

MYANMAR THREE CITIES WATER SUPPLY MANAGEMENT
IMPROVEMENT PROJECT

FINAL REPORT

To be presented to the Government of the Republic of Union of Myanmar

MARCH 2013

MINISTRY OF HEALTH, LABOR AND WELFARE OF JAPAN

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On this Report

The Project Team for Myanmar Three (3) Cities Water Supply Management Improvement Program under the Ministry of Health, Labor and Welfare of Japan's Water Supply Project Formation Program for FY2012 (hereinafter referred to as 'MHLW Project Team'), visited Myanmar during February 17, 2013 – March 2, 2013. MHLW Project Team visited Yangon, Nay Phi Daw, Mawlamyine and Patheingyi and met with various officials of counterpart organizations such as Department of Rural Development (DRD) of Ministry of Border Affairs, Environmental Sanitation Division of Ministry of Health, Mawlamyine Township Development Committee, Patheingyi City Development Committee among others.

MHLW Project Team stayed in Mawlamyine and Patheingyi for four (4) days in each city and collected information and data and conducted the discussions with the respective State (Regional) Cabinets and CDCs. Based on the results of these survey and discussion, MHLW Project Team made up the proposals for the improvement of water supply management in each city. The proposal for Patheingyi City was presented to the Regional Cabinet members on February 28th during their stay in Patheingyi. The proposal for Mawlamyine City was submitted to Mawlamyine TDC on March 15th after their return to Japan. Both proposals are attached in this report as Attachment I & II.

For both cities, MHLW Project Team proposes for the preparation of Master Plans as the basis of future investment. The draft TOR of Master Plan is attached in this report as Attachment III.

MHLW Project Team also proposes for the Human Resources Development Project targeted for both cities, the issue of drinking water safety as the central focus of the Project. The outline of the proposed Human Resource Development Project is attached in this report as Attachment IV.

MHLW Project Team had a discussion with Ministry of Border Affairs (DRD) and Ministry of Health of Central Government in Nay Phi Daw. MHLW Project Team's view on the current administrative arrangement concerning the urban water supply is attached in this report as Attachment V.

MHLW Project Team participated in Seminar on Water Supply, Sewerage and Drainage Sector Program in Yangon which was held on February 18th in Yangon and made

presentations on ‘Improving Water Supply Management’ and ‘Introduction of Case of Declaration of Safety of Drinking-water’. Both presentations are attached in this report as Attachment VI and VII.

I would like to thank for the cooperation and assistance extended by the concerned officials of the ministries, CDCs and State/Regional cabinet during our stay in Myanmar.

I sincerely hope that this report would contribute to the development of water supply systems in Myanmar and to the strengthening of friendly relationship between Japan and the Republic of Union of Myanmar.

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Attachment I

Improvement of Water Supply Management in Mawlamyine City

Improvement of Water Supply Management in Mawlamyine City (Ministry of Health, Labor and Welfare of Japan's Water Supply Project Formation Program in Myanmar)

I. Current Situation of Water Supply in Mawlamyine

I-1. Mawlamyine City

Mawlamyine City, with about 300,000 populations, is the third largest city in Myanmar following Yangon and Mandalay, and is the capital of Mon State. The city is a port city situated at a mouth of the Thanlwin River, one of the great rivers of Myanmar besides the Ayeyarwadi River. The distance from Yangon is about 300 km, seven hours by road. In 2006, by the completion of a multi purpose bridge (road and rail) on the Thanlwin River, the travelers from Yangon can enter Mawlamyine City without getting out of cars or trains. From Mawlamyine City, the road and railway are extended to Malay Peninsula. Mawlamyine City, which is also the western start point of Indochina East-West Corridor, which connects Da Nang City in Vietnam, Laos, Thailand and Myanmar, through Savannakhet, Laos, where the Second Thai-Laos Friendship River Bridge was built, has high potential for economic development. Industrial Zone was created in the southern part of the City. Once infrastructures such as expressway, electricity and water supply are improved, the City will be a target for foreign direct investment including Japanese firms. Another potential is tourism development. Mawlamyine City and the surrounding areas are endowed by many Buddhism sites.

In order to make these potentials into reality, the development of modern water supply system in the City is urgently needed.

I-2. Natural Environment

At the center of Mawlamyine City, there is a hill. The resident zone spreads in approximately 12 x 3 miles of slender area surrounded by the hill and rivers.

It has rainy and dry seasons. There is no rainfall in dry season. Although sufficient quantity of water flows in the river, the water level of the Shwe Nut Taung Dam and the Kim Pon Chon Dam tends to be lower in dry season because their upper stream are holding pond of rainfall. (MHLW team observed actually that the water levels of these dams were very low.) The underground water level also tends to be low in the dry season, and it depletes in some cases. For those reasons, river water becomes the last resort for securing water in dry season.

I-3. Existing Conditions of Water Supply in Mawlamyine City

(1) Existing Water Supply Facilities

The water supply works in Mawlamyine which uses Kim Pon Chon Dam as the water source started in 1920. Currently, four water sources are used for the water supply works. The outline of water supply works is shown in Table-1, and location of principal facilities are shown in Figure-1.

Attran (1) system transmits and distributes water to residents directly through main and sub-main pipe lines. Attran (2) system transmits water to the pumping station, and, then, the water is pumped up to the Sanaydy Reservoir, and is distributed to residents. Water from Kim Pon Chon Dam is distributed to residents by gravity. Water from the Shwe Nut Taung Dam is transmitted to the booster pumping station, and, then, is pumped up to RTC and to the Kan Thone Kan Reservoir.

Water supply hours are four hours per day (according to the answer to the questionnaire, water supply hour is 8 to 24 hours in some distribution block.), and the supplied water is actually the same as the intake raw water since there is no treatment facility.

Table-1 Outline of Water Supply

A) Area , Population and demand water	
Area	20.52 sq. miles(53.12km ²)
Ward	22
Number of households	40,659
Population	327,957
Planning daily water supply	6,559,140 gal. (29,820m ³)
Daily practicable water supply	3,600,000 gal. (16,370m ³)
Coverage ratio of TDC water supply ^{*1}	55%
Coverage ratio of private water sources	45%
Population Projection (after 10 years)	357,473
Population Projection (after 20years)	389,941
Number of taps	8,500
B) Water source	
Shwe Nut Taung Dam	1.2million gal. (5,460m ³)
Kim Pon Chon Dam	0.9million gal. (4,090m ³)
Attran River(1)	0.7million gal. (3,180m ³)
Attran River(2)	0.8million gal. (3,640m ³)
C) Private water source	
Tube well, Dug well	4,105
D) Public water supply	
Earth Reservoir (Average 0.2million gal.)	26
Brick Reservoir (Average 1,500gal.)	31
Tube well	3
D) Method of transmission	
Shwe Nut Taung Dam	Gravity
Kim Pon Chon Dam	Pumping + Gravity
Attran River(2)	
Attran River(1)	Pumping

Notes; ^{*1} This definition of coverage ratio is different from the common definition. (mention later)

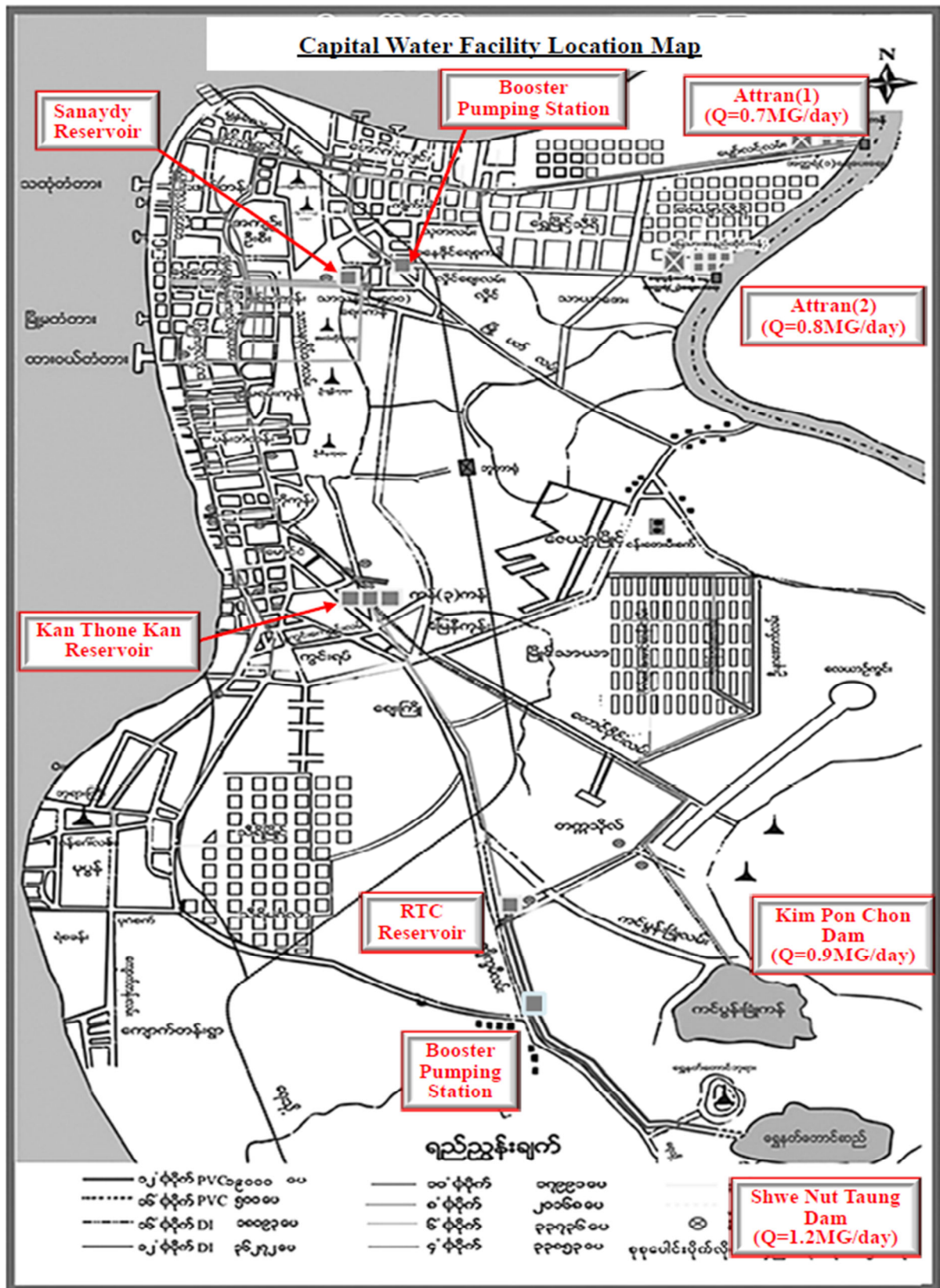


Figure-1 Capital Water Facility Location Map

(2) The Current Situation and Issues of Water Supply Works in Mawlamyine City

i) Piped Water Supply Coverage Ratio

According to the data provided by TDC, the served population of TDC water supply system is 180,376 which are 55% of total population of Mawlamyine City. On the other hand, the total number of taps is 8,500. Assuming that one household consists of 7 family members, the population connected to the TDC water supply system is calculated as 59,500 ($8,500 \times 7$) which remains as low as 18% of total population. TDC explained that the figure 180,376 includes the population who uses the water in brick reservoirs and earth reservoirs built by TDC in the city area. These populations can be classified as the population with 'the access to the improved water source' but can hardly be classified as the population of 'piped water supply coverage'. Therefore, the service coverage ratio of the water supply system in Mawlamyine City is actually 18%. The promotion of house connection is urgently needed.

ii) Quality of Supplied Water and Safety of Drinking Water

Regarding the current situation on quality of raw water from the river system Attran(1) and Attran(2) in Mawlamyine city, MCDC adopts sedimentation process utilizing natural lagoon-type pond as sedimentation basin where some effect of removing turbid substance to some extent in the sedimentation basin can be recognized. But, no other purification process is applied throughout the system, nor chlorination is applied as disinfection.

MHLW Project Team conducted bacteriological tests for identification of coliforms utilizing field test kit to confirm situations on safety of drinking water supplied in the city. The test results are shown in the following Figure-2 and 3. In all of the supplied areas, positive colonies of coliforms are detected. This indicates the situation on safety of drinking-water in the city is threatened, so it is insisted that to cope with this risk to human health, it is indeed necessary to establish appropriate water supply system with appropriate purification process.

In general, waterborne diseases caused by lack of safety of drinking water is one of the major factors which may affect, in particular, increase of under 5 year infant mortality rate. In this respect, as is recognized in the case of Mawlamyine, improper situation and management on safety of drinking water may reflect to the high rate of infant mortality in the Mon State, which is slightly lower than the national average in Myanmar, however, it is substantially high rate comparing with Japanese situation.

Table-2 Infant Mortality Rate in Mon State

	Infant Mortality Rate (Deaths per 1,000 Live Births)
Mon State	42.55
Myanmar (national average)	59.77
JAPAN (national average) (2006)	2.6

Source; Statistical Year Book 2008, Central Statistical Organization (CSO), Ministry of National Planning and Economic Development

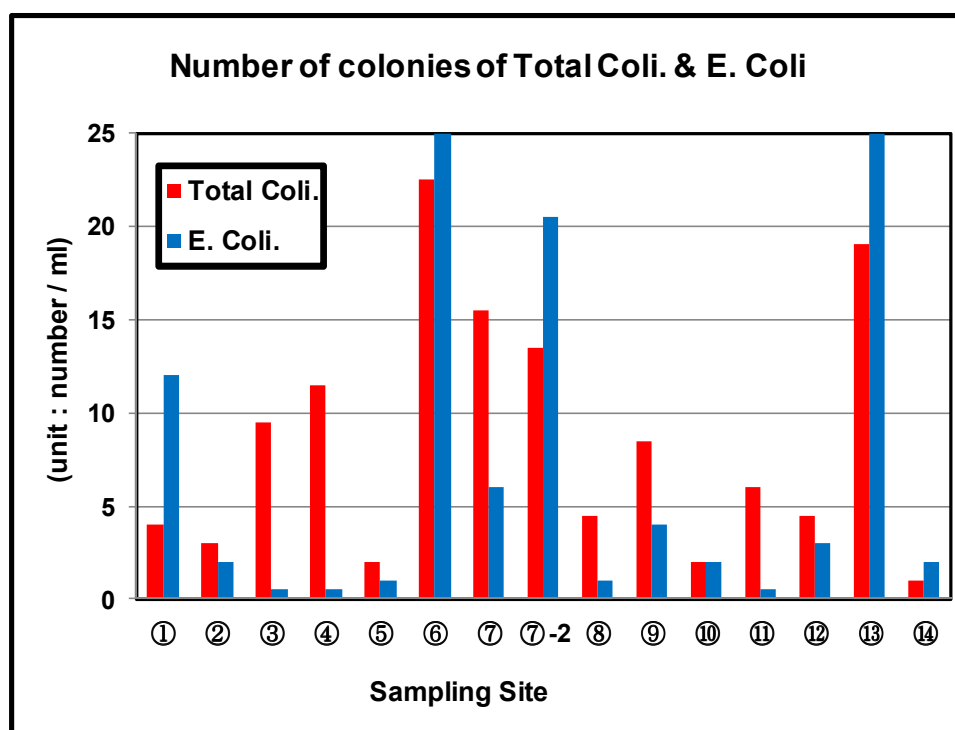


Figure-2 Result of the Water Quality Testing

iii) Drinking Water Supply for the Poor

According to TDC, 75% of the citizens in Mawlamyine City purchase bottled water for drinking purpose but the remaining 25% is the poor citizens who can not purchase bottled water and they are drinking the untreated water (only after natural settling) after boiling.

The areas where many poor populations reside are the low income settlement in the north eastern part of the city and village in the south western part of the City. In the low income settlement in the north eastern area, the residents draw water from the public reservoirs called brick reservoirs (26) and earth reservoirs (31) built by TDC to which TDC built water supply pipes from the stabilization ponds to which the water is pumped up from Attran River, and use it for domestic use including drinking after boiling. The water supplied from the River has high turbidity and high color, affecting the drinking water safety. It is questionable whether such water is hygienically safe even after boiling. TDC does not have the data on the hygiene and water borne diseases in the area.

The water supply system in the north eastern area is managed by TDC. Since the pipe laying works from the water intake points at the Attran River to the public reservoirs were conducted by residents by themselves, TDC does not collect the water charge from residents who are not connected to the pipes and draw water from the public reservoirs. As for the village in south western area, since the construction cost of the PVC pipeline which draw water from the TDC main pipe and deliver it to the village was paid by the villagers, TDC deliver the bulk water to the village with free of charge and the water supply in the village is managed by the village committee. In the north eastern area, the residents who connect to the piping system have to pay the water charge. Since only the main pipes and the limited length of sub-main pipes are installed and secondly and tertiary pipes are not installed in the area, the high house connection cost is the obstacle for realizing house connection particularly for the poor citizens. According to TDC, however, many residents desire for the house connection and the collection rate of the water charge is high.

As the fact that the residents in the low income area shouldered the construction cost of the pipe laying works shows, the poor has the strong desire for the development of the water supply system and their willingness to pay of the water charge is also high. It is highly desirable to install sub-main pipes and secondary and tertiary pipes in the area in order to promote the house connections.

iv) Financing of Water Supply Works, Price of Drinking Water in Mawlamyine

The account for water supply works is not separated from the municipal general account of Mawlamyine City. If you compare the water sales revenue and the expenditure for the

water related works of Mawlamyine City, the revenue exceeds the expenditure. The water tariff is Kyat 150 per m³ and the progressive tariff system, in which the unit water tariff increases if they consume larger quantity of water, is not applied. There is no separate water tariff for commercial users, since currently no commercial users are supplied water from TDC. TDC's 'served population', 180 thousands, includes those who draw water from TDC's public reservoirs with free of charge. The customers who are connected to TDC water supply pipes and actually pay the water charge accounts for less than 20% of the total population. Even so, the revenue exceeds the expenditure. The reason for this is considered that the quality of water supply service remains low as such that the water from the reservoirs and rivers are delivered without treatment and the cleaning of reservoirs are not conducted.

As indicated in the table below, the unit water tariff for the low income citizens supplied by two well-managed water utilities, namely, Phnom Penh Water Supply Authority (PPWSA) in Cambodia and Manila Water Company in the Philippines, who uses relatively small amount of water such as 70l/person/day, is US\$0.16/m³ and US\$0.2/m³ respectively which does not differ much from Kyat 150 (US\$0.19/m³) in Mawlamyine. Considering that the water supplied by PPWSA and Manila Water Company is perfectly drinkable water while the water supplied in Mawlamyine is not drinkable, the water tariff in Mawlamyine can be considered as being too high compared to its quality.

Table-3 Comparison of the Price of Water per m³ (US\$)

	Monthly Water Consumption per household is 10 m ³	Monthly Water Consumption per household is 20 m ³	Monthly Water Consumption per household is 30 m ³	Remarks
Manila Water	0.20	0.38	0.51	Drinkable
PPWSA	0.16	0.20	0.22	Drinkable
Mawlamyine TDC	0.19			Not drinkable

Thus, the water supply works in Mawlamyine City must improve its water supply services substantially while maintaining the water tariff at the affordable level for its residents. It requires various innovative approaches in both technology and management. The success of PPWSA and Manila Water Company, however, demonstrates that such innovation is not something impossible for the water works in developing countries.

v) O&M Capacity of Water Supply Works in Mawlamyine City and the needs for the human resource development

There are only two engineers in TDC exclusively engaged in the water supply works. Other engineers work for other sectors such as road too. The number of the staffs who works for water supply is 41 people including those who work also for other sectors. The water supply is managed by this limited number of staffs. When they carry out a proposed project, in construction, operation and maintenance of purification plant and rebuilding, maintenance of the piping network, the necessary technical skills and work volumes may increase markedly. It is necessary to provide continuously experts and technical guidance to TDC, and it is necessary for TDC to plan the personnel training of the engineers and secure enough number of the most suitable engineers.

The followings are current problem of O&M. Because any flow-meter is not installed, accurate quantity of water flow is not grasped from water intake to water distribution/supply. Only way to estimate the water quantity in the system is by the capacity of pumps and by reading the water meters of customers (8,500 places). The management of water volume is far from perfect.

About the pipeline section, there are many old pipelines whose age exceeds 40 years which is the service life of the water pipe. Appearance of surface leakages above the ground indicates leakage rate of whole system is supposed to be high. There are eight staffs in charge of pipe repair in TDC, but it is thought that appropriate repair of pipelines is not executed. In addition, it is observed that the stoppage of water supply occurs frequently in certain area because pipeline was constructed without proper pipe network calculation.

About the purification section, because TDC does not implement any treatment except utilizing the natural sedimentation basin, they do not have O&M capacity to manage purification plant.

In this respect, human resources development for the engineers should be urgently realized, and also it is necessary to secure proper number of capable engineers in TDC.

II. Waterworks Improvement Plan for Mawlamyine City

II-1. Waterworks Improvement Plan of Township Development Committee

Two projects for waterworks facilities improvement are subject to yen-loan-financed “Rural Development Project” by JICA and now, it is only these two projects that TDC owns as a clear plan.

(Project 1) Enhancement of Shwe Nut Taung system (installation of $\phi 12''$ PVC pipe and construction of 0.1 million gallons distribution reservoir)

(Project 2) Enhancement of Attran (2) system (installations of $\phi 10''$ PVC pipe and 60HP pump)

Since the amount of water supply in Mawlamyine is insufficient, TDC plans to increase the amount of water by these projects. TDC can duplicate the pipeline by these projects. So these projects are effective from the viewpoint of not only securing the amount of water but also maintenance, because these pipes can be used as backup pipes during an emergency or renewal.

Furthermore, TDC has a vision of a new water resource development below, which is not concrete now.

(Project 3) New development of Attran (3) system (Development of the intake facility at Attran River and installation of the pipeline from Attran River to Kan Thone Kan Reservoir)

II-2. The Need for Master Plan

In order to effectively improve waterworks facilities, formulation of a master plan is effective.

TDC has been estimating water demand in Mawlamyine as about 6.6 million gallons. However, this water demand is only calculated based on the volume of the 20 gallons per day per capita. For this reason, the actual trends in water demand have not been grasped. Since TDC does not install any flow-meters to their water system, they can not grasp the water balance of the system. Facilities that are once constructed are used until the end of their service lives (for example, in the case of concrete structures, service life is considered to be 60 years and expected life 100 years in Japan). Therefore, it is necessary to set the size and capacity of the each facility reflecting the water demand in the future.

It is recommended to improve the facilities efficiently with long-term perspective, taking into consideration of the followings;

- To make water demand forecasting and to estimate the future demand of water,
- To grasp the water balance of the their water system, and
- To consider the optimal water distribution area allocation based on the distribution network analysis.

II-3. The Need for the Study related to the Construction of Water Treatment Plant

Now, TDC supplies water to citizens without treatment except only natural sedimentation treatment. However, judging from the water quality conditions (quality of raw water from the river indicates apparently high turbidity and E. coli is detected etc...) and water use situation (the urban poor are drinking by boiling), in terms of human health, there is a problem with the actual water supply system in Mawlamyine. Therefore, construction of a water treatment plant is essential in order to supply safe water. Improving the water quality of Attran systems, which probes to be poor and is supplying water to the poor, is particularly a pressing issue.

In this investigation, MHLW Project Team did not get the detail data of river water quality of Attran. Therefore further water quality investigation is needed to determine what kind of water treatment method should be adopted.

In addition, further field investigation about the planned construction site of water treatment plant is also needed. In our survey, at this moment, it is found that vast area for the planned construction site is secured around the intake point of Attran (2). However, from the long-term viewpoint, if the water treatment plant is built in the center of town and the distribution pipeline is shortened, it is easier to manage the water pressure and residual chlorine concentration. Due to the high altitude of the central urban area of Mawlamyine, water can be distributed from large distribution reservoir such as Kan Thone Kan Reservoir by gravity flow. Based on the distribution network analysis, the optimal construction site of a water treatment plant should be chosen considering topographical conditions.

II-4. The Need for Repair and Replacement of the Pipeline Leakage

In Mawlamyine, it is guessed that a large amount of leakage occurs but the actual amount is unknown. TDC calculates a total capacity of the facilities as 3.6 million gallons, but it is assumed that such capacity is not effectively utilized in practice because of water leakage and lack of distribution network analysis. Now, water is insufficient in Mawlamyine (capacity of facilities partly satisfy only 55% of demand).

In conjunction with optimal water distribution area allocation and construction of water treatment plant, it is necessary to grasp the water leakage amount from the existing pipelines, repair and replace the pipes appropriately and improve the existing facilities to be able to distribute 3.6 million gallons of water at least. Especially by giving priority to repair and replace the pipes in gravity flow systems (Shwe Nut Taung system and Kim Pon Chon system), it is recommended to take full advantage of gravity flow system.

III. MHLW Project Team's Recommendation

III-1. Formulate a Master Plan

Short or medium to long term plan for management of water supply does not exist so far. Therefore, the master plan for water supply should be established as water supply development plan. The master plan should include the following contents;

- (1) Demand forecast
- (2) Goal setting and cost estimation for water supply facilities' improvement
- (3) Review of distribution block and calculation of distribution piping networks
- (4) Survey data for the construction of water treatment plant;
water quality survey, selection of filtration method and candidate site, and cost estimation of construction of water treatment plant
- (5) Renew of operation plan for dilapidated piping lines;
Estimation of the quantity of water leakage, identification of leaking pipes, and improvement plan of the leaked pipes
- (6) Organization and operation planning;
making adequate organization and operation policy necessary to construct, operate, and maintenance water treatment plant

III-2. Construction of Water Treatment Plant

As seeing from the fact that e-coli were found from tap water, current hygienic condition is not good for water supply quality. Therefore there is a need for urgent construction of water treatment plant equipped with chlorination facilities.

III-3. Human Resource Development (HRD)

It is necessary to perform HRD to be able to carry out the water supply services steadily with proper plan. The necessary points for the HRD are as follows;

- (1) HRD related to water demand prediction, short, medium and long term plan development.
- (2) HRD related to selection of the water intake place, each stage of the design (including decision of filtration method), construction, operation and maintenance of purification plant.
- (3) HRD related to development of block and zoning (pipe network analysis) of water supply. Introduction of the pipe network analysis software.
- (4) HRD related to leak detection technique.
- (5) HRD related to water quality analysis. Introduction of devices for water quality analysis.

III-4. Institutional Arrangement of the Water Supply Works in Mawlamyine

At present, the water supply works in Mawlamyine City is conducted by the Engineering Department of Township Development Committee under the Mon State Government. This structure is the same as the structure of other cities in Myanmar. Engineering Department is responsible for not only water supply but also road improvement in the city, improvement of city landscape, disposal of waste and other public works. There are about 40 staffs who are working specifically working for water supply works in the Engineering Department. The accounting of the water supply works is not separated from the municipal general account.

Such institutional structure is not the desirable structure for such business as the water supply works which is primarily a profitable undertaking. In Mawlamyine, TDC supplies water only to its household sector and not to the commercial sector. Although Mawlamyine City is now building an industrial zone in its south western area, the water supply to the industrial zone is not considered as the job of TDC. On this matter, TDC explains that this is because the water for the household sector is not sufficient, and, therefore, there is no water to supply to the commercial and industrial sectors. Viewing, however, the water supply works as the economic undertaking, the idea of cross subsidy in which the profit obtained by supplying water to the commercial and industrial users to whom higher tariff is chargeable will be used for maintaining the water tariff for households users at the affordable level, is essential for the healthy management of water supply works. Such idea would not come up from the public works concept in which the water supply works are considered as one of the public civil work.

It is essential to introduce business mind in the water supply works. As a first step, it is necessary to make independent accounting for the water supply works separated from municipal general account. It is also desirable to include not only engineer but also entrepreneur or economist in the management of the water supply works. MHLW Team felt TDC staffs' high spirit for the improvement of water supply works. There is a possibility for yielding the good cycle of the water supply works once the proper management is introduced to the water supply works in Mawlamyine City.

The most essential thing is to achieve the desirable good cycle and to avoid falling into the vicious cycle which many water supply utilities in developing countries have fallen. The following points are essential points for consideration in order to achieve the good cycle of water supply works.

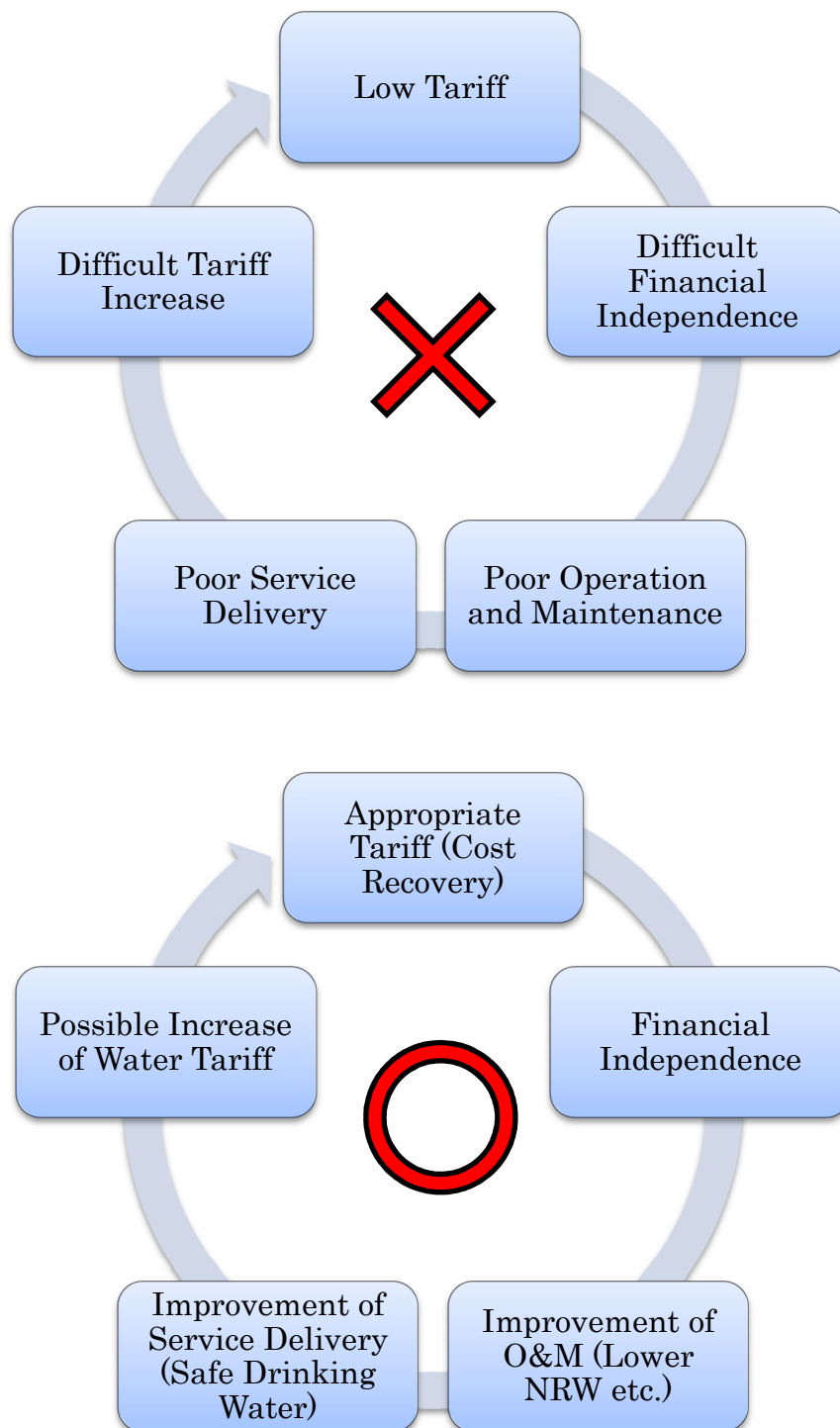


Figure-4 Bad Cycle and Good/Desirable Cycle of Water Supply Works

- (1) The account of the water supply works in Mawlamyine should be separated from the municipal general account of Mawlamyine City.
- (2) The water tariff should be set at the level which can cover at least the operation and maintenance cost and, in future the tariff should be raised to the level which can cover the capital cost too (full cost recovery level). There should be a law or legislation in which such principle is clearly stipulated in order to avoid the ungrounded opposition against the necessary tariff increase.
- (3) The core management strategy of the water supply works should be the reduction of Non Revenue Water and the Drinking Water Safety.
- (4) The management of the water supply utility requires not only the engineering expertise but also the business mind. It is therefore desirable to include not only engineer but also entrepreneur or economist in the management of the water supply works.
- (5) The management of the water utility should be conducted based on such numerical targets as water production volume and sales volume, non revenue water reduction, water qualities at the various stages of the water supply management in order to achieve the drinking water safety. Therefore, provision of water meters and laboratory facilities is essential.

Attachment II

Improvement of Water Supply Management in Pathein City

Improvement of Water Supply Management in Patheingyi City (Ministry of Health, Labor and Welfare of Japan's Water Supply Project Formation Program in Myanmar)

I. MHLW Project Team's Observation on the Current Water Supply in Patheingyi City

I-1. Current Situation of Drinking Water Supply in Patheingyi City

Currently, there is no modern water supply system in Patheingyi City. Two bottled water factories which use the RO membrane and more than 1,000 water vendors are playing an important role in drinking water supply in Patheingyi City. Water vendors take water from the wells (mostly shallow wells) in such places as temples which have relatively good water quality and transport it in the polyethylene tanks and sell to the households. Many households have their own wells in their house but the water from most of them does not have a good water quality and is not suitable for drinking purpose. Therefore, majority of general citizens buy bottled water for drinking purpose and use the water from their wells for domestic use other than for drinking. Since the bottled water is very expensive (6 times more expensive than the water from water vendors), some of them use the water from the water vendors as the drinking water. If they do not have their own wells, they need to rely on the water from water vendors for non-drinking domestic use.

Low income population who can not afford bottled water or the water from water vendors take the water of rainwater storage ponds by bucket with free of charge and use it. Sometimes they drink it without boiling.

I-2. The Price of Drinking Water in Patheingyi

The price of bottled water is Kyat 300 per 20l bottle, equivalent to Kyat 15,000 (US\$18.75)/m³, which is very high. Assuming that a household with 6 family members buys a 20l bottle water every 3 days for drinking purpose (1.1l/person/day), their monthly payment for bottled water is Kyat 3,000 (US\$3.75), which is double of the amount of monthly water tariff payment by the low income citizens in Phnom Penh City in Cambodia and Manila City in the Philippines, who are supplied 70l/person/day of perfectly drinkable water.

Table-1 Monthly Payment of Household for Drinking Water (US\$)

City	Monthly payment for drinking water	Remarks
Manila (piped water supply)	2.00	5 family members. Water consumption 70l/person/day
Pnom Phen (piped water supply)	1.60	5 family members. Water consumption 70l/person/day
Pathein (bottled water)	3.75	Buy a 20l/bottle bottled water every 3 days for 6 family members (1.1l/person/day)

The price of water venders who sell the water taken from the wells in such places as temples is Kyat 50 per 5 gallon (22.5l) polyethylene tank, or Kyat 500 per a cart which carries 8×5 gallon polyethylene tanks (180l), equivalent to Kyat 2,222~2,778 (US\$2.78~3.47)/m³, which is more than 10 times higher than the water tariffs in Pnom Phen City in Cambodia and Manila City in the Philippines and is more expensive than the water tariff in Yokohama City.

Table-2 Comparison of the Price of Water per m³ (US\$)

	Monthly Water Consumption per household is 10m ³	Monthly Water Consumption per household is 20m ³	Monthly Water Consumption per household is 30m ³
Manila Water (piped water supply)	0.20	0.38	0.51
PPWSA (piped water supply)	0.16	0.20	0.22
Yokohama City (piped water supply)	1.84	1.02	1.30
YCDC (piped water supply)	0.11		
Pathein (buy bottled water)	18.75		
Pathein (buy from water venders)	2.78~3.47		

The above figures imply that the current amount of water payment for most of Pathein citizens could be reduced substantially by the introduction of the well managed water supply system.

I-3. Drinking Water Safety in Pathein City

The MHLW mission conducted the water quality testing of the wells (shallow wells) in temples and a rain water storage pond which low income citizens and the poor in Pathein City use as the source of their drinking water. In all water sources tested, E-Coli were found. In some of wells and the rain water storage pond, high intensity E-coli was found. The current condition of drinking water safety in Pathein City is very bad and the development of the water supply system is highly needed.

The main cause of the child mortality is the water borne diseases due to the unsafe drinking water, particularly for child before five years old. Reflecting the inferior drinking water safety condition as seen in Pathein City, the child mortality rate in Ayeyarwadi Region is higher than the national average of the Union of Myanmar.

Table-3 Infant Mortality Rate in Ayeyarwadi Region

	Infant Mortality Rate (1999) (Deaths per 1,000 Live Births)
Ayeyarwadi Region	61.59
Myanmar (national average)	59.77

The water quality testing was conducted as follows;

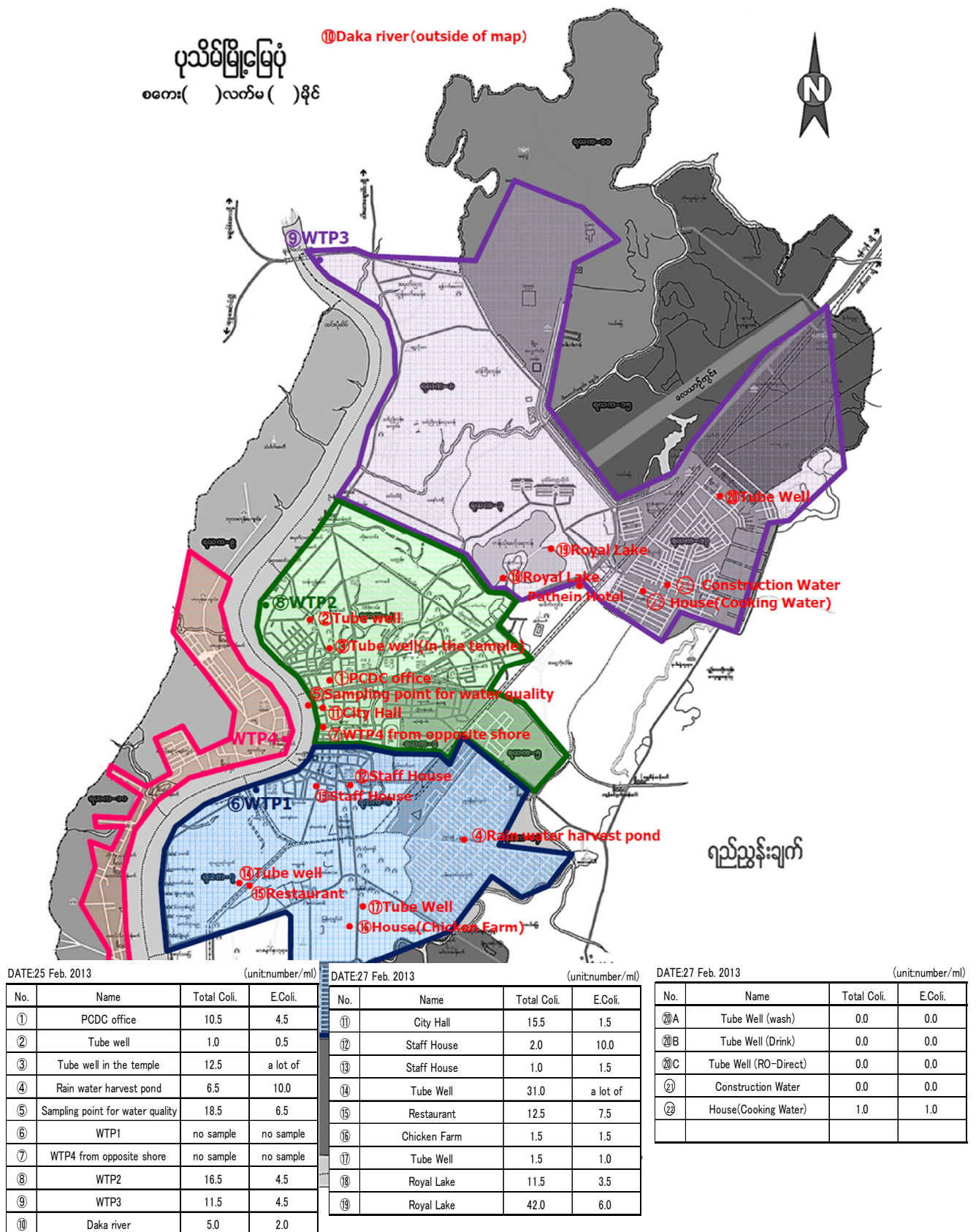


Figure-1 The Water Quality Testing Location and Result

I-4. Drinking Water Supply to the Poor in Patheingyi City

According to Myanmar Poverty Profile published by UNDP, the poverty incidence, which is defined as the annual income less than Kyat 376,151 (US\$470)), in Ayeyarwadi Region is 32% of total population in the Region.

The prices of bottled water or water vendors are beyond the affordability of the poor. Therefore, the poor in Patheingyi City rely on the rainwater storage ponds as the sources of drinking water, the water quality of which is absolutely not appropriate as the drinking water and is posing danger on the human life.

As for the counter measure for poverty alleviation, the development of water supply system in Patheingyi City is urgently needed.

II. MHLW Project Team's assessment on Patheingyi CDC's Development Plan for Water Supply Facility in Patheingyi City

II-1. Outline of CDC's Development Plan for Water Supply Facility

(1) Topography

Patheingyi is a capital city of Ayeyarwaddy Region and has 15 wards. The location of city is 90 mile from Adaman Sea. Topographically, the area of the town is relatively flat and average ground elevation is approximate 11.5 feet and the highest one is 33 feet above the sea water level.

(2) Existing water source for life water

Shallow well 6,162 Tube well 7,942 Rainwater harvesting pond 26

Only 40% of township people can get clean water.

(3) Planning population and Water supply demand

Planning population 138,677 people

Planning Daily Water supply demand per person 25Gallons/day

Planning Daily Water supply 3.47 million gallons

(4) Planning Water supply facility

3 intake facilities locate at left bank and one is right side of Ngawun River. Slow sand filtration tank installs for each water treatment plant. Sedimentation tank installs to reduce suspended solids and turbidity. Treated water is transferred to elevated tank (V=25,000gallons) by booster pump. Water in elevated tank distributes to households by gravity.

Table-4 Outline of Water Supply Facility

Number of WTP	Number of Ward	Treatment method	Number of elevated tank	Pipe length(feet)	
				Transmission	Distribution
1	6, 7, 8, 10, 12	Slow sand filtration	4	15,000	263,000
2	2, 3, 4, 5		4	25,000	160,000
3	1, 13		4	53,000	175,000
4	9, 10		2	3,500	92,000

(5) Filtrated velocity

Surface area of filtration tank is 160'x80' and daily water supply volume of filtration is 1.0 million gallons. Therefore, filtrated velocity is 3.9m/day.

(6) Quality test of water source

The water quality test conducted three times at middle site between WTP 1 and WTP2.

Number of turbidity is 50 to 80NTU and iron is 1.20 to 1.88mg/l. Survey team confirmed the e-coli (Escherichia coli) at water source of Ngawun River by simple test sheet.

II-2. MHLW Project Team's Assessment Results

(1) Planning population for water supply

According to the report of PRE-F/S Study on September 1988 by UNDP, the population of 1983 was 144,092 people by population censuses and population forecast of 2005 is 229,806 people. The 138,677 people, which are the target population of the CDC Plan, are far smaller than the target population of UNDP Plan. The planning of the water supply system should be based not on the current population but on the forecast of future population. Otherwise, even after the completion of the project, shortage of distribution volume of water supply will occur.

(2) Water Source

The water source for the water supply system should be decided taking into consideration the following factors.

- Far from the current pollution sources as much as possible.
- The future possibility of pollution sources should also be considered based on the future residential and industrial development possibility in the area.
- Intake place must be in the upper stream of pollution sources.
- Survey the ground water as the alternative water sources. Combination of surface water and groundwater can be a good alternative sometimes.

According to the basic principles as mentioned above, MHLW Project Team observed the following issues in the proposed 4 sites of water source in CDC's Plan.

- i) Site 1 and Site 4 are in the down stream of Pathein City and these water sources are already polluted. If these water sources are to be used, relatively high treatment technology and high operation and maintenance cost of the water treatment plant would be required.
- ii) As for Site 2, Site 3 and the Reservoir, since the sites are located in the vicinity of the Pathein City, the possibility of residential and industrial development in the surrounding areas and the possibility of future pollution source should be carefully considered.
- iii) Daka River site is currently not heavily polluted by E-Coli. There is a fertilizer factory which can be a pollution source. But water intake point can be built in the upper stream of the factory. Since Daka River site is far away from the city, the construction cost and O/M cost of pipeline will be high. Therefore, comparative study with other alternatives will be required.

(3) Pipe line.

It is mentioned that the pipe distribution network was calculated by Epanet2 software. However, it is difficult to confirm the appropriateness of pipe network because the calculation sheet of pipe network is not provided in the CDC plan.

(4) Filtration method

The number of turbidity in Ngawun River as the water source is more than 50. Comparative table between slow sand filtration method and rapid sand filtration method is attached herewith as Table-5. The filtration method should be decided based on such factors shown in this comparative table. Turbidity of water source and the size of the land are the most important factors.

II-3. MHLW Project Team's Recommendation

1. Since the water supply development needs to fulfill the future water demand, it is necessary to establish the planning framework based on the population growth forecast and to decide the target year for facility development.
2. Since the terrain of Pathein and the nearby area is characterized by the 'flat' land, the location of the facilities should be decided taking into consideration of the possibility of minimizing the energy cost.
3. Selection of water source is the most important factor in the planning of the water supply system. Water quality analysis in both dry season and rainy season should be conducted for all possible water sources (both surface water sources and ground water sources). Since the water supply facilities would be used for at least 30 years, the selection of water source should also take into account the possible city residential, commercial and industrial development based on the city development plan, if any, so that the future pollution source should also be avoided.

Table-5 Comparison of Filtration Method

	Slow sand filtration method	Rapid sand filtration method
Treatment Flow	<pre> graph LR Intake[Intake] --> ReceivingWell[Receiving well] ReceivingWell -- "(Sedimentation)" --> SlowSandFiltration[Slow sand filtration] SlowSandFiltration --> ReservoirTank[Reservoir tank] ReservoirTank --> Distribution[Distribution] Disinfection[Disinfection] --> SlowSandFiltration </pre>	<pre> graph LR Intake[Intake] --> ReceivingWell[Receiving well] ReceivingWell --> CoaguloSedimentationBasin[Coagulo-sedimentation basin] ChemicalsImplantation[Chemicals implantation] --> CoaguloSedimentationBasin CoaguloSedimentationBasin --> RapidSandFiltration[Rapid sand filtration] RapidSandFiltration --> ReservoirTank[Reservoir tank] ReservoirTank --> Distribution[Distribution] Disinfection[Disinfection] --> RapidSandFiltration </pre>
Outline of method	Method of water treatment is to use fine sand as filtrated materials.	Since the number of turbidity is high, coagula-sedimentation basin should be installed. Filtrated materials are rough sand.
Quality condition of Intake water (turbidity)	Less than nearly 10	More than 10
Filtrated velocity	4 to 5m/day	120 to 150m/day
Filtration area of 1.0MG	1,120m ²	38m ²
O&M technology	Easy	Necessity of experience
O&M cost	Low cost	High cost

source; *Design Guideline for Water Supply Facility in JAPAN*

III. Important Points for Creating Water Supply Organization in Pathein

Currently, there is no water supply organization in Pathein Township Development Committee. It is urgently needed to create a water supply organization in order to develop a water supply system in Pathein. To achieve the desirable good cycle and to avoid falling into the vicious cycle which many water supply utilities in Asia have fallen, enough attention should be paid to the following important points for consideration.

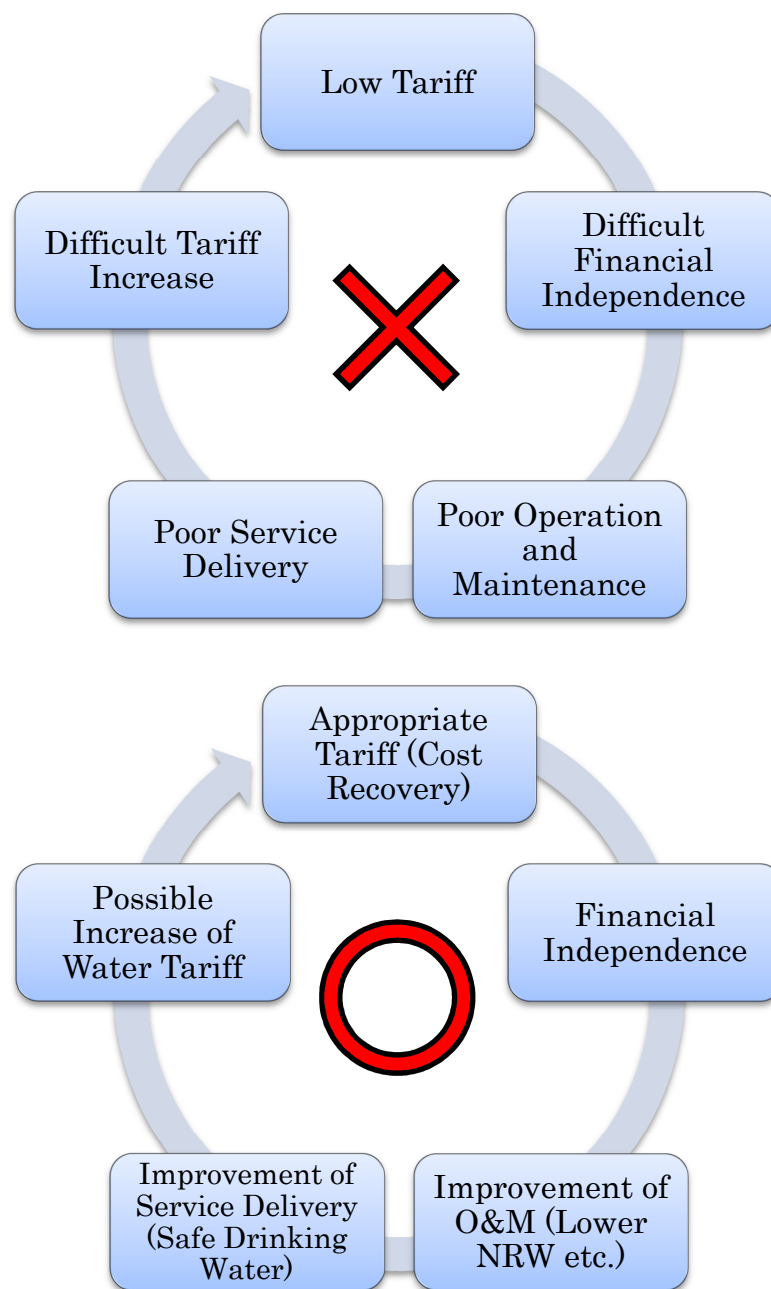


Figure-2 The Cycle of Water Supply System

- (1) The account of the newly created water utility in Pathein should be separated from the municipal general account of Pathein City.
- (2) The water tariff should be set at the level which can cover at least the operation and maintenance cost and, in future the tariff should be raised to the level which can cover the capital cost too (full cost recovery level). There should be a law or legislation in which such principle is clearly stipulated in order to avoid the ungrounded opposition against the necessary tariff increase.
- (3) The management of the water supply utility requires not only the engineering expertise but also the business mind. It is therefore desirable to include not only engineer but also entrepreneur or economist in the management of the newly created water utility in Pathein.
- (4) The management of the water utility should be conducted based on such numerical targets as water production volume and sales volume, non revenue water reduction, water qualities at the various stages of the water supply management in order to achieve the drinking water safety. Therefore, provision of water meters and laboratory facilities is essential.
- (5) At the very beginning stage of the water utility management, the essential expenses for the construction and operation and maintenance can not be covered by the water tariff revenue. Therefore, it is necessary for the municipal general account to provide subsidy to cover such expenses fully. In such cases, it is essential to make such subsidy visible by separating the account of water utility from the municipal general account. In order to cover the cost at the transitional stage towards the financially autonomous water supply utility, such measure can be considered for the new water utility to engage in the revenue producing business such as sales of drinkable water produced by the mobile water supply unit such as developed in Japan.

Attachment III

TOR of Master Plan for Water Supply Systems in Mawlamyine and Patheingyi

TOR of Master Plan for Water Supply Systems in Mawlamyine and Patheingyi

I. Proposed TOR of Master Plan for Water Supply Systems in Mawlamyine and Patheingyi

The result of MHLW Project Team's site investigation and interviews with stakeholders indicates that it is important for Mawlamyine City and Patheingyi City to prepare the Master Plan for the improvement of the water supply management in those cities.

The Master Plan should include the following contents;

- (1) Setting of the target year and establishment of the demand forecast
- (2) Water Treatment Plant Planning
- (3) Setting of distribution blocks
- (4) Reconstruction Plan for the dilapidated piping lines (for Mawlamyine City)
- (5) Organization and Management Plan

II. Why the Master Plan is necessary for Mawlamyine and Patheingyi?

- (1) Setting of the target year and establishment of the demand forecast

In both cities, CDC's designing of the water supply facilities are made based on the current population rather than the future population. If the water supply facilities are designed in such a way, it would be quite obvious that the shortage of distribution volume of water supply will continue even after the completion of the project. The basic principles in planning water supply, i.e., the short, the medium, and the long term plans, should be introduced in accordance with the appropriate demand forecast. It is necessary to set the target year for developing water supply facilities, and the distribution capacity of water supply system should be calculated based on the projected population. The scale and the capacity of the water supply facilities should be designed based on the distribution volume of water supply in the targeted year.

- (2) Water Treatment Plant Planning

As shown in the fact that e-coli and total coli were found at both existing and planning water sources and also it is indicated the high degree of turbidity, there is a need for urgent construction of Water Treatment Plant equipped with chlorination facilities from the view point of "Drinking Water Safety". The water intake point and the water treatment plant should be studied thoroughly by consulting factors such as avoiding the possible pollution at water source for the future and securing energy efficiency.

(3) Setting of distribution blocks

In both cities, CDC's designs of the distribution pipeline network do not include the distribution network calculation. Thus, it is difficult to confirm the appropriateness of pipe's diameter and effective pipe's inner pressure. In addition, it is assumed that there are unbalanced distribution of water supply and the lack of water pressure to distribution blocks. For those reasons mentioned above, effective usage of distribution water should be secured by planning distribution blocks and calculating water network from the determined location of the Water Treatment Plant.

(4) Improvement plan of dilapidated piping lines (for Mawlamyine City)

There are many aging pipelines which exceed the standard service life of 40 years and also found many leak points. A large amount of leakage occurs while the water to be distributed is in shortage. Therefore, it is urgently needed to secure the water for distribution as well as reducing the running cost. Those issues are to be solved by grasping of distribution of water balance by means of installation of the water flow meters, measures against leakage in short, medium, and long term plans, and preparation of improvement plan of dilapidated pipelines.

(5) Organization and Management Plan

In both cities, the accounts of the water supply works are not separated from the municipal general accounts. The concept of the water account, in which the personnel expenses and O&M expenses are to be covered by water rate from residents, should be introduced, and set the water charge at the appropriate level. In addition, in both cities, there are few number of water engineer. Therefore, organization and management plan including human resource development plan for water supply works should be established.

Attachment IV

TOR of Project on the Human Resource Development for Promoting Safe Drinking-Water Supply

TOR of Project on the Human Resource Development for Promoting Safe Drinking Water Supply

I. Counterpart Authority

The counterpart authority of the proposed plan is water supply related departments in the respective development committee.

II. Purpose of the Plan

(1) Short term purpose

The short term purpose is that the inhabitants in the selected pilot area can obtain safe drinking water, and contribute to their health as a direct effect and benefit.

(2) Mid-to long-term purpose

The mid-to long-term purpose is to establish a basement to obtain safe drinking water for all the inhabitants in the target area of the development committee. By pursuing this purpose, it comes to be able to establish a basement for declaring the safety of drinking water in the target area in the future.

III. Area of Cooperation

Area of cooperation is human resources development in development committee for promoting sound management of water supply business which contributes to human health from the aspect of Water Safety Plans.

IV. Contents of Cooperation

Contents of cooperation are to carry out human resource development project for staffs from the water supply related department in respective committee in collaboration with counterparts from health and education sectors.

V. Activities

Suggested activities are as follows;

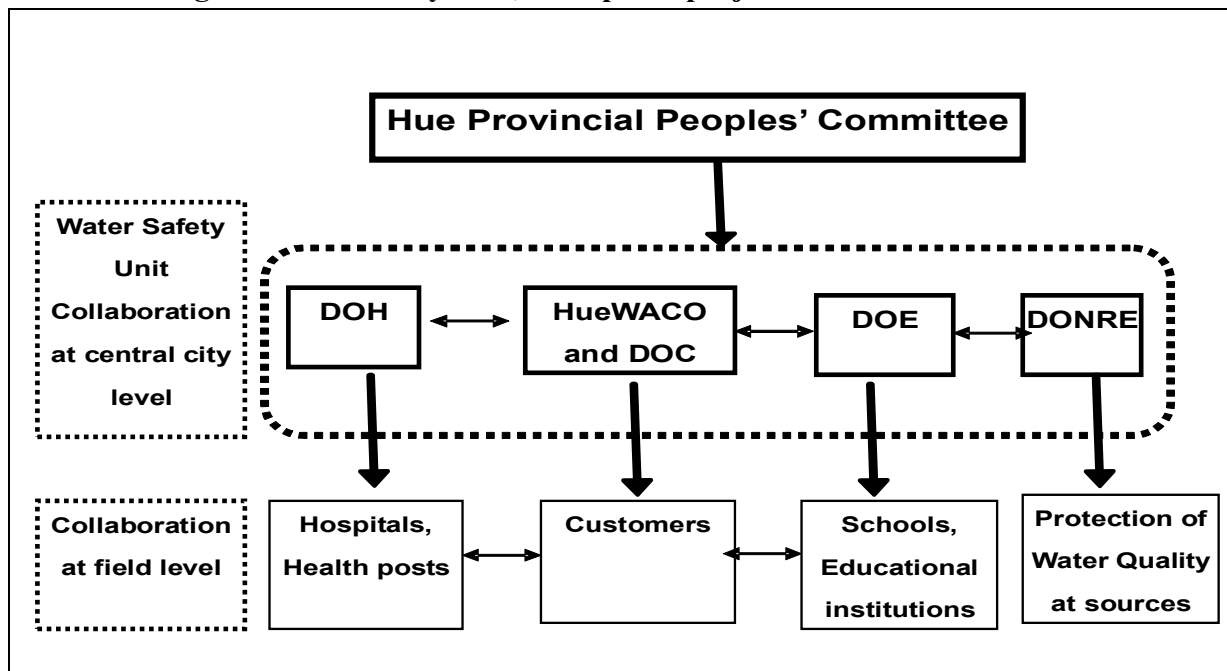
- (1) To establish Water Safety Unit in development committees in both cities in order to work toward the Declaration of Safety of Drinking Water by their own initiatives. It is expected to develop framework of collaboration with health and education sectors in development committee through this unit. (Refer to Annex 1: Image of Water Safety Unit; example of project with HueWACO)

Concrete activities by the Water Safety Unit are suggested bellow;

- To carry out some activities for citizens and staffs in the development committees for raising awareness on safe drinking water supply prior to the completion of the construction of the expected water supply facilities
- To monitor water quality at the relevant points in the water system in collaboration with health sector
- To select main primary and junior high schools as monitoring points of water quality in the pilot area, and to carry out constant monitoring turbidity, residual chlorine, and pH as minimum requirements for the basic parameter. Each parameter will be analyzed manually.
- To disseminate knowledge and raise awareness on the merits to lay on safe drinking water facilities in terms of health and cost

- (2) To carry out technical exchanges with Hue WACO to share their achievements and experiences through the Third Country Training Programme in order to work toward the Declaration of Safety of Drinking Water
- (3) To draft an action plan in order to work toward the Declaration of Safety of Drinking Water (refer to Annex 2: Case of Declaration of Safety of Drinking Water by Hue WACO)
- (4) To encourage the introduction of the IT-related system that is intended to operate water distribution control appropriately
 - SCADA (Supervisory Control and Data Acquisition) System: volume and pressure control on water distribution (including monitoring of water quality, residual chlorine etc.)
 - GIS: mapping system of distribution network
- (5) To carry out on the job training on site, and to receive staffs from development committees to Japan
The trainees will be expected to learn operation and maintenance of water supply facilities which is going to be constructed.
- (6) To carry out information exchange and to cooperate with WHO (World Health Organization) on drafting and implementing the Water Safety Plans

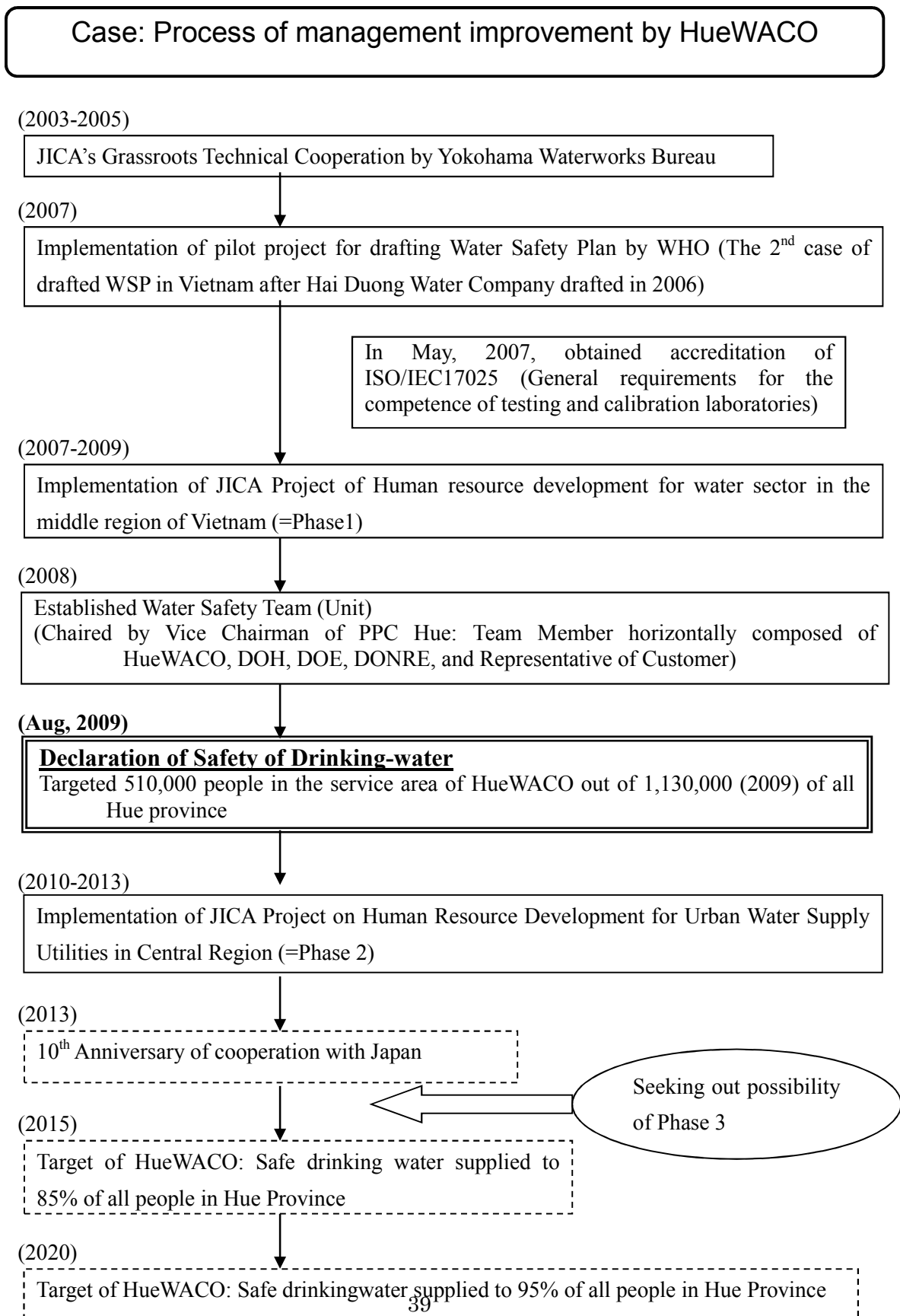
Annex 1: Image of Water Safety Unit, example of project with HueWACO



Field of charge and On-site organization of each organization
constituting a framework of the collaboration from the above Unit

Organizations	Role and Responsibilities	On-site organization
HueWACO	Operation and maintenance of facilities related to water supply management, chlorination for disinfection and water quality analysis	
Department of Construction (DOC)	Observation and guidance for urban infrastructure construction including water supply and sewerage system	
Department of Health (DOH)	Improvement of daily life and the health through health guidance, Hygiene management instruction, Inspection of quality of supplied water	Hospitals, Health posts
Department of Education (DOE)	Social development in the City through education	Schools, Educational institutions
Department of Natural Resources and Environment (DONRE)	Protection and pollution control of water quality at water sources such as lakes, reservoirs and rivers	

Annex 2: Case of Declaration of Safety of Drinking-water by HueWACO



Attachment V

Current Situation and Problem of Myanmar's Urban Water Supply Administration

Current Situation and Problem of Myanmar's Urban Water Supply Administration

I. Lack of the central government ministry which is in charge of urban water supply administration in Myanmar

Before the cabinet reshuffle on September 2012, Department of Development Affairs of Ministry for Progress of Border Areas and National Races and Development Affairs were in charge of the administration of water supply in both urban and rural areas. In the course of cabinet reshuffle, the department was reorganized as Department of Rural Development (DRD) which came to be in charge of rural water supply only and lost the administrative function of urban water supply. Since then, the development committee in each city came to handle the urban water supply business under the supervision of the State Cabinets and the Regional Cabinets in 7 states and 7 regions. As a consequence, the administrative function for urban water supply disappeared from the central government.

Currently, JICA is preparing for the Poverty Reduction and Rural Development Project under ODA Loan Program. Water supply is one of the targeted sectors, and the urban water supply business is included to target cities such as Mawlamyine and Patheingyi. JICA and Government of Republic of the Union of Myanmar agreed on the implementing agency as DRD for the water supply portion of the Project. However, it has not had the administrative authority over the urban water supply anymore.

Considering public works including water supply which directly affects lives of the inhabitants, it is appropriate for the local government to take care of such works. In this sense, it is a right direction for Myanmar to shift the responsibilities as implementing authority from the central government to the local government. Even though the practical supply works are executed by the local government, however, the role of the central government is still important on the grounds that it covers and supervises common water supply issues across the country. Thus, it is necessary to have functions on water supply administration in the central government from the following 4 reasons;

(Reason 1)

If there is no ministry in the central government to aggressively promote the diffusion of the water supply system, the decision is on the Chief Ministers of the States and the Regions. Thus, it sometimes happens that the water supply systems could develop well under where the Chief Minister is enthusiastic about prevailing those systems, while under

those who do not have interest in the water supply systems, it would be left behind. It could be an obstacle to prevail water supply systems nationwide especially in a case that the prevalence aims at preventing people from water borne diseases.

(Reason 2)

The public water supply work is one of the areas which is required to conduct duties in accordance with various technical standards including water quality standard. If there is no governmental organization that dealt with establishing standards and monitoring its state of implementation on water business, the practical work by the local government would not function well, and thus, it would not lead the improvement of the quality of service in the end.

(Reason 3)

Ideally, the water supply work should be run on full cost recovery basis in which both capital cost and O/M cost are covered by the water rate. In Myanmar, however, it is very difficult for the local government to mobilize financial resources for building water supply system. The diffusion of the water supply system has not progressed yet, and some cities of substantial size is equipped with no water supply system. In the early stage of development, it is necessary to utilize funds from the central government and the foreign organizations in order to build the nationwide water supply system. Then, it may eventually come the day to mobilize resources from the financial market by issuing local bonds in the near future since it may not be sufficient enough to cover all the costs necessary to diffuse the system by the funds from the central government and the foreign aid. Regarding the issuance of the local bond, it is not probable for the local government to make it real without back-up of the central government. In order to serve this function, it must be needed a ministry which is in charge of planning and executing those funding within the central government.

(Reason 4)

The diffusion of the water supply systems nationwide requires a lot of human resources to build, operate and maintain the water supply systems. The required human resource development can not be achieved without the appropriate planning by the ministry in charge of such matters in the central government.

Attachment VI

Presentation on 'Improving Water Supply Management'

Ministry of Health, Labor and Welfare of Japan's Water Supply Project Formation Program in Myanmar

Kazushi HASHIMOTO
Team Leader
Yachiyo Engineering Co., Ltd.

Improving Water Supply Management

February 25, 2013 Pathein

MHLW's Project Formation Program

■ Conduct a variety of surveys on specific international cooperation plans

- Technically review programs and plans in developing countries
- Provide appropriate guidance and advice
- Transfer the technical expertise of Japan
- Support developing countries to draft relevant programs and plans in order to receive supports such as financial cooperation, etc..
- Choose from the projects applied by private companies in Japan



[Projects conducted]

- FY2012: Honduras and Myanmar
- FY2011: Nicaragua and Viet Nam
- FY2010: Cambodia and Lao PDR
- FY2009: Bolivia, China and Lao PDR
- FY2008: Cambodia, Honduras and Paraguay

Targeted Cities of the MHLW's Water Supply Project Formation Program in Myanmar

Mawlamyaine

- -Capital City of Mon State with 330,000 population which is the main trading center and seaport in the south-eastern Myanmar

Patheingyi

- -Capital City of Ayeyarwaddi Region with 140,000 population which is also one of major port city in Myanmar

3

Current water supply condition of Mawlamyaine City and Patheingyi City

Mawlamyaine City

- City's water supply system covers 55% of total population.
- 45% of population rely on rain water, tube wells, dug wells and (probably) water vendors.

Patheingyi City

- There is no piped water supply system.
- Total population rely on rain water, tube wells, dug wells and (probably) water vendors.

4

Myanmar Water Supply Management Improvement Project

1. Condition of the water supply facilities in Mawlamyaine and Patheingyi

- Existing facilities and O/M (site survey + data collection)
- New project plan (JICA information + data collection)

2. Management of the water supply works in Mawlamyaine and Patheingyi

- Strategy to create a desirable good cycle of water works
- Drinking Water Safety Plan
- Financing of water works
- Water and the poor
- Institutional Framework (policy, planning, administration, guidelines and regulations, financial support, human resources development)

5

Importance of Management in Water Supply Works

Why do I think that Management Improvement is so important in water supply project in Myanmar?

Because I believe that Myanmar should avoid the vicious cycle of water works commonly observed in developing countries!

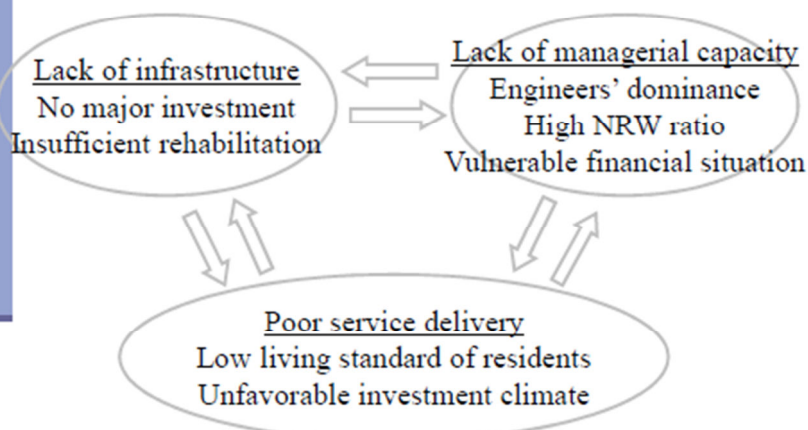
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Management problems widely observed in the water supply works in Asian cities

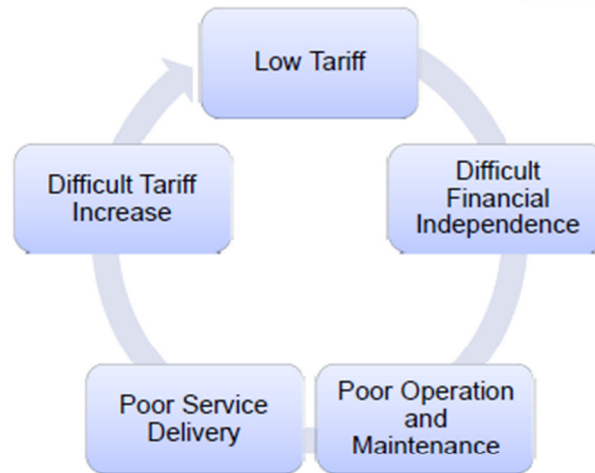
1. High NRW ratio
 - Leakage – technical + management
 - Water theft – management
2. Poor service delivery (un-safe drinking water)
 - more management than technical
3. Financially vulnerable organization (Low water tariff)
 - management
4. No water supply to the poor (low water supply coverage)
 - management + technical

7

These problems are inter-linked



(Example of linkage)
Vicious Cycle of Low Water Tariff



9

Desirable good cycle of water works



10

(Example of good cycle happening 1)
Pnom Phen Water and Sewerage Authority
 (PPWSA)

Items	1993	2006
Employee/1,000 connections	22	4
Supply capacity (m ³ /day)	65,000	235,000
Service coverage	25%	90%
Water supply hours/day	10	24
Water supply pressure (Av.)	0.2kg/cm ²	2.5kg/cm ²
House connection	26,881	147,000
NRW ratio	72%	8%
Rate of water tariff collected	48%	99.9%
Is the water drinkable?	Not drinkable	Drinkable ¹¹

(Example of good cycle happening 2)
Manila Water Company

The water supply service in the Metropolitan Manila was privatized in 1997. The concession for Manila East was awarded to Manila Water Company (J/V of Ayala Group, Mitsubishi Corp, United Utility).

● Performance Indicators of Manila Water Company

Items	1997	2010
Served population	3Million	6.1 Million
Percentage of population with 24 hour supply	26%	99%
NRW ratio	63%	16%
Employee/1,000 connections	9.8	1.4
Is the water drinkable?	Not drinkable	Drinkable ¹²

What is common between PPWSA and Manila Water Company?

- Financial independence from the central/local government
- Decentralization of decision making in the organization
- Thorough NRW Reduction

13

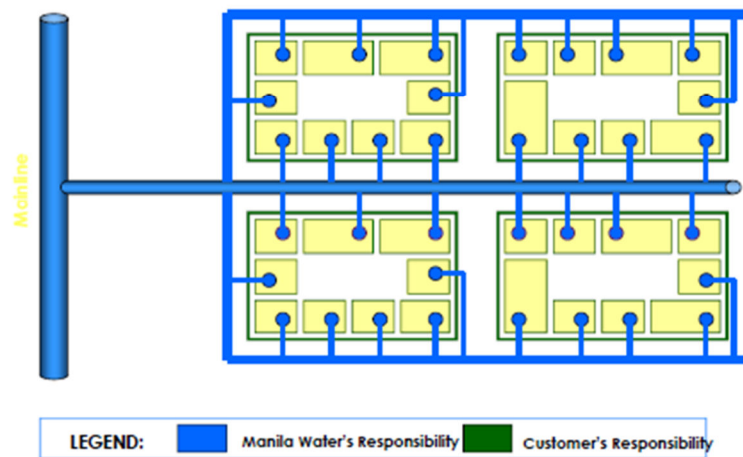
People can pay the water tariff for safe drinking water

Water Tariff Comparison (tariff/m³ depending on water consumption volume per month)

Monthly Water Consumption per household	10m ³	20m ³	30m ³
Manila Water	0.20	0.38	0.51
PPWSA	0.16	0.20	0.22
YCDC	0.11	0.11	0.11

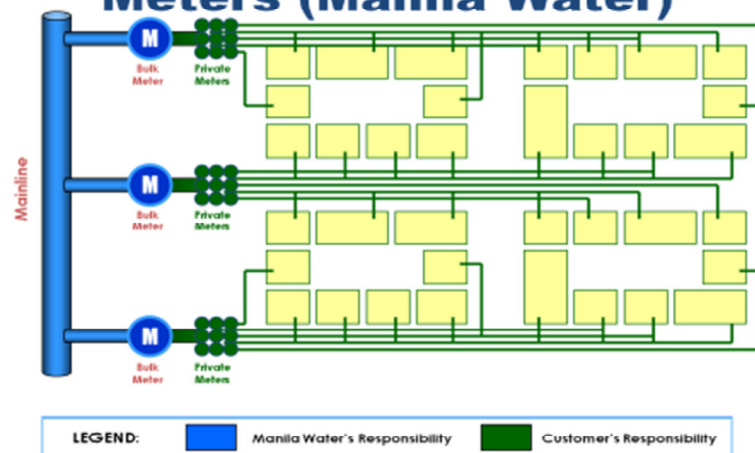
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Standard Connections



15

Bulk with Clustered Private Meters (Manila Water)



16

Clustered Private Meters (Manila Water)

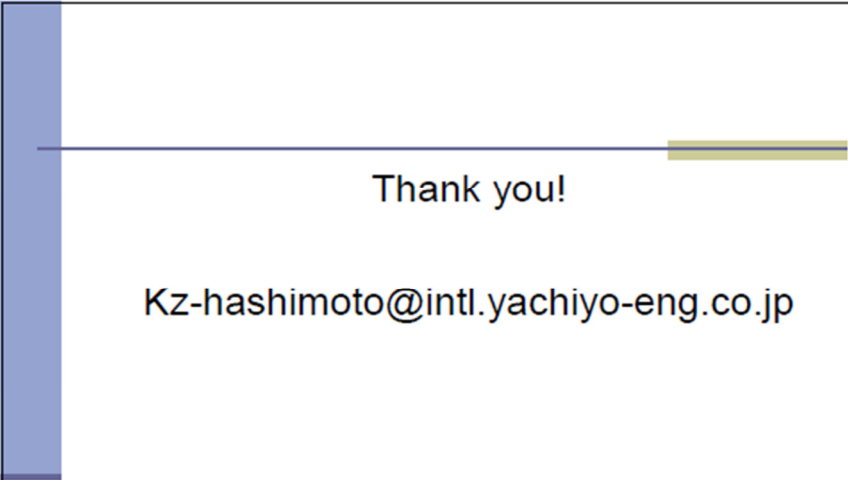


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Composition of our Project Team

- **Ministry of Health, Labor and Welfare (MHLW)**
 - nation wide water supply administration
- **Yachiyo Engineering Co., Ltd**
 - leading consulting and engineering company specialized in infrastructure
- **Yokohama Water Works Bureau**
 - experience of JICA Project for 'Declaration of Safety Water' in Hue, Vietnam
- **METAWATER**
 - leading water engineering company

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Thank you!

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Attachment VII

Presentation on
‘Introduction of Case of Declaration of Safety of Drinking-water’

Seminar on
**WATER SUPPLY, SEWERAGE AND DRAINAGE
SECTOR PROGRAMME IN MYAMMAR**
18 February, 2013

Introduction of Case of Declaration of Safety of Drinking-water



Shigeru SUGAWARA
Manager for Project Development
Project Development Division
Business Promotion Department,
Waterworks Bureau
Yokohama City Government



Water is Life

Our Mission

Safe Drinking-water for all people

We understand Situations in Myanmar

Within 10 Leading Causes of Morbidity (2010) in Myanmar

No 4. Diarrhoea and gastroenteritis of presumed infectious origin (5.0%)

Expected improvement (Myanmar Health Vision 2030)
Indicators related to future generation

	(2001-2002)	2011	2021	2031
Infant Mortality Rate/1000 LB	59.7	40	30	22
Under five Mortality Rate/1000 LB	77.77	52	39	29

Source: Health in Myanmar 2012 (Ministry of Health, Myanmar)

National Surveillance System focuses on Waterborne diseases

Diarrhoea
Severe diarrhoea (Cholera)
Dysentery
Viral hepatitis

One of the objectives

- To ensure that every citizen is free from diseases

To realize objectives

- Enhancing disease prevention activities

(Myanmar Health Vision 2030)

**Role and
Responsibility of
Public Water Utilities**

**Collaboration &
Contribution**



Motivation & Driving Force for International Contribution

Why we Yokohama promote?

Because It's our Mission!

Responsibility of a water supply utility

“Water Supply Vision”

- One of the long-term policy targets of JP

Human Resources Development

“Human resources development vision of the YWWB”

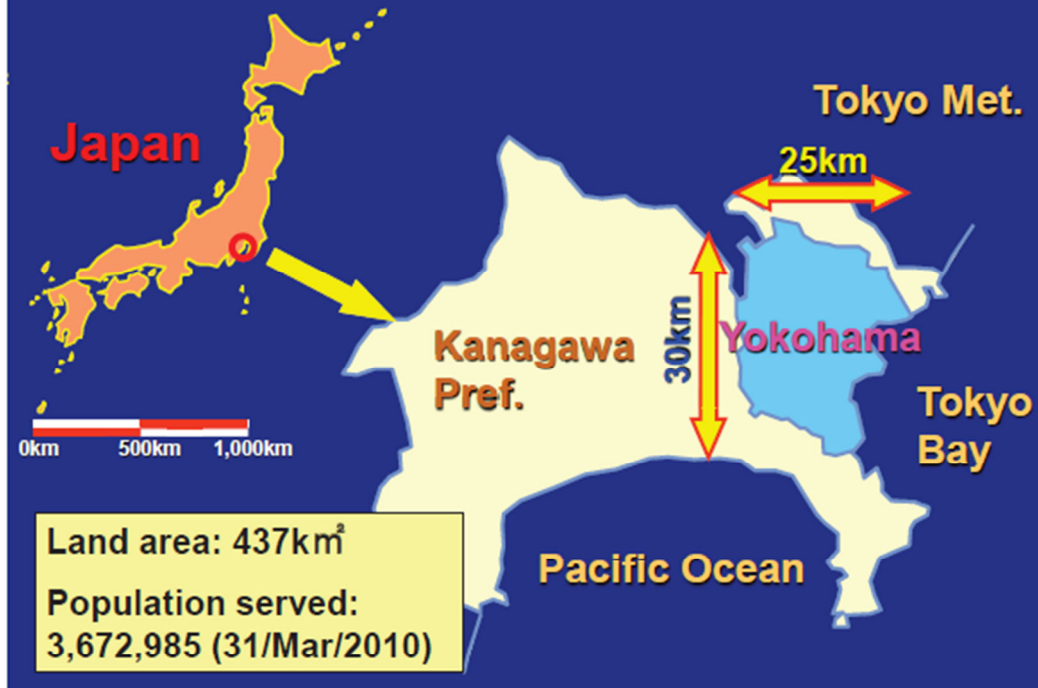
- Developing human resources who can contribute to the international society

Policies of the Yokohama City Government

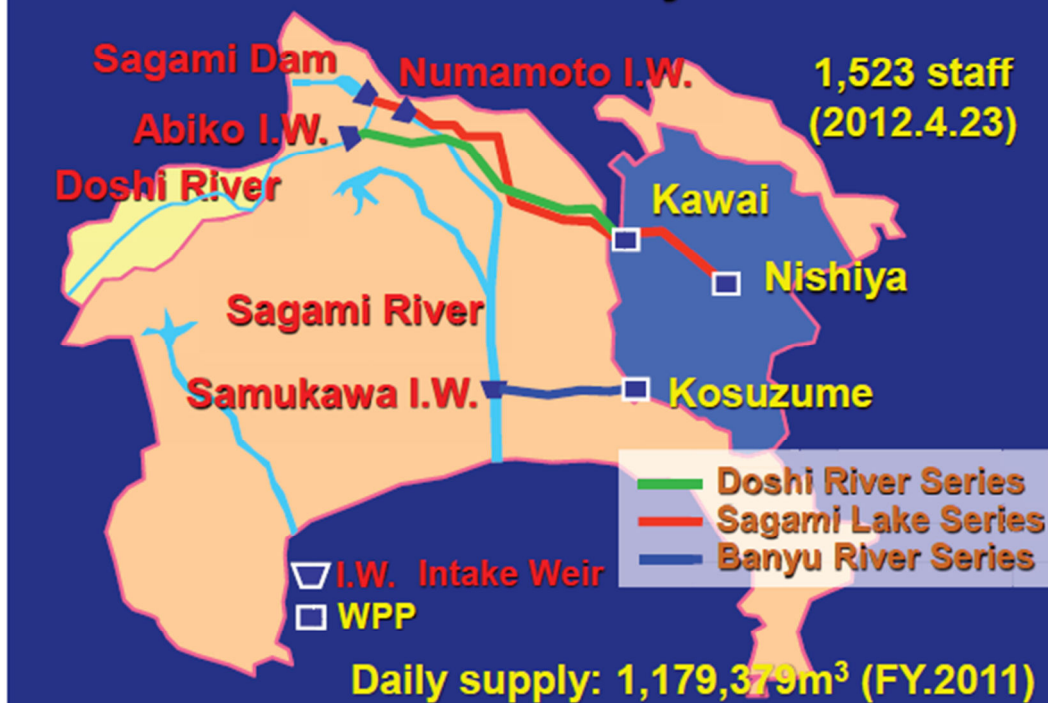
“Long-term Vision”

- Hub city for gathering and exchanging world knowledge
- Creative urban city for expanding a place of new field

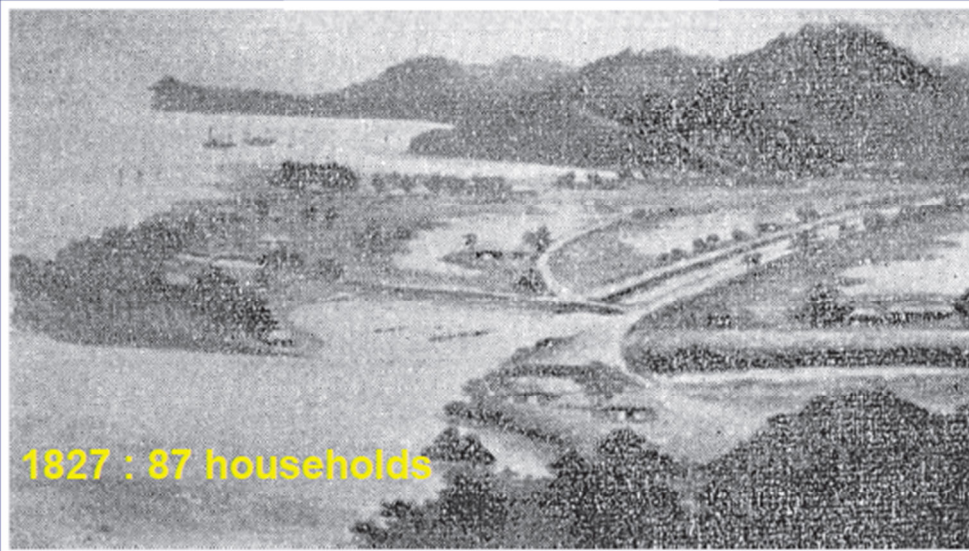
Location of Yokohama



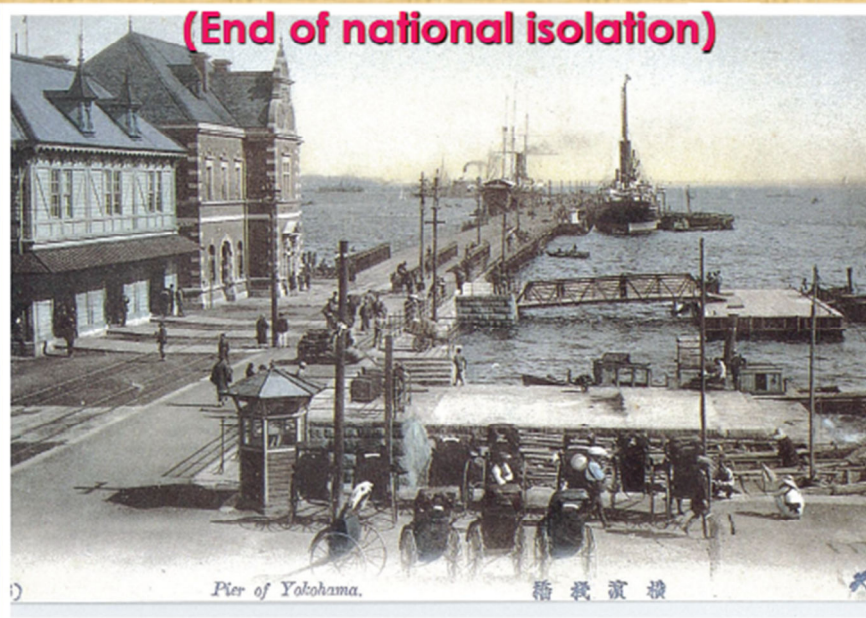
Intake & Treatment Facility of Yokohama



Yokohama: small fish village (18 Century)



1859 : JP government opened Yokohama port
(End of national isolation)



1883 : Population was 70,000, short of water for people¹⁰

Japanese experiences/ challenges for public health promotion against waterborne diseases

1878 **Cholera** was prevalent in Japan

1886 **Cholera** was prevalent again

1890 Establishment of Waterworks
Ordinance

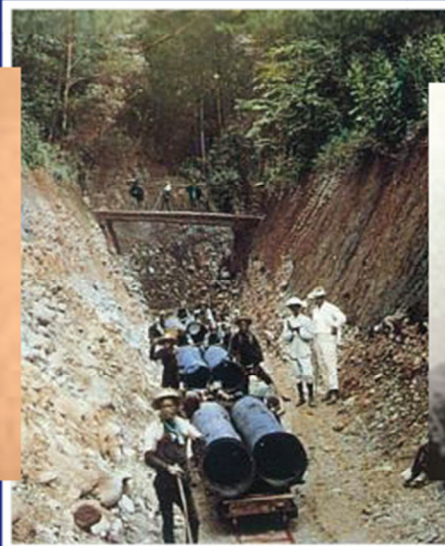
1937 **Dysentery** caused by water

1957 Enactment of Waterworks Act

Start of construction of conveyance aqueducts in Yokohama by H. S. Palmer (1885)



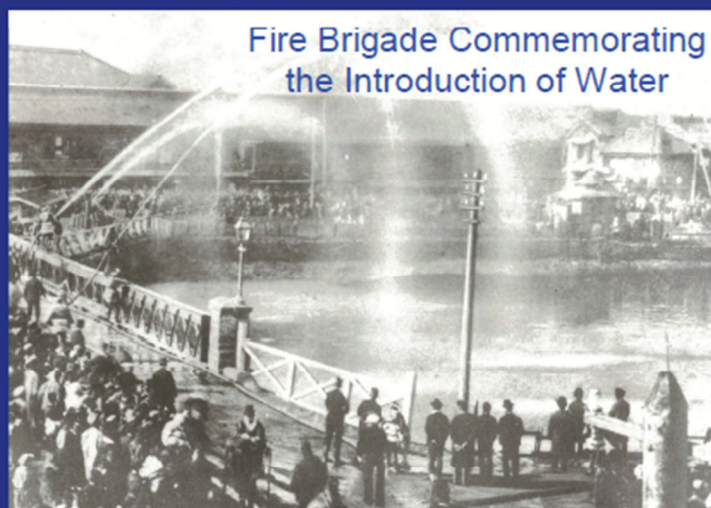
Mr.H.S.Palmer



Mr.Zentaro Mita

CIP 18 inch x 2 Lines

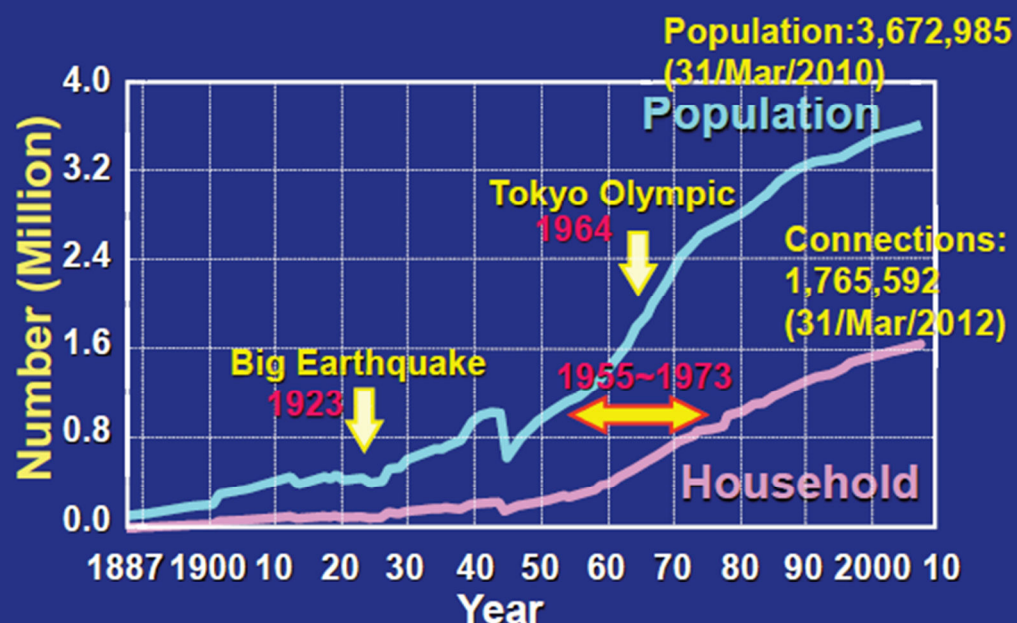
First Modern Waterworks in Japan **Started in Yokohama in 1887** **Water supply using iron pipes, slow sand filtration**



Fire Brigade Commemorating
the Introduction of Water

(Daily max. 5,720m³ and 106,200 pop.)

Change of Population & Households in Yokohama





International Contribution as Assets for Yokohama

40 years' of experience: Rich international experience and connection

- 1973 Dispatch of the **first** expert to Afghanistan
- 1987 Start of the acceptance of the overseas trainees in commemoration of the 100th anniversary
- 1994 Establishment of the international cooperation committee
- 1999 Collaboration with the CITYNET (Intercity cooperation network in Asia and Pacific)

- Collaboration with JICA

In September 2002, the JICA Yokohama International Center was established in the Minato-Mirai district in Yokohama City.

- Acceptance of overseas trainees

2,250 trainees from 110 countries (as of March 31, 2012)

- Dispatch of experts 210 bureau staffs to 29 countries

Sharing experiences

INTERNATIONAL CONTRIBUTION CASES

Focusing on Water Safety with HUE in VIETNAM

“Safe Water Declaration” ensuring
that people can drink water directly
from the tap, Aug, 2009

Result through Cooperation

“Safe Water Declaration ” was announced in Hue Province
(Aug, 2009)

**Citizens
enjoying
Water from a
Public Tap**



Targeted 510,000 people out of 1,130,000 (2009) of all Hue
province in the service area of HueWACO

Series of Activities with Hue, Vietnam

2003 ~ 2005
Start of
cooperation

JICA Grass root technical cooperation "Partnership Program" with Thua Thien Hue Construction and Water Supply State One Member Company Limited (COWASU)

2007
Collaboration

Implementation of pilot project for drafting **Water Safety Plan** by WHO

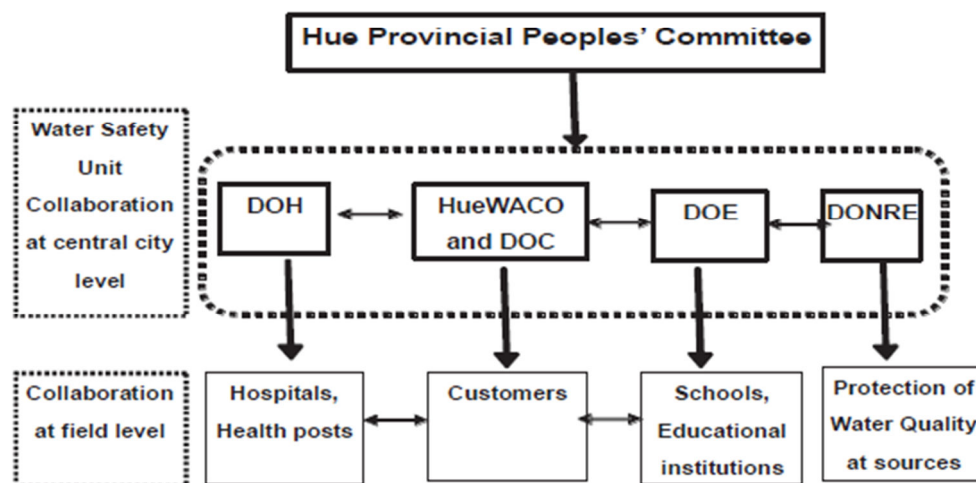
2008 Efforts
by HUE

Established **Water Safety Unit**, chaired by Vice Chairman of PPC Hue: Member composed of HueWACO, Health, Educational sectors, Representative of Customer, etc.

2007 ~ 2009
Deepening of
exchanges

JICA Technical Cooperation Project with Thua Thien Hue Construction and Water Supply Company (HueWACO), "Project of Human resources development for water sector in the middle region of Vietnam"

Image of Water Safety Unit





Input Total Management Experiences of Water Supply Services by JICA Project for *“Declaration of Safety Water”*

Purpose: Improvement of Capacity of HueWACO

Fields: Water Treatment (Filtration),
Water Quality Management (Disinfection),
Distribution Management,
Human Resource Development/ Personnel
Management, Customer Service

Dispatched Staff: 18 from YWWB

Received C/P: 29 from HueWACO

Outcome: Direct Drinking Water from Tap



Key activities for the Declaration: **Implementation of Water safety Plans**

Water Source to Tap: All process in water supply system

Promotion team: Involvement of staff, including executive levels

Multi-sectoral approach: **Total management of services**

- (1) Engineering measures (O/M): Filtration and Disinfection, Pressure control, Leakage control, Water quality control, etc.

Continuous monitoring: Observation, Manual analysis (Turbidity, Residual chlorine, etc.)

- (2) Non-Engineering measures: Campaign/ Awareness for citizens, School children, HRD, etc.

One of the Input examples

Visiting schools



Key to Success

- *Initiative by the Government promoting institutional framework (Water Safety Unit)*
- *Decision making (commitment) by top management after Executive forum for Enhancing Sustainability of Urban Water Service in Asian Region(YOKOHAMA FORUM 2010)*
- *Partnership driven by Two Wheels (HueWACO & YWWB): pier to pier relationship*
- *Approach for HRD by total management of water supply services*
- *Collaboration among Water, Health and Educational Sectors, and related donor agencies (WHO), etc.*
- *Water Safety Plans useful tool for securing safe water*

Our Mission



**Safe water for children,
The future generation of Myanmar!**

Thank you for your attention!



I am Hama-pyon,
Mascot of YWWB

