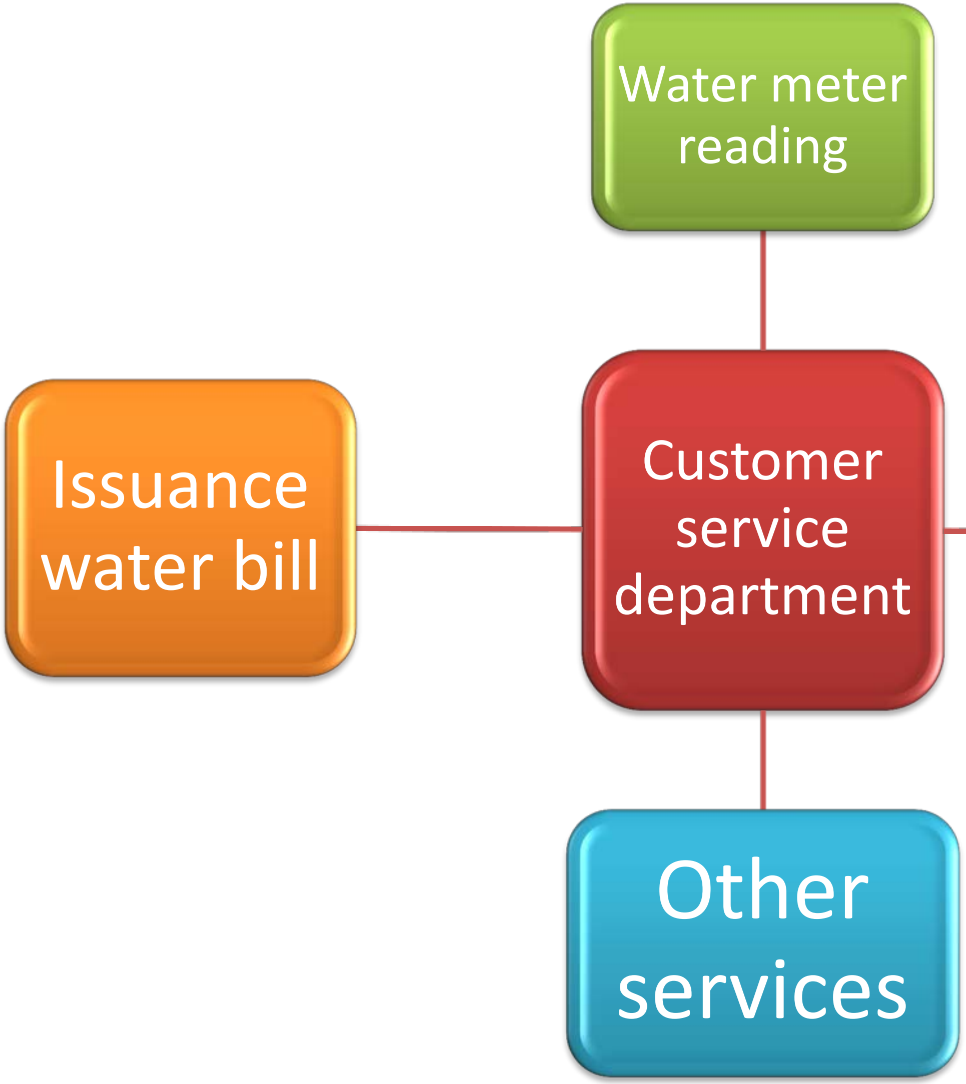
Water availability & consumption Variation in Iran

Trend of Water availability (1955-2020)

Year	Per Capita(m^3)
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


Water meter reading
Issuance water bill
Customer service department
Calculating the costs of water
Other services

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

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8. Etc.

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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

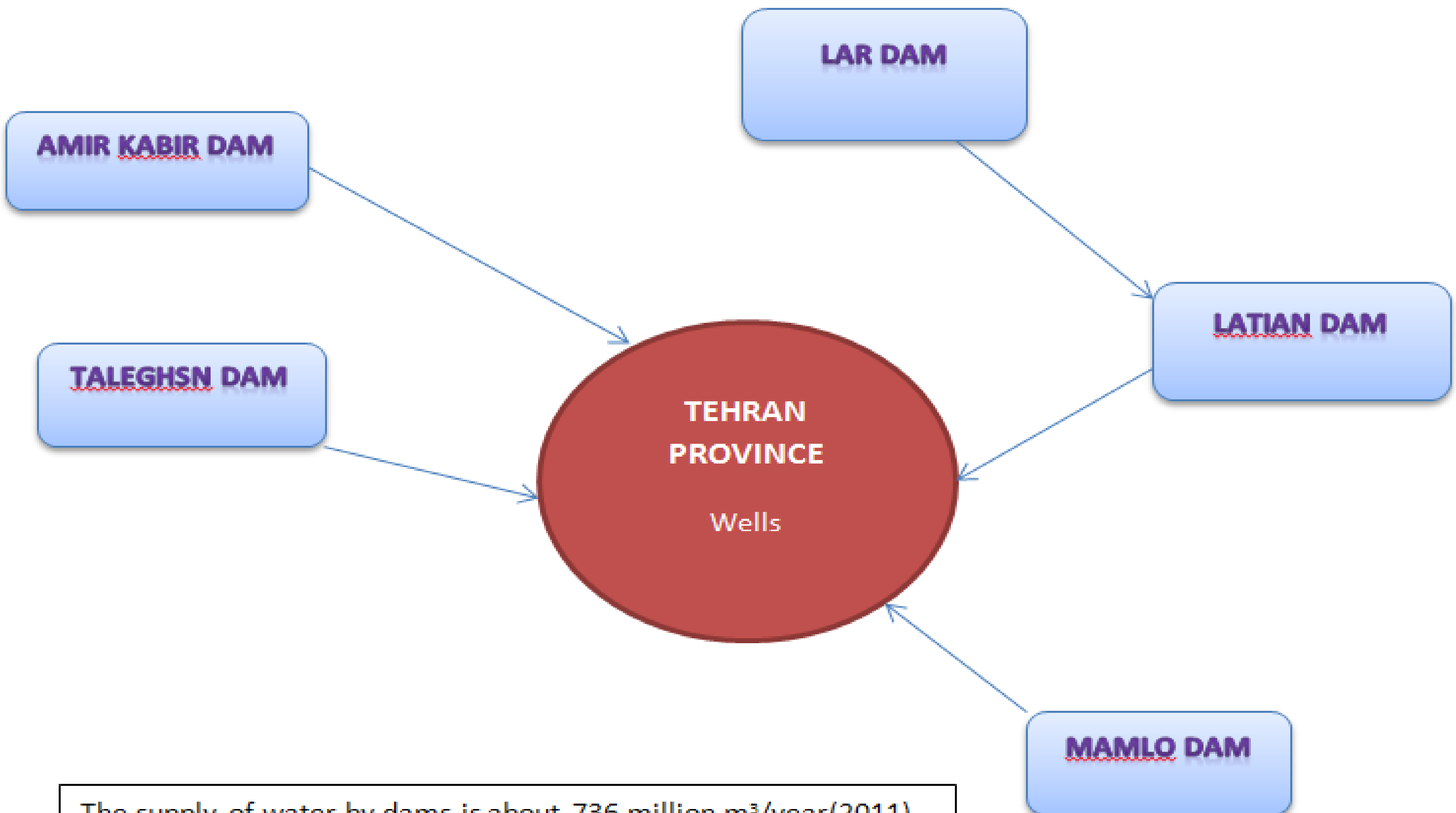
Expansion of urban areas and the inclusion of water resources within their limits

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



The supply of water by dams is about 736 million m³/year(2011)

The supply of water by wells is 570 million m3/year(2011)

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.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Turk.
Azr.
Ar.
Azerbaijan
Caspian Sea
Turkmenistan
Ashkhabad
Kizyl-Arvat
Chardzhou
Mary
Astara
Tabriz
Orumiyeh
Lake Urmia
Rasht
Mahabad
Irbil
Zanjan
Qazvin
Kirkuk
Sanandaj
Tehran
Emamshahr
Mashhad
Kushka
Hamadan
Qom
Dasht-e Kavir (salt desert)
Kavir-e Namak
Herat
Bakhtaran
Arak
Baghdad
Zagros Mountains
Afghanistan
Esfahan
Farah
Iraq
Shahr-e Kord
Yazd
Ahvaz
Dasht-e Lut
Basra
Khorramshahr
Yasuj
Iran
Umm Qasr
Kerman
Kuwait
Kuwait
Shiraz
Zahedan
Bandar-e Bushehr
Persian Gulf
Saudi Arabia
0 200 km
0 150 mi
Bandar-e 'Abbas
Bandar-e Lengeh
Manama
Hofuf
Qatar
Bahrain
Doha
Dubayy
U.A.E.
Abu Dhabi
Oman
Jask
Chah Bahar
Pak.
Gulf of Oman
Riyadh
36°
30°
24°
48°
54°
60°

About IRAN

- Geographic coordinates: 32º 00’ N, 53º 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)

IN THE NAME OF GOD

Country Report Of Iran

B.Sc: civil engineering

M.Ss:Urban Managment

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 geopolitical significance owing to its location in three spheres of Asia. Iran is the third largest oil producer in the world and the second largest gas producer in the world.**
- **Tehran is the capital, the country's most populous city and the politica industrial center of the nation**

Whole Country:

Area: 1648195 km^2

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^2

Population Served: 77 million person

Water connections: 13000000 connections

0 150 300 km
0 150 300 mi
ARMENIA
AZERBAIJAN
TURKMENISTAN
Caspian Sea
Tabrīz
Mashhad
TEHRĀN
IRAQ
Qom
Kermānshāh
Bīrjand
Dezfūl
Esfahān
Tigris
AFGHANISTAN
Yazd
Ahvāz
Euphrates
Bandar-e Khomeyī
Kermān
Ābādān
Shīrāz
KUWAIT
Zāhedān
Būshehr
Persian Gulf
PAKISTAN
Bandar 'Abbās
Strait of Hormuz
BAHRAIN
SAUDI ARABIA
QATAR
UNITED ARAB EMIRATES
Gulf of Oman
Chābahār
OMAN

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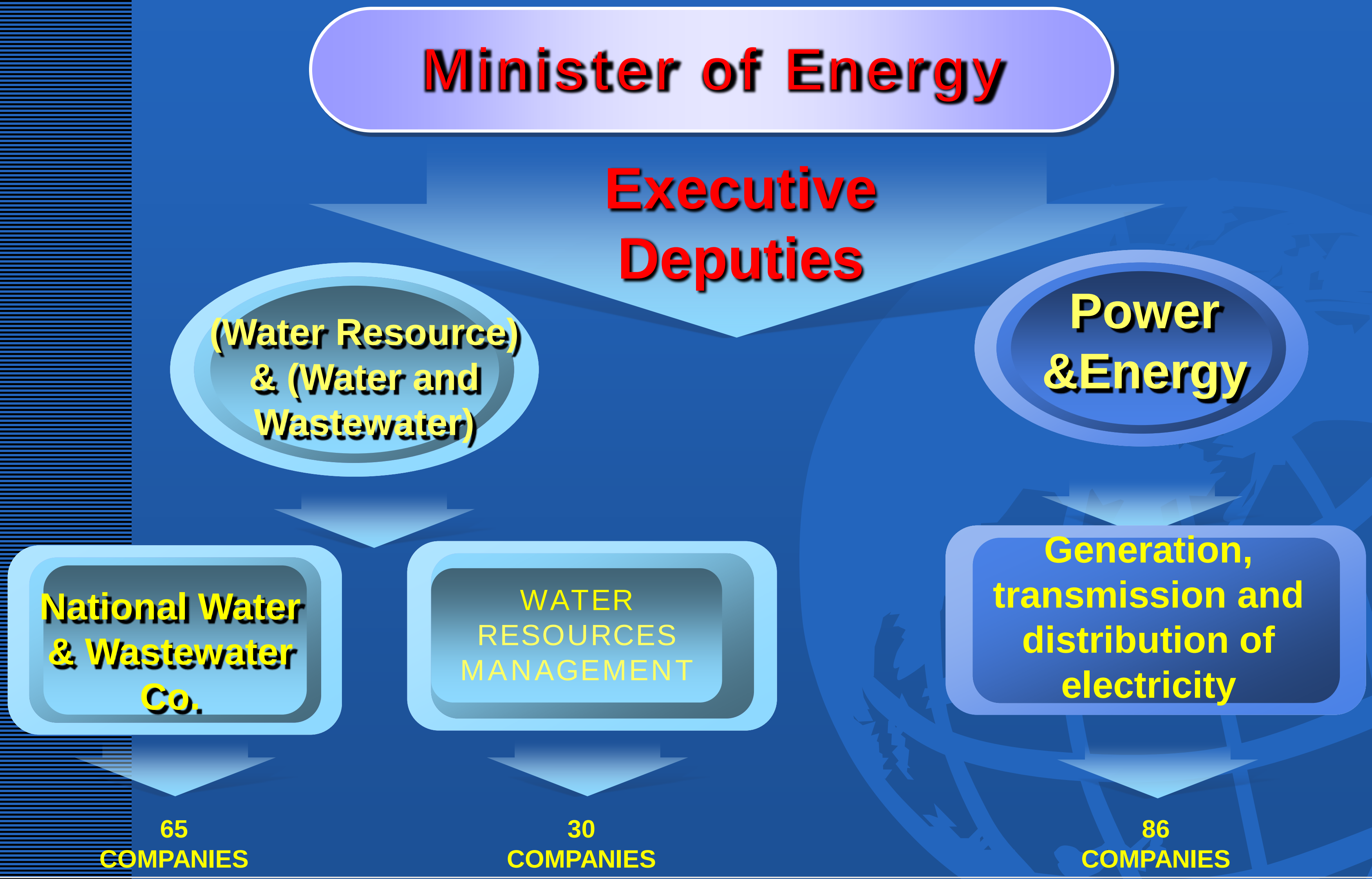
My official position : operation sector

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



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

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Managing Director

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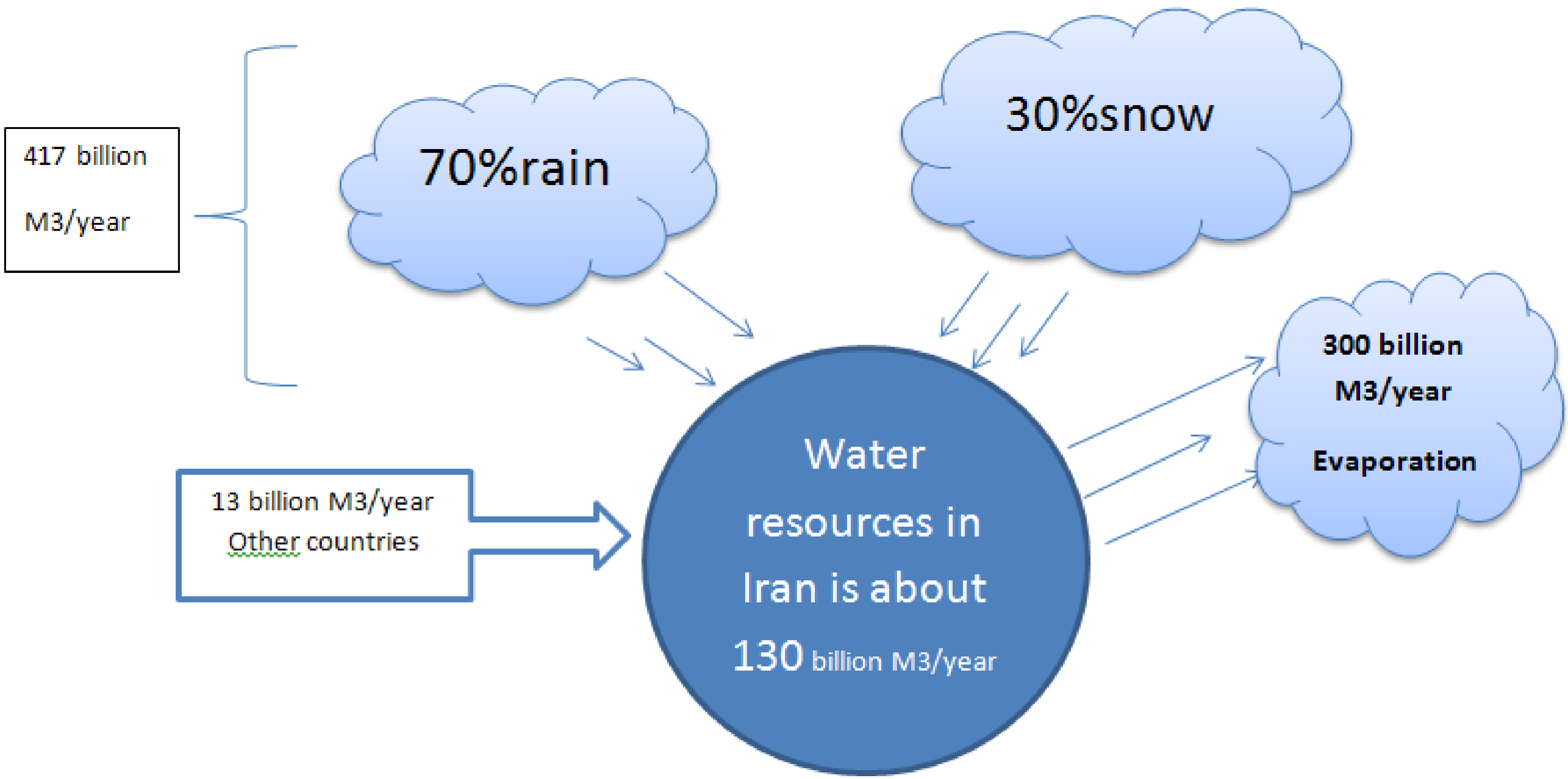
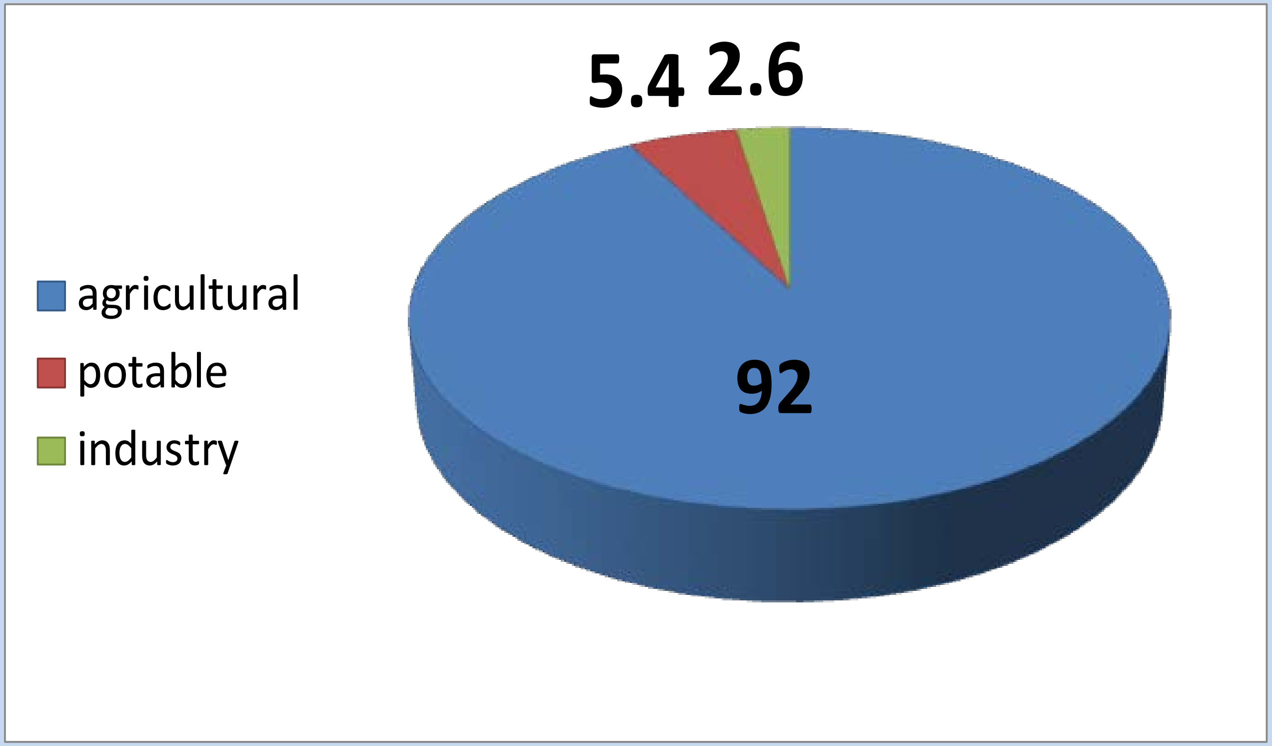
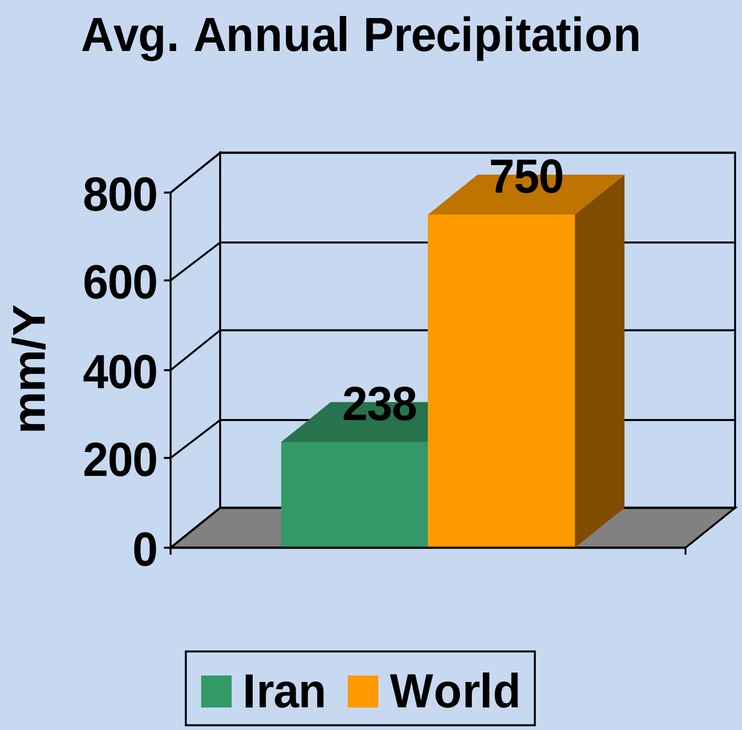


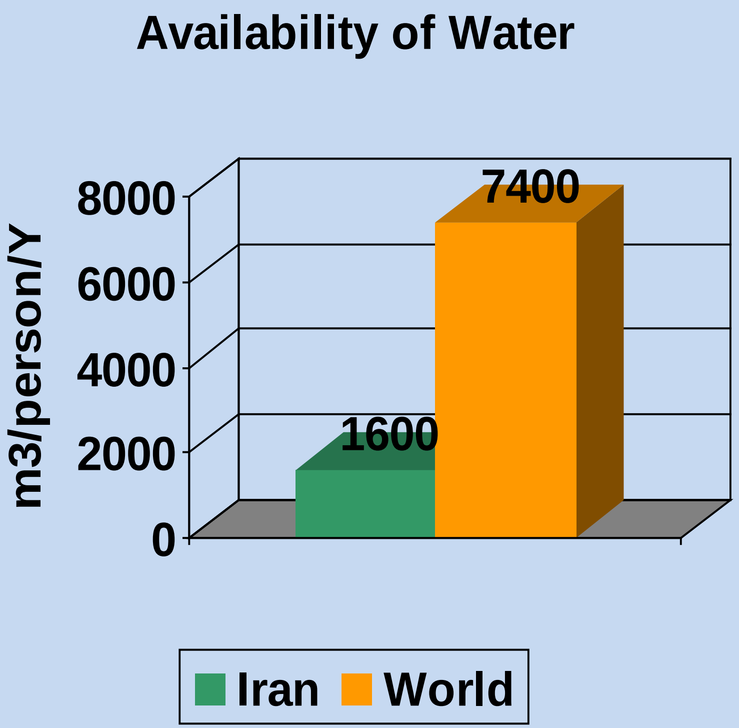
Water use in iran



National Water & Wastewater Engineering Company of Iran

Precipitation and Availability of Water





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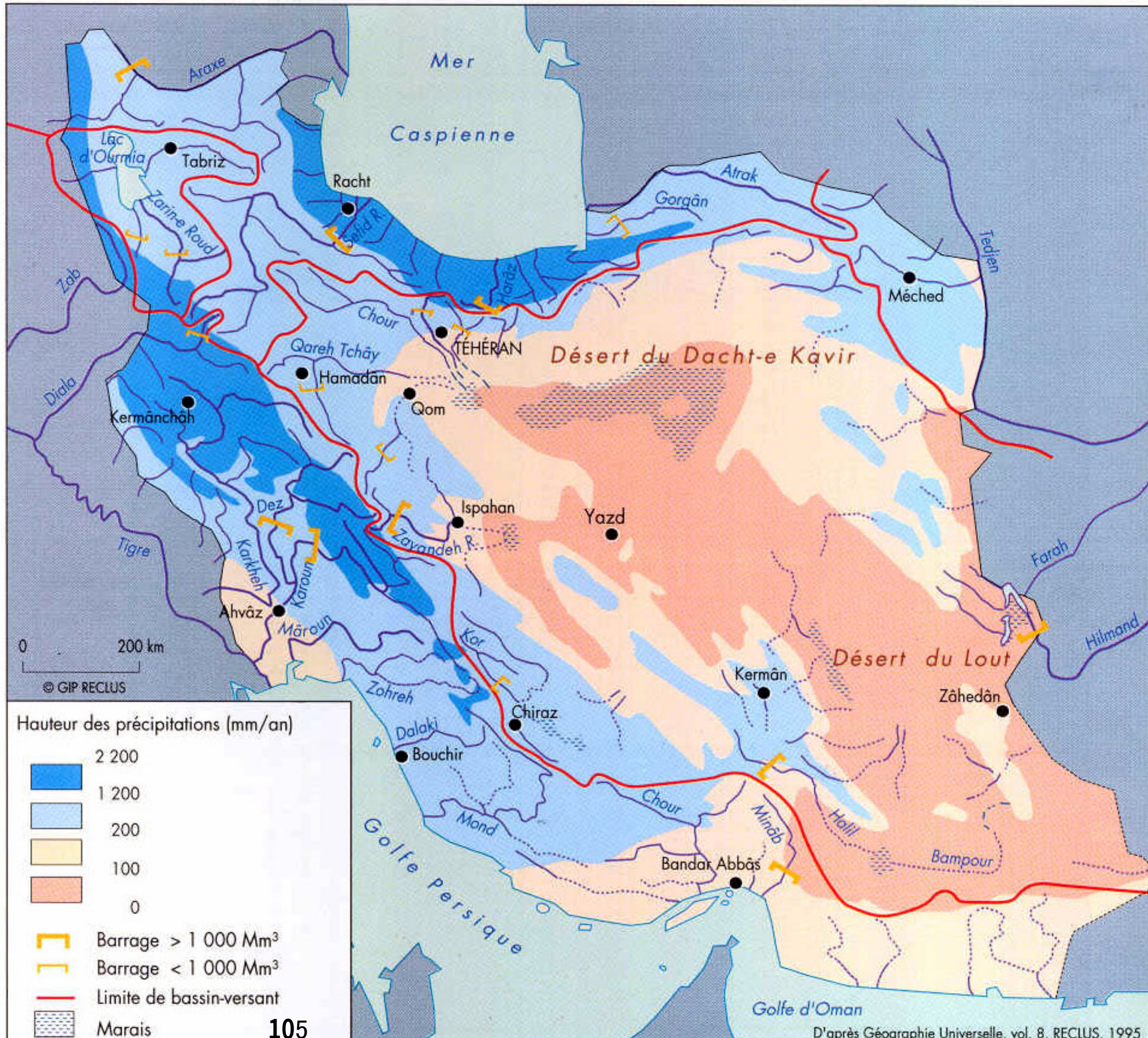

- In Iran rainfall is highly variable. In the north is more than 2113 mm. in desert areas is about 15 mm. in West and North West, North East and southern Alborz is about 500 mm. and Not more than 200 mm of rainfall in other areas. Iran is grappling with water shortage problems. and May be Encounter with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

Water availability & consumption Variation in Iran

Trend of Water availability (1955-2020)

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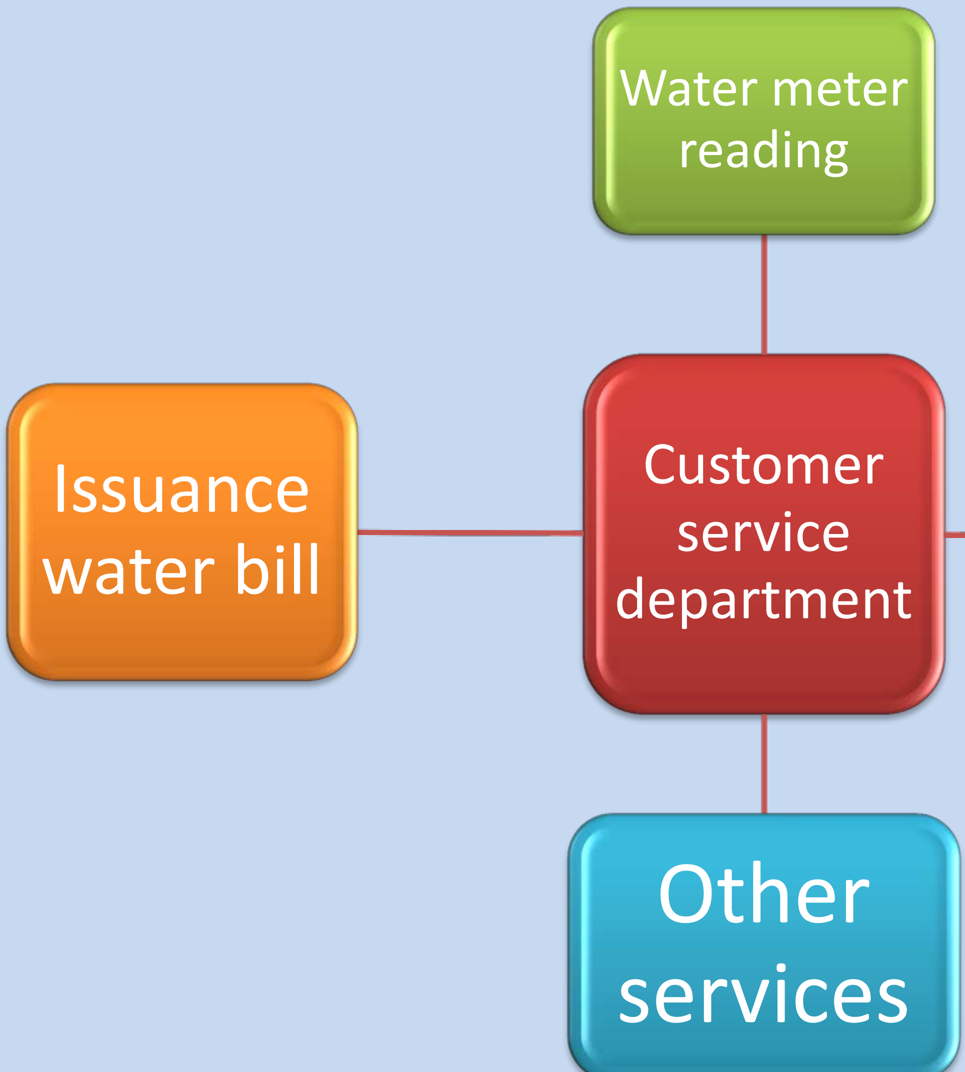
Water meter reading
Issuance water bill
Customer service department
Calculating the costs of water
Other services

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

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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 %

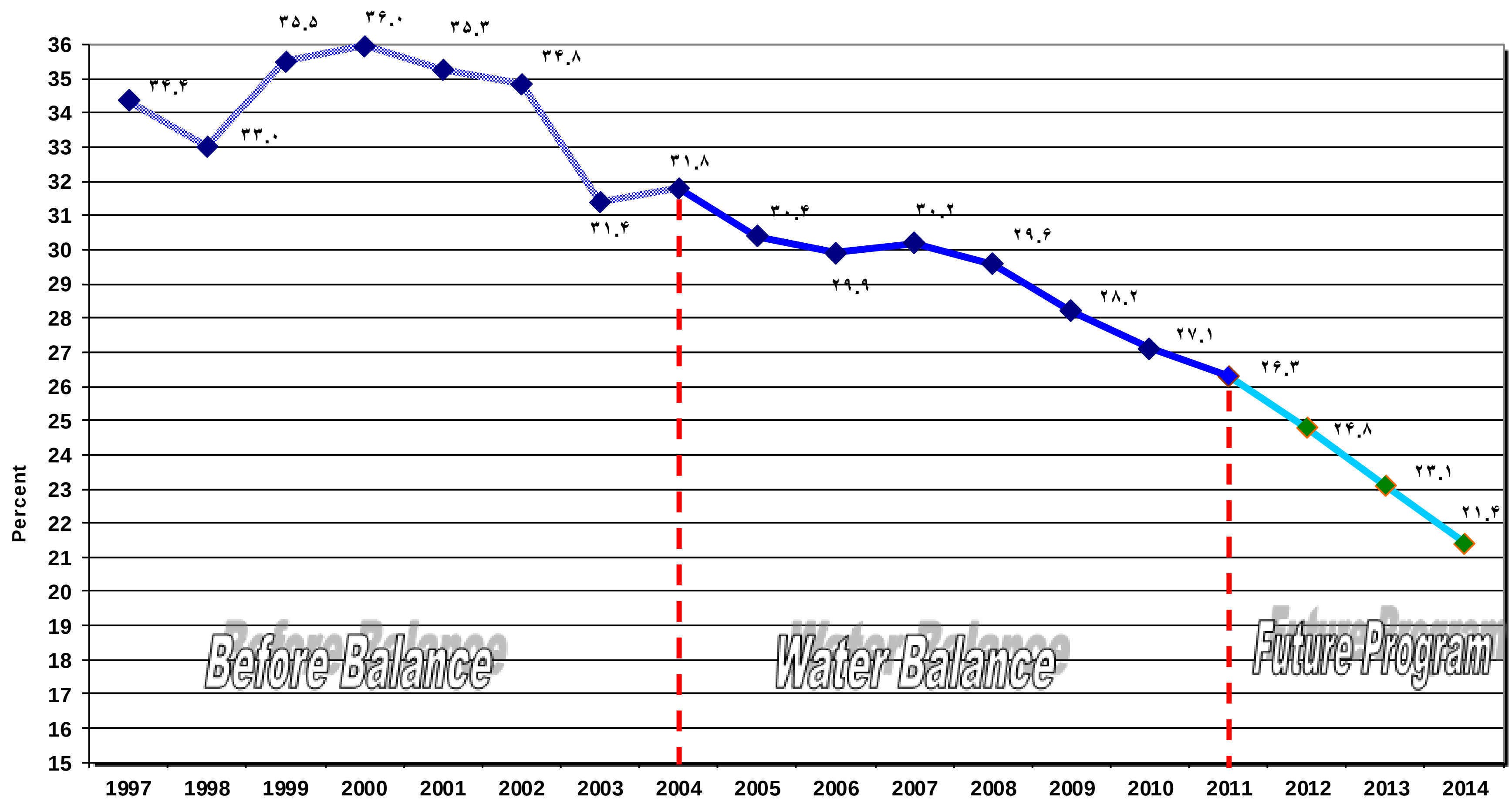
Reduction of non-revenue water1

<table>
<tr><td rowspan="4">System input volume 5422056 095 (m3/year)</td><td rowspan="2">Authorized consumptio n 4135343382</td><td>Revenue water 4041555403</td><td>Billed authorized consumption</td><td>xx m^3 /year (74.5 %)</td></tr>
<tr><td rowspan="3">Non Revenue Water (NRW)

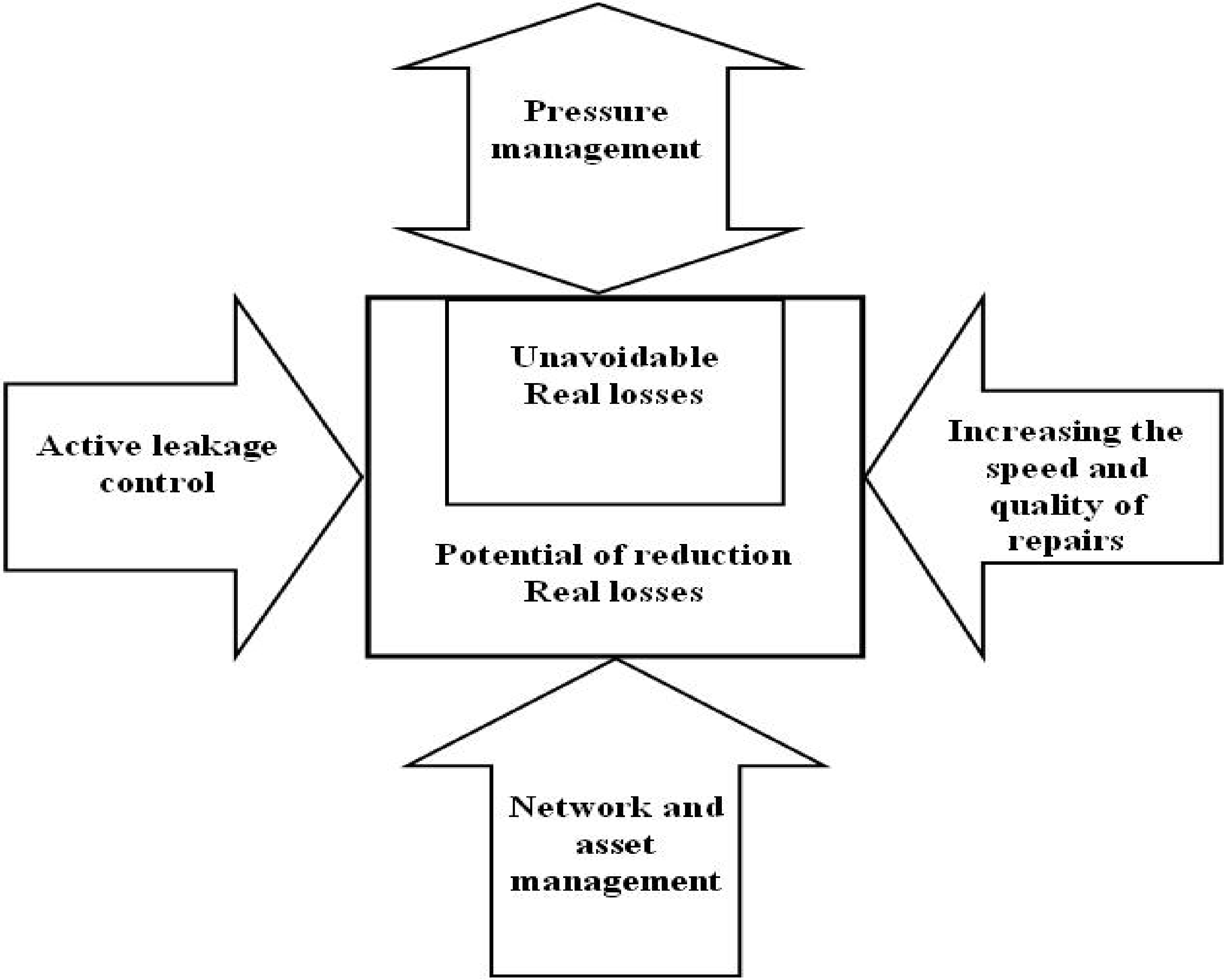
1380500692</td><td>Unbilled authorized consumption (ex. fire fighting, cleaning)</td><td>xx m^3 /year (1.8%)</td></tr>
<tr><td rowspan="2">Water losses

1286712713</td><td>Apparent losses (Unauthorized consumption (i.e. Illegal use), Customer metering inaccuracies)</td><td>xx m^3 /year (9.7 %)</td></tr>
<tr><td>Real losses (Leakage)</td><td>xx m^3 /year (14%)</td></tr>
</table>

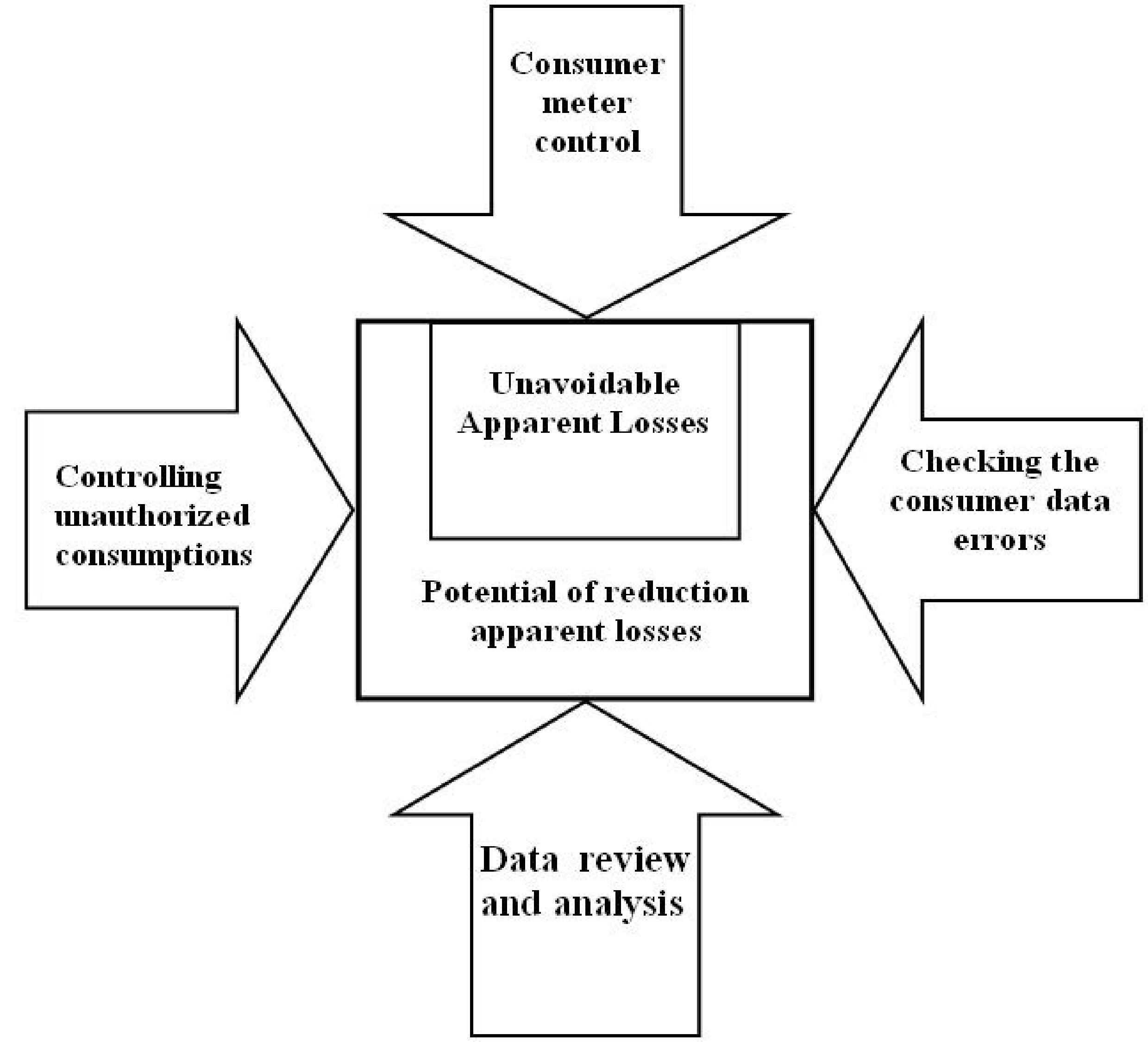
Comparison of NRW in Iran



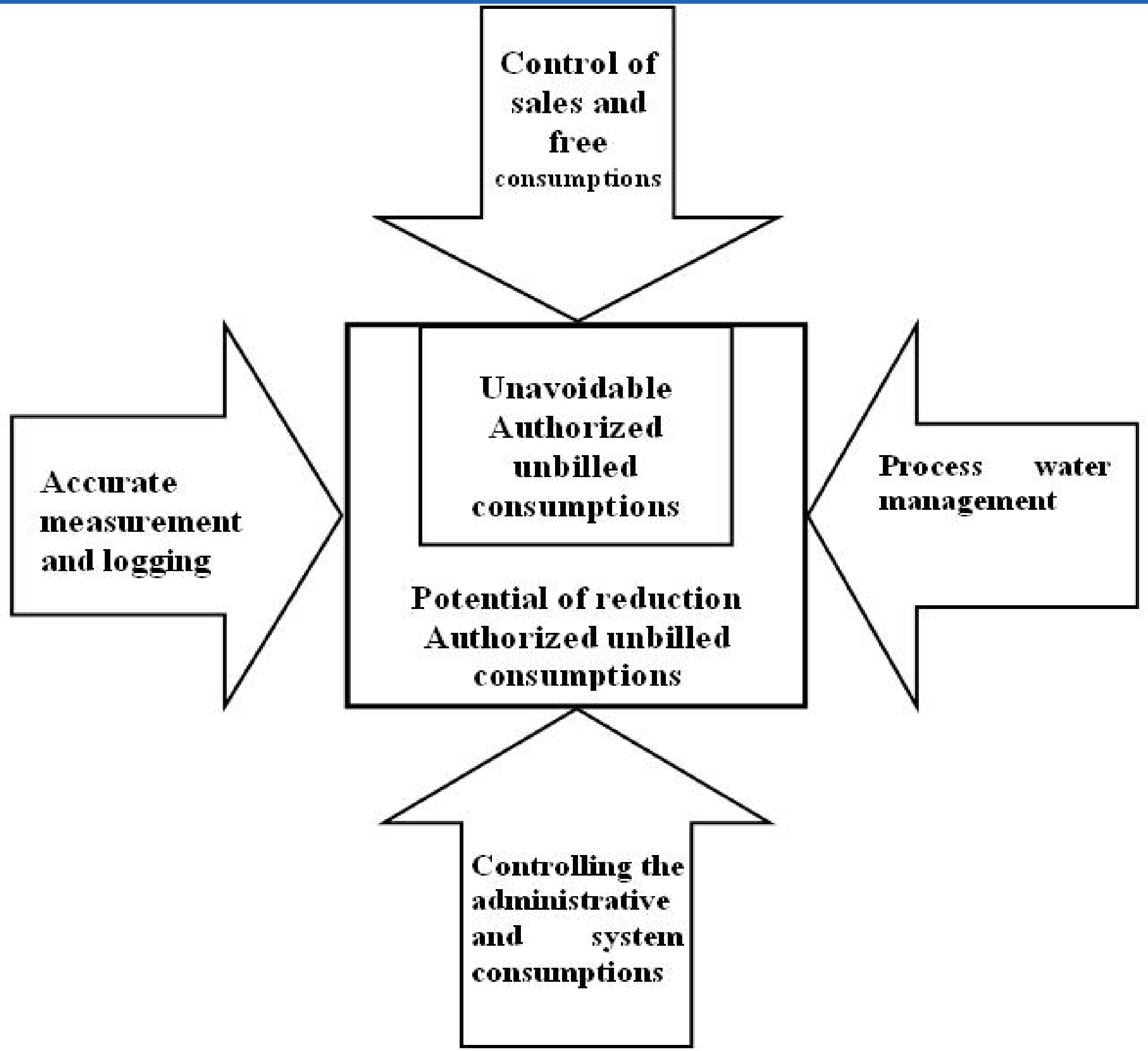
Real Losses Strategies



Apparent Losses Strategies



Unbilled Authorized Consumptions Strategies



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The worn-out condition of water systems

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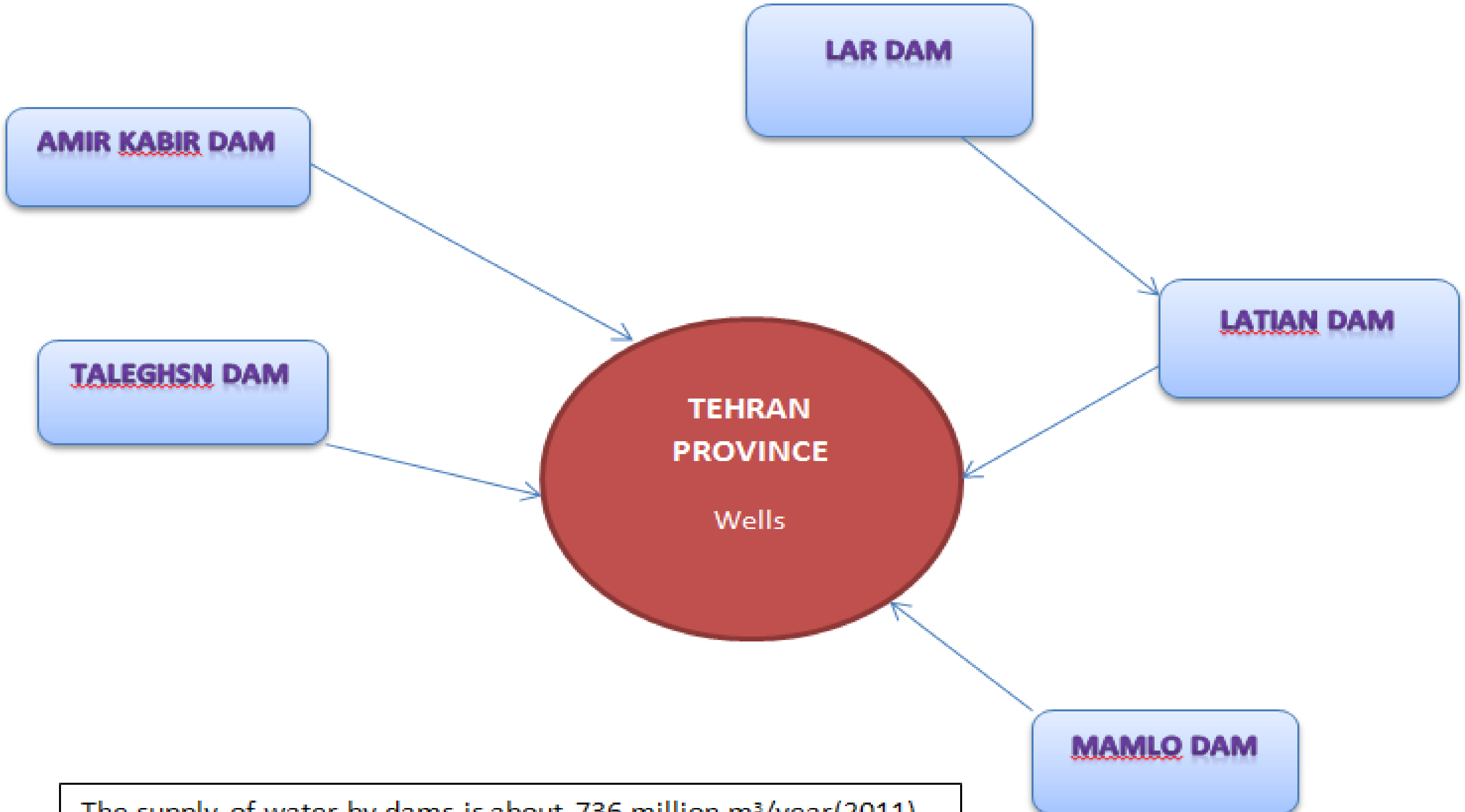
Thank You For your Kind Attention

ご清聴ありがとうございました



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Turk.
Azr.
Ar.
Azerbaijan
Caspian Sea
Turkmenistan
Ashkhabad
Kizyl-Arvat
Chardzhou
Mary
Astara
Tabriz
Orumiyeh
Lake Urmia
Rasht
Mahabad
Irbil
Zanjan
Qazvin
Emamshahr
Mashhad
Kirkuk
Sanandaj
Tehran
Kushka
Hamadan
Qom
Dasht-e Kavir (salt desert)
Kavir-e Namak
Herat
Bakhtaran
Arak
Baghdad
Zagros Mountains
Afghanistan
Esfahan
Farah
Iraq
Shahr-e Kord
Yazd
Ahvaz
Dasht-e Lut
Iran
Yasuj
Basra
Khorramshahr
Umm Qasr
Kerman
Kuwait
Kuwait
Shiraz
Zahedan
Bandar-e Bushehr
Persian Gulf
Saudi Arabia
Bandar-e 'Abbas
Bandar-e Lengeh
0 200 km
0 150 mi
Manama
Qatar
Doha
Hofuf
Bahrain
Pak.
Chah Bahar
Jask
Dubayy
U.A.E.
Abu Dhabi
Oman
Gulf of Oman
Riyadh
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30°
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About IRAN

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- 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

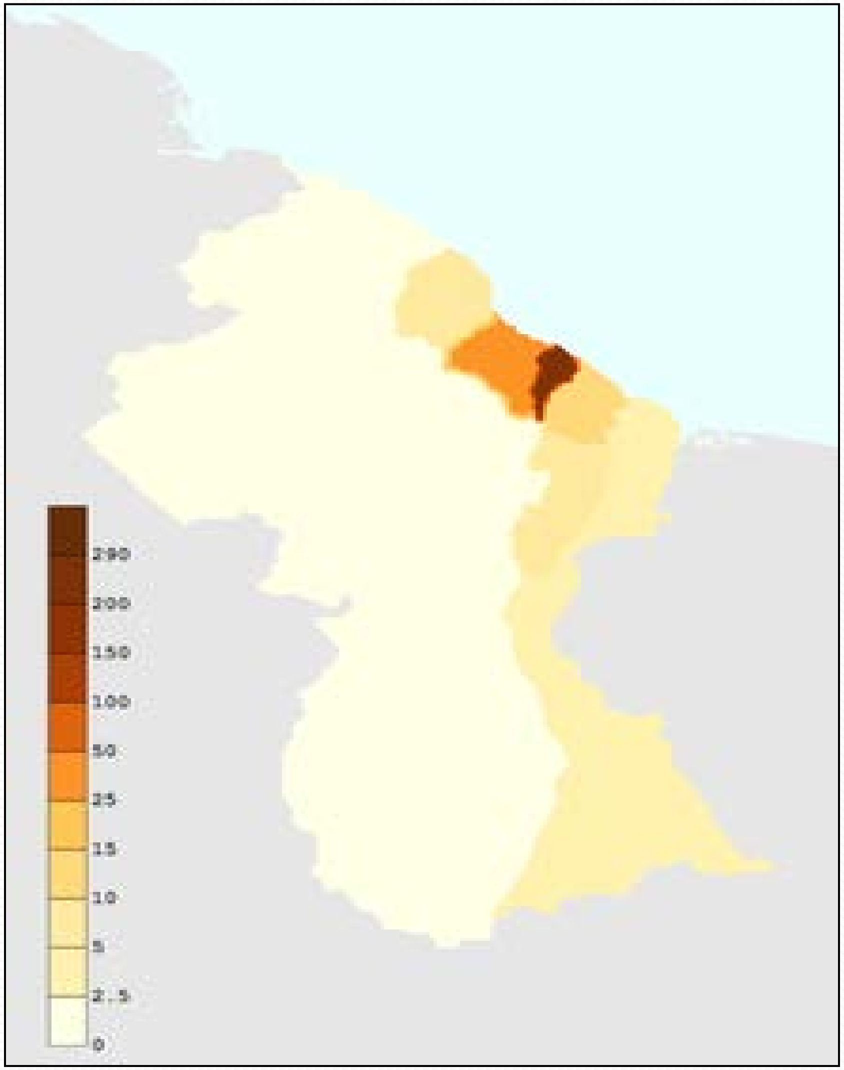
General Country Profile: Background

- 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)

<u>Whole Country</u>

Area :	215,000 km^2
Population:	750,000
Coverage Water Supply:	98 %
Selected Water Supply System:	Georgetown
Service Area:	30 km^2
Population Served:	240,000

General Country Profile: Background



Guyana's population density in 2005 (people per km²).

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.

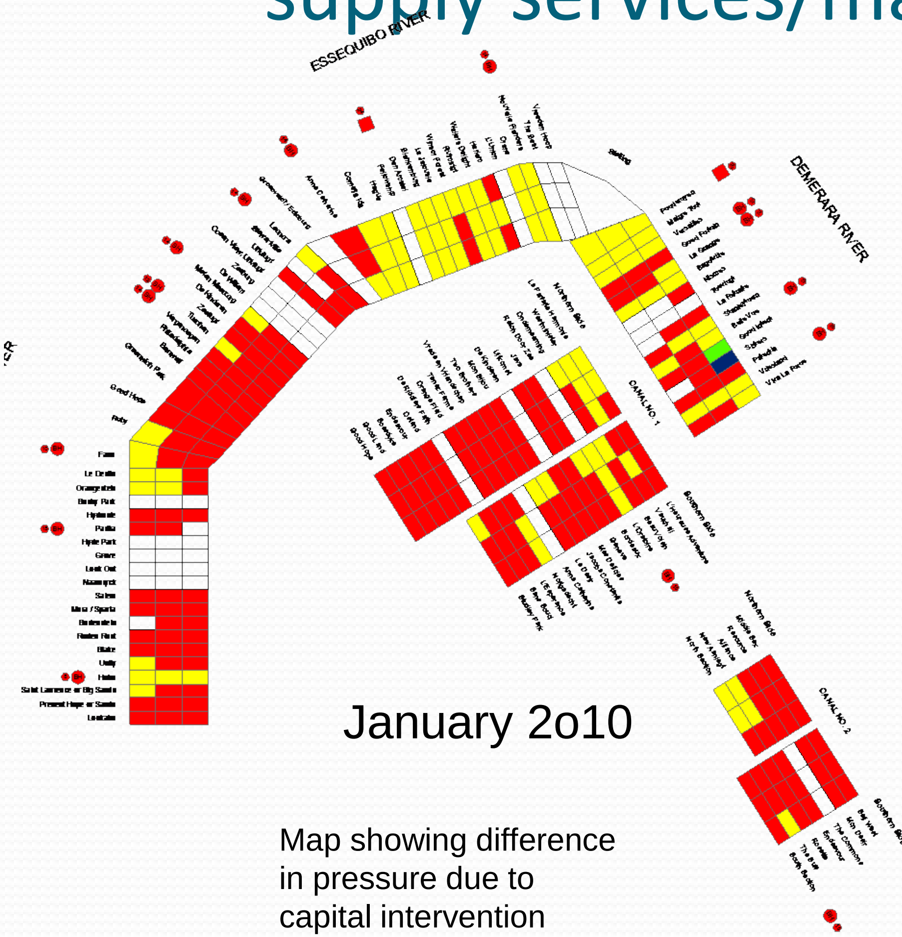
For us to manage ourselves on a self supporting basis, we have to:

- 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^3/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	60
70 %	Collection Ratio	63 % (Including Arrears 98%)
490	Staff Number	574

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



January 2o10

November 2011

GRADE	KEY		
PS 1		> 5 m	Excellent
PS 2		4 - 4.99m	Good
PS 3		3 - 3.99m	Adequate
PS 4		2 - 2.99m	Poor
PS 5		< 2 m	Awful
		0 m	
		Information Not Available	
		Treatment Plant	
	BH	Bore Hole	
	#	Total Hours of Operation	
	*	GPL Failure	

Map showing difference in pressure due to capital intervention

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)

DIRECÇÃO NASIONAL DOS SERVICUS DE ÁGUA

DNSA

REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE

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 8º and 9º 30’ south, longitude 124º and 127º 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

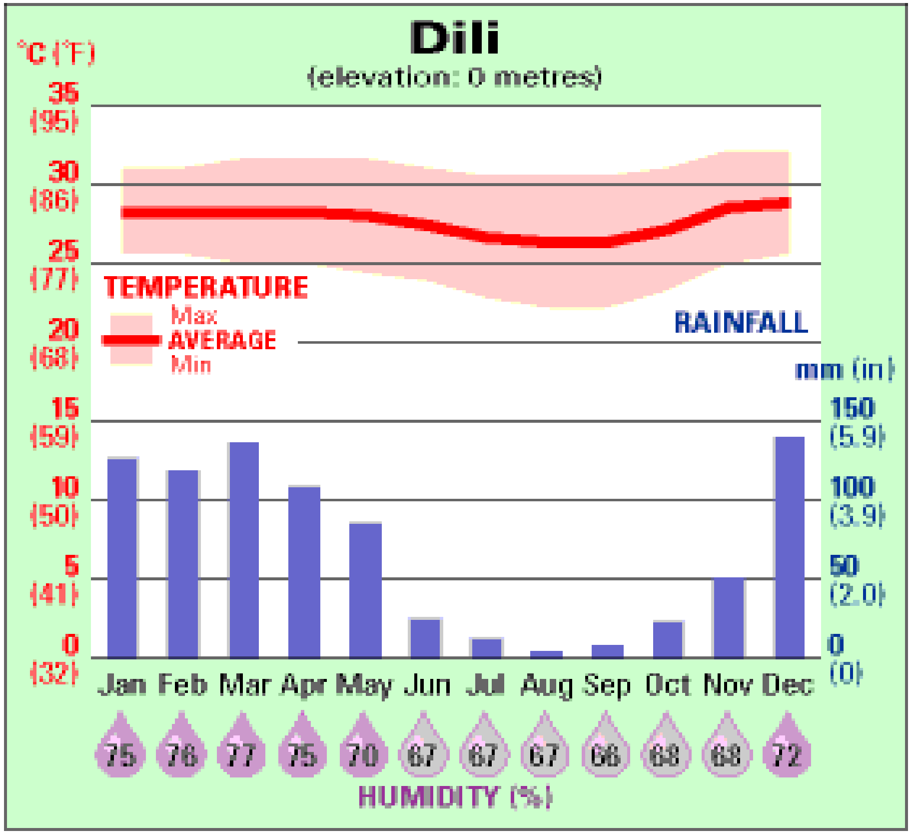
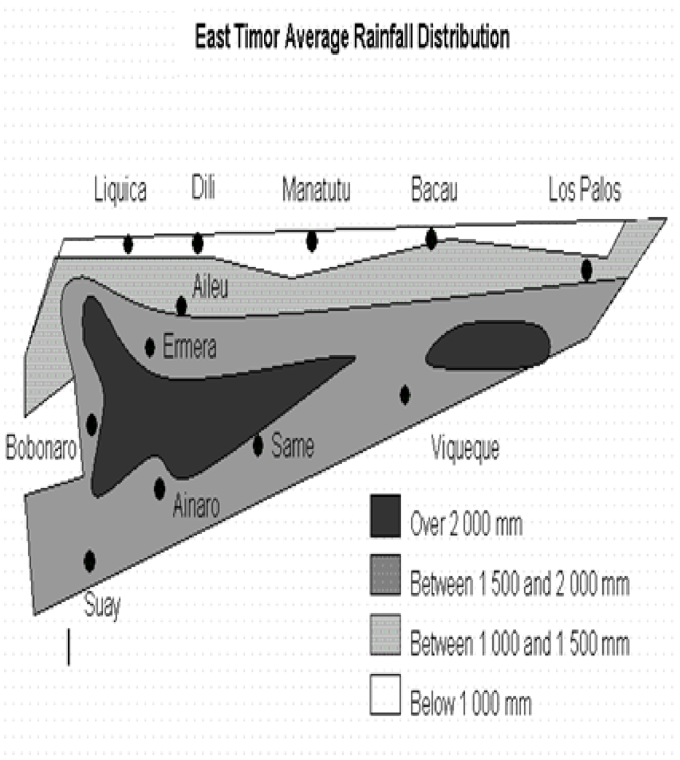
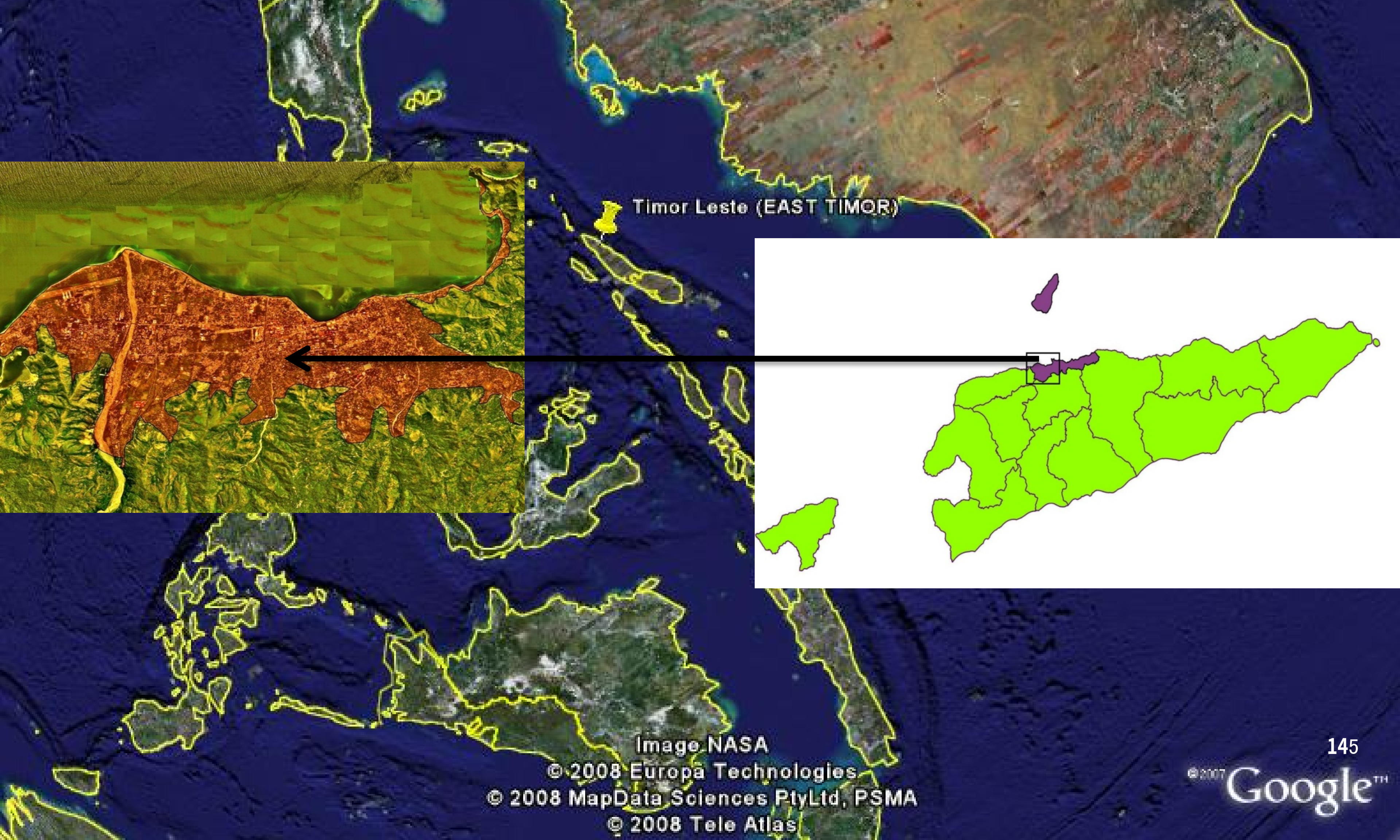


Figure. 2



Topics

Current Situation on Water distribution network in Dili, Timor Leste !



P O P U L A T I O N

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:

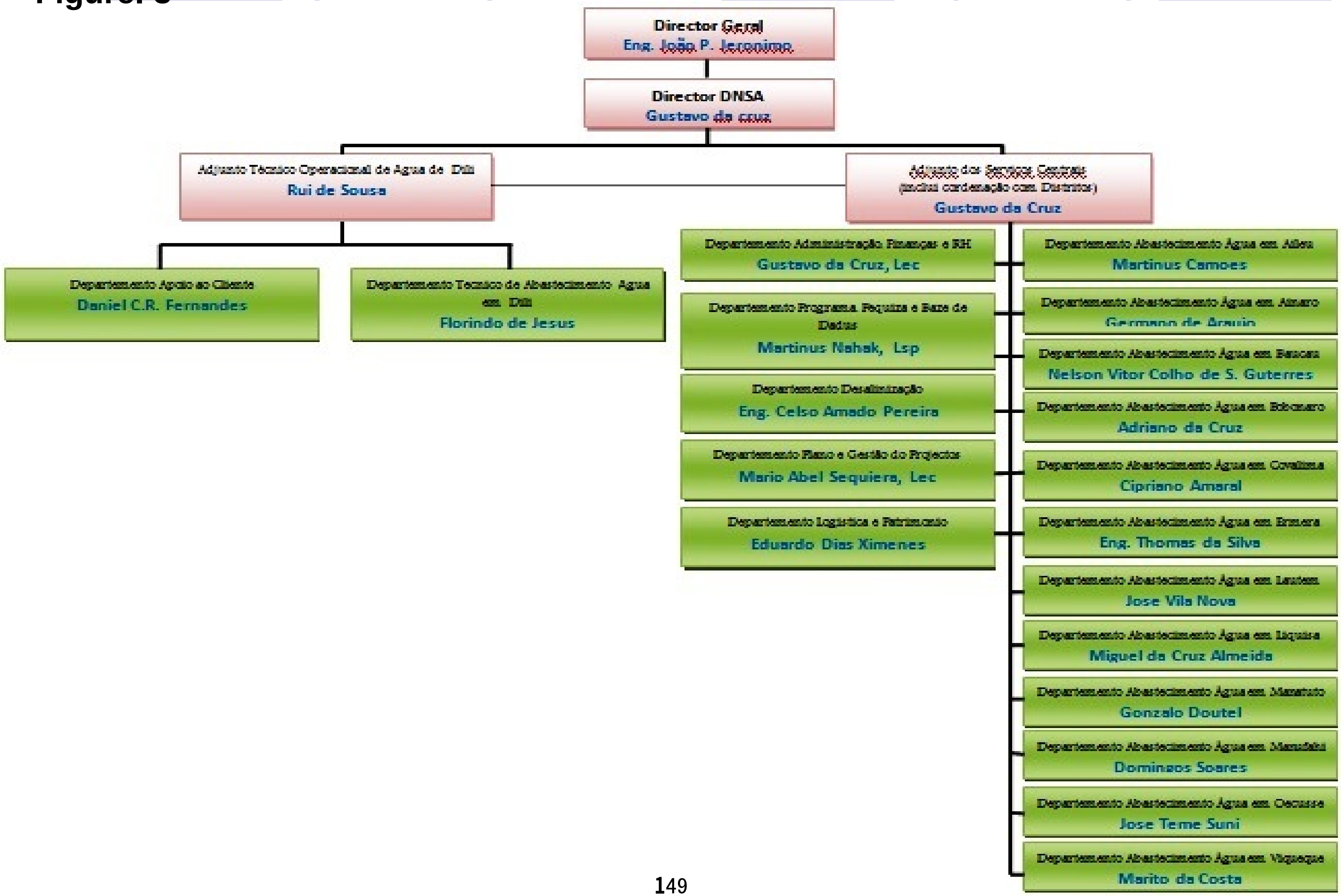
(a) Staff Number (✓)

(b) Staff salaries (✓)

(c) Tariff (✓)

NATIONAL DIRETORATE OF WATER SERVICES

Figure. 3



- 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**

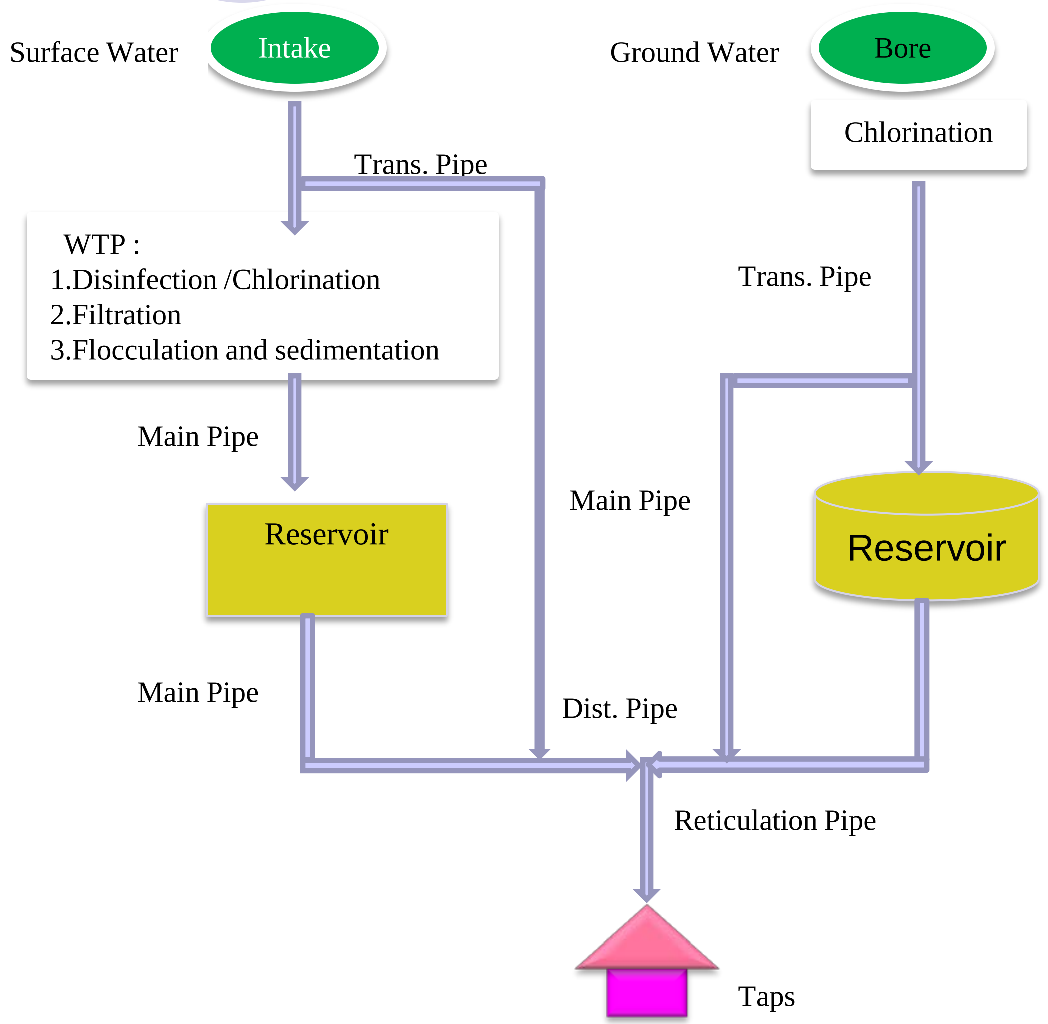
- Type of the management : **Government-owned**
- Cost for operation/management :

(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 : 372 sq.km
- Present service area : 29.52 sq.km
- Population of present service area : 11,247 Connection
- Population served by the piped : 78729 People
- Water Services Zones : 10 Zone

Map of Zones Water Supply

Figure. 5

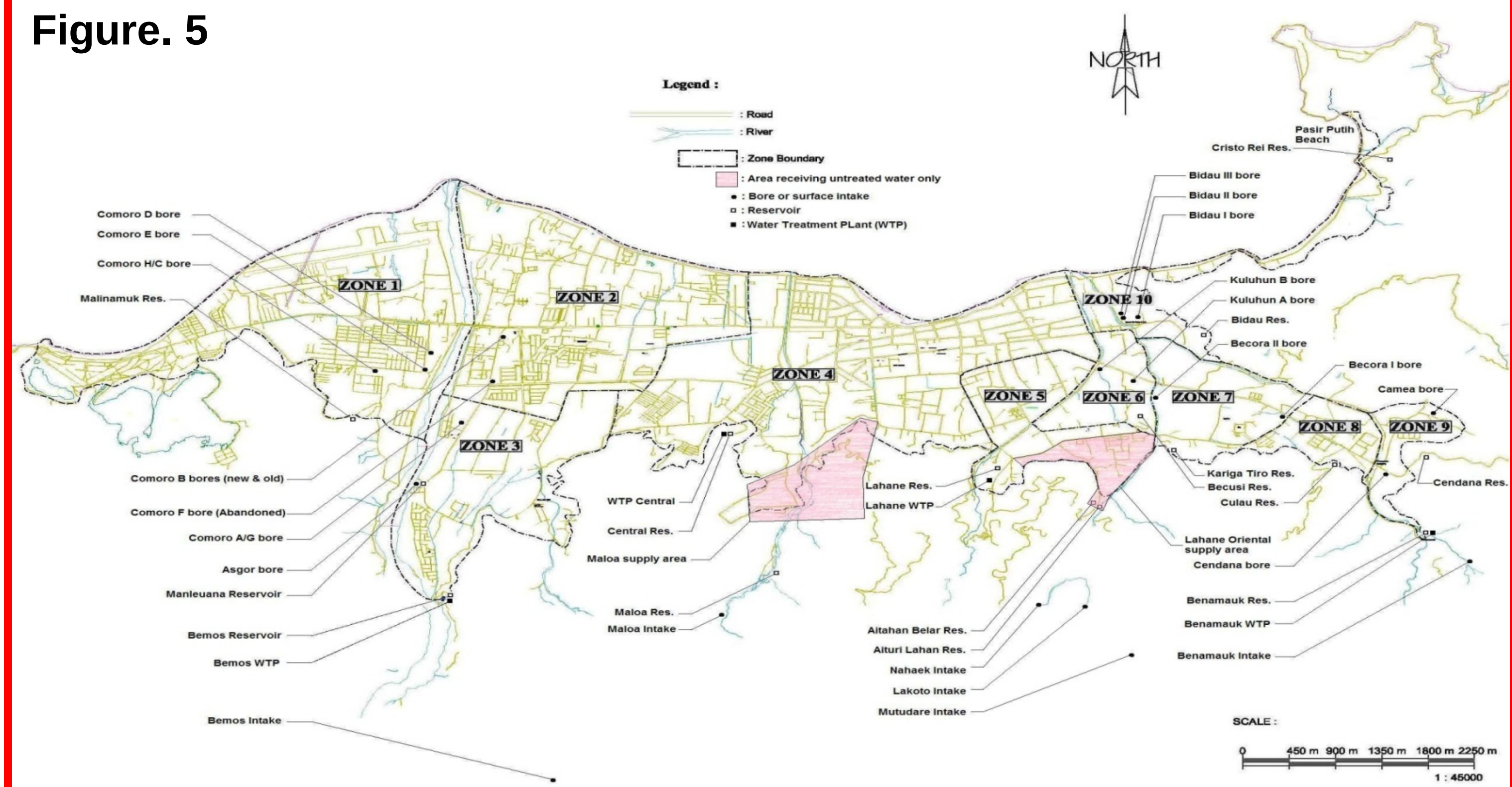
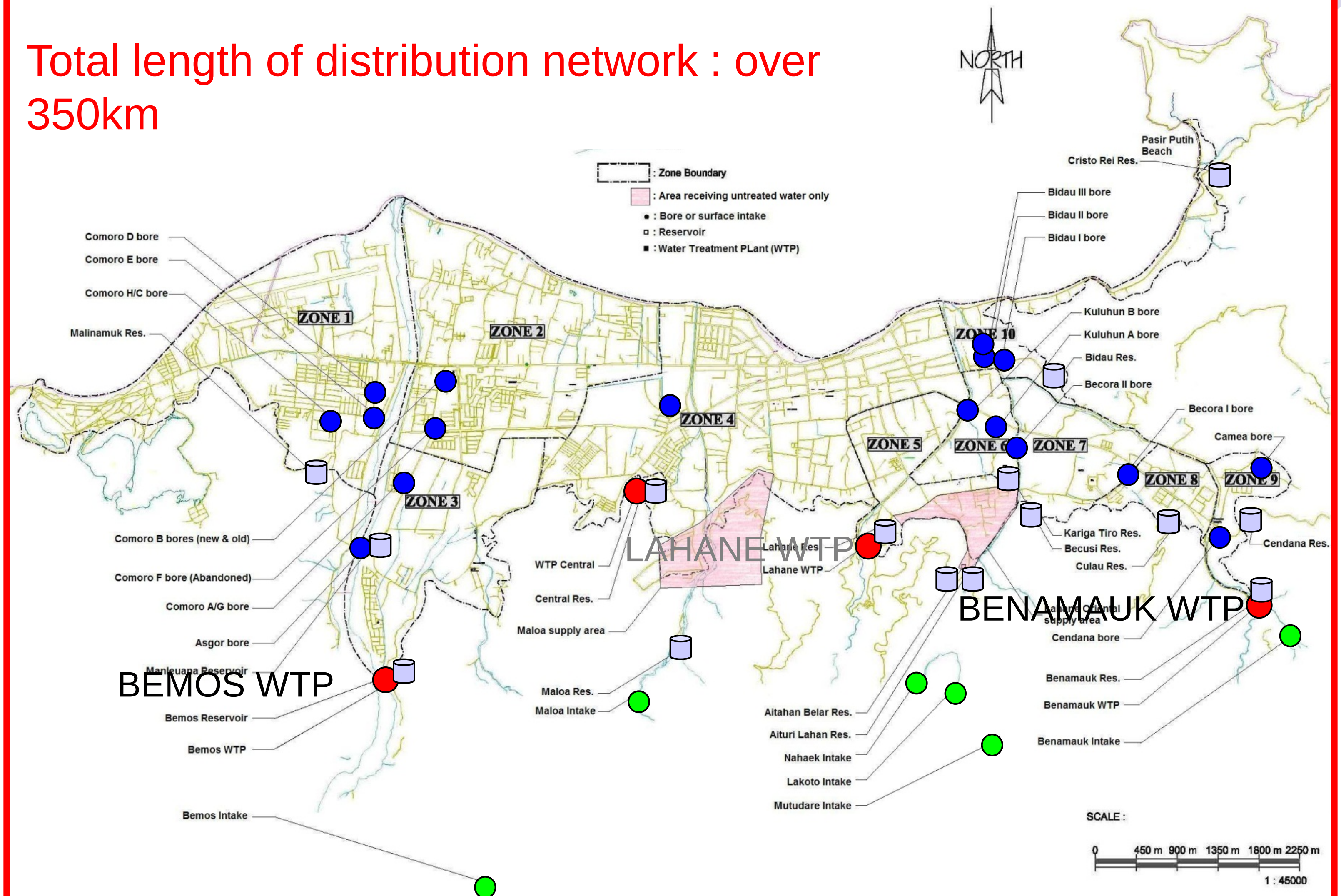


Figure. 5.1

Total length of distribution network : over 350km



II. Infrasrtucture :

Water Treatment Plant Facility

Figure. 6

Central Water Treatment Plant:

Figure. 7

Bemos Water Treatment Plant

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, commercial, institutional, other)	TOTAL
10,646	601	11,247

III. Water Consumption and production

- Volume of water produced by the utility (12,992,461 million m^3/year)
- Volume of water metered : (1, 417,092 million m^3/year) in the partial area
- Estimated un-metered consumption ; (11,575,369.05 million m^3/year) in the partial area

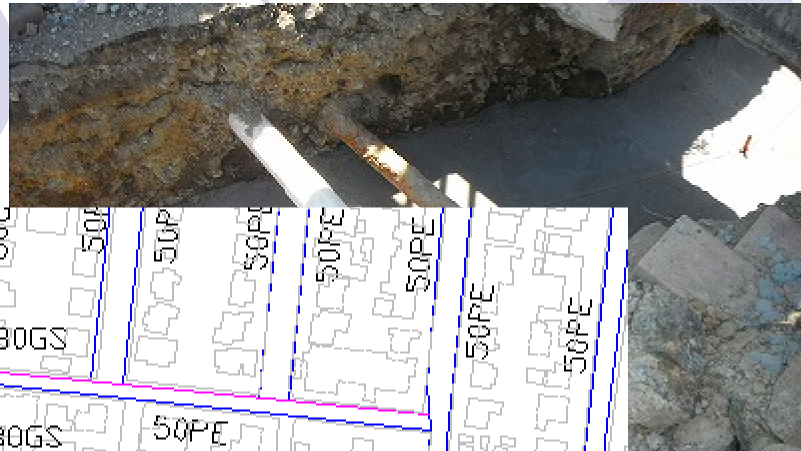
Capacity of Production in Timor Leste

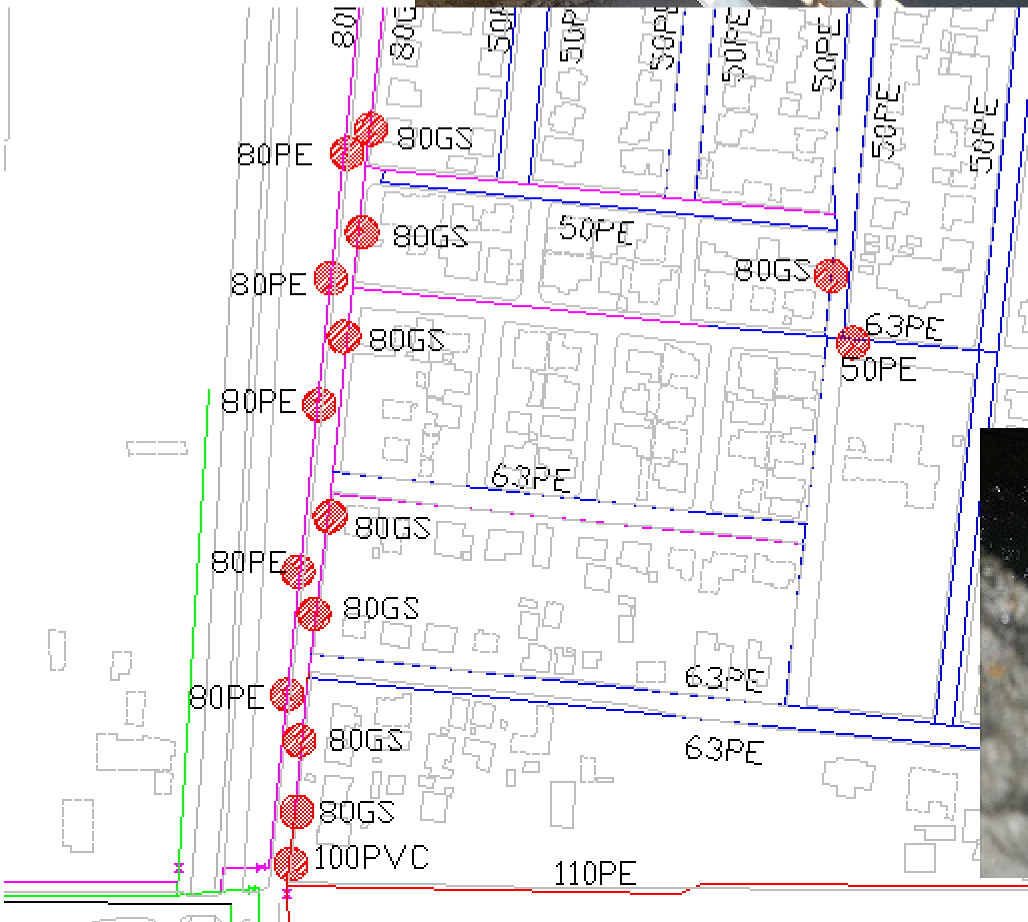
Tabel. 2

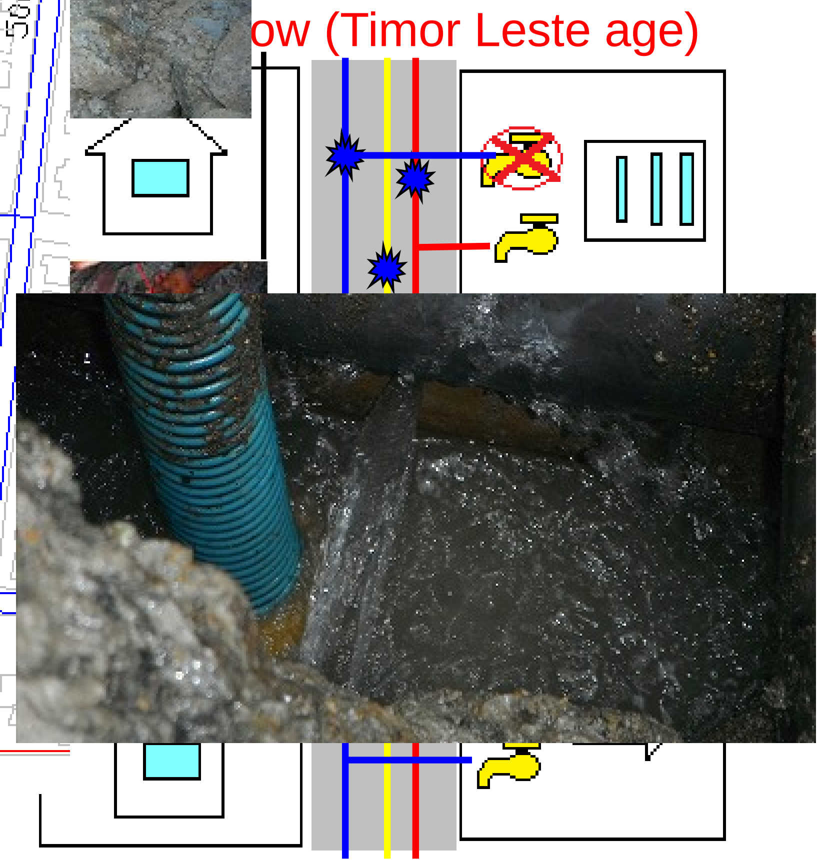
Name	Maximum Production (m3/day)	Maximum Production (m3/year)	Intake
Comoro C, D, E	2,652	954,828	Bore
Comoro B, A	6,226	2,241,231	Bore
Comoro Asgor	697	250,776	Bore
Bemos	3,500	1,260,000	Bemos
Central	6,600	2,376,000	Bemos
Untreated	1,900	684,000	Maloa
Lahane	2,600	936,000	Nahaek Lakolo Mutudare Benamauk
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)

Condition in distribution network







illegal connection

Physical leaks

Material of pipe in Timor Leste

ACP

PVC

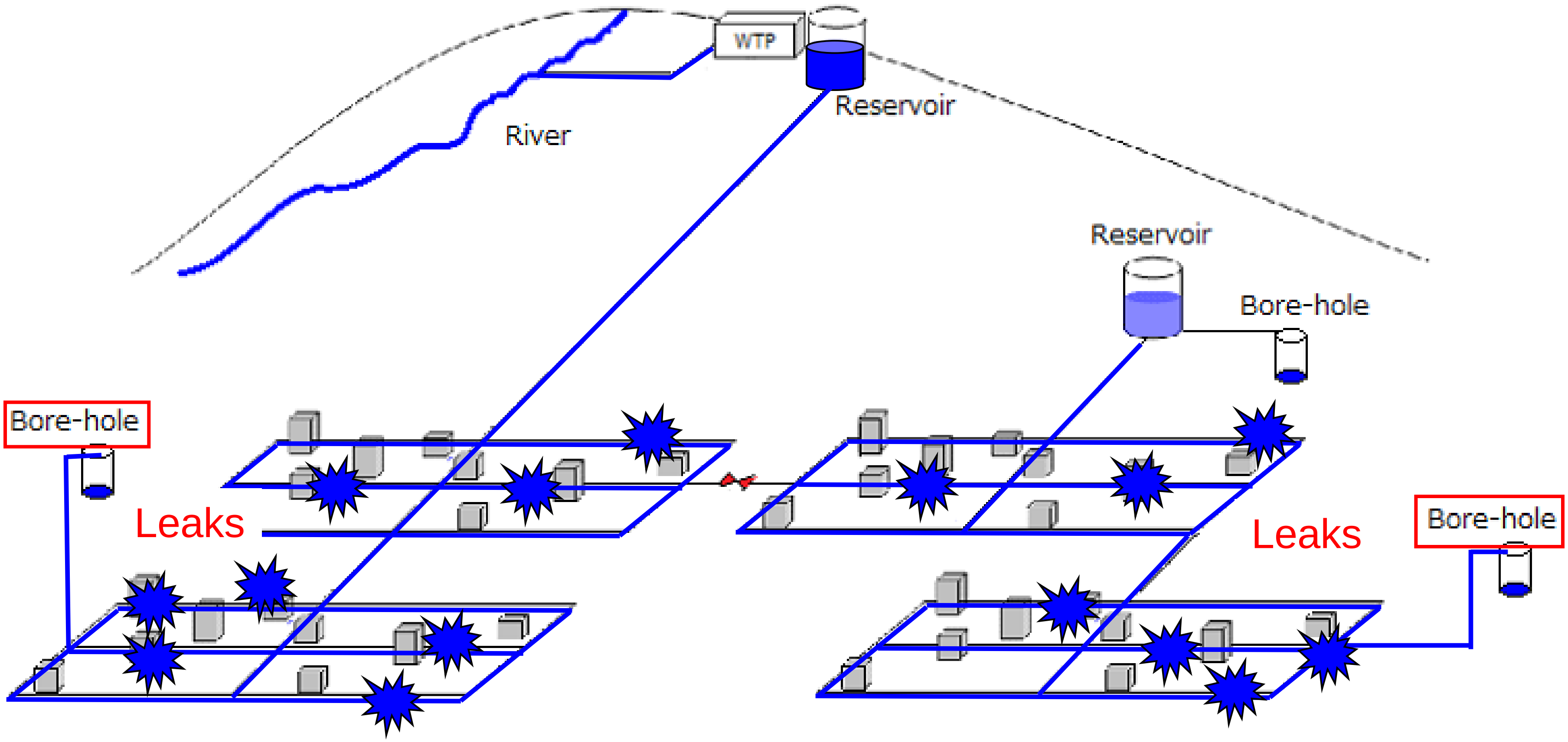
DIP

GS

PE

Situation in the distribution network

Figure. 11



What is happening in the distribution network?

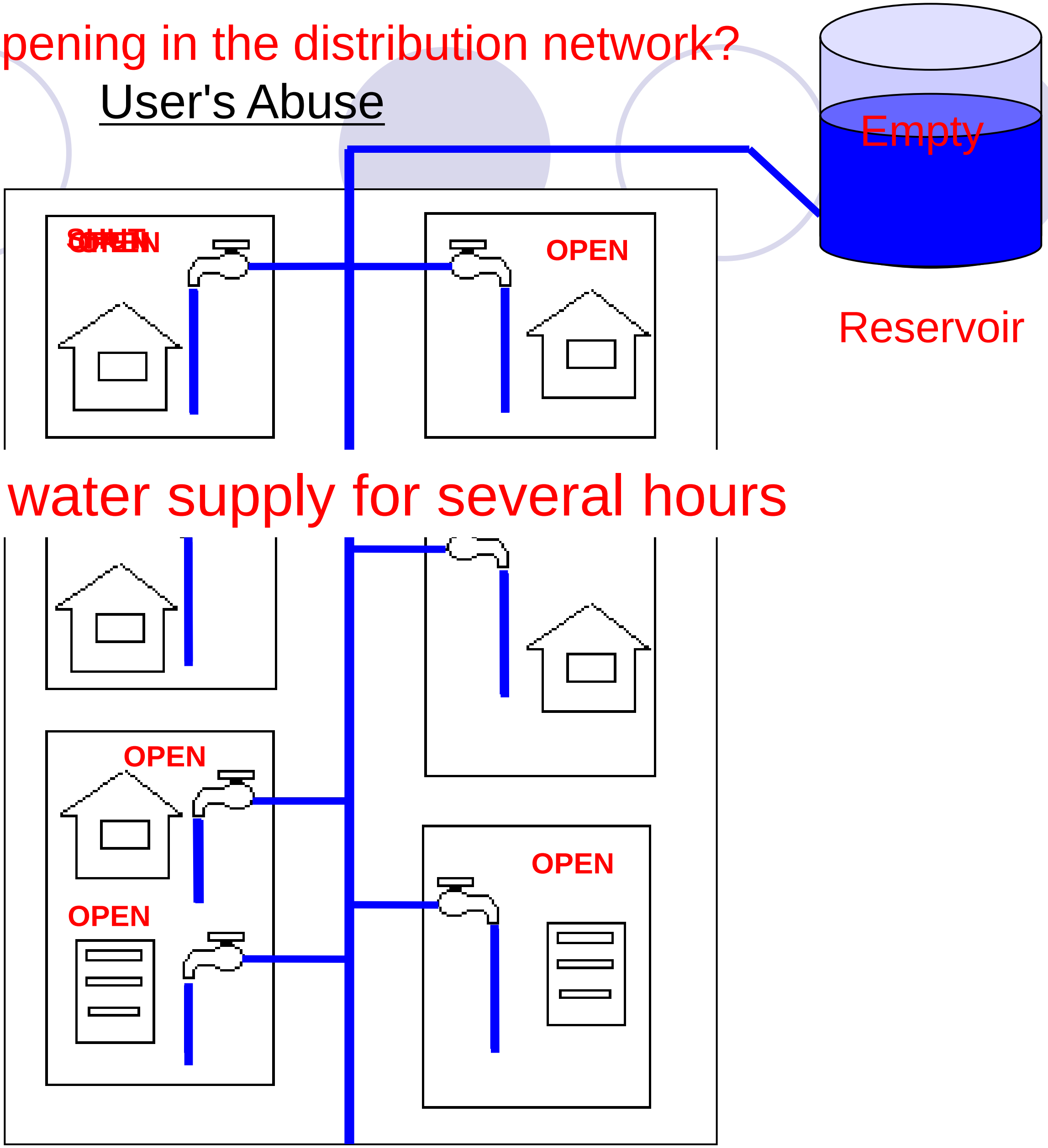
User's Abuse

Figure. 12

Current condition

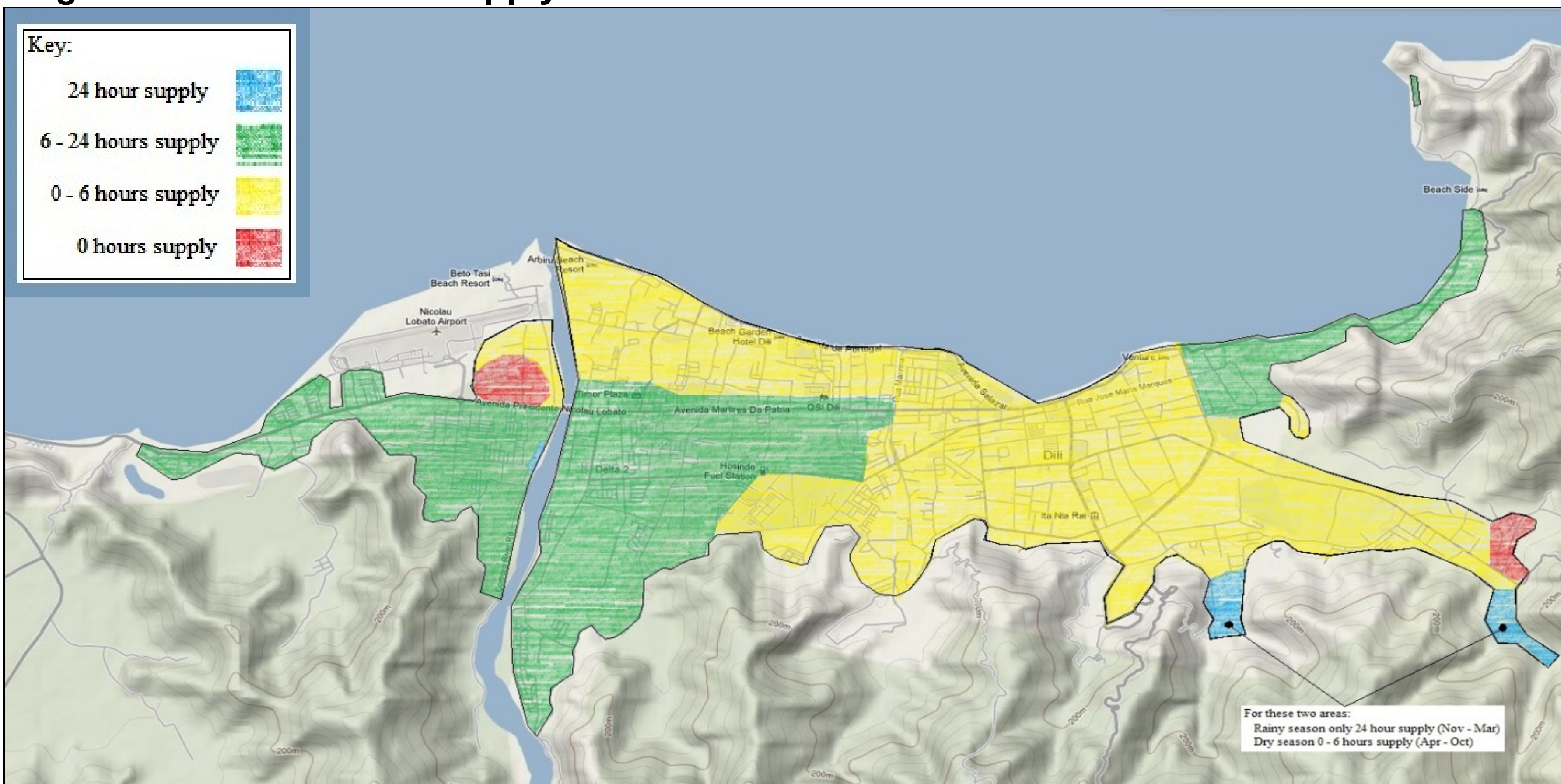
Good condition

Limited water supply for several hours



- 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

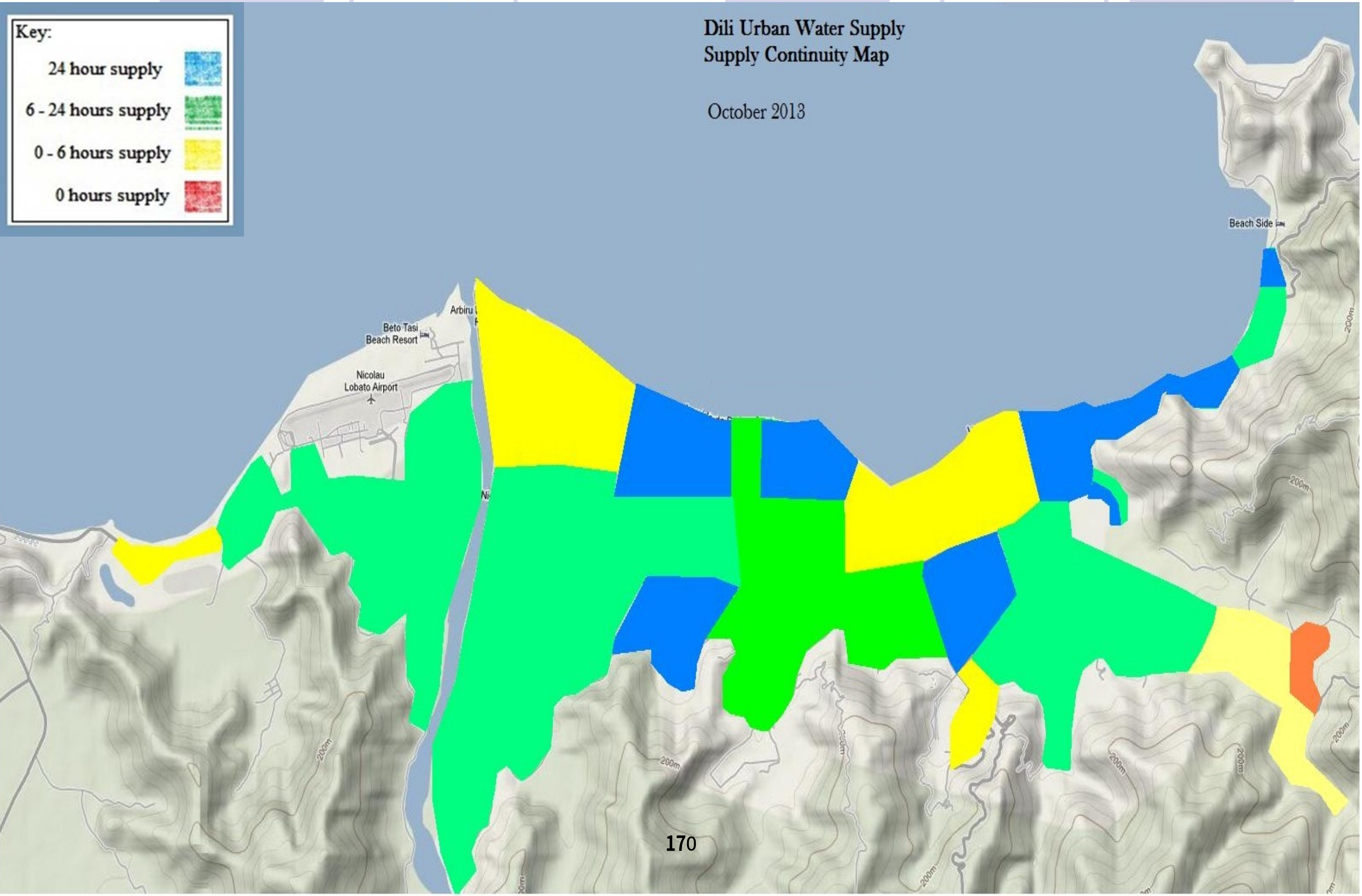
1. Caretaker appointed in sub zones
2. Improved planning and detail design with Technical assistance from JICA and ADB
3. Public Private Partners (PPP) is being evaluated

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

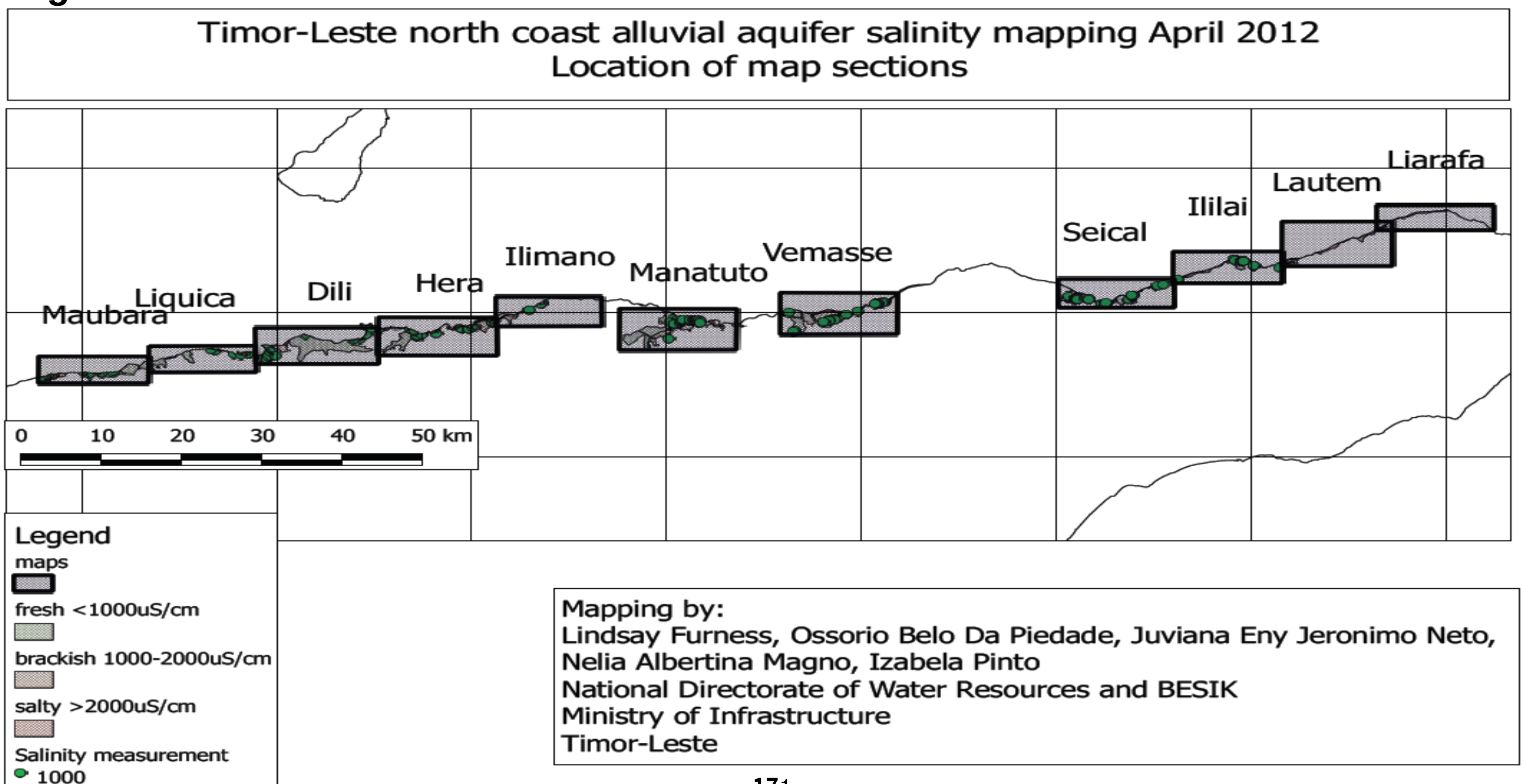


Water resource management

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		
6	Arsenic (As)	Once	only for groundwater source before selection of the water 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	More frequently during monsoon

Drinking water quality Standard/norms/regulation in Timor Leste

Tabel. 6

National Drinking Water Quality Standard

No	Parameter	Unit	Maximun permissible limit	Remarks
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	
4	Total Dissolved Solid (TDS)	Mg/L	1000	
5	Turbidity	NTU	<5	NTU is Nephelometric Turbidity Unit
B	**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 detectable in any 100 ml sample		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
15	E. Coli or Thermotolerant bacteria	must not be detectable in any 100 ml sample		

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, commercial, institutional, other)	Bulk water sales	TOTAL
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)		
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

PAM JAYA

jica

2013

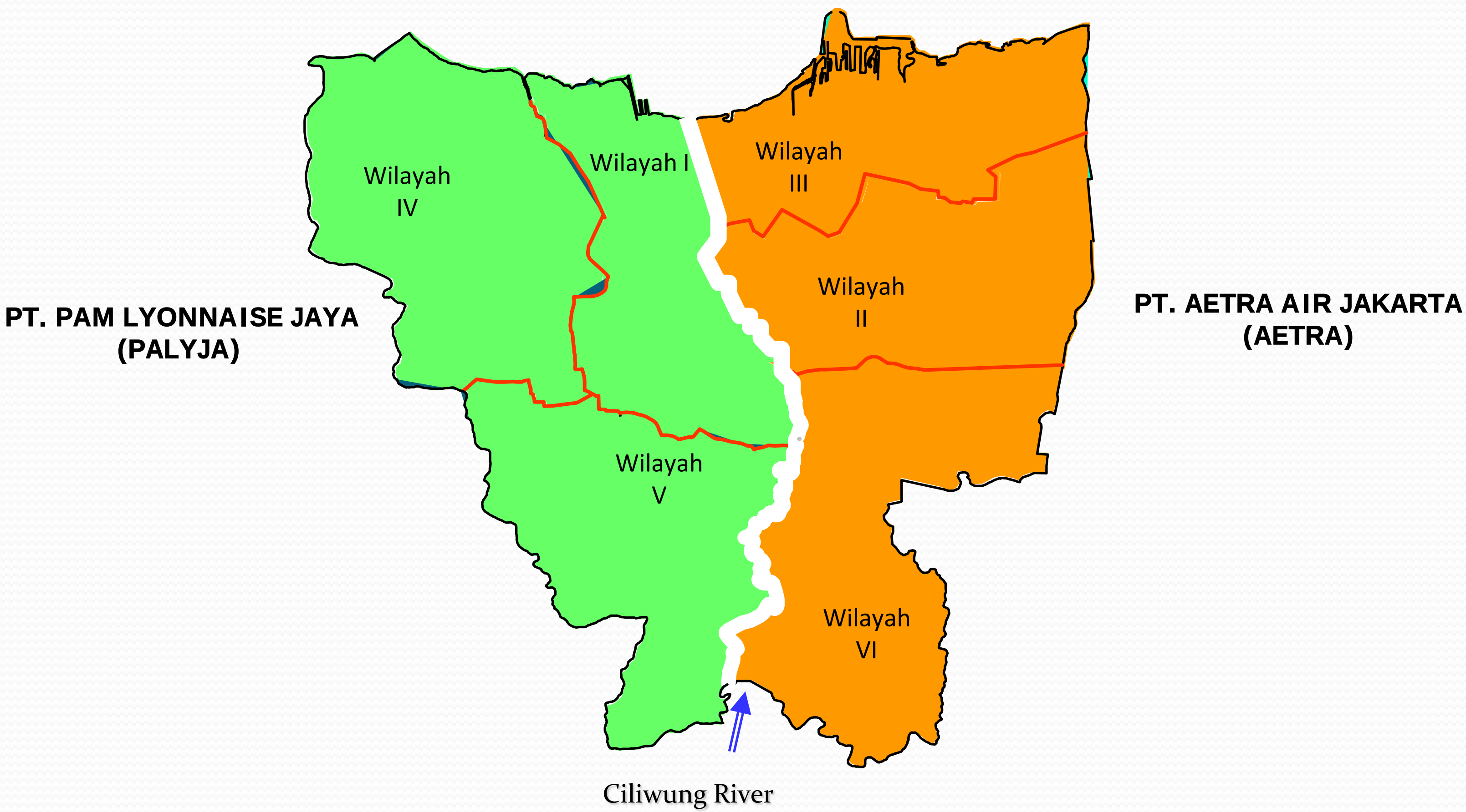
Indonesia & Jakarta overview

- **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)

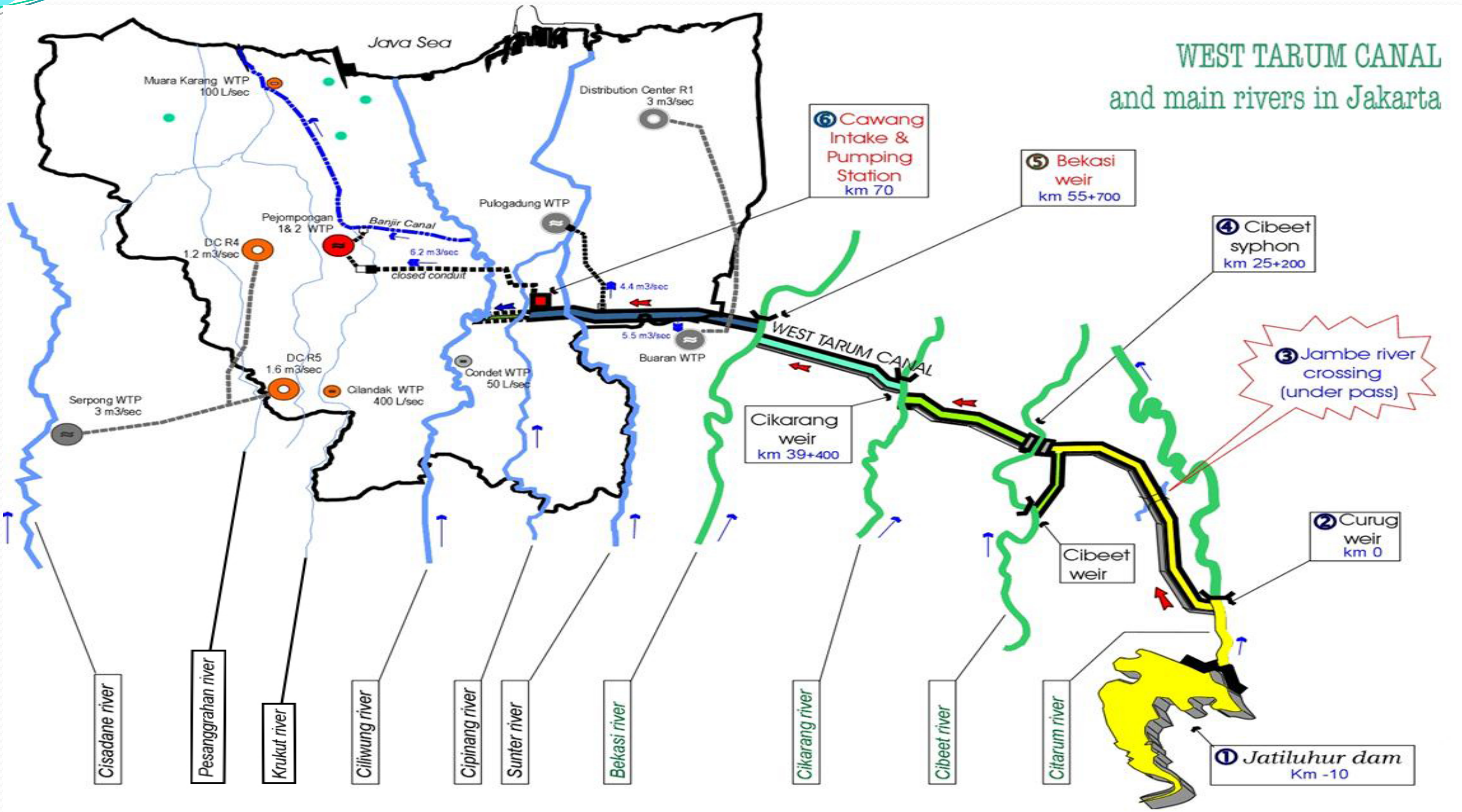
Jakarta Water Supply Authority

- 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

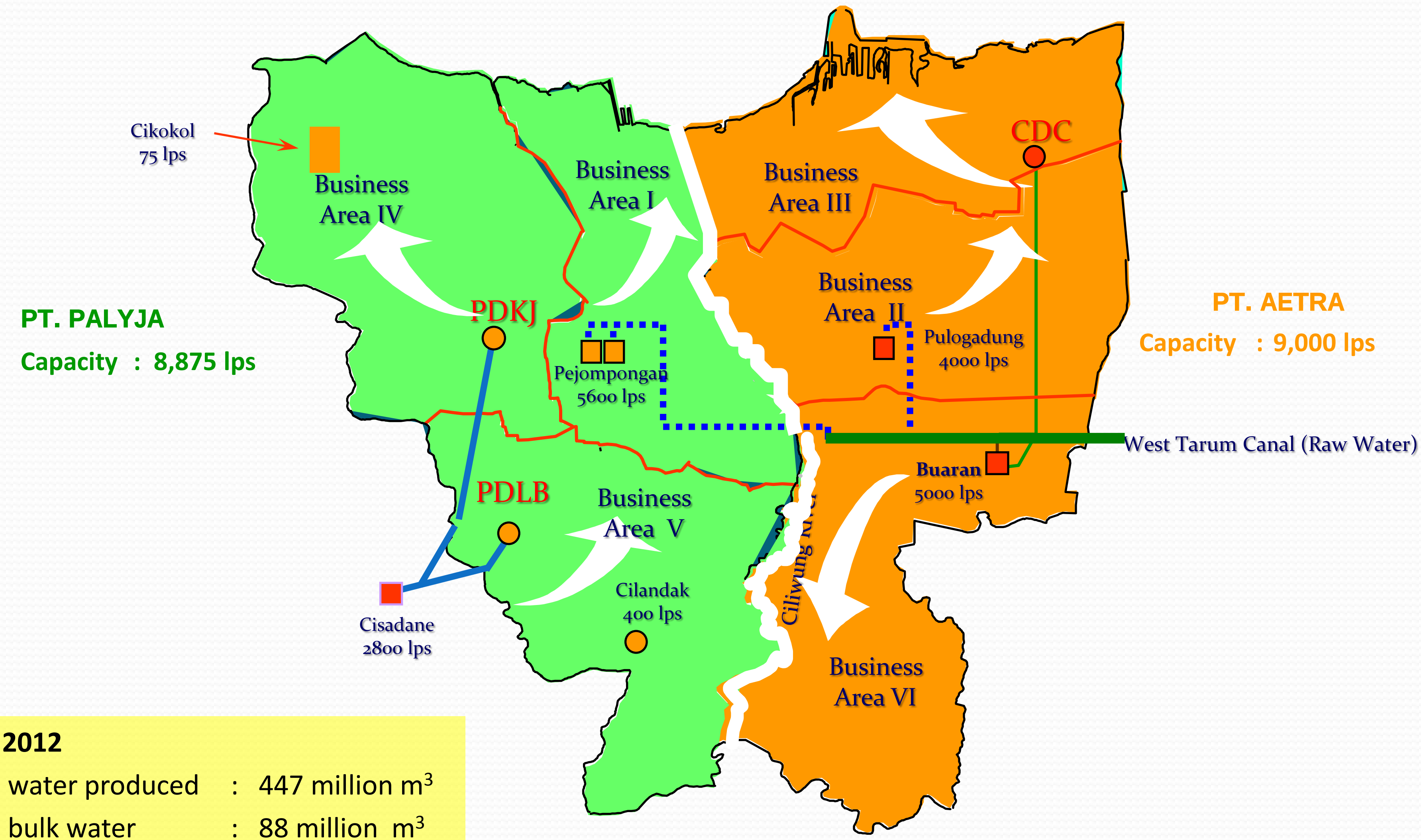
Current problems:

- 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



Year 2012

Total water produced	:	447 million m^3
Total bulk water	:	88 million m^3
Water produced	:	Drinking water

Water treatment management

Current problems:

- Worsening raw water quality → increasing production cost

parameters exceeding raw water standards	Organic matters, Pb, coli form, Manganese, Ammonium

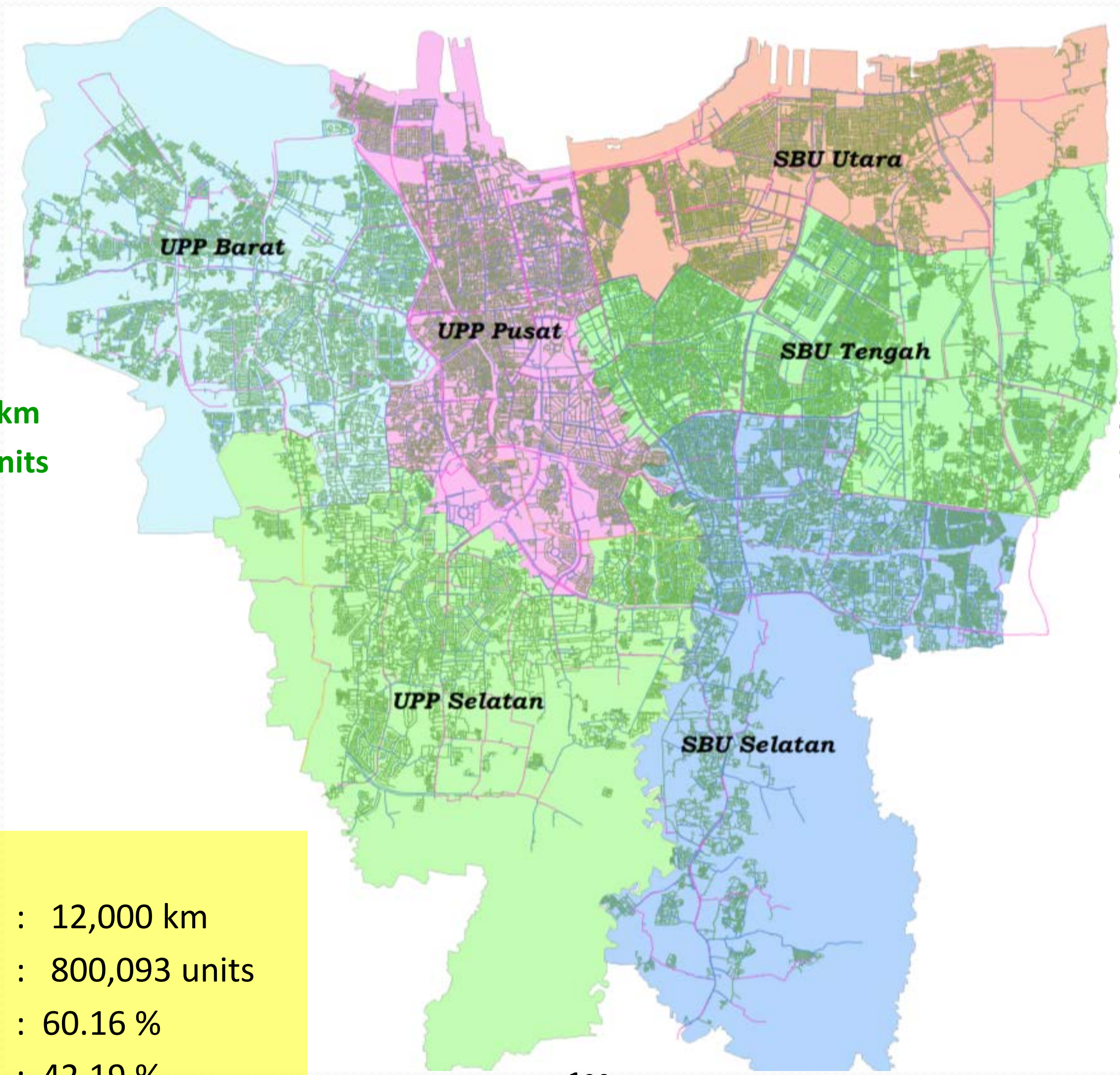
Current efforts:

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

Achievements:

- Increased production capacity
- Improved reliability of WTP

Distribution capacity



PT. PALYJA

∑ pipe length : 5,300 km

∑ customers : 407,459 units

PT. AETRA

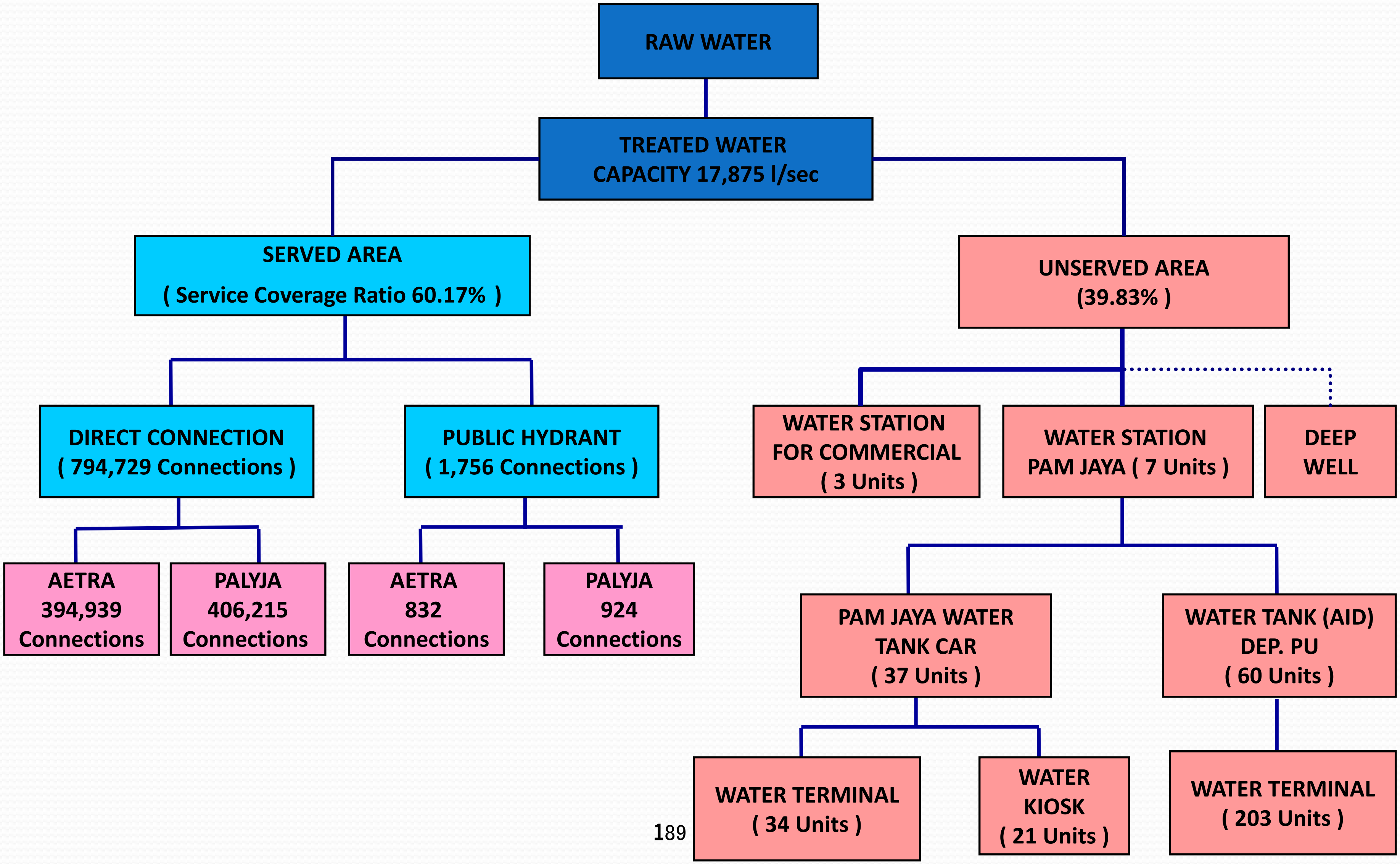
∑ pipe length : 6,700 km

∑ customers : 392,634 units

Year 2012

Total pipe length	:	12,000 km
Total Customers	:	800,093 units
Service Coverage Ratio	:	60.16 %
NRW	:	42.19 %

Water supply distribution



Water supply management

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 supply management

Water distribution balance:

<table>
<tr><td rowspan="10">Volume Input System</td><td rowspan="4">Consumption</td><td rowspan="2">Billed authorized consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue water</td></tr>
<tr><td>Billed Unmetered consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized consumption</td><td>Unbilled Metered consumption</td><td rowspan="8">Non Revenue Water</td></tr>
<tr><td>Unbilled Unmetered consumption</td></tr>
<tr><td rowspan="6">Losses</td><td rowspan="3">Commercial losses</td><td>Unauthorized consumption</td></tr>
<tr><td>Inaccurate Customer meter</td></tr>
<tr><td>Reading accurary and data processing error</td></tr>
<tr><td rowspan="3">Physical losses</td><td>Leakage on transmission and distribution mains</td></tr>
<tr><td>Leakage and overflows from utilities storage tanks</td></tr>
<tr><td>Leakage on service connection up to customer meter</td></tr>
</table>

Water supply management

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

Water supply management

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^3	125 million m^3	310 million m^3

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

No.	Customer group	Consumption block per m^3		
		0 – 10 m^3	11 – 20 m^3	> 20 m^3
		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

1 USD = 11,500 IDR

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	1. Optimization and up-rating of water treatment process, 2. Online analyzer on parameters of water quality during water treatment process	1. Pipe network area metering, 2. Leakage detection and repair, 3. Pressure management system on distribution network and pumps, 4. Law enforcement against illegal connection / consumption	1. Replacing old pipes with HDPE and PVC pipes, 2. strict control of pipe laying works to comply with standards	Water quality monitoring in the network and water taps
Results of the action taken	1. Increasing volume sold 2. Increasing revenue	1. Upgraded production capacity of WTPs, 2. Improved reliability of WTPs	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

PAM JAYA

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	1. intermittent supply to some of our customers due to inadequate pressure, 2. High level of NRW (>40%)	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	1. Illegal connection, 2. Inaccurate metering, 3. Pipe leakage, 4. Pipe breaks caused by other utilities works	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	1. NRW level reduced to economic level of water losses, 2. 24 hour continuous supply to all areas	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		

Thank You
ありがとうございます

PAM JAYA

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

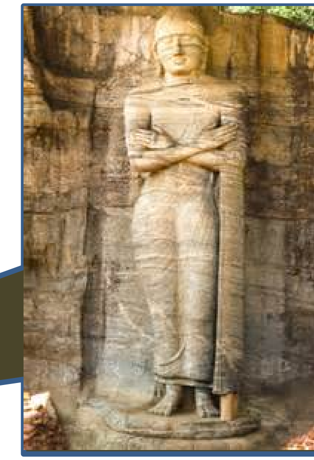
BY

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

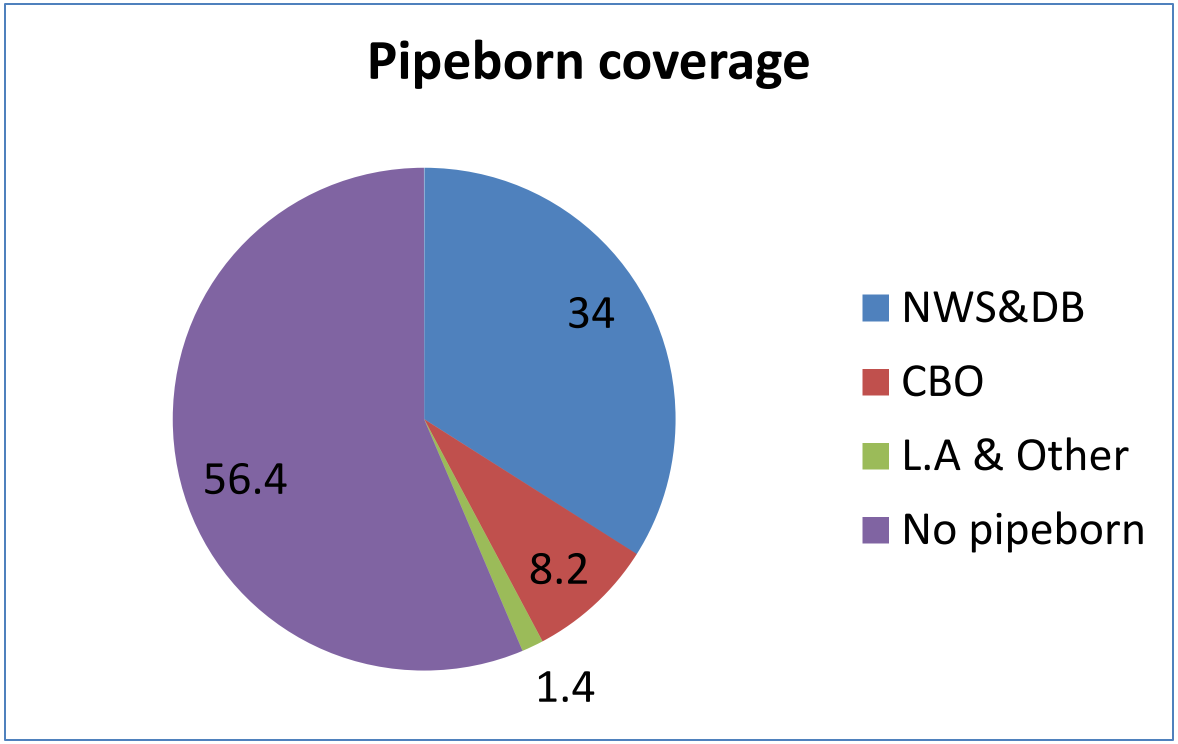
Area – 65,660 Sq.Km

Population – 20.27 Mlns

Religions - Buddhism,Hinduism, Islam, Christianity

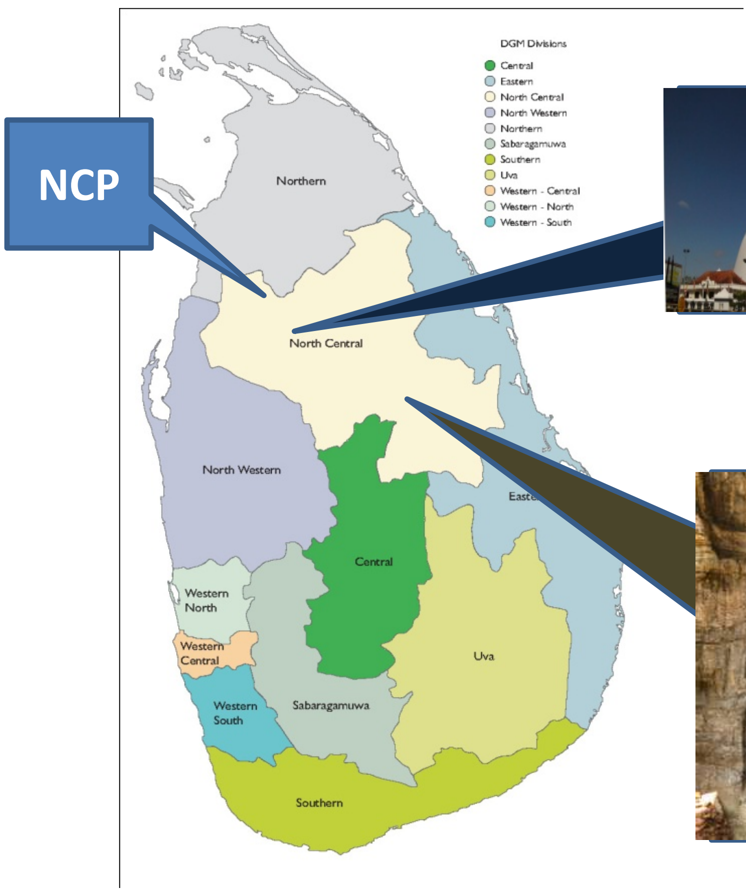
About NWS&DB

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

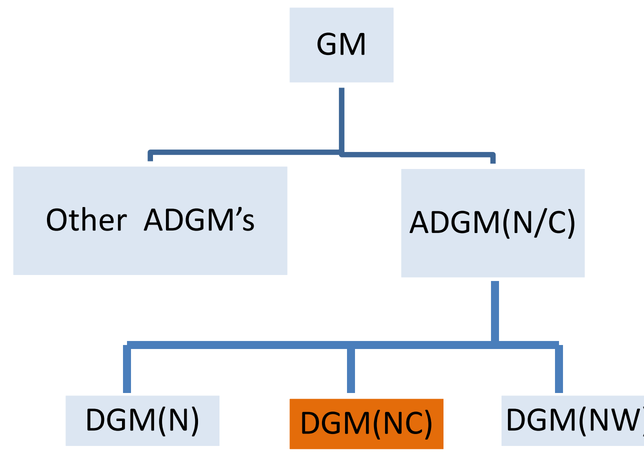


About the working area . . .

North Central Province (NCP)

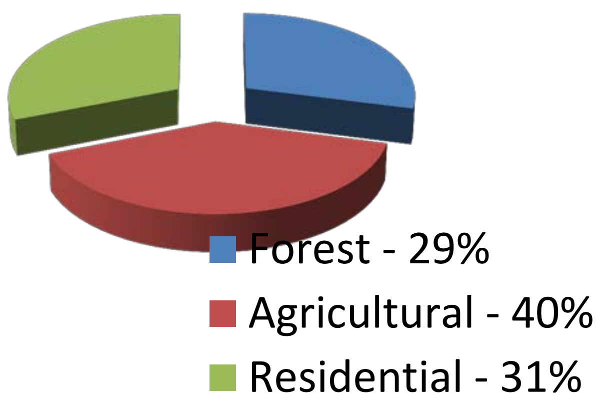


Position as DGM(NC)



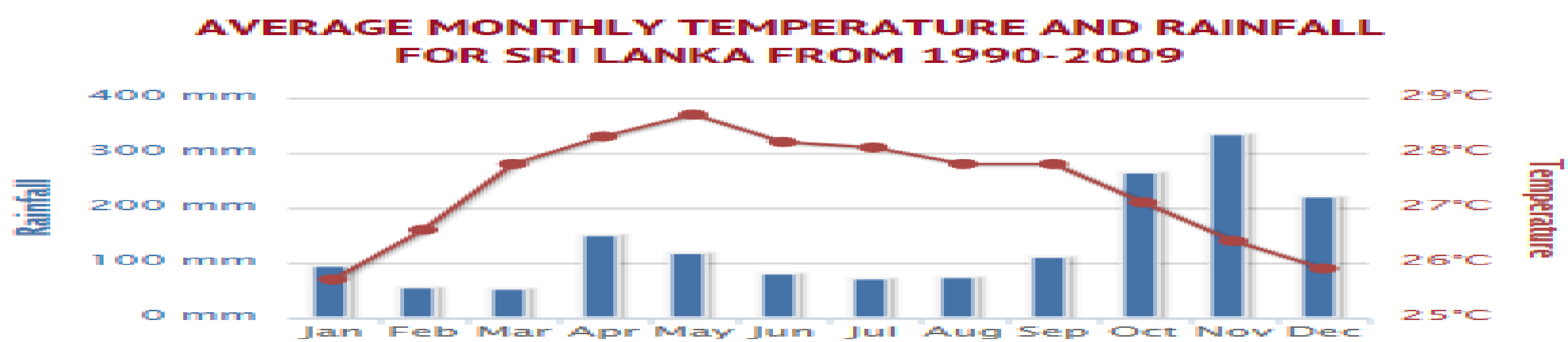
Geography and water resources

Land distribution



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

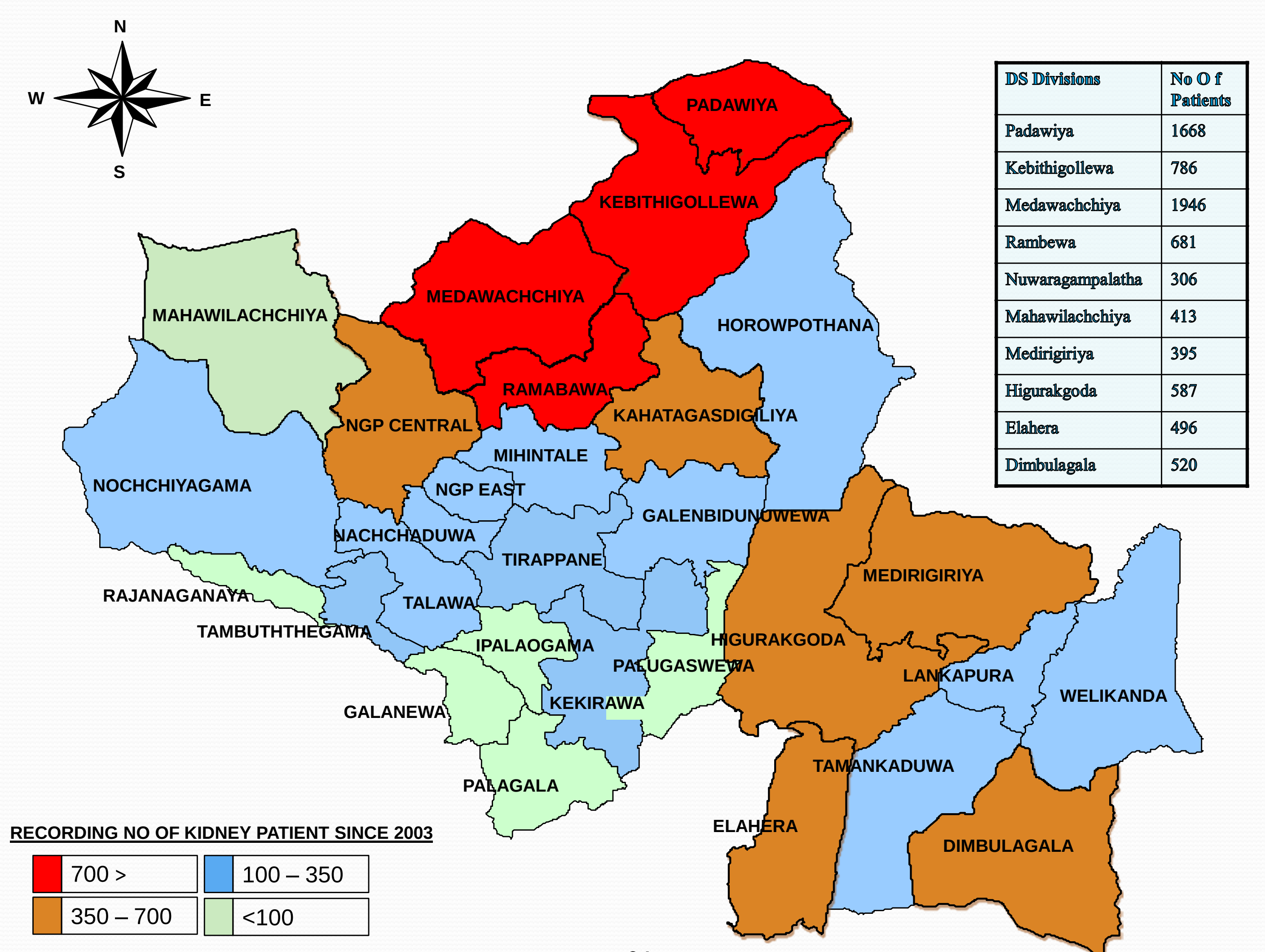
Water quality problems in unprotected catchments . . .

- 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 . . .



DS Divisions	No O f Patients
Padawiya	1668
Kebithigollewa	786
Medawachchiya	1946
Rambewa	681
Nuwaragampalatha	306
Mahawilachchiya	413
Medirigiriya	395
Higurakgoda	587
Elahera	496
Dimbulagala	520

What we have planned . . .

OPTIONS

- AWARENESS
- ADVANCE TREATMENT
- BOWSER SUPPLY
- PIPE EXTENTIONS
- RAIN WATER SYSTEMS

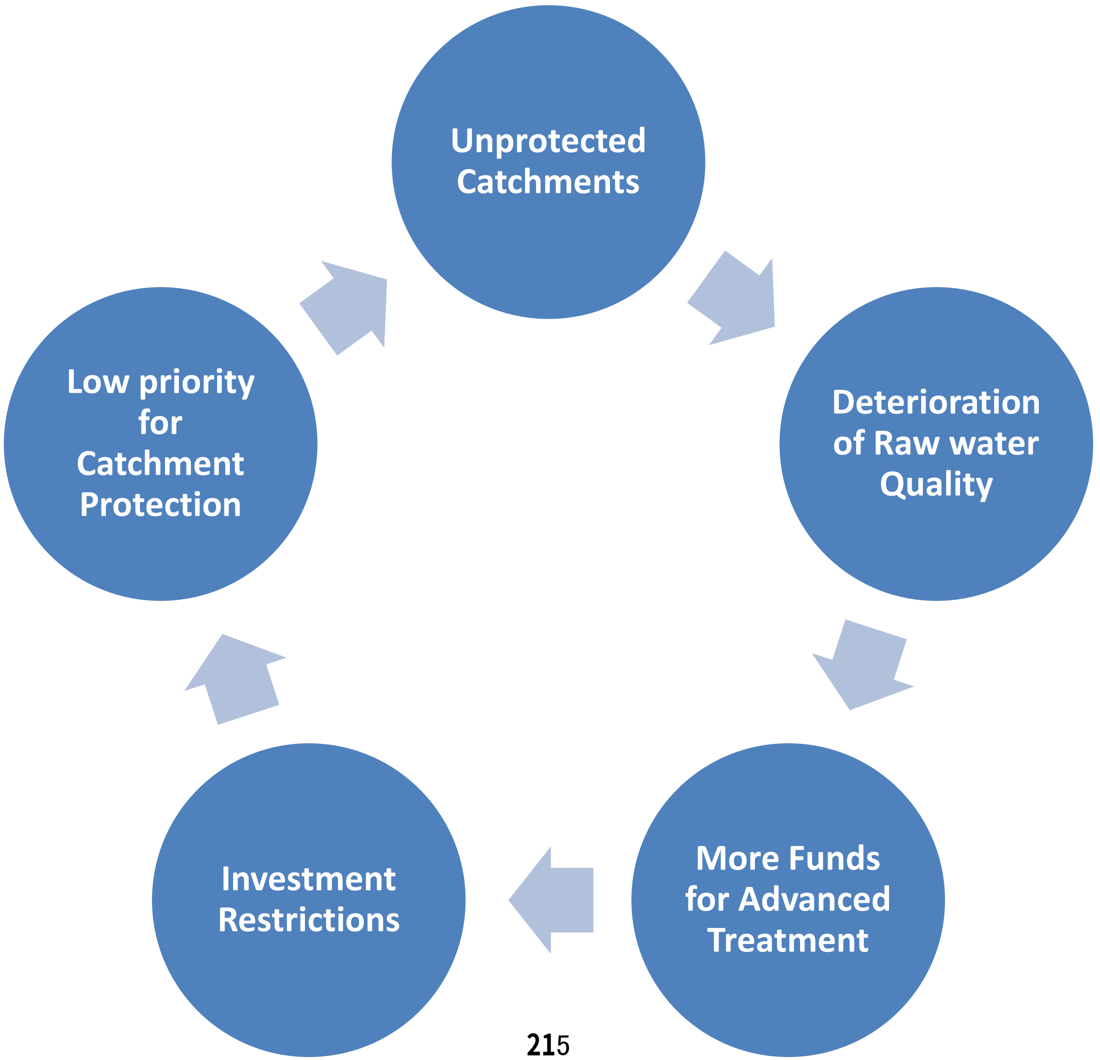
Other factors - -

- Number of connections - 1,592,411
- Billing Vs collection - 95%
- Tariff - Stepped type
- Others in water sector - LA's, CBO's,NGO's
- Sewerage - In Colombo
- PS involvement
    - D&B Projects funded by foreign agencies
    - Local contractors involved with Govt. funding

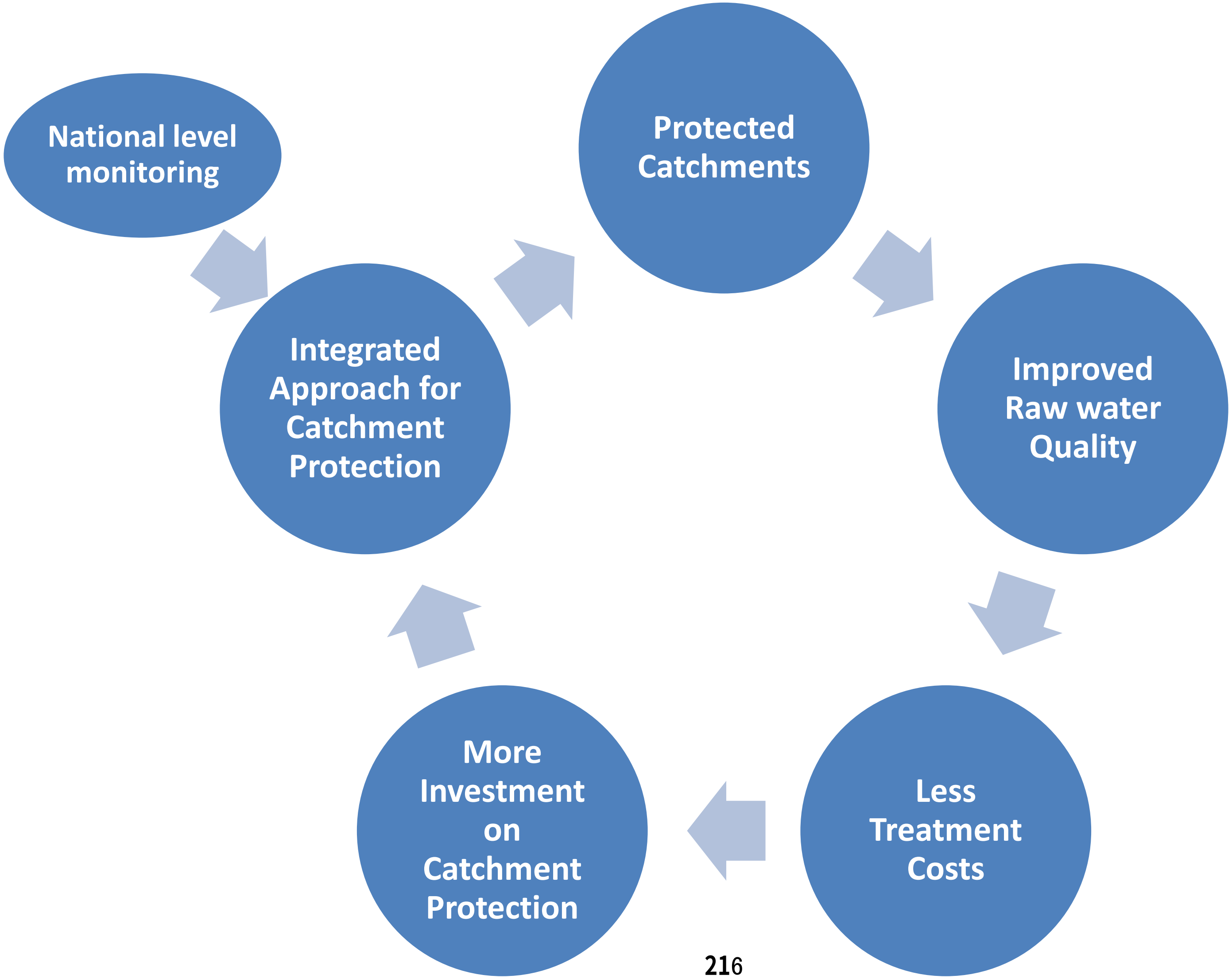
Current problems considered in the Report . .

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

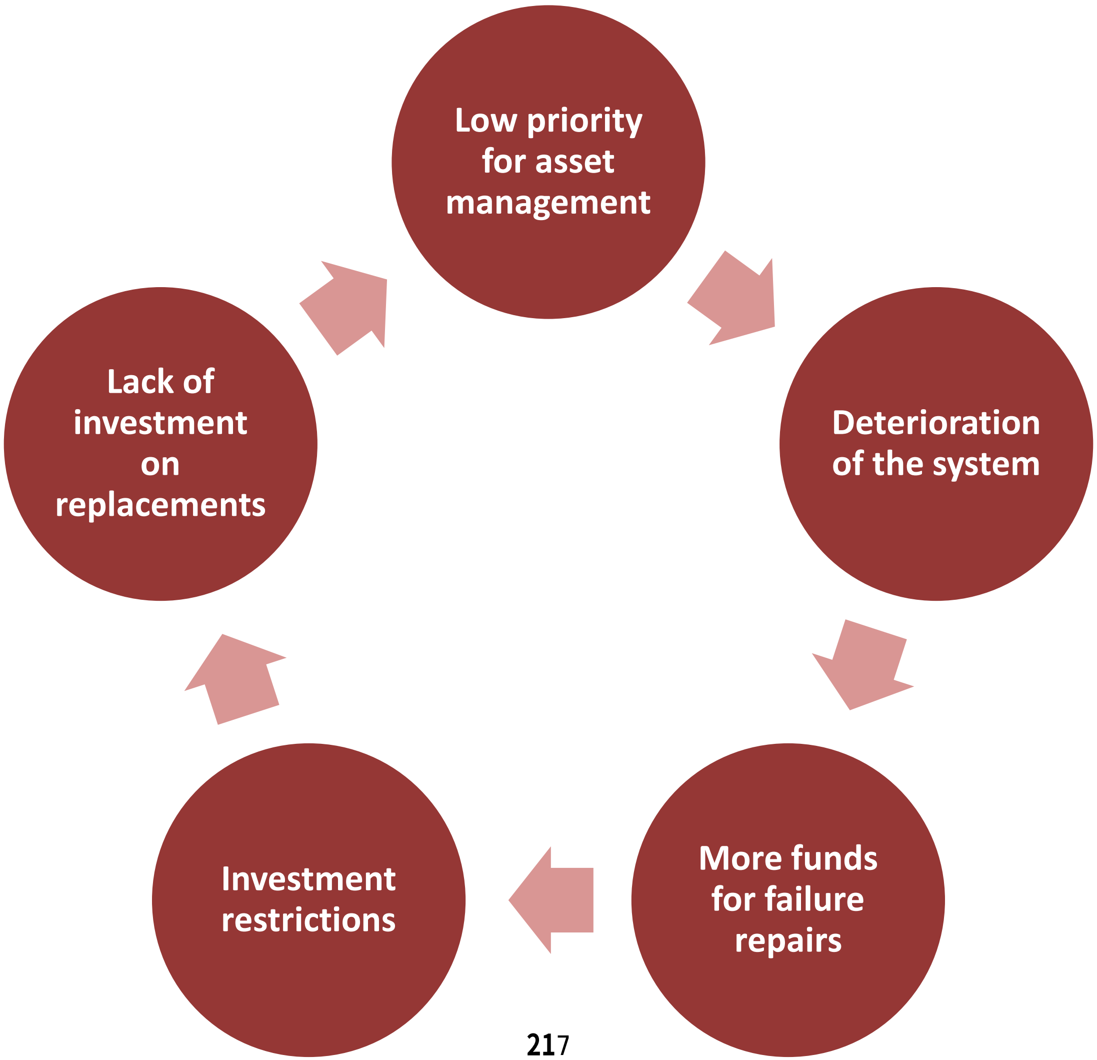
VICIOUS CYCLE ON WATER SAFETY



VIRTUOUS CYCLE ON WATER SAFETY

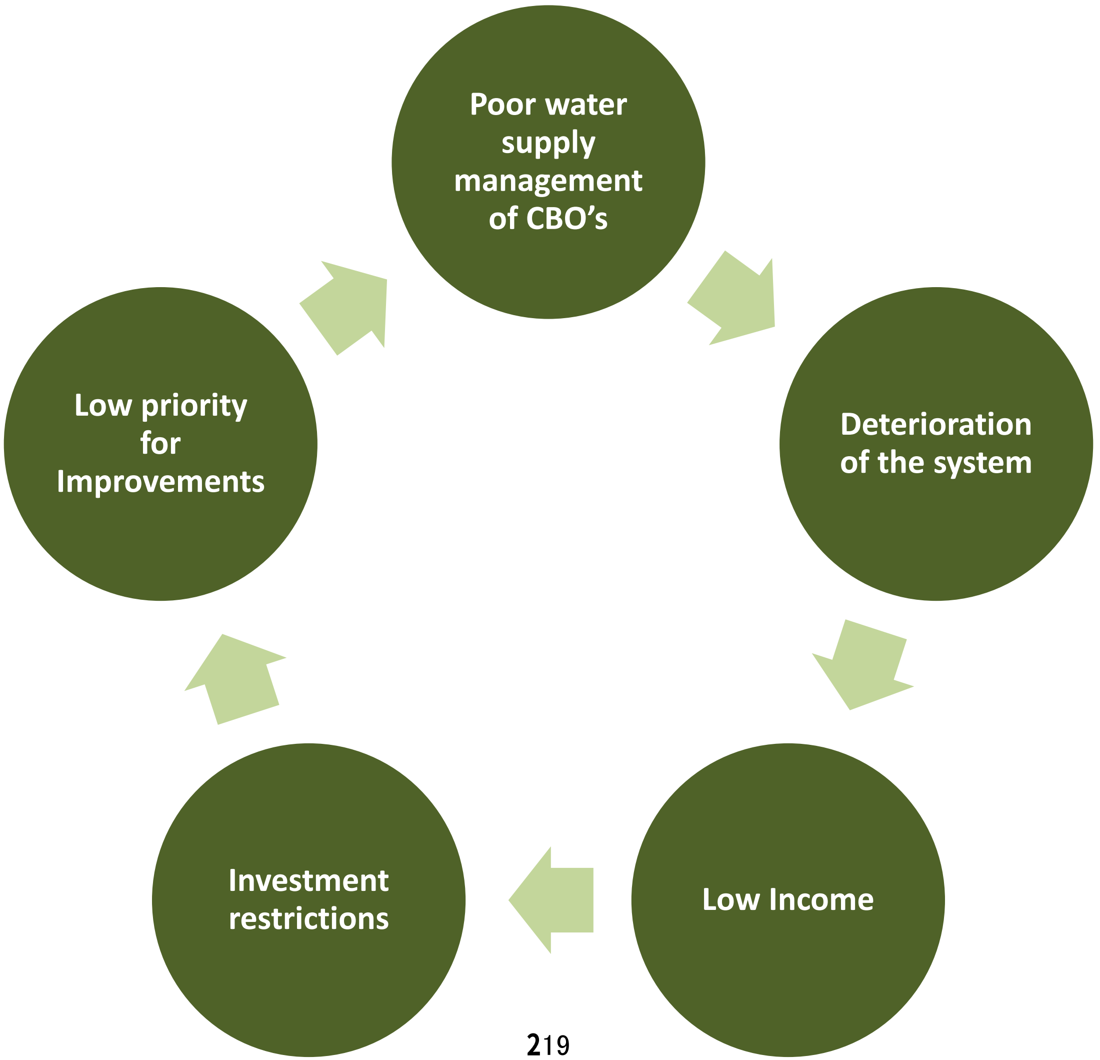


VICIOUS CYCLE ON ASSET MANAGEMENT

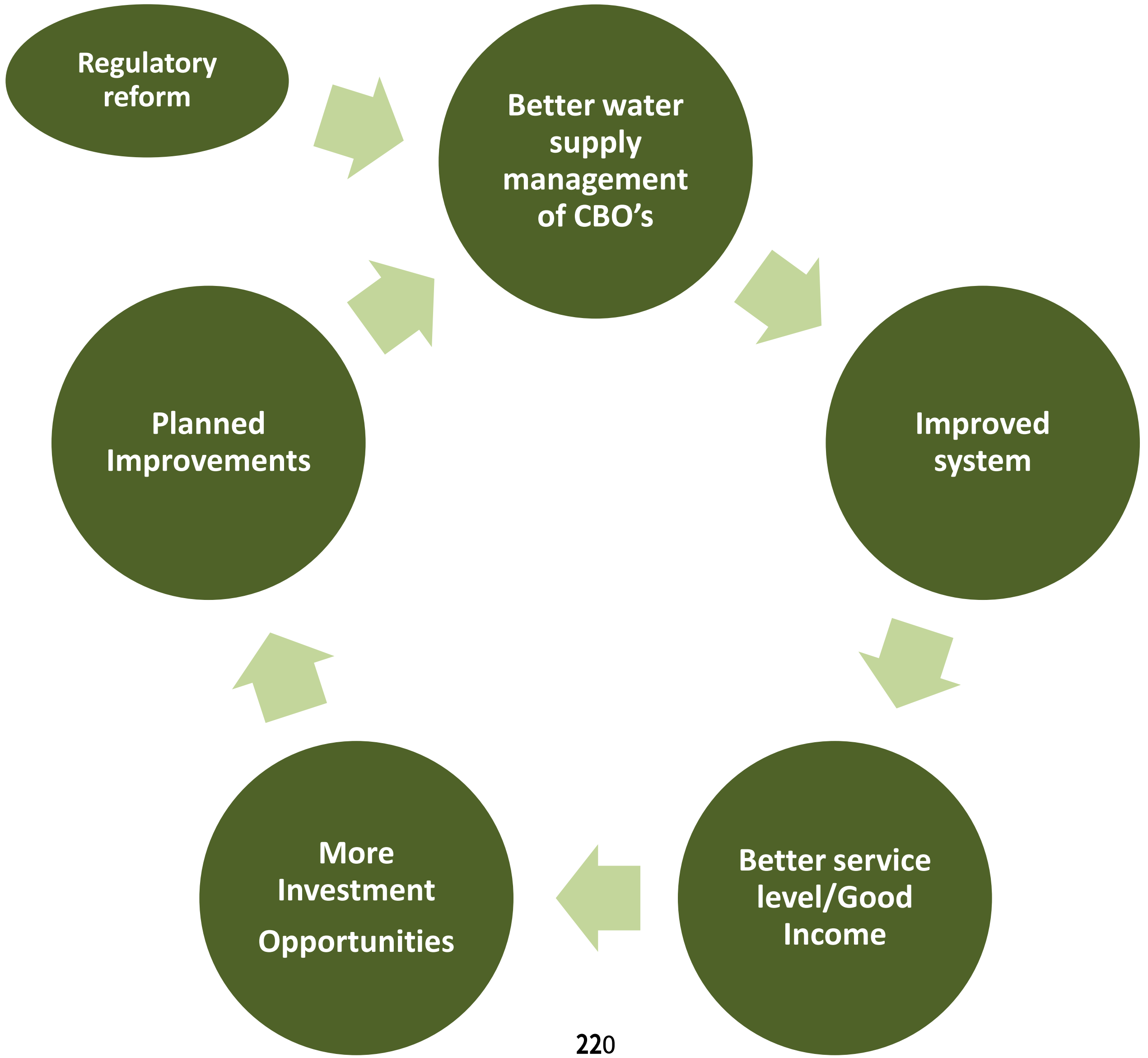


VIRTUOUS CYCLE ON ASSET MANAGEMENT

VICIOUS CYCLE ON SELF SUPPORTING SYSTEMS



VIRTUOUS CYCLE ON SELF SUPPORTING SYSTEMS



IMPROVEMENT PLAN

No:	Activity	Resources	Responsibility	Due Date	Cost ?	Expected Outcome	Indicator
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	Recommendndns

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 26^0 22’ N to 30^0 27’ N and 80^0 4’ E to 88^0 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^{0}C to 42^{0}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

1. 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 450m^3,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 m^3/day
- Production capacity of well 2160m^3/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

1 unit = 1000 litres

Surunga Tariff Structure

(Domestic Use)	In US$	(Institutional Use)	In US$	Government (Domestic Use)	In US$
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^3	34.35
41 to 55	0.19	41 to 55	0.24	For each 1 m^3	1.34
> 55 unit	0.22	> 55 unit	0.28		

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 450m^3OHT), 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 cause	Lack of investments 300 mil US$ is needed/yr, only UD$ 30 mil/yr is available	Sources are depleting May be due to climate variability, global effect	Purification mostly done in urban water supply High cost of WTP	Inadequate supply Due to high demand,	HDPE pipes used mostly DI or other metal pipes are expensive	WQ during monsoon is not satisfactory Lack of coagulation, laboratories, and WTPs	Always lacking trained personnel User operated 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 Activity	Water supply and sanitation coverage will increase	Source yields measurement	Increment in service coverage by WTPs	Increased water production, reduction in leakage and NRW	Less number of leakages	Significant increase in Water Quality	Increased personnel capacity, efficient staff

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

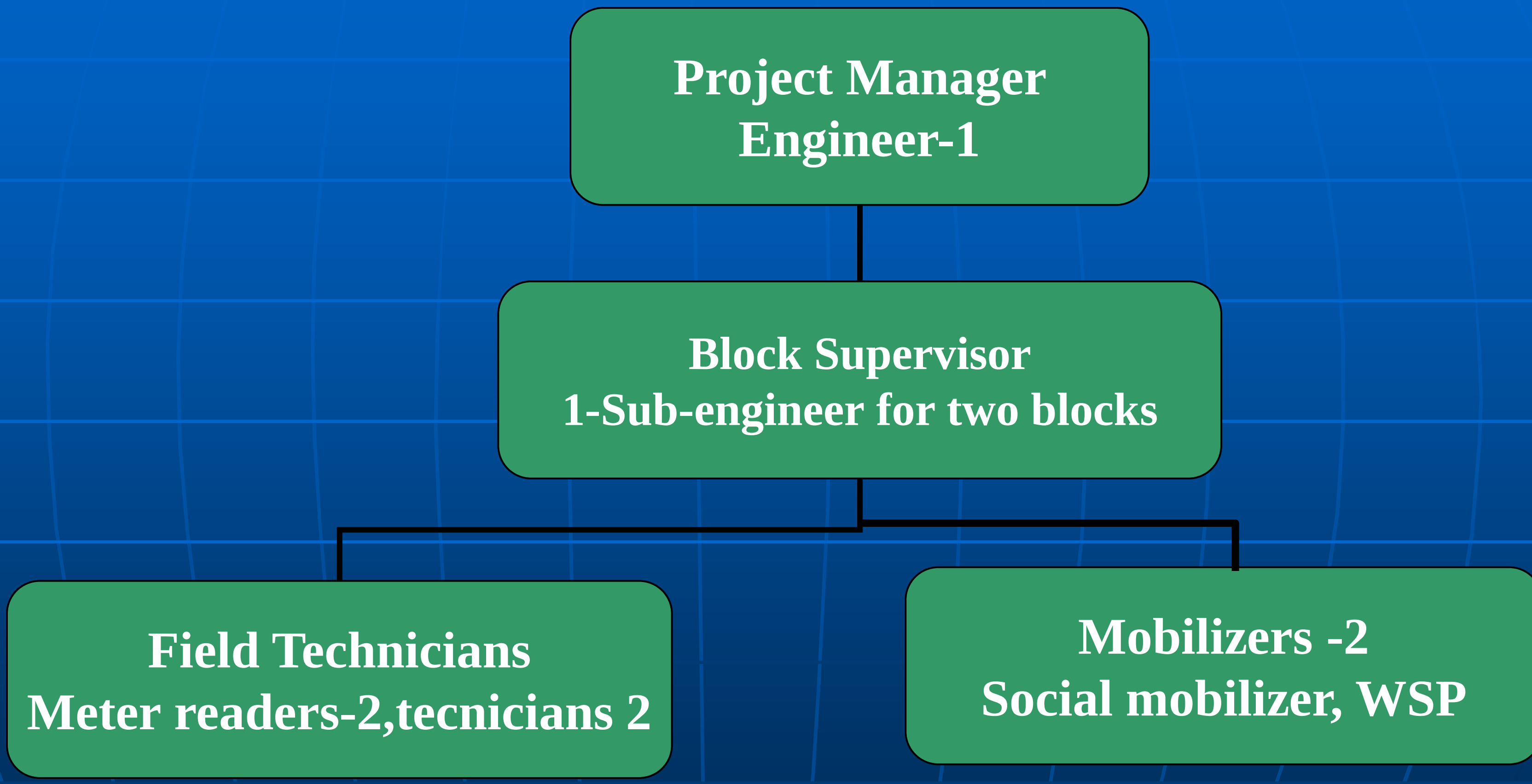
Remedial Measures

- 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 OHT450m^3,9km distribution pipe line, maintenance works)

Proposed Organogram



Expected Outcomes

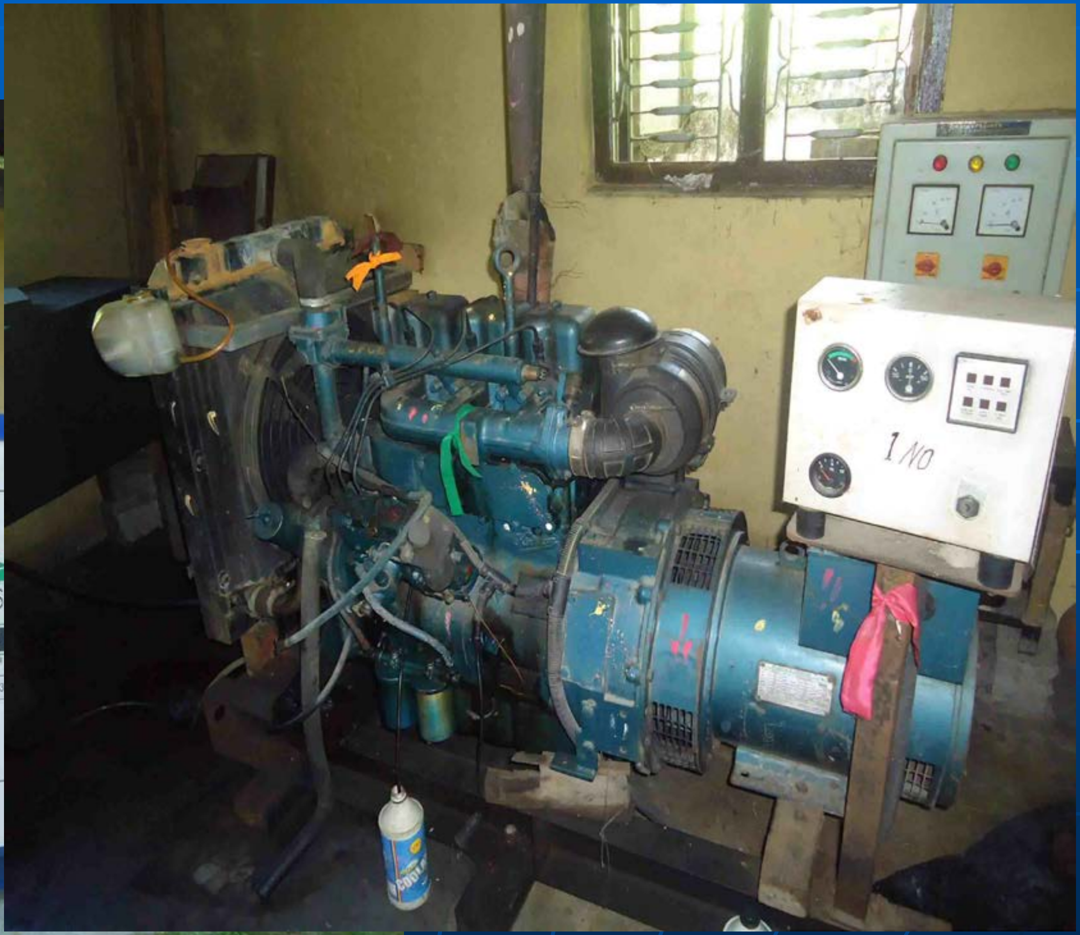
- Tangible increase in water quantity
- Marked difference in quality of service (quantity, pressure, WQ, reliability, billing, collection, complaints handling, etc.)
- Reduction in water leakage losses by 10%
- Enhanced monitoring mechanism for distribution due to efficient database, training, mapping,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

Project in Pictures

Project in Pictures

Project in Pictures

Project in Pictures



Project in Pictures

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

THE REPUBLIC OF THE UNION OF MYANMAR
MANDALAY REGION GOVERNMENT
MANDALAY CITY DEVELOPMENT COMMITTEE
MANDALAY
COUNTRY REPORT

FOR
WATER SUPPLY ADMINISTRATION FOR BETTER MANAGEMENT OF
WATER SUPPLY SERVICES(B) (JFY 2013)
NO. J13-00786

ASSISTANT ENGINEER
WATER AND SANITATION DEPARTMENT

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

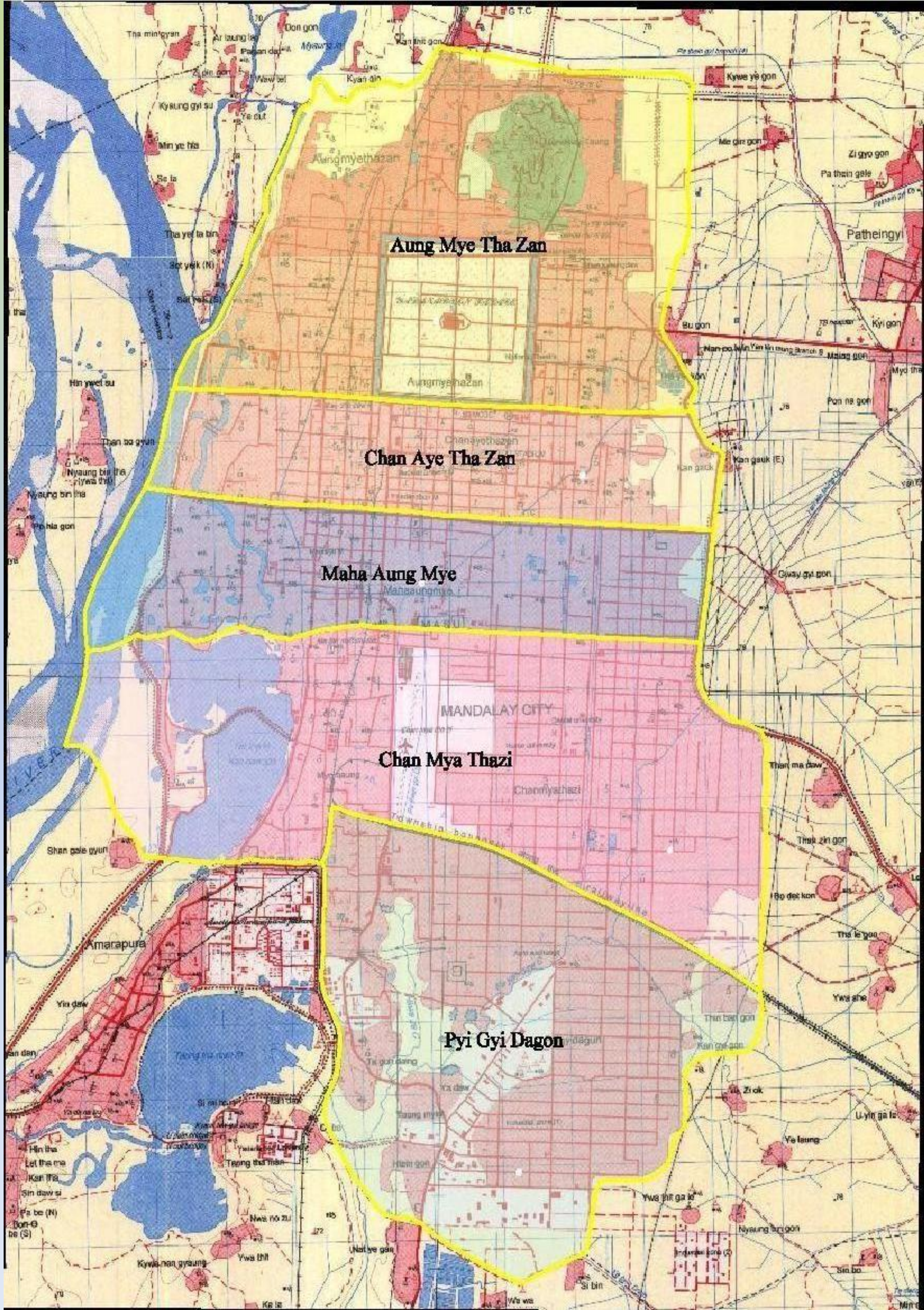
1) Naypyidaw Region
2) Sagaing Region
3) Thnintharyi Region
4) Bago Region
5) Magway Region
6) Mandalay Region
7) Yangon Region
8) Ayeyarwaddy Region

City Testimony

- Location : E Long; 96˙06'
  N Lat; 21˙59'
- Area : 117.86 km^2
- Population : 10,48941
- Population growth : ≈ 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

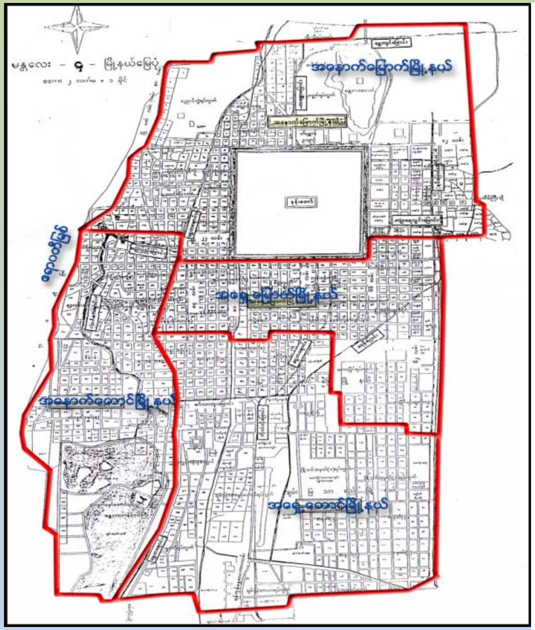
- 5Nos (1993-2011)

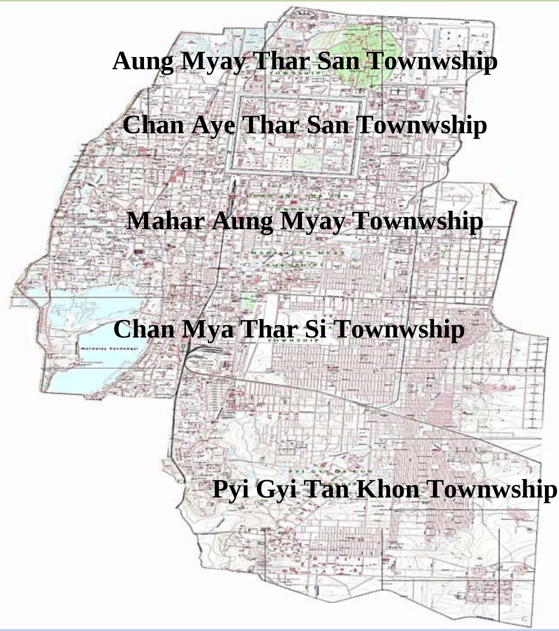
Numbers of Townships

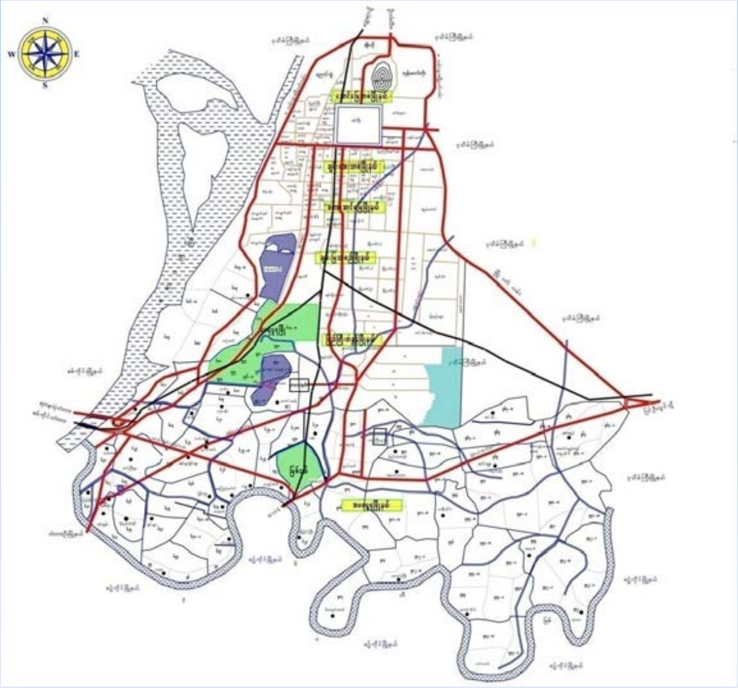
- 6Nos (2011-Now)

Numbers of Wards

- 96Nos (Now)







I. Organization profile

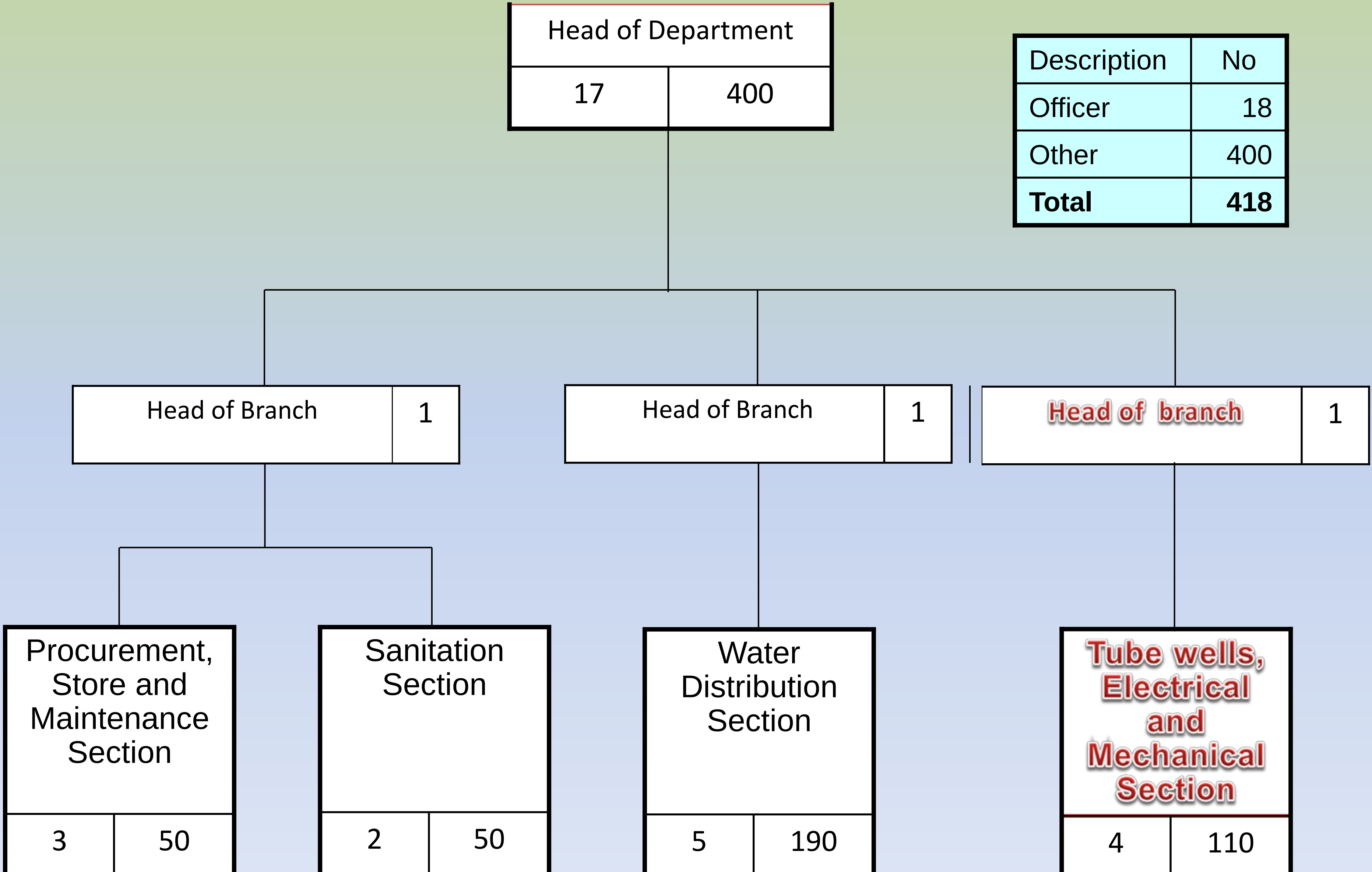
MANDALAY CITY DEVELOPMENT COMMITTEE

1.	Name of Applicant's Organization	- Water and Sanitation Department
2.	Work of Organization and Service	- Water supply and Sanitation work
3.	Type of the applicant's organization	- Local Government
4.	Applicants occupation .	- Assistant Engineer (supervise for tube well drilling &operation , booster pump operation and maintenance
5.	Organization chart of water and sanitation Department	- Table A

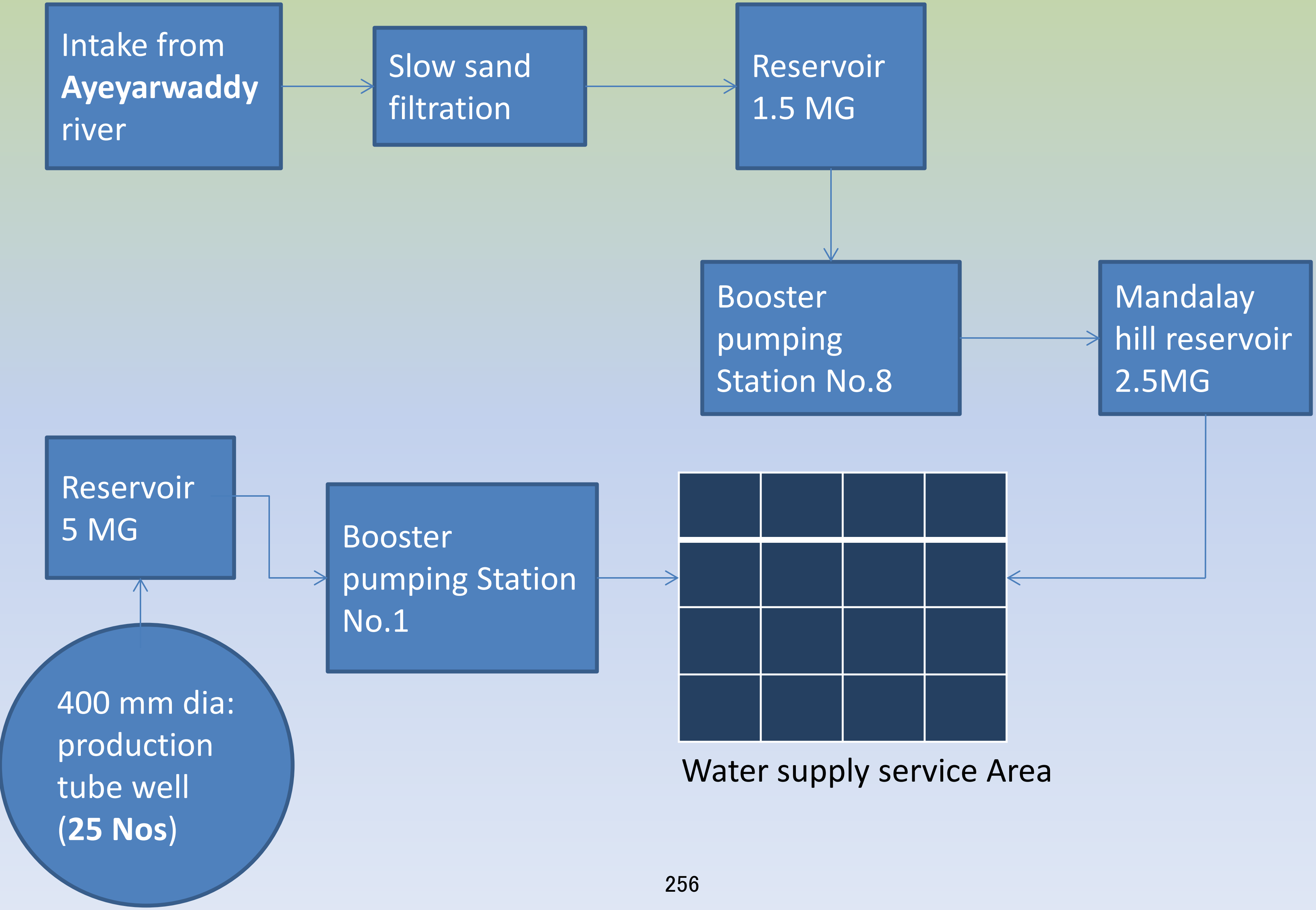
Table A

WATER AND SANITATION DEPARTMENT
Organization Chart

Description	No
Officer	18
Other	400
Total	**418**



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

Table B

Comparative of Rain fall per years 2004 to 2012

year	rain fall	total days of raining	maximum rain fall	
			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	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	

V. Water rates and Bill collection system

Water rates

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

Water billing

1.	Estimated unaccounted for water	-36818 (m^3/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 Standard	
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	Desirable	Imperative
Sr. No	PARMETER										
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	less	less	less	less	less	less	< 5	5	50
3	Turbidity (N.T.U)	Nil	Nil	Nil	Nil	Nil	Nil	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 ($CaCo_3$) (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 ($CaCO_3$) (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_4) (mg/l)	<200	<200	<200	<200	<200	<200	<200	<200	200	400

WATER QUALITY DATA OF 36 TUBEWELLS													
	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	Desirable	Imperative
Sr. No	PARAMETER													
1	p^H (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 ($CaCo_3$) (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 ($CaCO_3$) (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_4) (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-15	TW-16	TW - 17	TW - 18	TW - 19	TW - 20	TW - 21	TW - 22	W.H.O Standard	
	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
Sr. No	PARAMETER												
1	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
2	Colour (Units)	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	5	25
4	Conductivity (micromhos/cm)	380	420	420	480	480	420	340	420	400	380		
5	Calcium as Ca (mg/l)	60	58	56	40	48	58	350	60	48	48	75	200
6	Hardness, Total ($CaCo_3$) (mg/l)	180	180	180	180	180	180	120	200	180	160	100	500
7	Magnesium as Mg (mg/l)	10	10	10	15	15	8	8	12	15	10	30	150
8	Chloride as Cl (mg/l)	10	10	20	10	10	10	10	10	10	10	200	600
9	Total Alkalinity ($CaCO_3$) (mg/l)	240	260	260	260	240	260	220	260	260	240	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	0.1	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	0.05	0.5
12	Sulphate (SO_4) (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 Standard	
	Date	23.5.13	23.5.13	23.5.13	Desirable	Imperative
Sr. No	PARAMETER					
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 ($CaCo_3$) (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 ($CaCO_3$) (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_4) (mg/l)	<200	<200	<200	200	400

WATER QUALITY DATA

Sr. No	Sampling Point	Moat Water	Ayeyarwaddy River Water	Dohthawaddy River Water	Sadawgyi Dam Water	W.H.O Standard	
	Date					Desirable	Imperative
	PARAMETER						
1	p^H (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 ($CaCo_3$) (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 ($CaCO_3$) (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
12	Sulphate (SO_4) (mg/l)	<200	<200	<200	<200	200	400

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 Parameter & Test Method				
No	Parameter	Type of Instrumetn	Test Method	Test Range
	Physical Examination			
1	p^H	p^HMeter/ 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 $CaCO_3$		Titration Method	
	Total ($CaCO_3$)			
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_3 - 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	
			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_3	mg/l	100	500
7	Magnesium as Mg	mg/l	30	150
8	Chloride as Cl	mg/l	200	600
9	Total Alkalinity as $CaCO_3$	mg/l	200	500
10	Iron as Fe	mg/l	0.1	1

No	Parameter	Units	W.H.O Standard	
			Desirable	Imperative
11	Manganese as Mn	mg/l	0.05	0.5
12	Sulphate as SO4	mg/l	200	400
13	Nitrate Nitrogen (NO_3-N)	mg/l	-	50
14	Arsenic (As^+)	mg/l	-	0.01
15	Copper (Cu^+)	mg/l	-	2
16	Cyanide (CN^-)	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

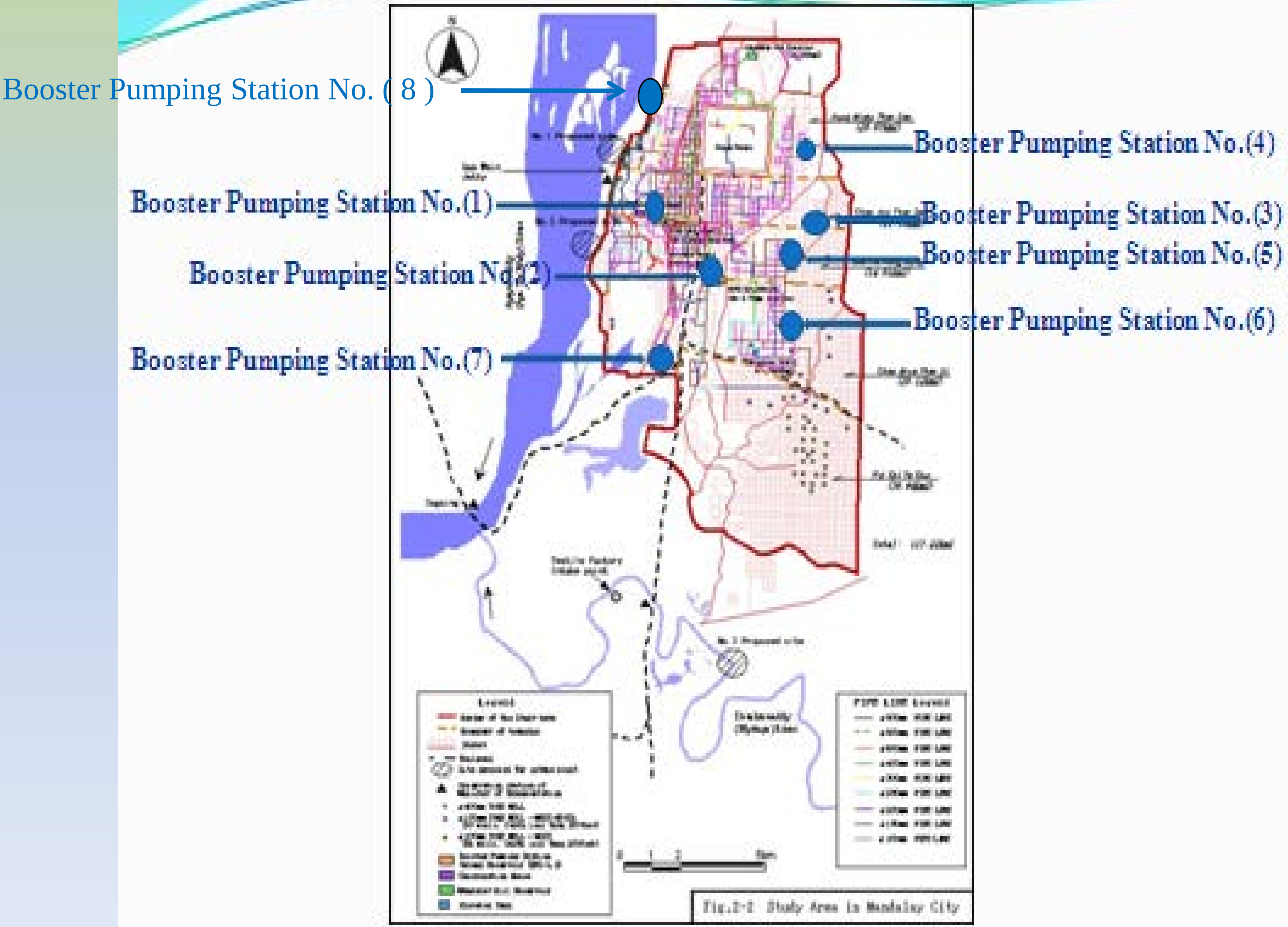
No	Parameter	Type of Instrument	Test Method	Test Range
1	D.O	Sension 378 (HACH)	Probe Method	
2	B.O.D	Sension 378 (HACH)	Winkler's Method & Probe Method	
	HEAVY METAL			
3	Arsenic as As	Test kit (HACH)	Strip/ Colour Matching	0-500 ppb
4	Copper as Cu	Test kit (HACH)	Colour Disc & Colour Matching	0-100 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^H 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 $CaCO_3$		Titration Method	
7	Magnesium as Mg		Titration Method	
8	Chloride as Cl		Titration Method	
9	Total Alkalinity, Total as $CaCO_3$		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

1. population ratio to be served by the applicant's organization _ 72 **: 28**
2. Average number of hours per day of water availability to most people _ 8hour/ day (depend upon electrical power)
3. The distribution water use _ it is not directly used for the potable water
4. Non revenue water(NRW) _ 35%

Fig. 1 The Present Water Supply System in Mandalay City



VIII.Other

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

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**)

4 Length of water distribution network:(**200 km**)

5 Capacity of storage in network (**51360m3**)

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

Domestic (Households)	Non Domestic (Industrial, commercial, Institutional, other)	TOTAL
-	-	-

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***

Domestic (Households)	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 *(Σ(participants x training event duration)) in the year:* ***(30days)***

5 Proportion of total operating budget used for Human Resource Development (HRD): **(_ %)**

VI. Customers

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

□ other method

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	To	Cost/m3	From	To	Cost/m3	From	To	Cost/m3
1.									
2.									
3.**									

Notes:
** 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*
*** Where there are more than 3 blocks in the tariff schedule please specify the approximate average tariff rates for consumptions above tariff block 2.*

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

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
7. Inadequate cost-recovery framework			X
8. Insufficiency of trained personnel			
(1) Professional			X
(2) Sub-professional			X
9. Lack of planning and design criteria			X
10. Inappropriate technology			X
11. Intermittent water service			X

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)

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

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

PROBLEM ANALYSIS MATRIX(for sharing experiences among participants)

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

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 : the plan	To provide the demand for water according to the increasing population of the town
2.1. Background: and present situations of the problems	Since 1990, Mandalay Water Supply Project has been distributing 1,800,000 gallons of water a day with Dia, 400 mm Production Tubewell (19) Nos which can produce 50,000 gallons of water per 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 the plan :(i) Permission of Mandalay City Development Committee
(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 35th 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 Power supply :Installing 315 KVA Transformer

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

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

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 Responsibility :(i) Mandalay City Development Committee
:(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^2
Population :	193,9 million Habitants
Coverage Water Supply:	84.6 %

Selected Water Supply System: **Paraná**

Service Area :	199,314 km^2
Population Served:	10,6 million

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.

Iguaçu Water Treatment Plant

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

<table>
<tr><td rowspan="4">System input volume</td><td rowspan="2">Authorized consumption</td><td>Revenue water</td><td>Billed authorized consumption</td><td>466,630,192 m^3/year (65%)</td></tr>
<tr><td rowspan="3">Non Revenue Water (NRW)</td><td>Unbilled authorized consumption
(ex. fire fighting, cleaning)</td><td>6,950,00 m^3/year (1%)</td></tr>
<tr><td rowspan="2">Water losses</td><td>Apparent losses
(Unauthorized consumption
(i.e. Illegal use),
Customer metering inaccuracies)</td><td>79,452,860 m^3/year (11%)</td></tr>
<tr><td>Real losses
(Leakage)</td><td>159,722,469 m^3/year (22%)</td></tr>
</table>

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 /m^3)
- 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 Self-supporting 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
-	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.

Miringuava Water Treatment Plant

SANEPAR

PARANÁ
GOVERNO DO ESTADO

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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 contributiing to the promotion of health and social welfare activities in the friendly nations.

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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。

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