การประปาส่วนภูมิภาค
Provincial Waterworks Authority

PWA Water Utility Management

Presented to

Asean Water Utilities' Staff

BY

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GRAND MERCURE FORTUNE HOTEL, BANGKOK

PWA

Provincial Waterworks Authority

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www.pwa.co.th

Thailand (Facts & Figures)

Area : 513,120 sq km (world ranking 51)

- **Land : 510,890 sq km**
- **Water : 2,230 sq km**

Thailand (Facts & Figures)

Land Uses

- **Arable Land : 30.71%**
- **Permanent Crops : 8.77%**
- **Others : 60.52%**

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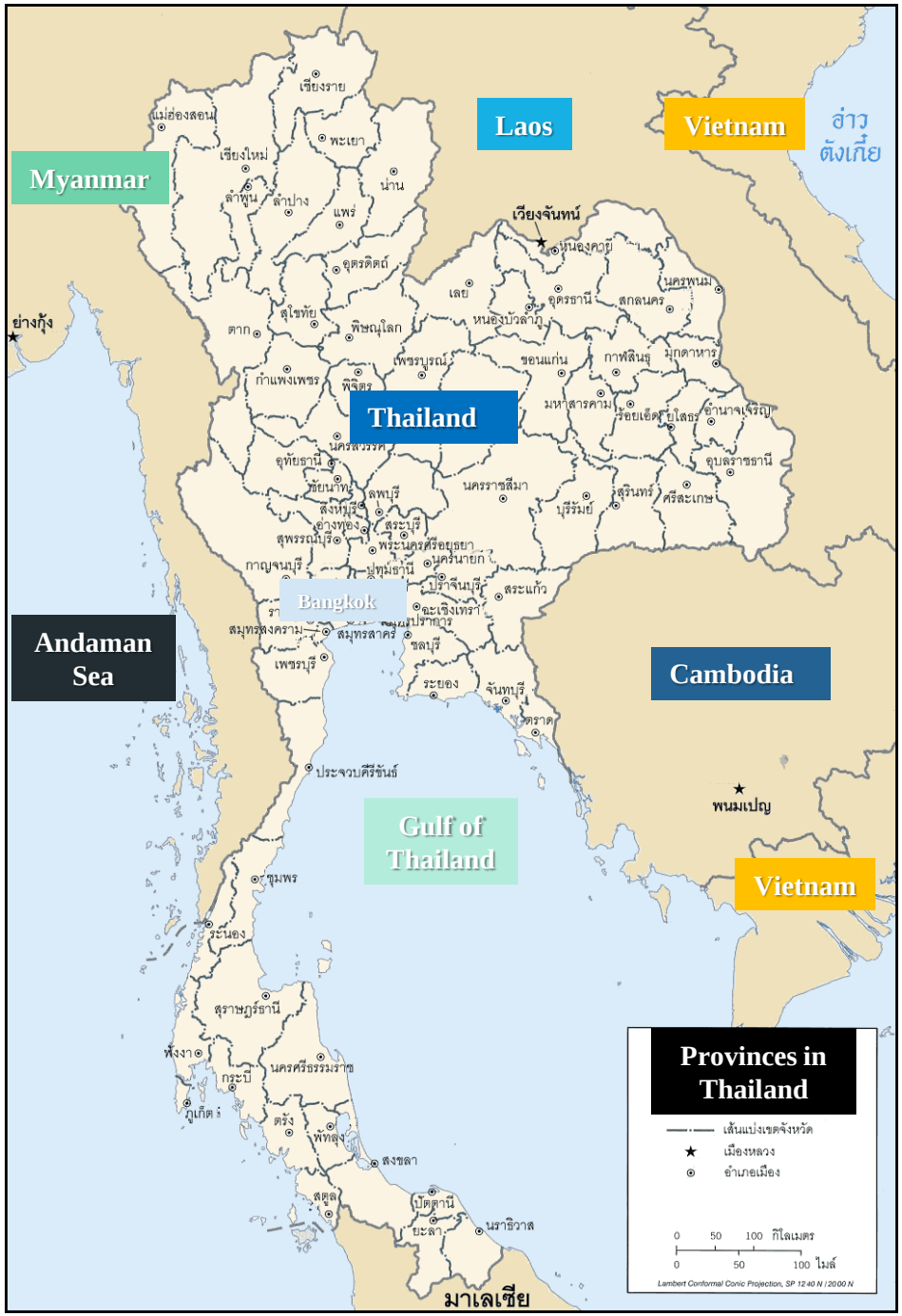
Thailand & its neighbors



Thailand (Facts & Figures)

Land Boundaries : 4,863 km

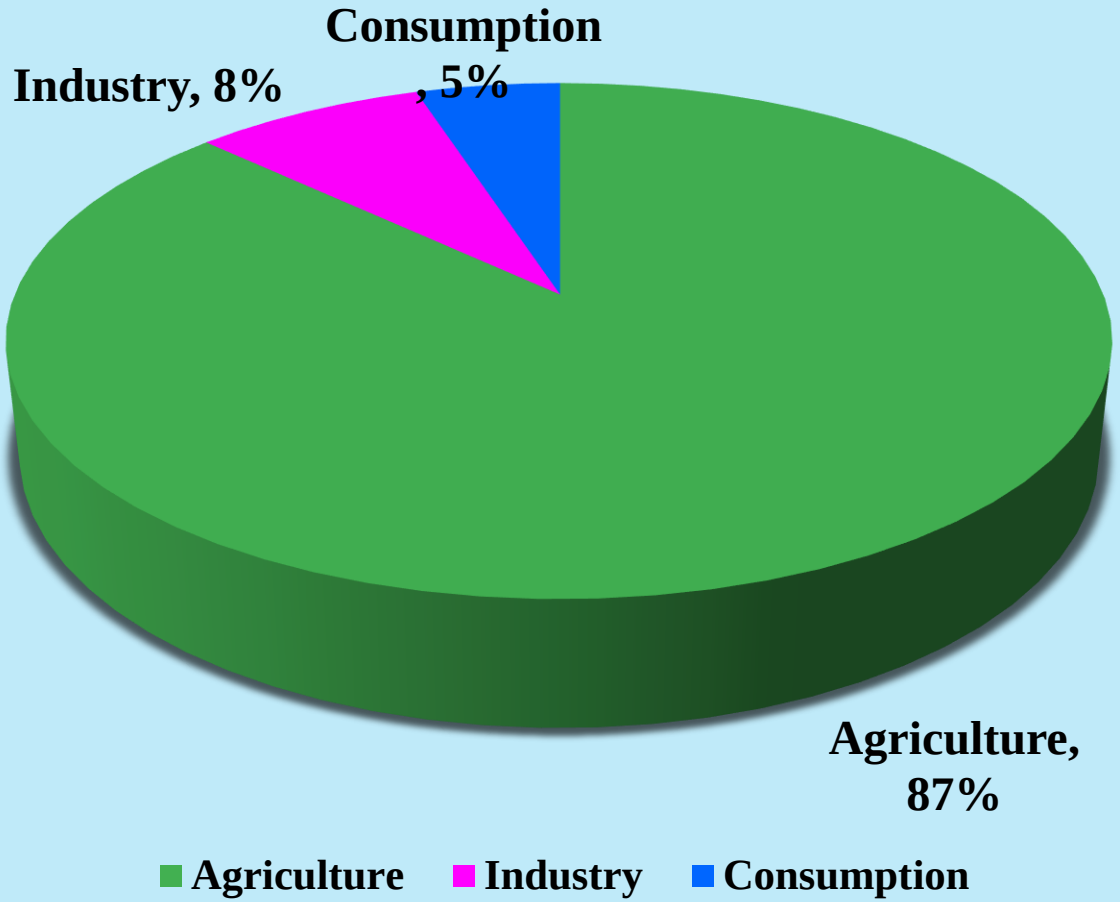
Borders:

- Myanmar 1,800 km
- Cambodia 803 km
- Laos 1,754 km
- Malaysia 506 km

Coastline : 3,219 km

Thailand (Facts & Figures)

Water Use



Thailand (Facts & Figures)

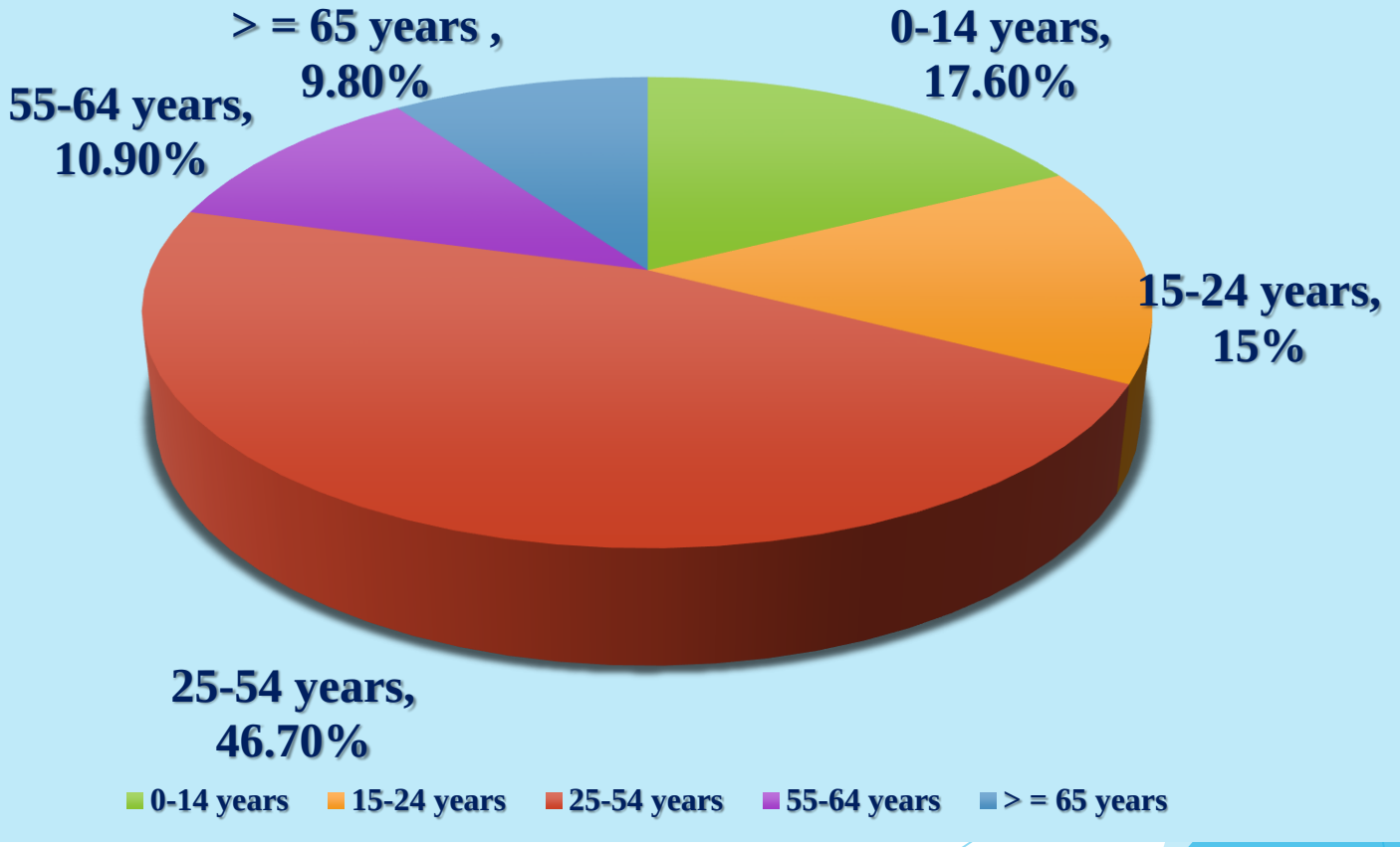
Population : 67,741,401 (Data as of July 2014)

World Ranking : 21

Median Age : 36.2 years

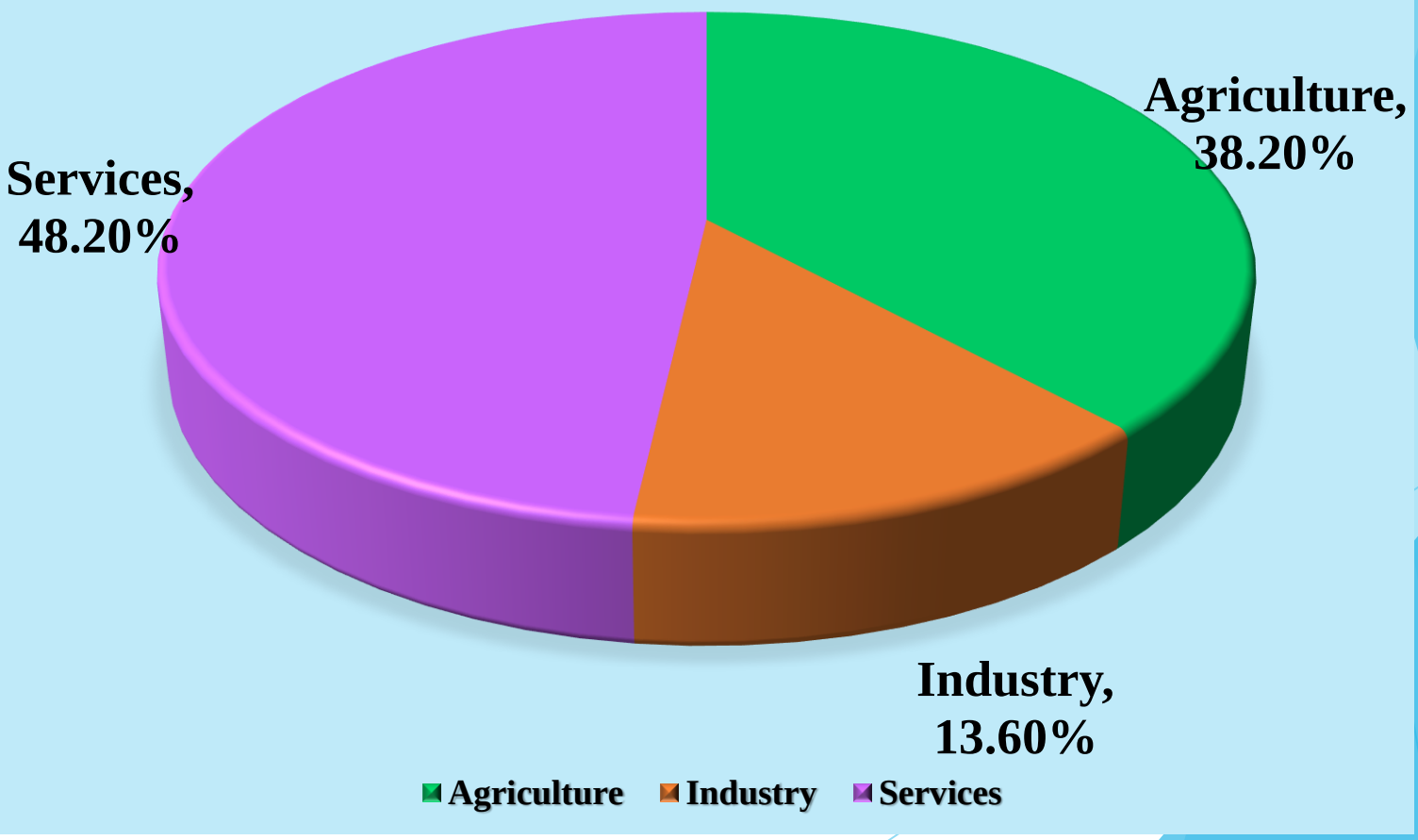
Thailand (Facts & Figures)

Age Group



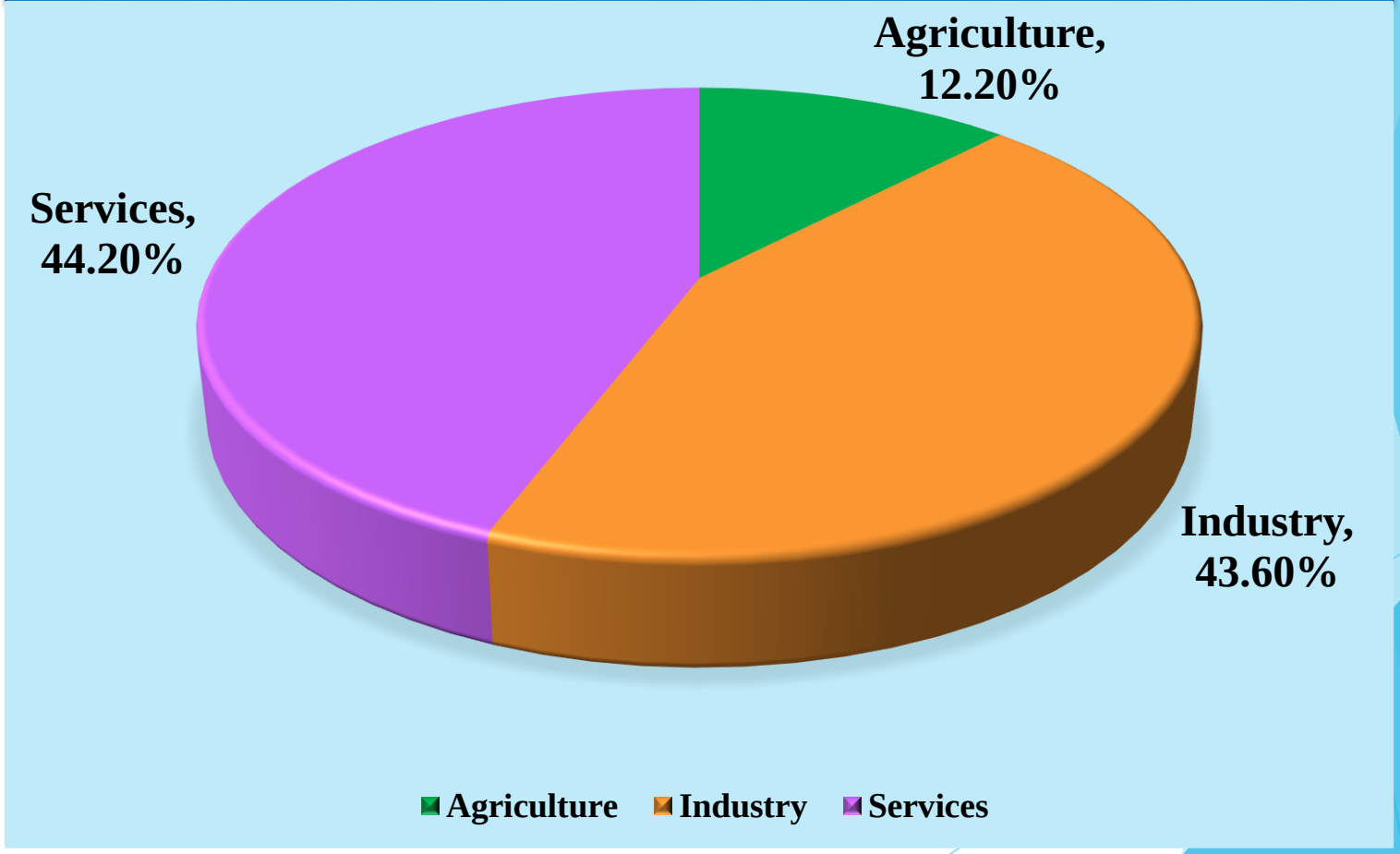
Thailand (Facts & Figures)

Labor Force



Thailand (Facts & Figures)

GDP Composition (By Sector)



Corruption

Corruption Perception Index : 1 = Least Corrupt

2012	2013	2014
88/176	102/177	85/175

Source : Transparency International

Communication

Railways : 4,071 Km.

Roadways : 180,053 Km.

PWA's Service Areas

- 10 Regional Offices
- 234 Waterworks
- Service Areas
  - 74 Provinces.
  - > 1,000 Municipalities.
- People serviced
  - 3.8 million households or 11 million population (16%)

MWA : Bangkok + 2 Other provinces

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No. of Utilities Using Different Source of Water

79% of Utilites use surface water

3% of Utilites use groundwater

18% of Utilites use surface + groundwater

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Private Sector Participation (PSP)

1995 till 2015

- **11 Contracts (15 waterworks)**
  (4 BOOT, 5 BOO, 1 BTO, 1 Leasing contract)

- **Production capacity**
  (0.94 MCM/D, 21% of total production)

Sources of PWA Surface Water (Data as at 2014)

Source	MCBM/Y	%
11 PSP contracts	343	21.0
Buy from Irrigation Dept.	245	15.0
Buy from East Water	98	7.2
PWA water sources	964	59.14
Total	1,630	100

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PWA Production System

331 waterworks use a conventional system

3 waterworks (on islands) use RO system

Conventional Production System

- Pump water from raw water sources
- Use alum for sedimentation & flocculation
- Use lime to stunt the growth of seaweed or algae
- Filtration (Rapid sand)
- Chlorination

Water Distribution

- Gravity
- Direct pumping (in city)
- Combination of both

Production Control System

Over 90% of PWA water supply schemes are controlled manually

Fewer than a dozen are controlled by SCADA

NRW Control Techniques

- DMA
- Outsource work to private companies (Utilities with > 20,000 connections)
- Set up mobile teams to fix pipe burst & leak
- Replace old pipes with new ones

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Local Authority Tariff Rates

Not the same, vary from place to place

Much cheaper than those of PWA & MWA

Starting from 4.0 Baht ($ 0.12 US) to 6.0 Baht ($ 0.18 US) per cubic meter


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สำนักงานประปาระยอง


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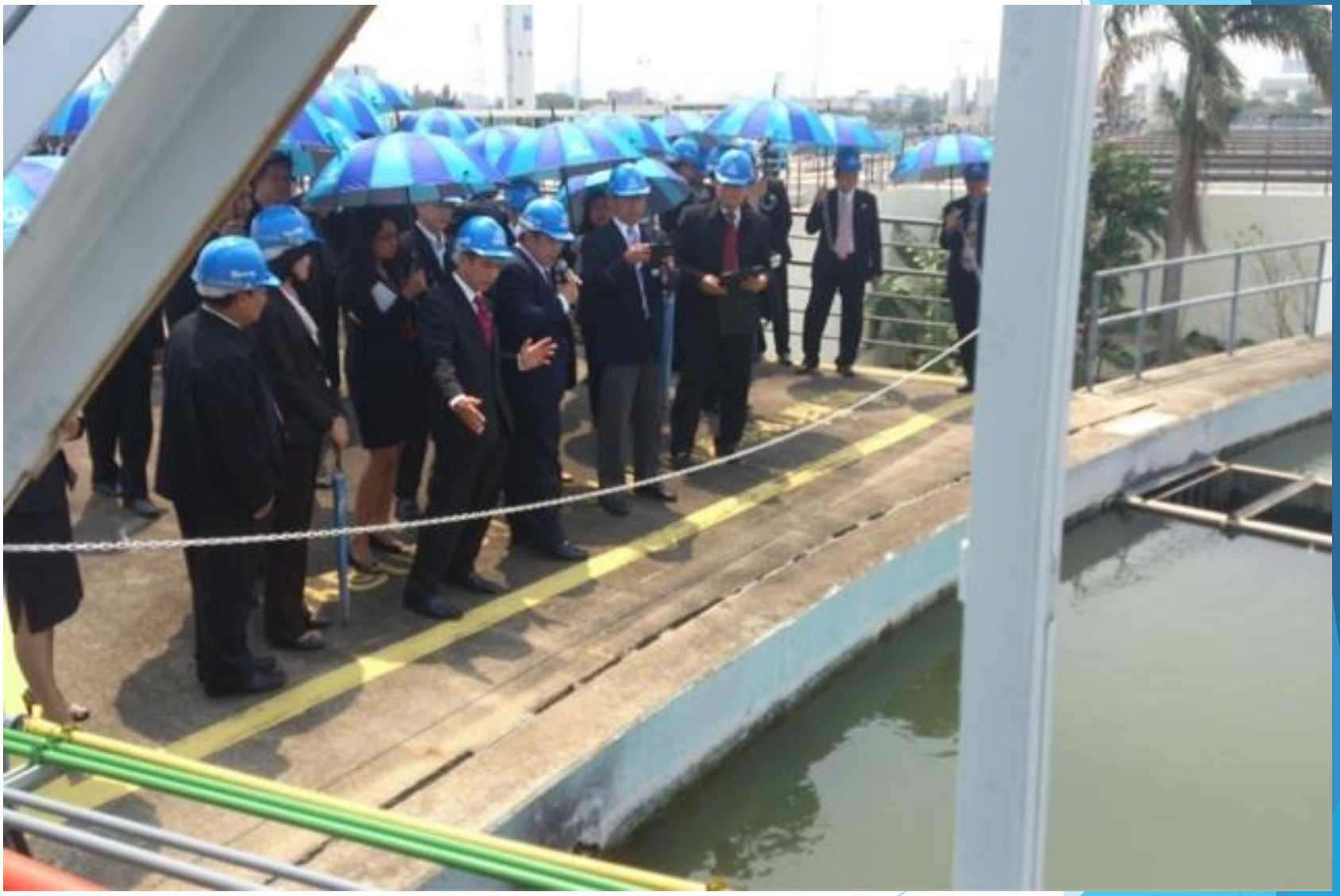
MWA's Service Areas

- 23 Branches
- 4 Major Treatment Plants
- Service Areas
  - Bangkok + 2 Neighboring Provinces
  - 2.23 million households or 8.4 million population (12.5%)

MWA : Bangkok + 2 Other provinces



Comparison between PWA & MWA (2014)

Item	PWA	MWA
Water produced	1,630 mil. m^3	1,797 mil. m^3
Water sold	1,180 mil. m^3	1,377 mil. m^3
% of water sold	72.5%	76.6%
Non-revenue water (NRW)	27.5%	23.4%
Treatment plants	several hundreds	4
Raw water sources	wide variety (rivers, canals, reservoirs, deep/shallow wells, sea water)	2 major rivers

Comparison between PWA & MWA (2014)

Item	PWA	MWA
Connections	3.8 million	2.1 million
Staff	8,900 people	4,185 people
Revenue	$ 785.1 million	$ 609.0 million
Expenses	$ 579.4 million	$ 394.0 million
Net profit	$ 205.7 million	$ 214.88 million
Established	1979	1967
Production system	flocculation, coagulation, sedimentation, filtration, chlorination	similar

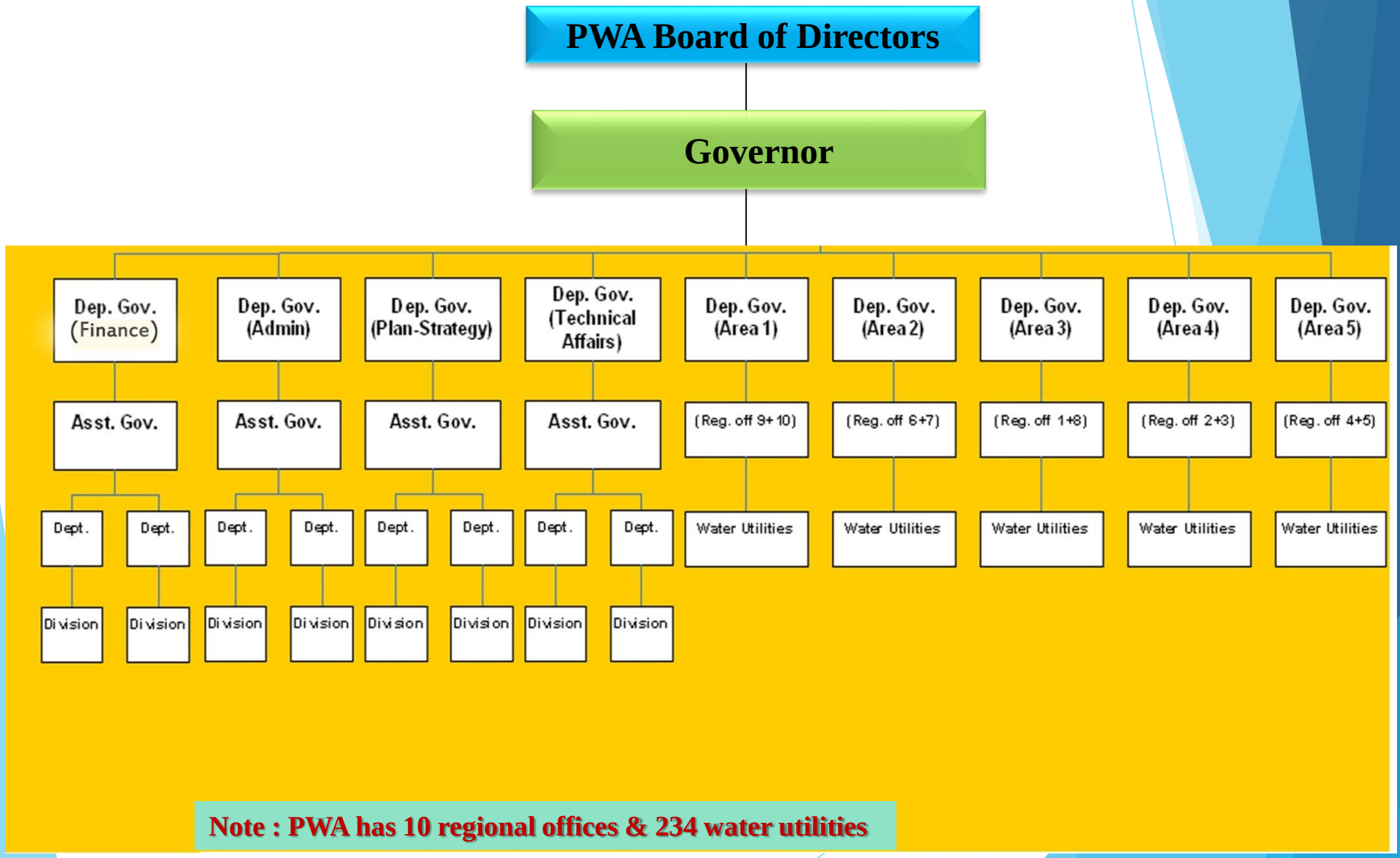
PWA Vision

Customers are delighted with water quality and excellent services.

PWA Mission

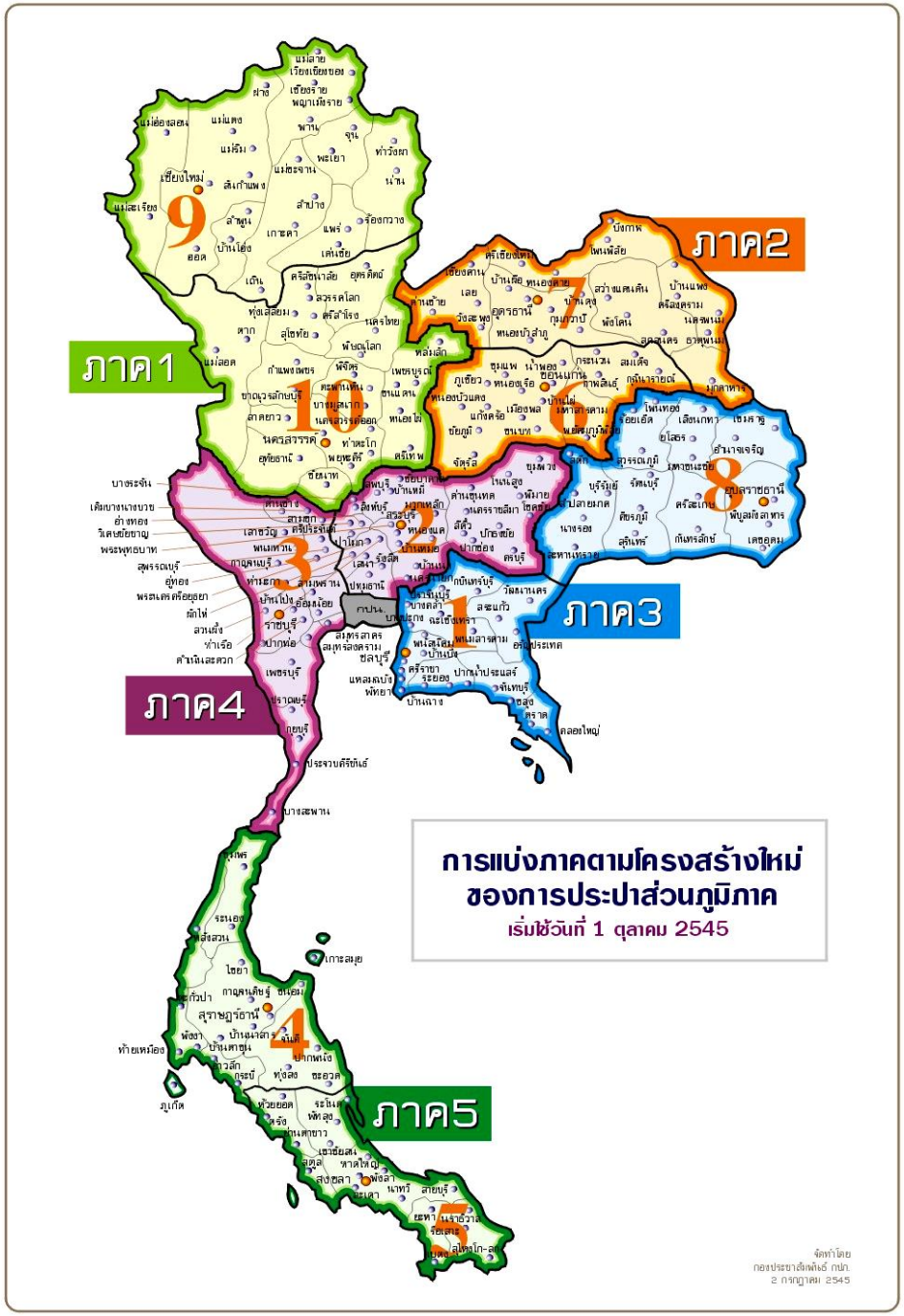
- Do and promote piped water business.
- Survey and acquire raw water to be used for piped water production.
- Do other businesses related to piped water supply.

PWA's Organization Chart



Note : PWA has 10 regional offices & 234 water utilities

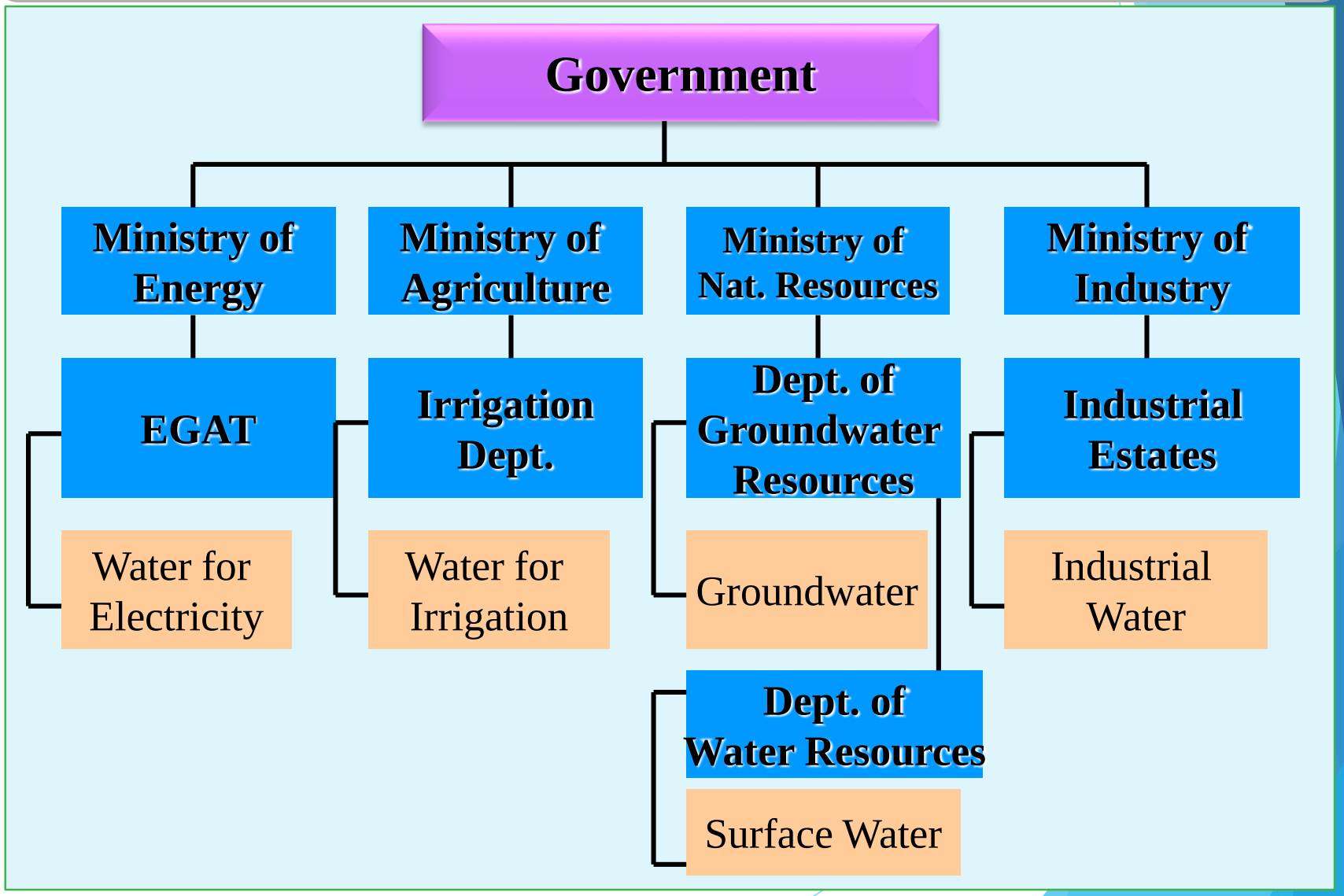
PWA Administrative Structure



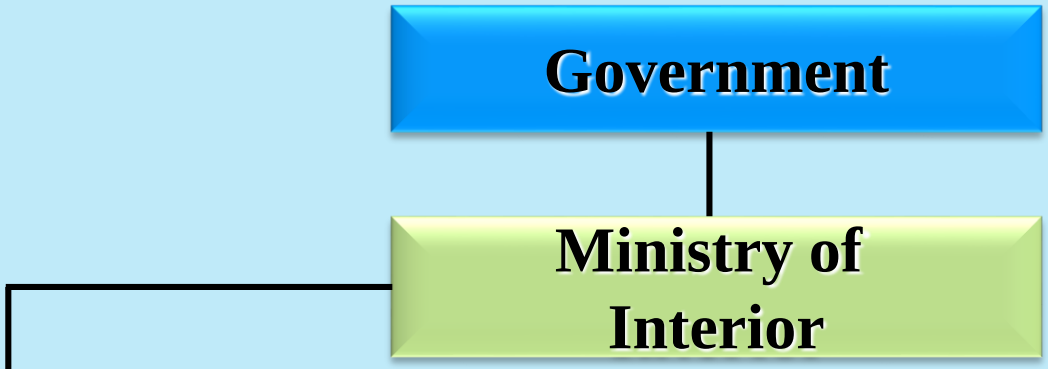
(in the provinces)

- **Consist of 5 areas.**
- **Each area is supervised by a deputy governor for operation (1-5)**

Institutional Structure for Water Resources

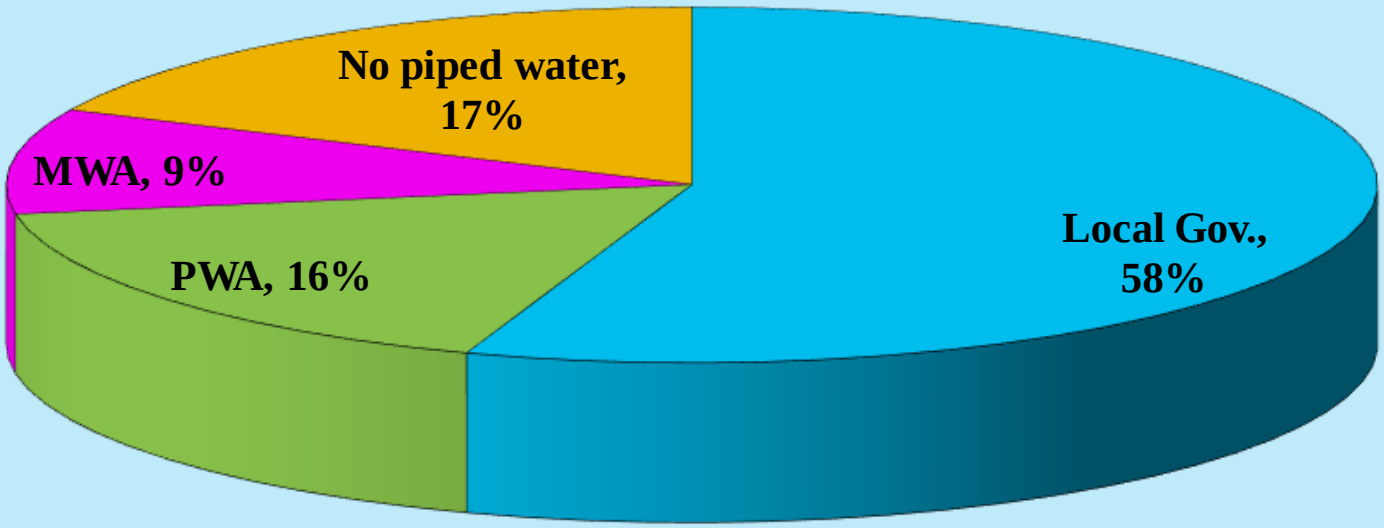


Institutional Structure for Water Supply



-MWA (water in Bangkok & 2 neighboring provinces)
(2.1 mil. Households or 9.0% or 8.4 mil. people)
- PWA (water in 74 provinces)
(3.8 mil. Households or 16.0% or 11 mil. people)
- Dept. of Local Government Promotion
(Financial support)
- Local governments
(11.5 mil. Households or 58.0% or 36.0 mil. people)
- No piped water system (11.6 mil. people or 17.0%)

Water Supply in Thailand



PWA Water Utilities (234)

160 small-scale WUs (< 15,000 connections)

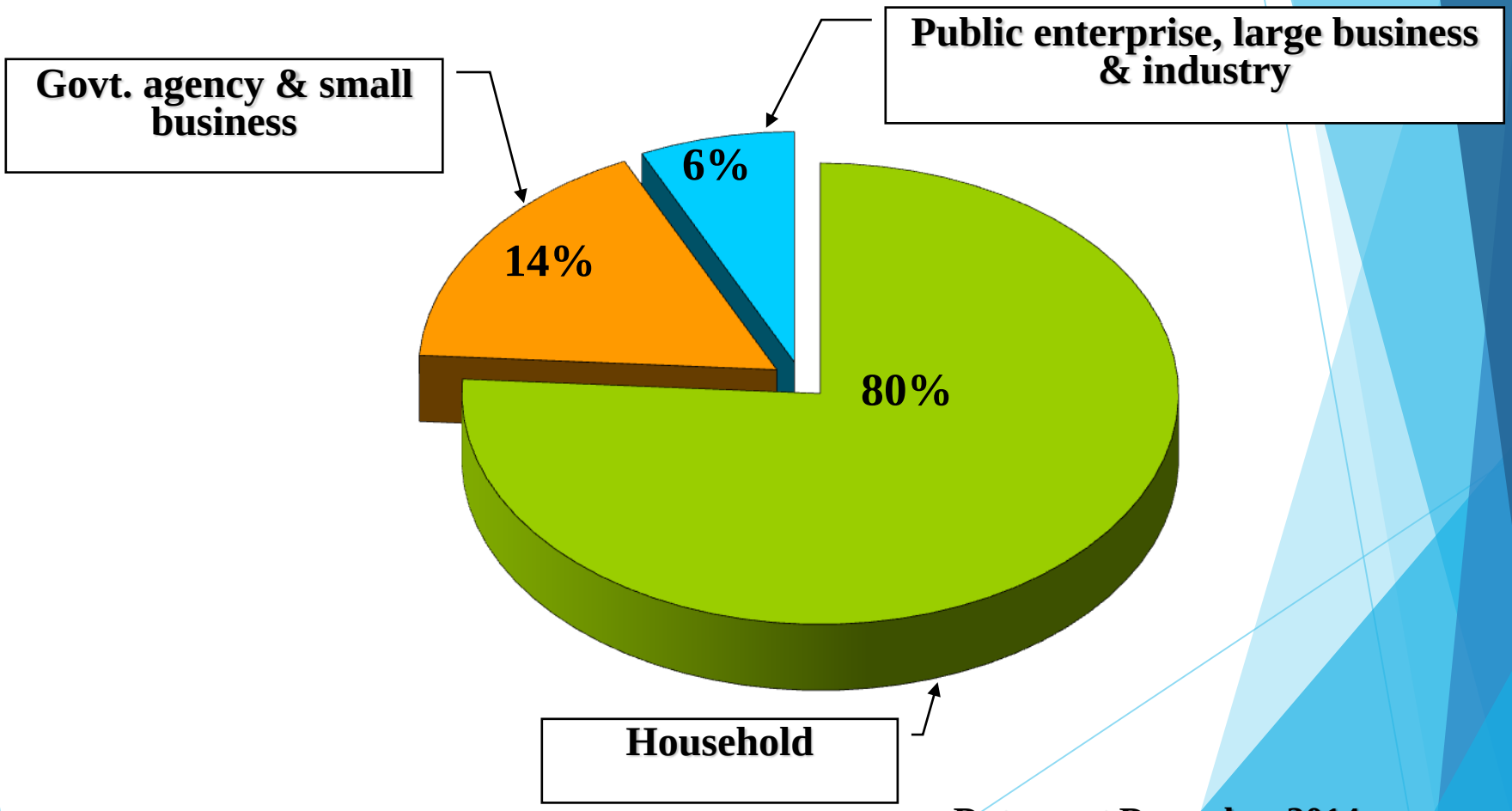
52 medium-scale WUs (15,001- 40,000 connections)

13 large-scale WUs (40,001 – 65,000 connections)

6 very large WUs (65,001 - 90,000 connections)

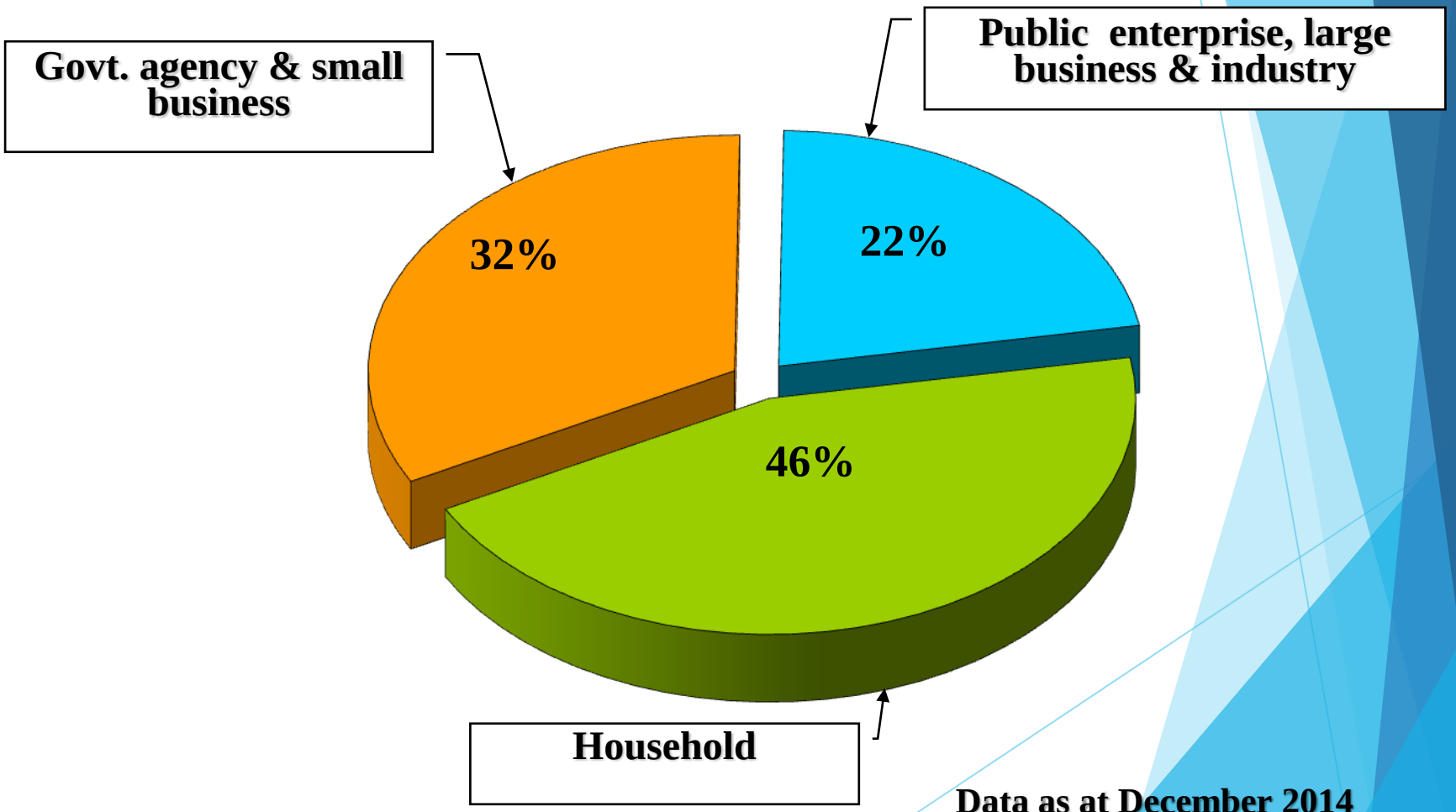
3 super large WUs (>90,000)

Ratio of Customer Groups
(2014 : 3.8 Mil. connections)



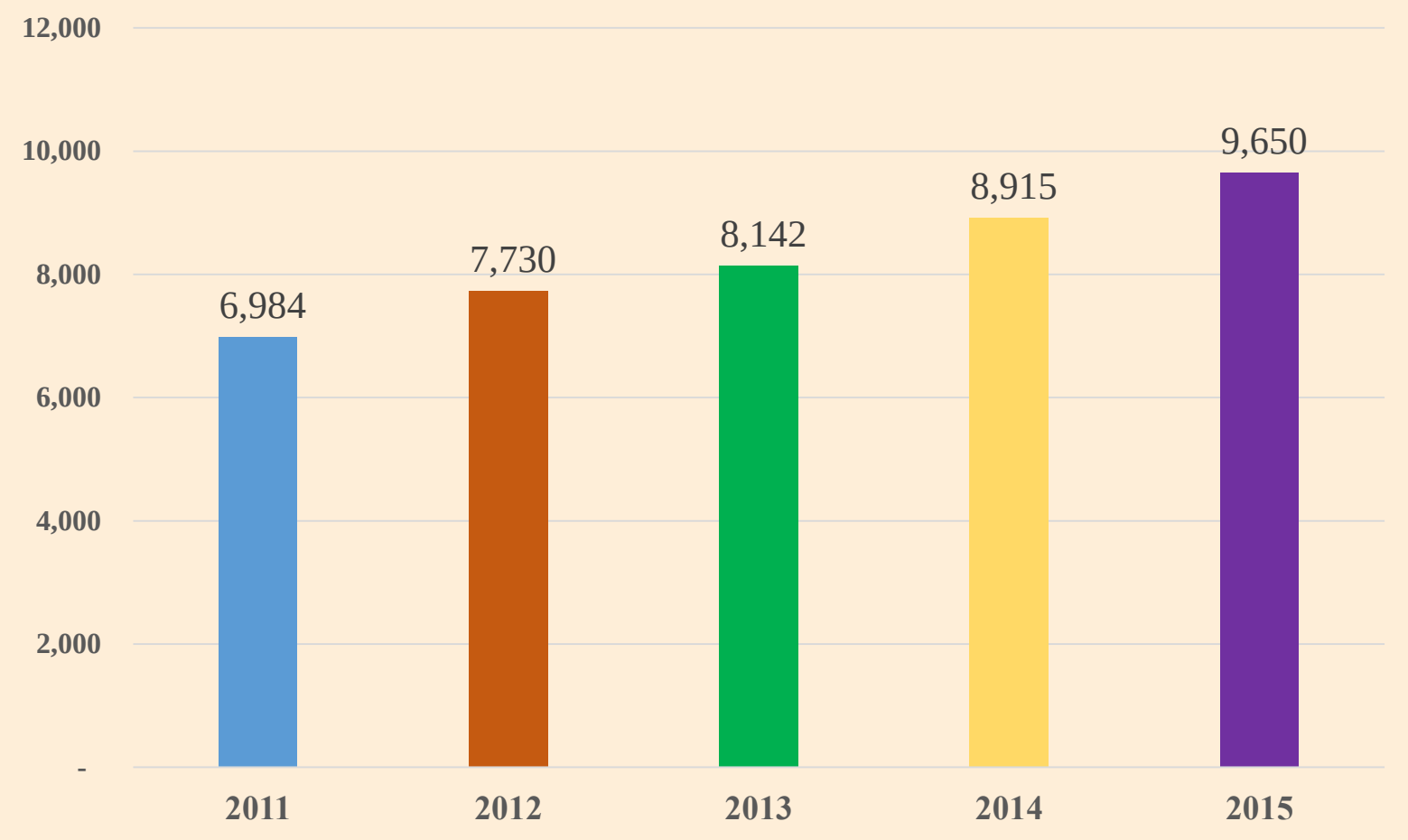
Data as at December 2014

Amount of Water Consumed by Groups

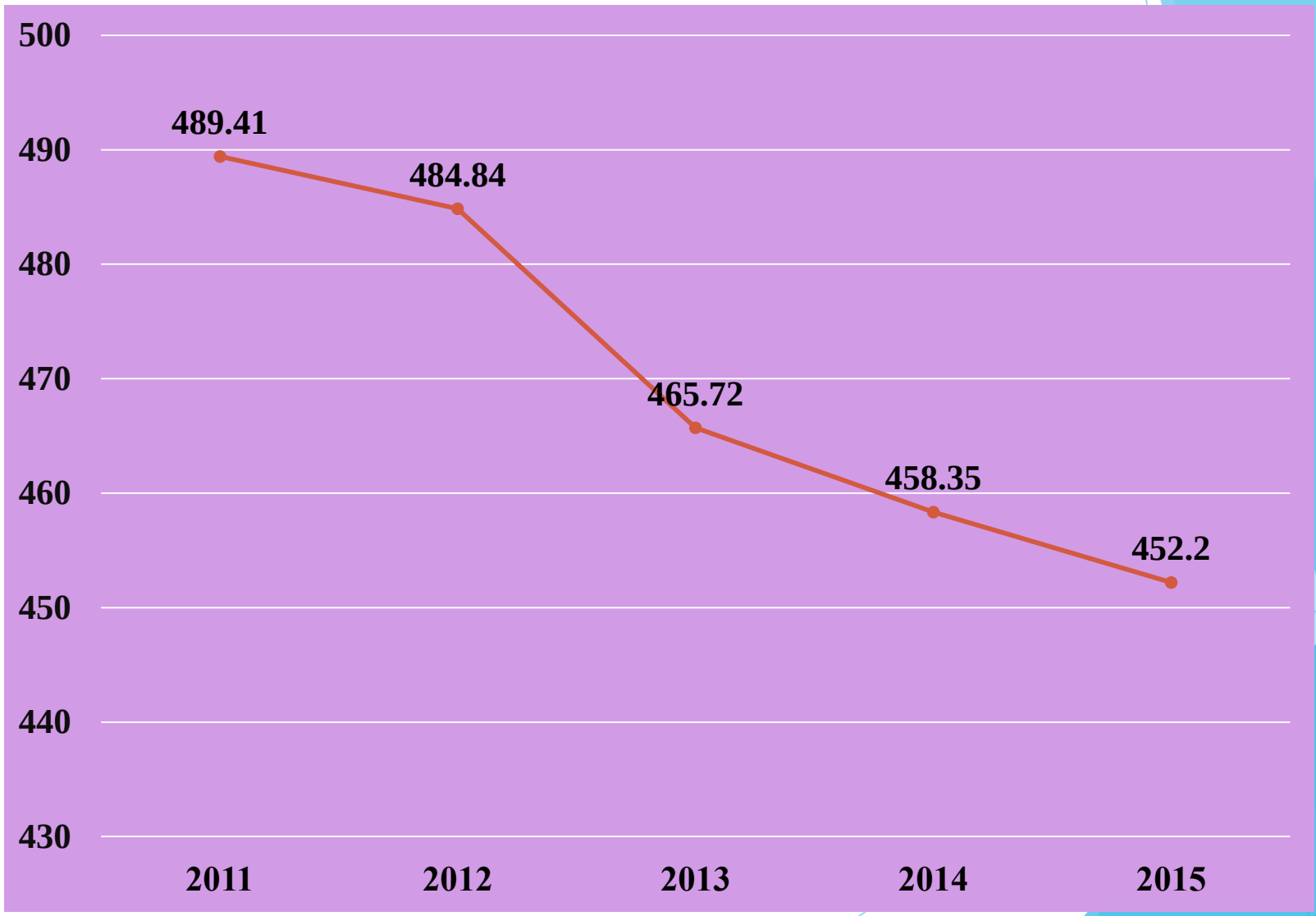


Data as at December 2014

No. of staff (2011 – 2015)

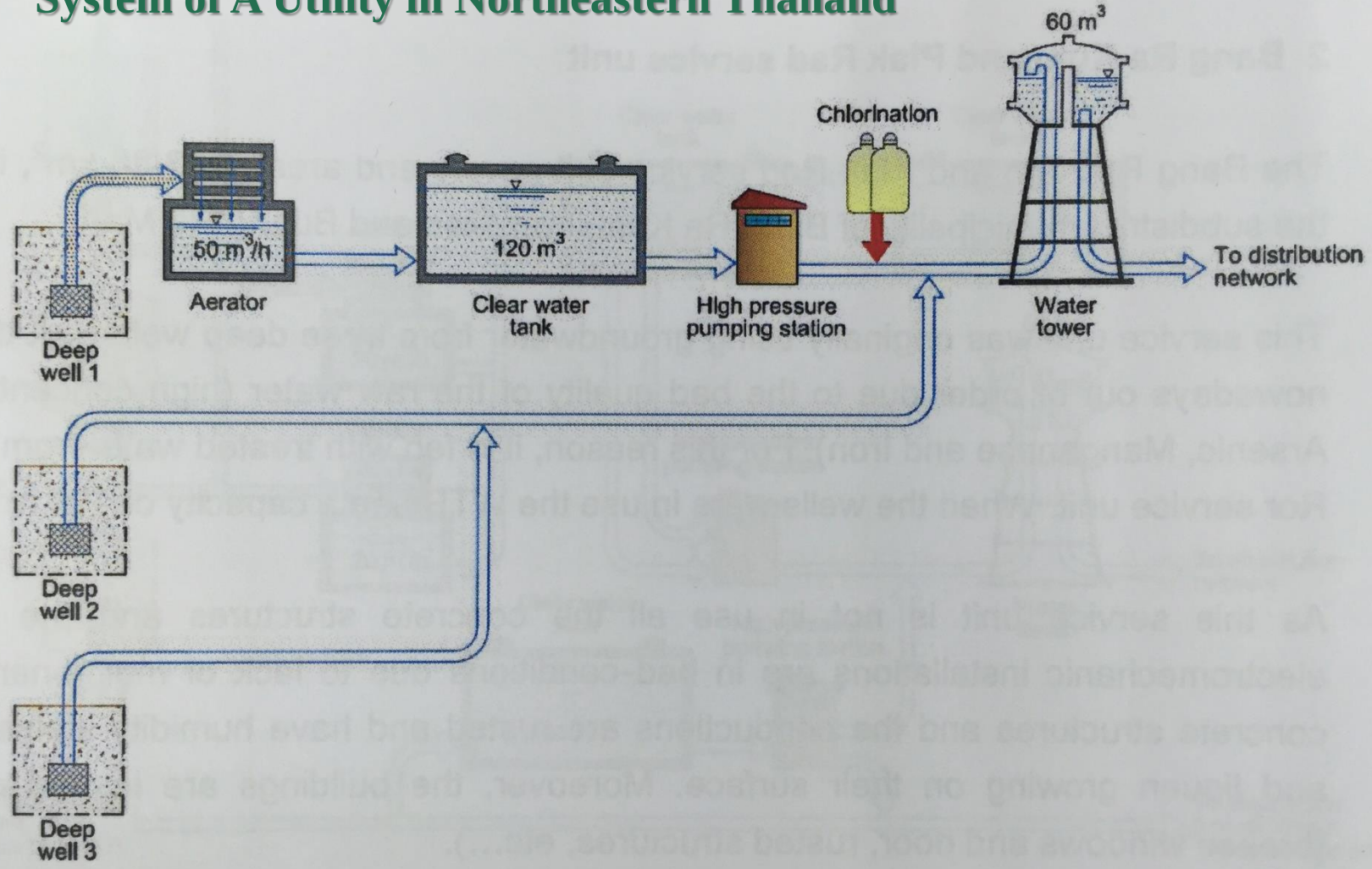


Ratio of Connection : Staff (20010 – 2014)



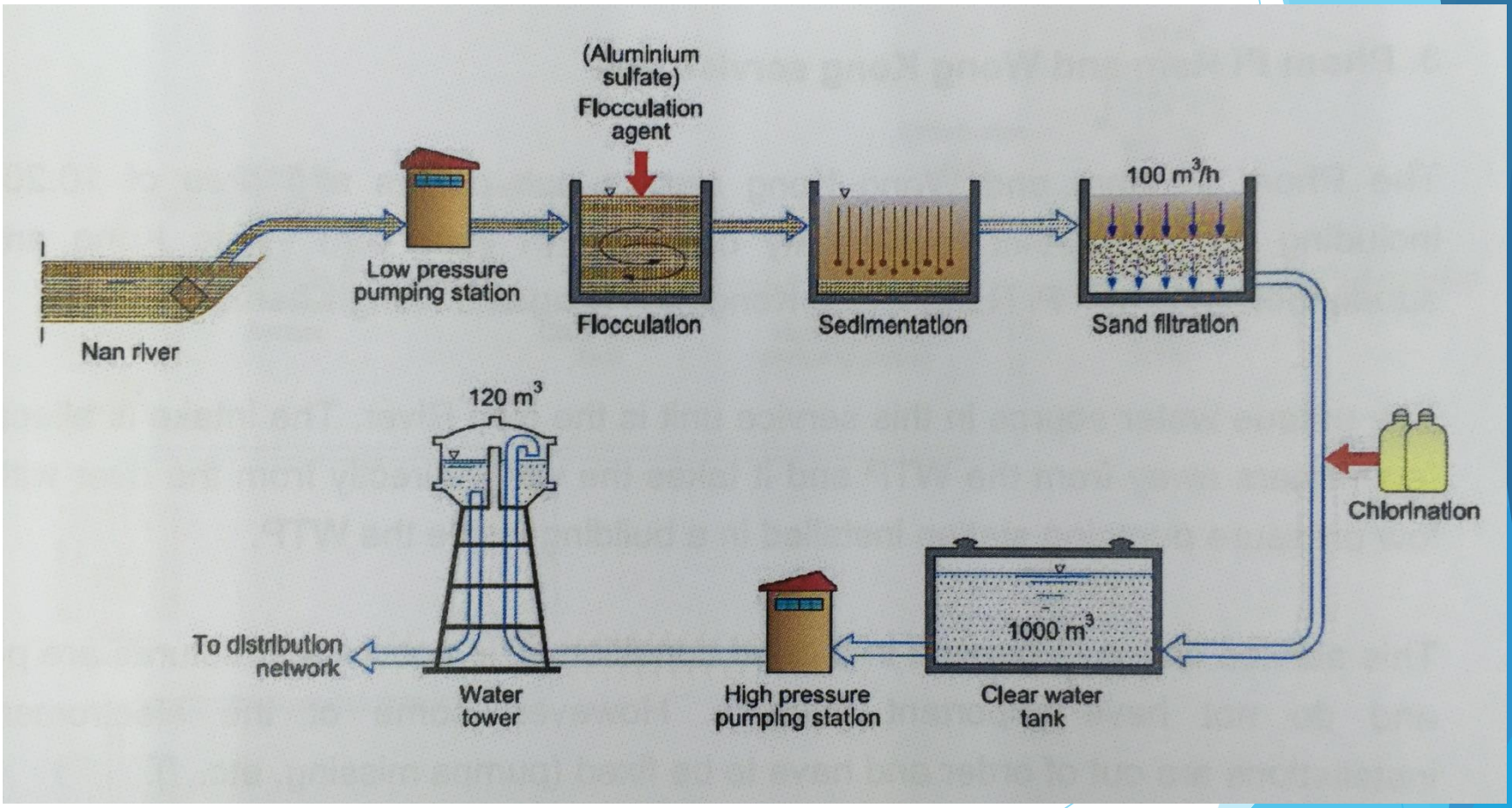
Water production & distribution system

System of A Utility in Northeastern Thailand



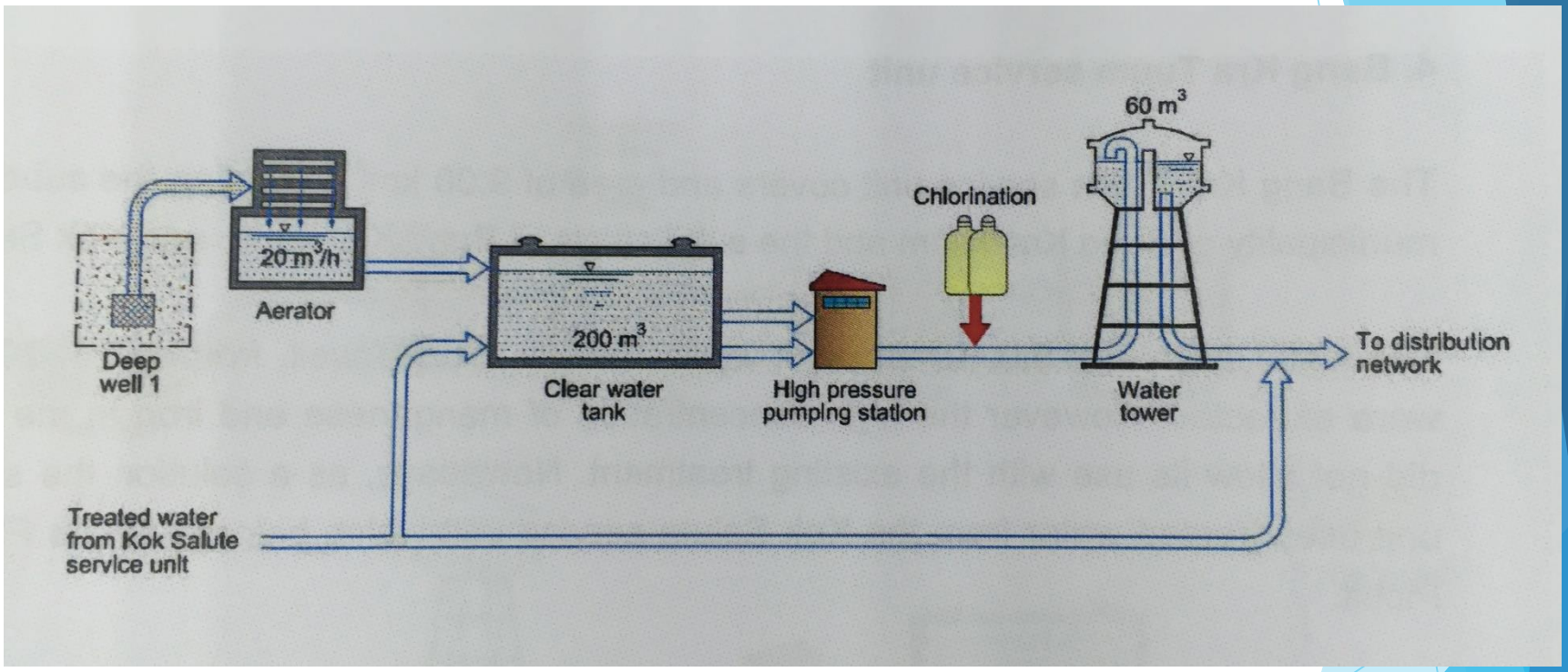
Water production & distribution system

System of A Utility in Northern Thailand



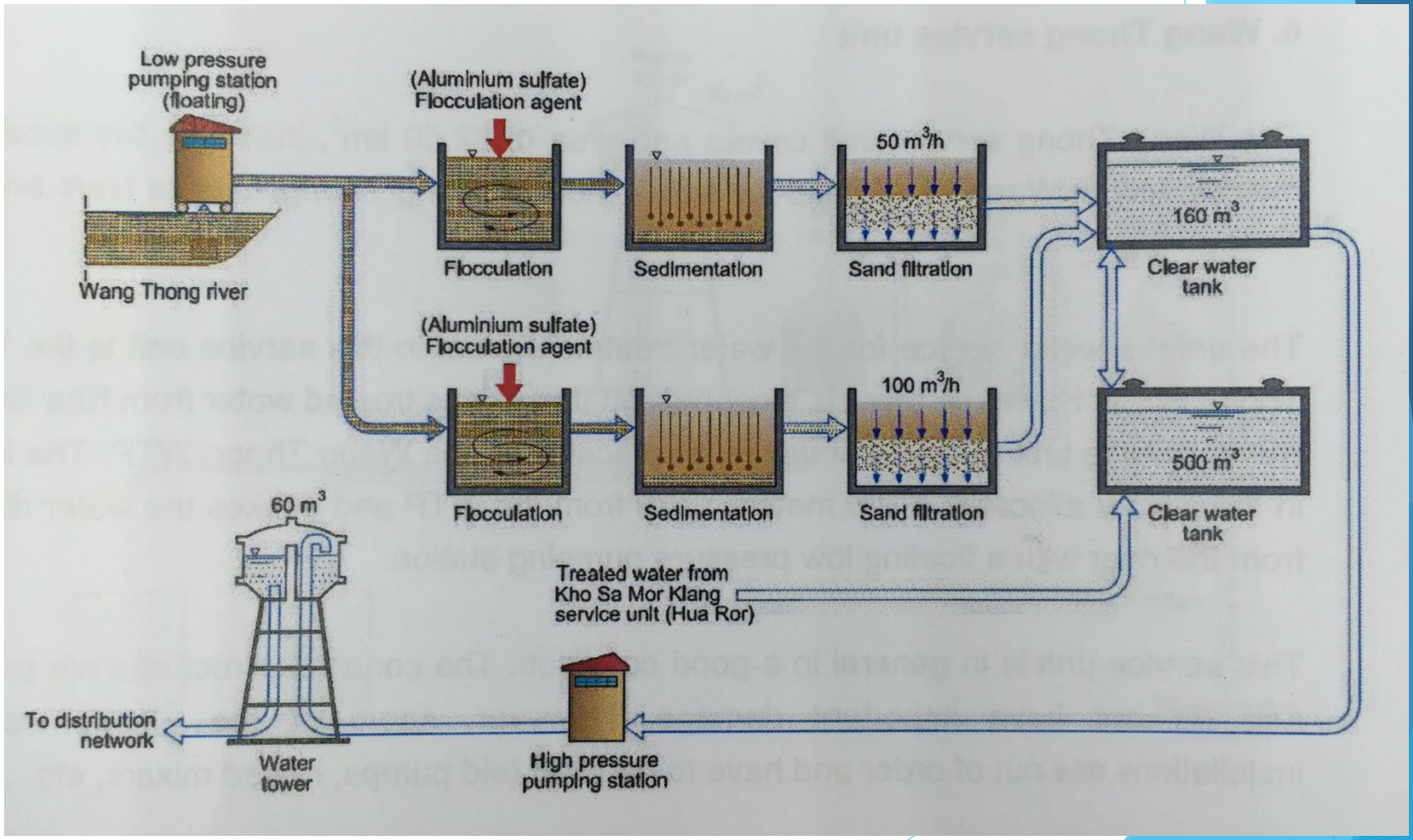
Water production & distribution system

System of A Utility in Southern Thailand



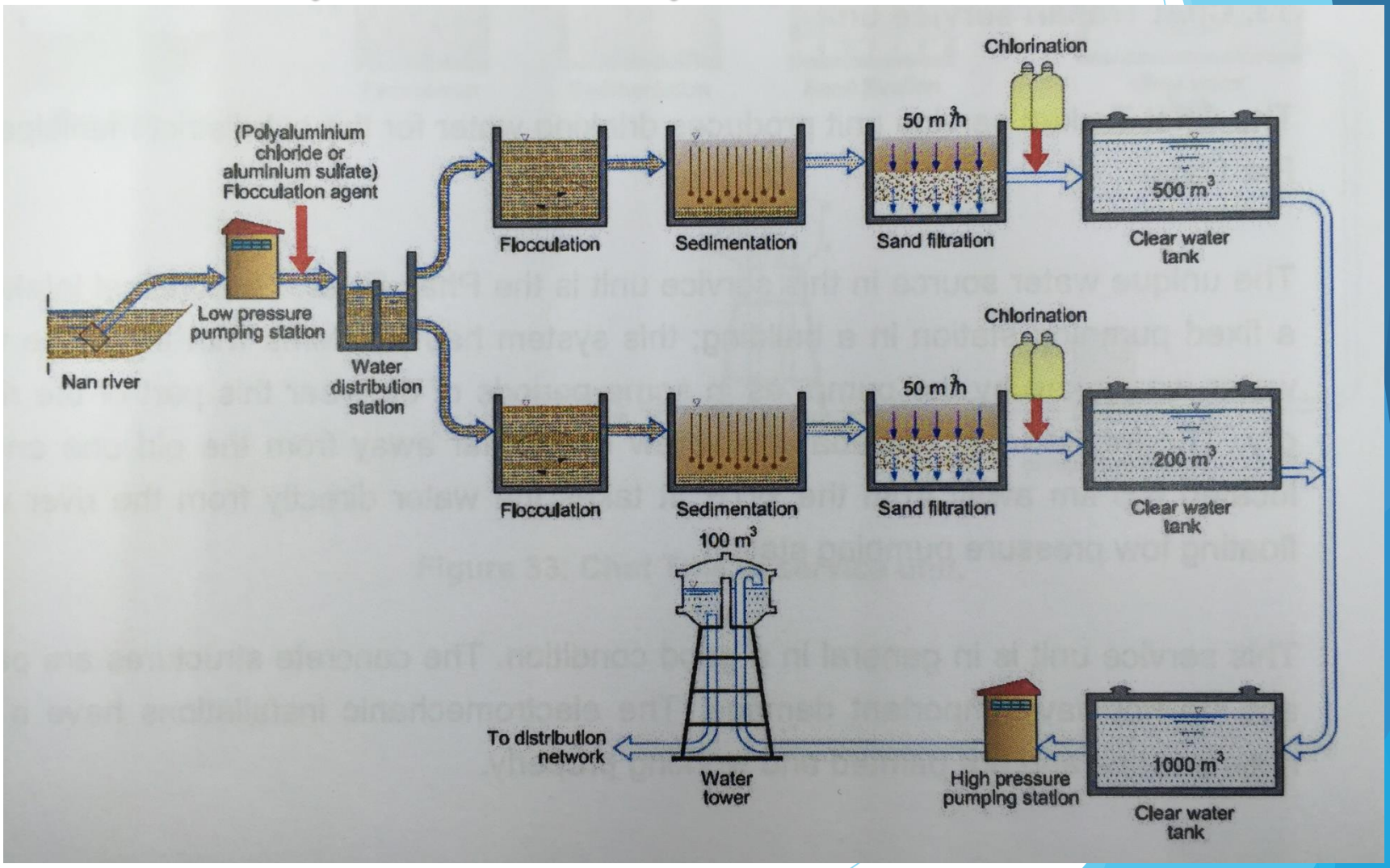
Water production & distribution system

System of A Utility in Central Thailand



Water production & distribution system

System of A Utility in Central Thailand



Water production & distribution system

1. **Low-pressure pumping station**
   - Intake of raw water is from natural sources, such as rivers, canals, reservoirs, deep well, etc.
   - Raw water constantly monitored, analyzed & controlled for its quality

2. **Flocculation**
   - Quality of raw water is improved by putting in chlorine, lime or alum to assist in sedimentation

Water production & distribution system

3. Sedimentation

- Water mixed with chlorine, lime or alum will flow into sedimentation tanks
- Then small sediment is combined to become big sediment and sink to the bottom of tank until clear water is obtained

4. Sand filtration

- To eliminate small sediment or polluted particles, water from sedimentation tanks get sand and pebble filtration to obtain clear and clean water

Water production & distribution system

5. Disinfection

- Chlorine, in proper amount, is put into water having passed through a filtration process, for disinfection. Chlorine is not dangerous to one's health
- Then, clear water is kept in a tank for later distribution to customers

6. Water quality control

- Water quality is carefully and steadily monitored and controlled to ensure its clearness, cleanness and safety before distribution to customers and households

Water production & distribution system

7. Water distribution

- Clear water is pumped through a high-pressure pumping station to be stored in a water tower (elevated tank) with sizes of 50 m^3, 60 m^3, 100 m^3, 120 m^3, 500 m^3 or 1,000 m^3
- Water is distributed directly from water tower to customers via distribution network
- Sometimes, water is pumped into distribution pipeline system to increase pressure so that it can be distributed farther and cover more people

PWA's Investment in 2014

Project	No.	Investment Capital ($ Million)
1. Rehabilitation & extension	13	272.53
2. Pipeline rehabilitation	9	3.28
3. Post-transfer rehabilitation	7	2.34
4. Water source development	9	20.0
5. Service area expansion	126	5.72
6. Regular operations	-	45.66
Total	164	349.53

Water Tariff Rate

For first 10 cubic meters

- $ 0.3 per CM for group 1 (customer)
- $ 0.5 per CM for group 2
- $ 0.6 per CM for group 3

Sample of Tariff Rates (by group)

Amount of Water (CM)	Customer Group	Fee ($)	Customer Group	Fee ($)	Customer Group	Fee ($)
10	1	3.29	2	5.48	3	5.89
30	1	14.58	2	18.71	3	21.0
80	1	48.87	2	55.16	3	69.44
100	1	62.74	2	70.65	3	89.60

($ 1 = Baht 35)

Training & Education

- In 2015, nearly 400 training courses provided
- Average of over 7 day / staff / year training & development
- From 2010 – 2015, 55 scholarships provided to staff to further their study for a master degree at local U. (6 staff doing their Ph.D.)

Training & Education

2 staff get a scholarship to do their Master at Birmingham U. and Brunel U. in the UK

Over Baht 55.0 million ($1.70 million) was spent on staff training and development (in 2015)

Most recipients of scholarships work at utilities & regional offices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Corporate Social Responsibility (CSR)

- Create awareness among PWA's management & staff at all levels to fully realize the significance of activities benefiting society
- Allocate budget to ensure a constant support for social activities
- Campaign for networking to encourage cooperation from other agencies in helping to fulfill PWA's various projects carried out in remote areas

Overview of PWA

CSR Activities

- Development of Communities & Society
- Environment Conservation
- Paying Attention to Customers

Overview of PWA

Development of Communities & Society

- PWA Preserves Communities
- Pure Water for Academy Project
- Bottled Water Project

Overview of PWA

Environment Conservation

- PWA Preserves the Environment Project
- Thai Youth Camp Loves Water Project
- School Save Water Project

PWA
Provincial Waterworks Authority
การประปา

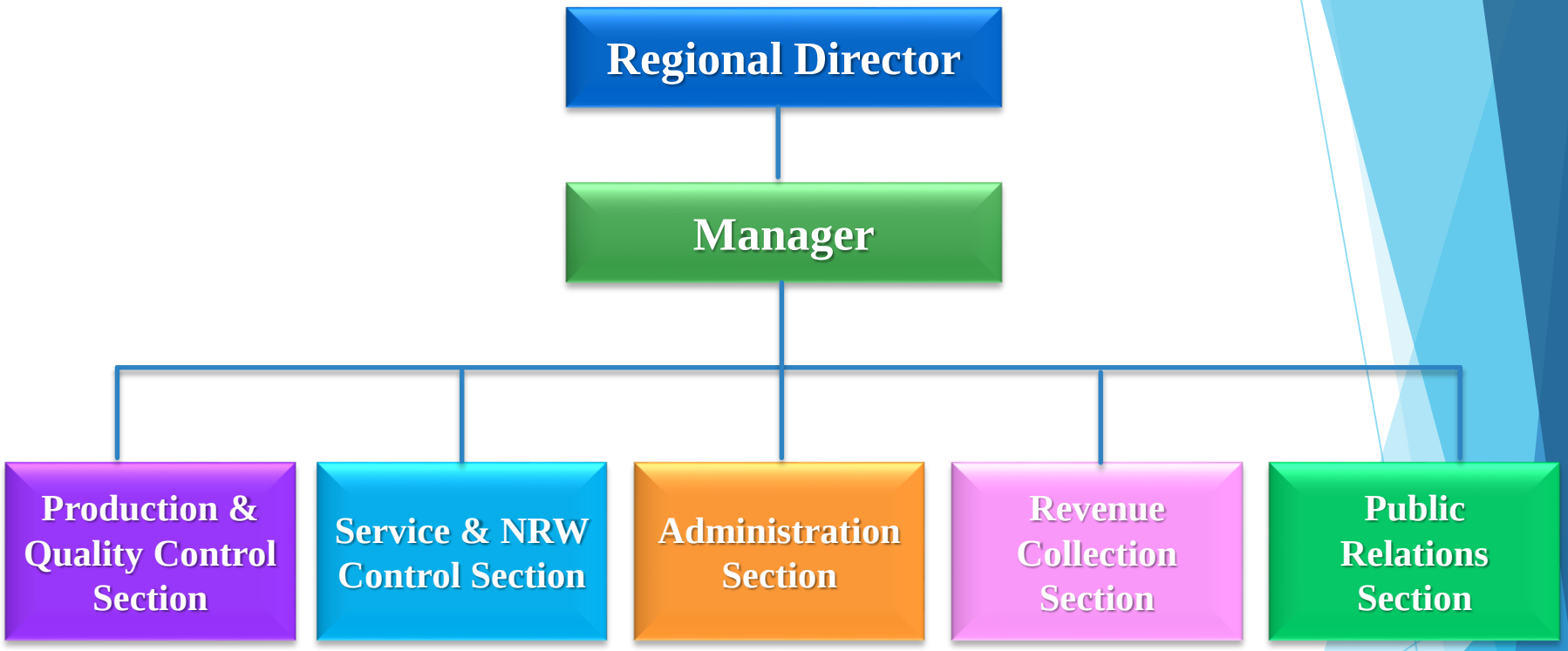
Overview of PWA

Paying Attention to Customers

- Potable Tap Water Project
- Home Care Project

- Instant Water Supply Project
- I CARE Model Project

PWA Water Utility's Organizational Structure



Key Role of Production & Quality Control Sect.

- Plan for amount of raw water & customers' demand

- Produce & control WS distribution through coordination with the service & NRW control section

- Analyze & control the quality of raw water & WS

- Control expenses of water production & use of chemicals

Key Role of Production & Quality Control Sect. (Cont.)

- Take care of maintenance & repair of machinery & power system at every point of production work

- Prepare data & make a report on production system e.g. amount of chemicals demand, power energy usage, users of groundwater

Outputs of the Section

- Water amount sufficient for customers' demand
- Continuous production
- A rapid solution to the problem
- Appropriate production costs
- Water pressure proper to distribution pipeline condition
- Efficiently control use of energy

Key Role of Service & NRW Control Section

- Make a survey, cost estimate & installation of WSS for new customers

- Coordinate with external agencies for a repair or change of pipelines (Highway Dept., local governments)

- Fix or change equipment & water meters, including cutting off, reconnecting & checking the accuracy of meters

Key Role of Service & NRW Control Section (Cont.)

- Monitor & detect point of leaks, pipe burst or leak and repair

- Prepare & modify GIS data of customers so that it is update & real-time

- Control NRW in accordance with plan defined

Outputs of Service & NRW Control Section

- NRW is controlled as targeted

- Dead meters are changed, slow or inaccurate meters are fixed

- Meters installed at the number & time defined

- Frequent modification of GIS data for its update & real-time

Key Role of Administrative Section

- Record utility staff's performance & competency

- Record staff's daily performance (presence, absence, leave, lateness) & present data on personnel administration, such as appointment, promotion, reshuffle, promotion, etc.

- Record utility's staff training & development

- Take care of administrative & correspondence work

- Deal with procurement work & supplies management

Key Role of Administrative Section (Cont.)

- Control utility's budget & make accounting & financial report

- Receive public request for installation of WSS, receive installation fee payment, arrange a contract with new customers, coordinate with the service & NRW control section to speed up system installation

- Mobilize utility's staff to take part in CSR activities as planned or defined by PWA

Outputs of Admin. Section

- Recording of utility staff's performance is accurate & complete

- Customers' great satisfaction on utility's work

- No. of staff participating in CSR activities meets target

Key Role of Revenue Collection Section

- Read & record water use from meters, check accuracy of meter reading
- Prepare for water bills (invoices)
- Prepare for water fee receipts, control fee collection & monitor accuracy of water fee receipts
- Receive water fee payments at utility's counter or through other payment channels (various commercial banks, 7/11 stores, post office, Tesco Lotus, etc.)

Key Role of Revenue Collection Section

- Classify customer group (1-3) & revise their status based on the rules defined
- Speed up debt (outstanding fees) collection
- Speed up revenue collection to meet the target defined

Outputs of Revenue Collection Section

- Revenues meet the target
- Small outstanding fees (debt) & short period of overdue fees
- Small number of meter-reading frauds, meter tampering, water thefts
- The number of fee payment receipts is correct
- Water meters are in good condition & usable

Key Role of Public Relations Section

- Oversee utility's customer database
- Formulate PR plans to generate public's understanding of utility's services, and to create its good image
- Define a customer relations plan to increase the number of customers
- Receive customers' complaints & answer their questions

Key Role of Public Relations Section

- Launch a PR campaign in advance or as soon as possible in case of pipe burst or leak or temporary termination of water distribution
- Organize community relations activities, including CSR activities to generate good relations with the public & customers
  - Encourage utility staff to be aware of significance of activities benefiting society
  - Support social activities to assist the underprivileged & those suffering from natural disasters (flood, drought, fire)
  - Allocate budget to ensure constant support for school activities
  - Campaign for networking to encourage cooperation from other agencies in helping to fulfil utility's projects

Outputs of PR Section

- Increase in the number of customers
- Increase in customers' satisfaction

Utility's CSR Activities

- Development of communities & society
- Environment conservation
- Paying attention to customers

Utility's CSR Activities

- **Development of communities & society**
  - **PWA Preserves Communities**
    1. Improve Landscape around Water Sources Project
    2. Distribute WS to Help People Project
    3. Donate Money/Supplies to Help Victims of Public Disasters Project
  - **Pure Water for Academy Project**
    - Promote school children's quality of life
    - Donate > 500 cole water-making machines to 250 schools across the country

Utility's CSR Activities

- **Development of communities & society**
  - **Bottles Water Project**
    - **Distribute bottled water to public, agencies & charitable organizations**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10,000 บาท

Utility's CSR Activities

- **Environment Conservation**
  - **PWA Preserves the Environment Project (reforestation, reservoir construction, natural water sources conservation)**
  - **Schools Save Water Project (raise students' awareness of the value of water, help preserve water resources, use water economically, take a look at water production process at utility's treatment plant) (from 2008 – 2015, > 230 schools take part in this project)**


โครงการ กปภ.รักษ์สิ่งแวดล้อม
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โครงการปลูกป่า ๑ มิเตอร์ ๑ ต้นไม้
การประปาส่วนภูมิภาคสาขาเชียงใหม่ (ขั้นพิเศษ)
ณ บ้านหัวเสา ต. ป่าแป๋ อ.แม่แตง จ.เชียงใหม่ (ป่าทุ่งจ๊อ ต้นน้ำน้ำแม่แตง)
ในวันเสาร์ที่ ๑๖ สิงหาคม ๒๕๕๗


35 กปภ.

Utility's CSR Activities

- **Paying Attention to Customers**
  - **Potable Tap Water Project (from 2000 – 2015, 170 PWA utilities have declared their water drinkable)**
  - **Home Care Project**
  - **I CARE Model Project**
  - **Instant Water Supply Project**

Utility's CSR Activities

- **Paying Attention to Customers**
  - **I CARE Model Project**
    - ➢ Utilities focus on customers & markets based on customer relation management (CRM) concept

    I = Integration – integration of customers' demand into utility's management system

    C = Communication – get data from customers called "customers' voice"

    A = Analyze – analyze customers' demand & expectation

    R = Relation – utility creates close & warm relationship with customers after analyzing their demand & expectation

    E = Evaluation – evaluate customers' feelings to find out how first 4 processes (I C A R) have affected their satisfaction on utility's services

Utility's CSR Activities

- **Paying Attention to Customers**

  For Instant Water Supply Project, Mr. Water Supply takes customers' complaints comprising:

  - **WS not running or having low pressure**
  - **Unusually high water fee**
  - **Water having odor or color or contaminated**
  - **Pipe burst or leak inside/outside homes**
  - **Broken meters**


โครงการเติมใจให้กัน
(HOME CARE)
การประปาส่วนภูมิภาคสาขาปากพนัง
ให้บริการตรวจสอบซ่อมแซมระบบประปา
ชำระค่าติดตั้ง
รับคำร้องขอติดตั้งประปา
ให้คำปรึกษาเรื่องน้ำประปา


PHILIPS


โครงการมุ่งมั่นเพื่อปวงชนเฉลิมพระเกียรติ 60 พรรษา
สมเด็จพระเทพรัตนราชสุดาฯ สยามบรมราชกุมารี
บริการซ่อมแซมระบบประปาภายในบ้าน
การประปาส่วนภูมิภาคสาขาแหลมฉบัง
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Home Care


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กปภ.
การประปาส่วนภูมิภาค
Provincial Waterworks Authority
สุข-สิ้น-เพื่อ-ปวงชน
การประปาส่วนภูมิภาค


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หน่วยปฏิบัติการ
ตรวจสอบน้ำสูญเสีย
การประปาส่วนภูมิภาค


การประปาส่วนภูมิภาค

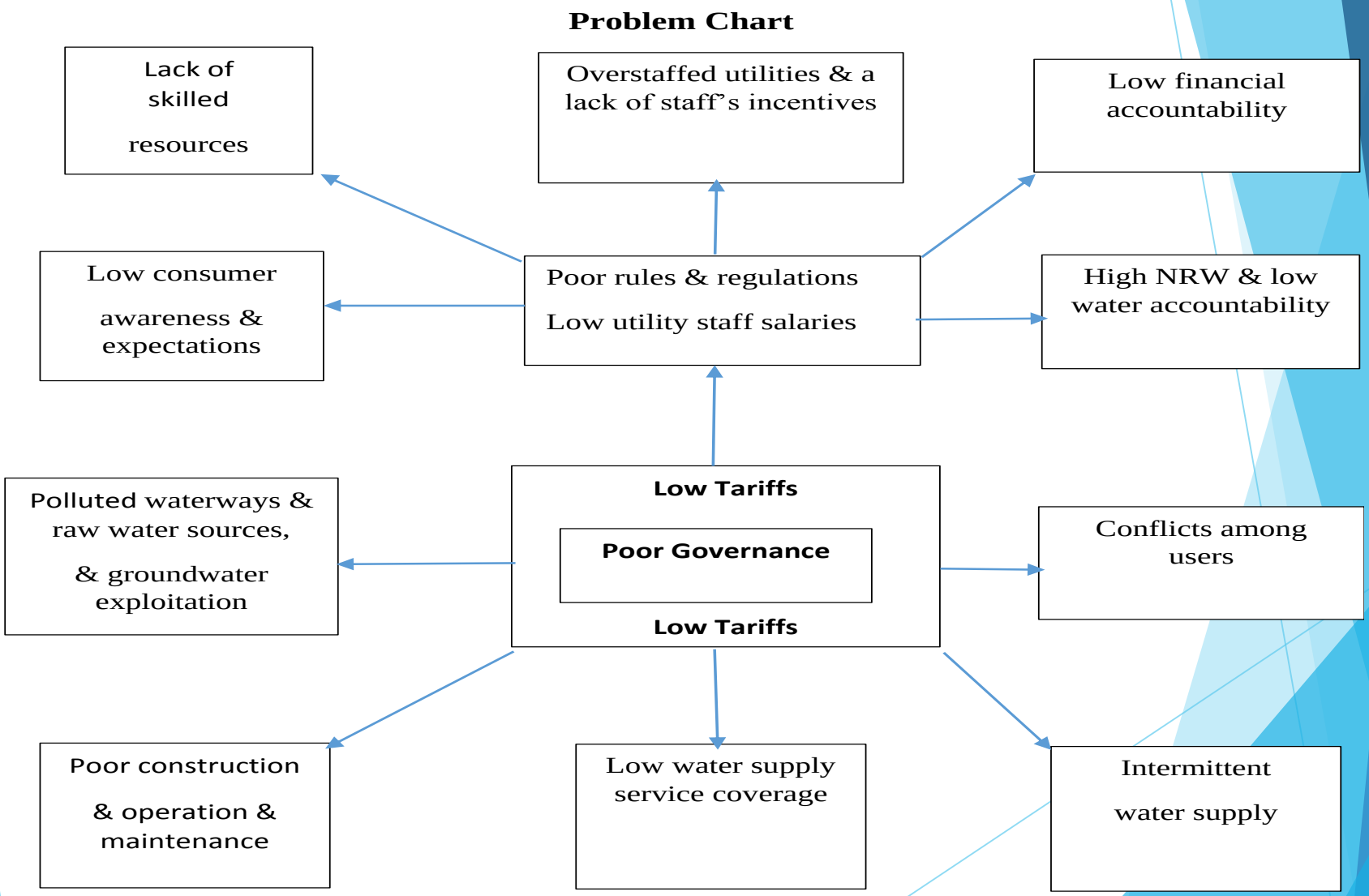

มุ่ง-มั่น-เพื่อ-ชุมชน
ประปาใหม่ - รับชำระค่าน้ำประปา-อื่นๆ


มุ่ง-มั่น-เพื่อ-มวลชน
ประปาใหม่ - รับชำระค่าน้ำประปา-อื่นๆ

Utility's Problems & Solutions

- In 2003, PWA had its first organizational restructuring (second & third in 2007 & 2011, respectively)
- Decentralization of authority from PWA headquarters to regional offices & utilities
- PWA's management & staff perform in strict compliance with the principle of good corporate governance defined

Utility's Problems & Solutions



Utility's Problems & Solutions

- **Poor governance & low tariffs defined as core problems**
- **Polluted waterways & raw water sources result from failure to create an understanding among the public living close to those places**
- **Overexploitation of groundwater due to lack of proper monitoring & control**
- **Ask government to raise groundwater tariff rates to equal & subsequently higher than those of PWA's water tariff rates**
- **Utility staff launched a PR campaign or negotiated with people living near PWA's raw water sources to help promote them & keep them clean**

Utility's Problems & Solutions

- **Low WS service coverage traced to low tariffs & lack of revenue to develop or extend services**
- **Since 2004, PWA has initiated a policy of full-cost recovery**
- **Tariff rates increased 3 times (gradually) to reflect investment costs**
- **Utilities made a PR campaign to inform customers of the need to raise tariffs**
- **After tariff raise, PWA had enough revenue to invest in new raw water sources & extend service areas or rehabilitate old water supply schemes**

Utility's Problems & Solutions

- **Utilities applied efficient metering, billing & water fee collection to overcome intermittent WS, apart from formulating the principle of good corporate governance (code of corporate conducts & code of ethics) to prevent corrupt practices**
- **Conflict of interest (during dry season) between rural farmers & urban water users**
- **Conflict in water use resolved by developing a long-term plan, finding new raw water sources, developing existing sources**
- **Create understanding among rural farmers & the public**

Utility's Problems & Solutions

- Before 2003, PWA's NRW (around 35%) & low water accountability was due to old pipes, illegal connections, erroneous meter reading, poor data handling
- Poor utility regulations & low salaries (part of poor governance) contributed to above problems
- Utilities' old regulations were complex, outdated & not appropriate for transparency & decision making
- Staff's salaries were low, making it difficult for them to earn enough to support their families
- Since 2003, PWA resolved problems by raising staff's salaries 3 times until the amount is close to that of the private sector

Utility's Problems & Solutions

- Give a strong incentive for PWA staff to resume their work with PWA instead of looking for a new job
- Problem of brain drain at PWA eliminated
- New rules & regulations for use of PWA water formulated & clearly identified to ensure transparency & efficient metering, billing & fee collection
- For large-scale utilities (> 20,000 connections), meter reading & billing outsourced to private companies
- Fee payments made at utilities, commercial banks, convenient stores, Tesco Lotus, deduction from customers' bank account (instead of collection by staff) to avoid embezzlement by fee collectors

Utility's Problems & Solutions

- Poor construction (contractors not do jobs as defined in contracts) partly due to utility staff's inefficient construction supervision
- Poor staffing & low tariffs affected utilities' quality of O&M
- Sometimes, new projects proposed before replacement of meters & old pipes
- Provide training to engineers & technicians on construction supervision
- Recruit new staff with experience in construction supervision

Utility's Problems & Solutions

- **Utility staff with great experience in construction supervision transfer knowledge & experience to younger & new staff**
- **Staff's salaries increased to attract & maintain quality staff to do O&M work**
- **Old meters fixed or replaced, old pipes replaced to reduce NRW incurred by both physical & commercial losses**
- **Low tariffs caused low consumer expectations**
- **Public believed water should be free as it was a gift from nature**


Rush Car Wash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Utility's Problems & Solutions

- **Utilities launched a PR rally urging customers to be aware of significance of piped WS & how much PWA had invested to get raw water treated**
- **Tell customers tariffs had to be raised to meet the costs of WS, which continued to rise due to more advanced treatment, greater distance for distribution, and more costly distribution in densely populated areas**

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- **Low financial accountability caused by utilities' poor rules & regulations**
- **Overstaffing of utilities due to nepotism & outside interference**
- **Lack of skilled human resources linked to staff's low salaries**
- **Utilities' rules & regulations amended to prevent irregularity, malfeasance, fraud & corrupt practices of staff**
- **Transparency for recruiting new staff (via examination only)**

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- Reshuffle of staff among utilities
- Lots of engineers & water scientists recruited to take charge of water production & distribution instead of technicians
- Clear & fair criteria for appointment of utility managers & section heads
- Salaries raised to equal those working in the private sector
- Staff development & training
- From 2010 – 2015, > 60 scholarships given to staff to further their study for bachelor, master and PH.D degrees in outstanding local universities

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- 2 staff get scholarship to study in the UK (one in business administration & the other in IT management)
- In 2015, $ 1.6 million dollars spent for staff training & development
- In 2006, PWA's autonomy increased through amending PWA Act allowing PWA' Board of Directors to raise tariffs instead of the cabinet
- Caliber & skills of utilities' management & staff increased (first organizational revamp in 2003) via recruiting new staff with backgrounds truly needed, not only engineers or technicians

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- O&M staff recruited & intensively trained for their jobs resulting in significant improvement in the quality of repairs & maintenance of WS schemes
- Formerly, some utilities were heavily overstaffed due to interference of politicians & nepotism
- Overstaffing lowered staff morale as some staff did much more work than others
- Output or productivity was low
- Many staff worked sideline as freelance consultants, to augment income
- Corrupt staff not laid off due to assistance of labour union

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- **Organizational reengineering initiated in 2003, old rules & regulations amended to ensure good corporate governance**
- **New staff recruited through intensive competitive exam conducted by outstanding local universities to ensure transparency & fairness**
- **Nepotism (favoritism) eliminated**
- **Promotion to higher position is through skills, merit or efficient performance only**
- **Early retirement programs in 2004, 2007 and 2009 encouraged old & unskilled staff to retire in order to replace them with new blood**

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- No. of utility staff reduced in proportion to the no. of connections
- Currently, PWA utilities have 2.1 staff per 1,000 connections
- Anti-corruption center established at PWA headquarters, aimed at accurate, transparent & fair operation
- Staff getting involved in corrupt practices are subject to a fair trial
- Staff found guilty of any wrongdoing get punished according to severity of offence (parole, transfer to active post, salary cut-down, dismissal, sued in court)

Utility's Problems & Solutions

Indirect consequences of poor governance & low tariffs

- **Incentives given to utility staff to perform (bonuses given based on PWA's annual income)**
- **Staff have to work hard to increase revenues while reducing expenses**
- **Merit system applied for promotion of staff to higher position**
- **Special promotion offered to staff with outstanding performance & high competency**
- **Utility staff performance evaluated by a committee chaired by utility manager, to ensure transparency & fairness**
- **Seniority is just one factor used as a criterion for staff promotion**

Measurement of Utility Staff's Performance

The quality of water & services required by customers:

- Sufficient amount of water
- Quick delivery & service
- Ease of contact
- Time in response to customers' demand
- Ease of use of water & service & maintenance
- Other special qualities such as cleannesss, taste & safety of water, including the quality of services

Measurement of Utility Staff's Performance

Customer-oriented results of water & services

- Customers' satisfaction
- NO. of complaints & problem solutions
- Awards & recommendations from customers & other agencies
- An increase of customers

Billing & Collection

- Utilities improve their billing & collection by making it easy to pay bills
- Many local outlets to pay bills (commercial banks, subtraction from customers' bank account, post offices, convenient stores, utility counter, etc.)
- Utilities with over 20,000 connections outsource fee collection work to private companies since 2006
- At present, > 50 middle- and large-scale utilities outsource collection to a private company
- Previous corrupt practices by utility staff avoided

Billing & Collection

- Collection staff transferred to do other jobs, such as O&M, administrative work, etc.
- Utilities' revenues increase significantly

PWA Utility Managers' Characters to Cope with the Opening of AEC

- Be proactive – start first
- Begin with the end in mind – have clear goals & objectives
- Put first things first – give priority to one's performance
- Think win-win – all parties get benefits from business
- Seek first to understand, then to be understood – understand others and their interest, reduce conflicts

PWA Utility Managers' Characters to Cope with the Opening of AEC

- **Synergize – coordinate to create innovations, avoid non-creative criticism, open to good thinking of others**
- **Sharpen the saw – constantly apply above 6 characters in real life, use them in time of need**

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Regional Office 2

Chaisithawas Temple Water Station Total produces capacity 2,000 cu.m./hr or 48,000 cu.m./day And has water tank capacity 10,000 cu.m.

Water Production & Distribution System

: Intake Pumping Station

: Water Treatment System

: Chemical Feed & Disinfection System

: Water Quality Control System

: Distribution Pumping Station

Water Production & Distribution System

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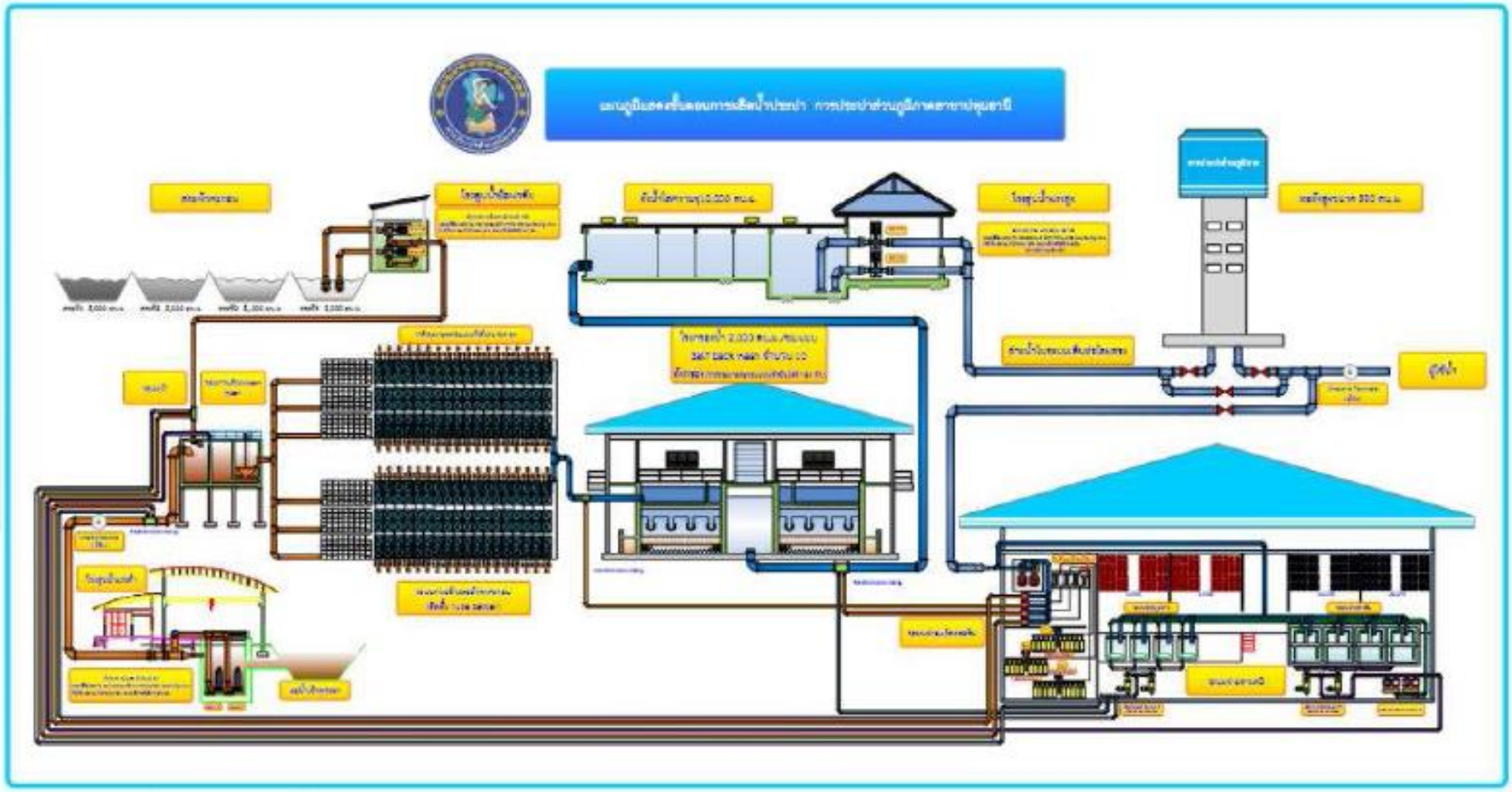


Intake Pumping Station : Wat Kai Tear

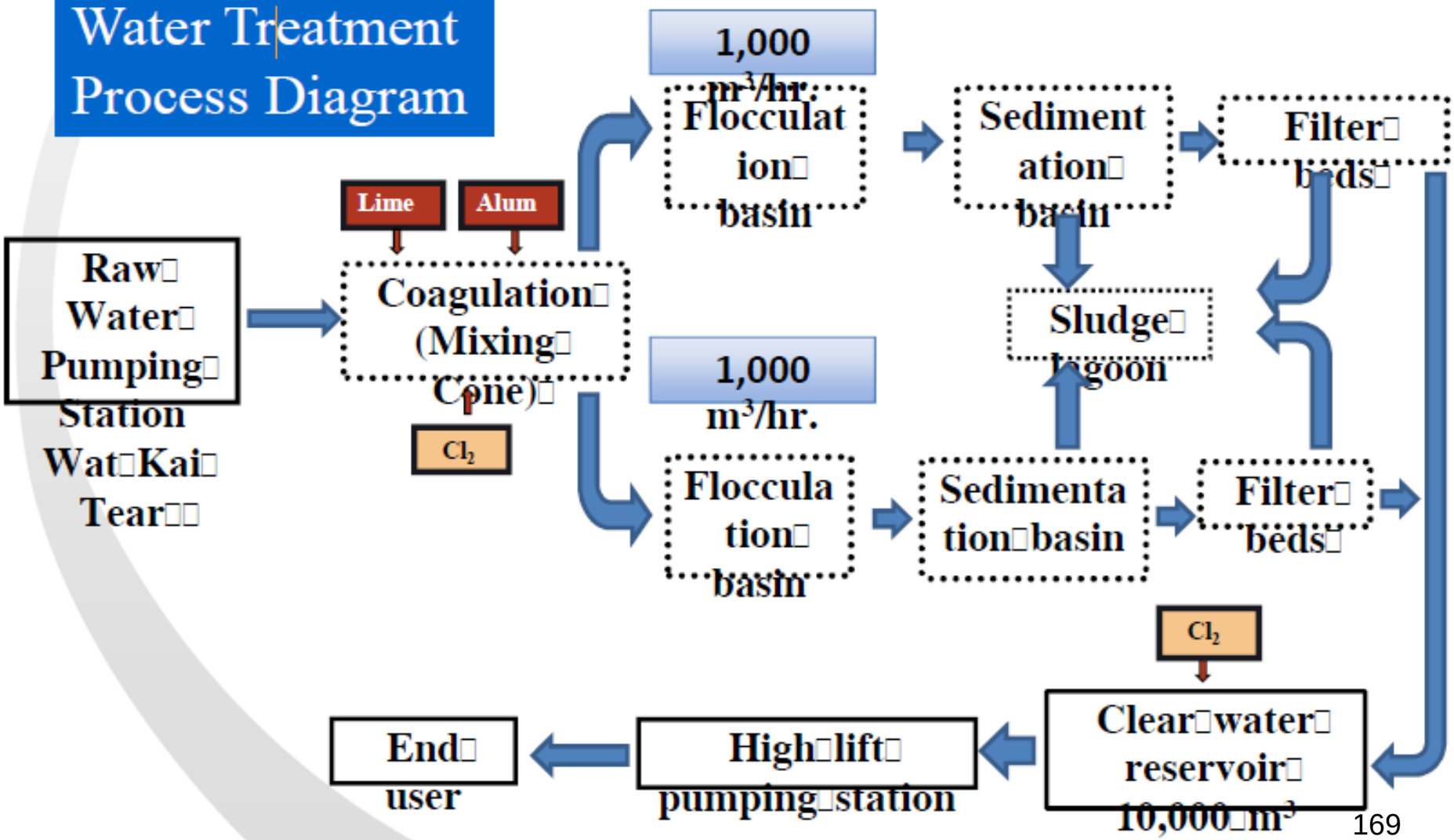
Raw Water Source : Chao Phaya River Location : about 3.2 kilometers from Water

Water Treatment Plant : Wat Chaiyasitthawas

Water treatment Process : Conventional Treatment Design capacity : 2,000 cum.per hour

Water Production & Distribution System

Water Treatment Process Diagram



Water Production & Distribution System

Water Treatment Plant : Wat Chaiyasitthawas

Coagulation (Rapid mixing)
(mixer cone)

Floculation (Slow mixing)
(Horizontal baffled floculator)

Sedimentation
(Rectangular sedimentation tank)

Filtration
(Rapid sand filtration)

Clear water tank

Distribution system

Chemical feeding process

: Chemical Adding
- Alum
- Lime
- Chlorine gas


: Jar test to decide optimal chemical feeding rate in lab
: Adjust optimal chemical feeding rate to chemical feeder

Water Treatment Chemical

Alum Feeder

Lime Feeder

Chlorine gas Feeder

Distribution Pumping Station

: 3 pumps (1 run, 2 standby)
: capacity 2,100 cu.m.per hour and varies by woking pressure

Water quality measurement equipments

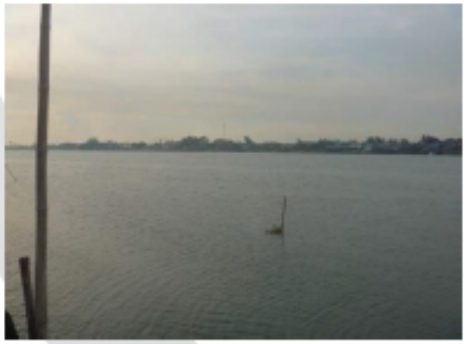
Raw water : pH
: Turbidity

Treated water : pH
: Turbidity
: Residual chlorine

Water quality control

Water Production & Distribution System

Raw water source

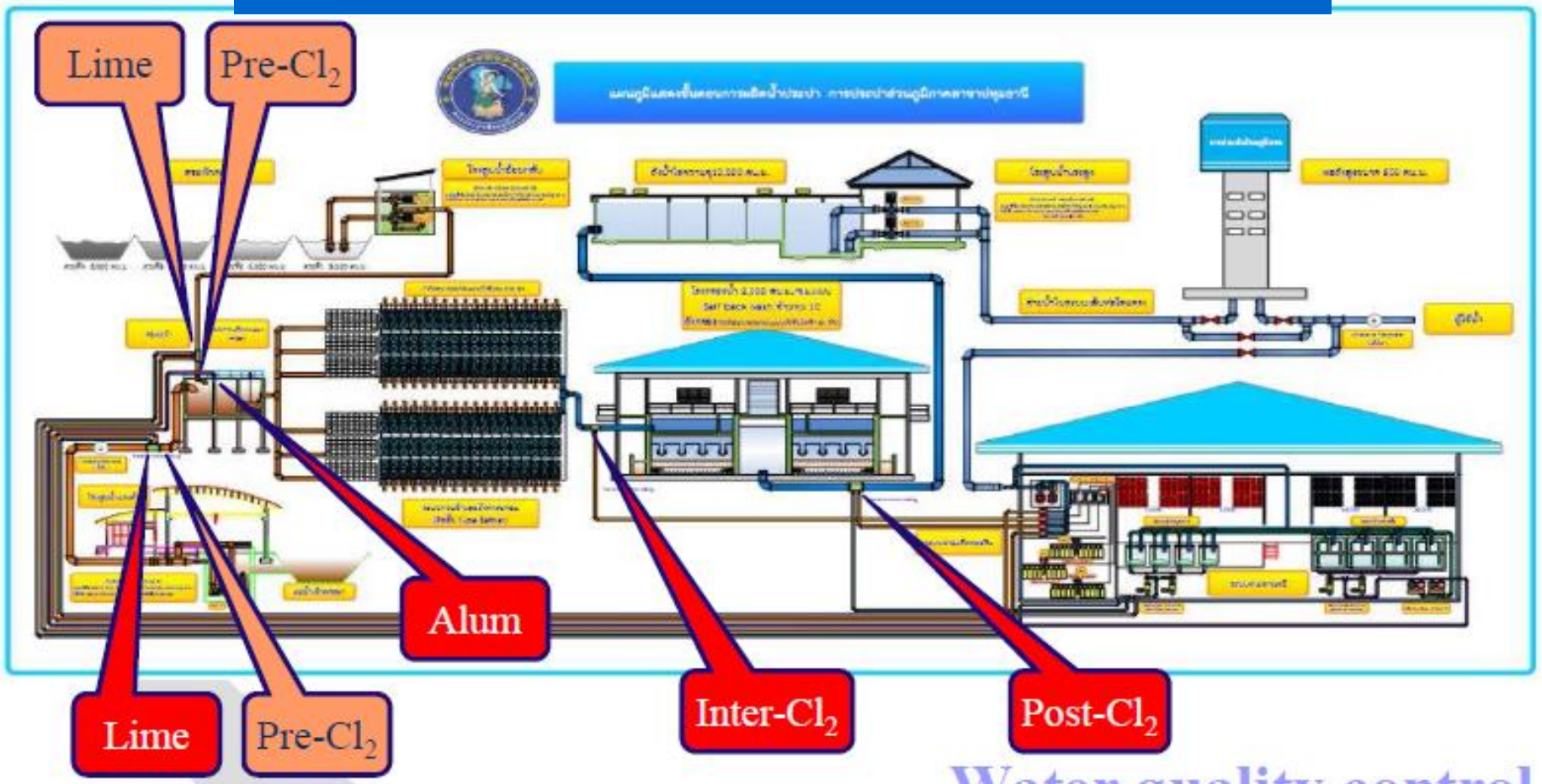


Chao Phraya River

Raw water quality

Parameters	Average value	Remark
Turbidity	53 NTU	Data: June 2013 – June 2014
pH	7.47	

Chemical feeding process of Pathum Thani WTP



Sludge Disposal

: 4 Sludge lagoons: Total volume around 20,000 m^3 (5,000 m^3/Sludge lagoons)

Water Production & Distribution System

Water quality measurement equipments of Pathum thani Plant

Testing: pH
Turbidity
Residual chlorine
Conductivity
DO

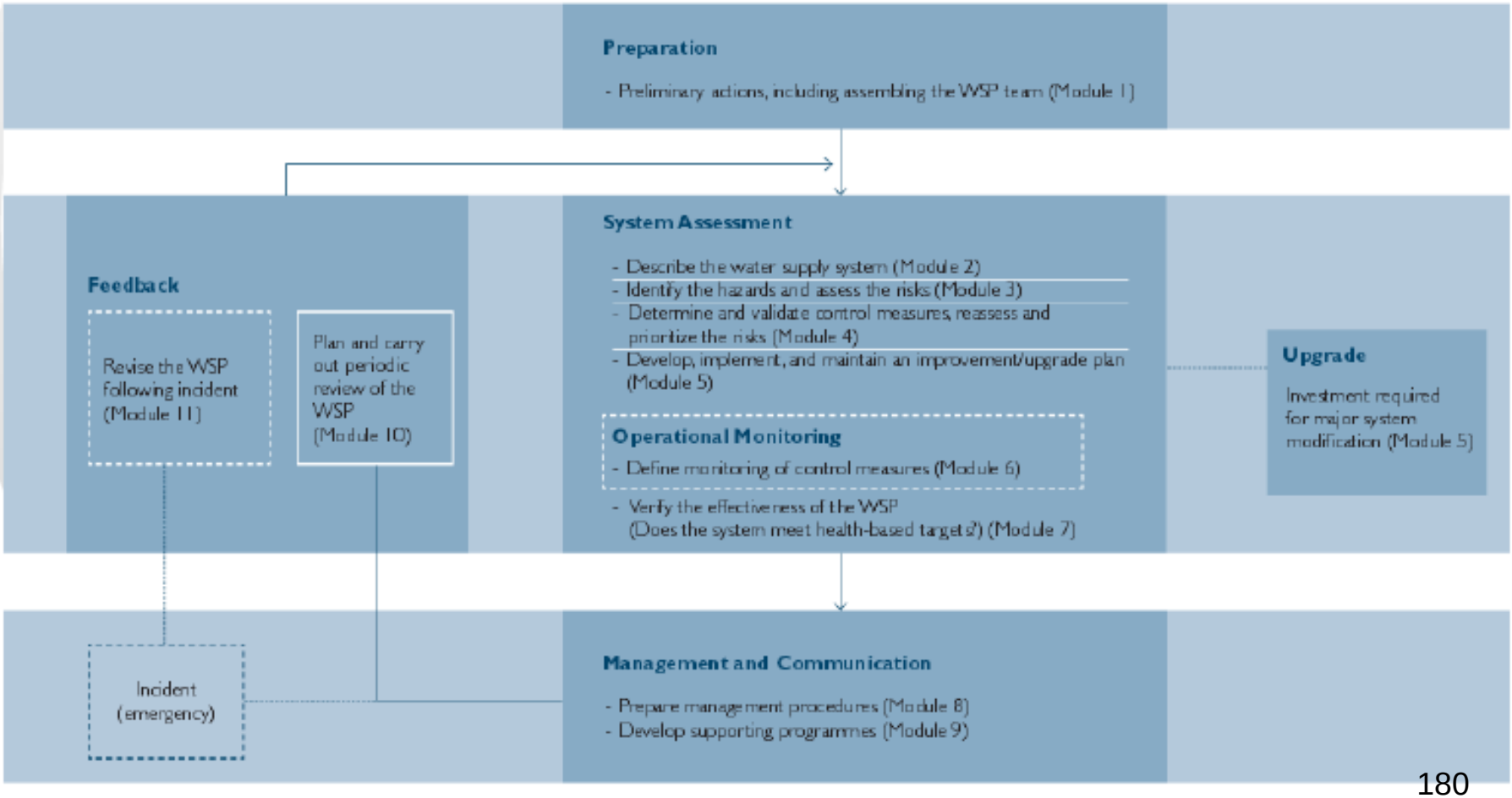
Online system

Water quality control

SCADA system

Water Production & Distribution System

Water Safety Plan



Preventive Maintenance

Database Machine &Equipment in Production Plant

Maintenance Schedule in main Machine &Equipment

Water Loss Reduction Management

Agenda

- DMA for Water Loss Reduction Management
- GIS for Water Loss Reduction Management

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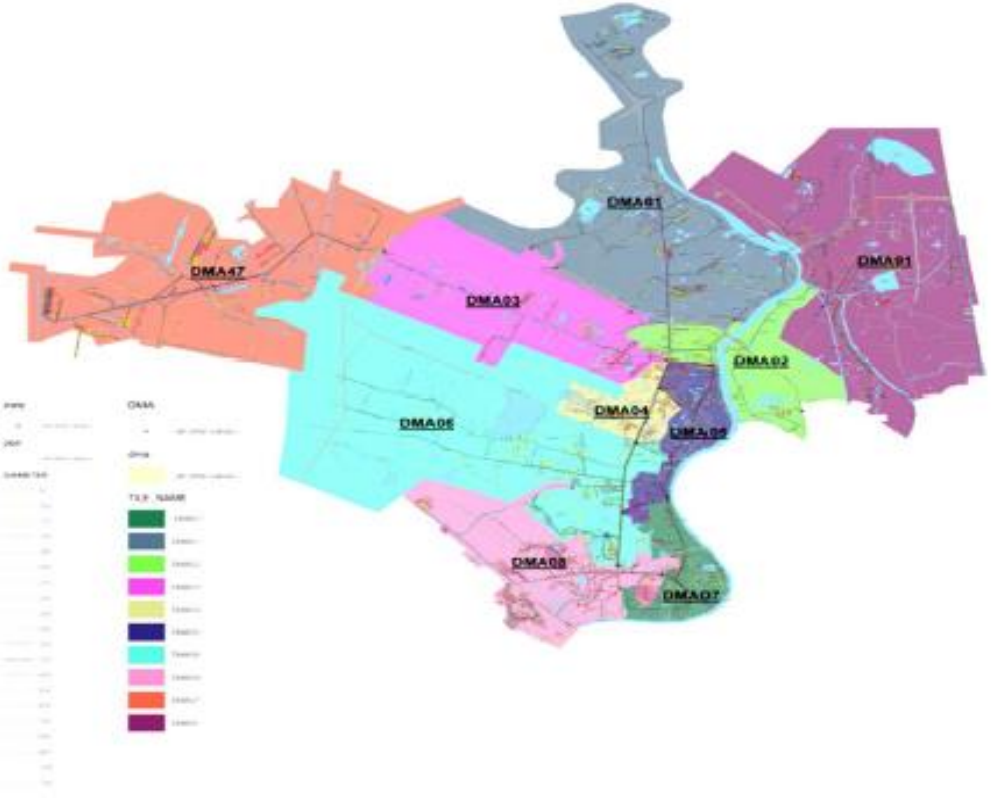
Water Loss Reduction Management

General Information		
Water supply stations	2	station
DMA	10	Zone
System Input Volume	2,497,000	m^3/month
Billed Metered Consumption	1,834,737	m^3/month
Length of pipe	1,244	km
Customers	50,726	unit
Water Lose	622,263	m^3/month
Water Lose %	26.52	%



District Metering Area

- Use DMA Control water management

DMA is devide area for surveillance water loss management

DMA Equipment

DMA Equipment

SMS

Display Screen

Data Logger

Pressure Gauge

DMA: Water Loss Reduction Management

DMA Equipment

RTU

Data Logger

Display Screen

Battery for RTU

DMA Equipment

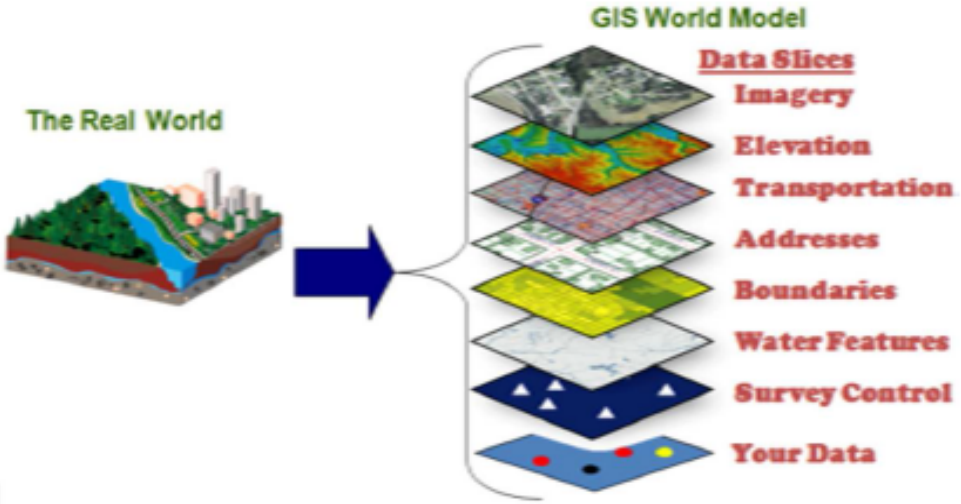
Pressure

Flow Meter

GIS

What is GIS?

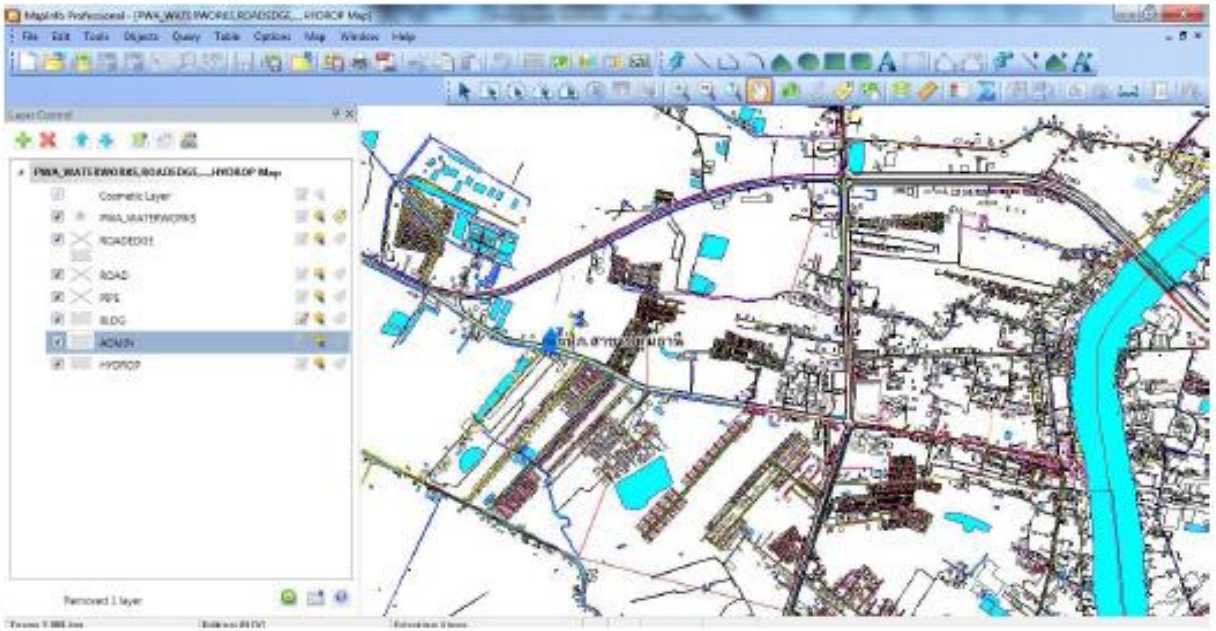
A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships.



GIS

Significant PWA's GIS data

- Base map
- Pipe
- Valve
- Meter
- Leak point
- Fire hydrant
- Building



GIS

Geographic Database Geographic database refer to the data management systems associated with Spatial database and Attribute database.

Spatial database

Attribute database

BLDG_ID	PIPE_ID	CUSTCODE	CONTRACNO	CUSTNAME	METERNO	MTRMKCODE	METERSIZE	BGNCUSTI
1	0	1858568	1609/45	[illegible]	014721	21	01	450628
2	0	1858237	1606/45	[illegible]	1640	14	01	450628
3	0	1859265	1616/45	[illegible]	0660	14	01	450628
4	0	1858455	1608/45	[illegible]	1809	14	01	450628
5	0	1813843	1163/45	[illegible]	004727	14	01	450607
6	0	1789913	922/45	[illegible]	010408	21	01	450520
7	0	1789681	919/45	[illegible]	010404	21	01	450520
8	0	1847811	1503/45	[illegible]	000126	01	01	450618
9	0	1857977	1603/45	[illegible]	1685	14	01	450628
10	0	1852259	1547/45	[illegible]	013857	07	01	450618
11	0	1969847	291/46	[illegible]	0080	14	01	451202
12	0	1887141	1892/45	[illegible]	0181	14	01	450806
14	0	1930047	2322/45	[illegible]	009467	01	01	450909
15	0	1852363	1548/45	[illegible]	1334	14	01	450618
16	0	1858019	1604/45	[illegible]	014716	21	01	450628
17	0	1773329	755/45	[illegible]	012344	14	01	450419
18	0	2020833	798/46	[illegible]	009094	02	01	460318
19	0	1999125	581/46	[illegible]	002798	02	01	460210
20	0	1971637	309/46	[illegible]	013860	07	01	451202
21	0	1971741	310/46	[illegible]	000178	14	01	451202
22	0	1655428	1495/44	[illegible]	012292	01	01	440608
23	0	1928039	2302/45	[illegible]	009444	01	01	450909
24	0	1852581	1550/45	[illegible]	000124	01	01	450618
25	0	1854651	1571/45	[illegible]	014676	21	01	450625
26	0	1852477	1549/45	[illegible]	014655	21	01	450618
27	0	1854765	1572/45	[illegible]	007188	07	01	450625

.00 x 8.50 in

Preventive Measures

- Apply network system simulation for optimizing water distribution according to the demand. District Metering Area (DMA) Installation well equipped with Pressure Reducing Value (PRV) for pipe burst
- Aged pipes replacement
- Surveying for mapping system improvement of pipe networks

Aged pipes replacement

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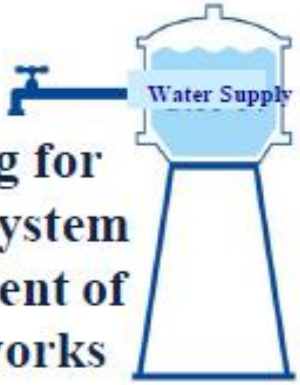
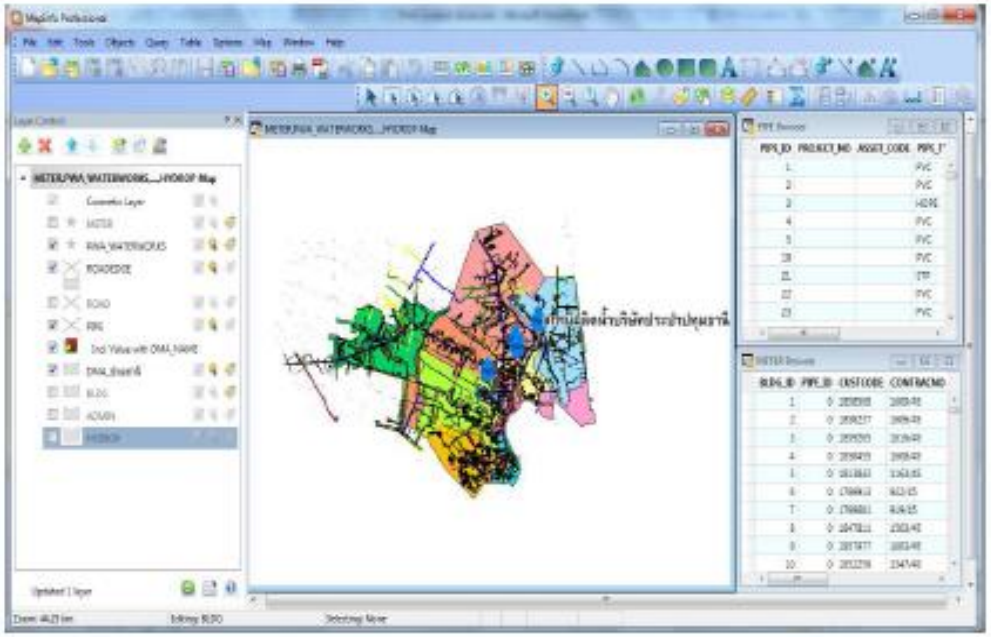
GIS: Water Loss Reduction Management



Surveying for mapping system improvement of pipe networks

GIS: Water Loss Reduction Management



GIS for Water Loss Reducing in PWA's Management

- improve and update GIS database
- store, create and improve pipe network information in GIS map
- survey, store, create and improve customers information
- create both attribute and spatial data
- create Hydraulic model

Benefits of GIS for Water Loss Reduction

- Easily access to queries information
- To be Equipment for water loss reduction management in the future plan
- To be Assist in DMA design and Hydraulic model


Thank You
VeryMuch!

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Questions & answers