

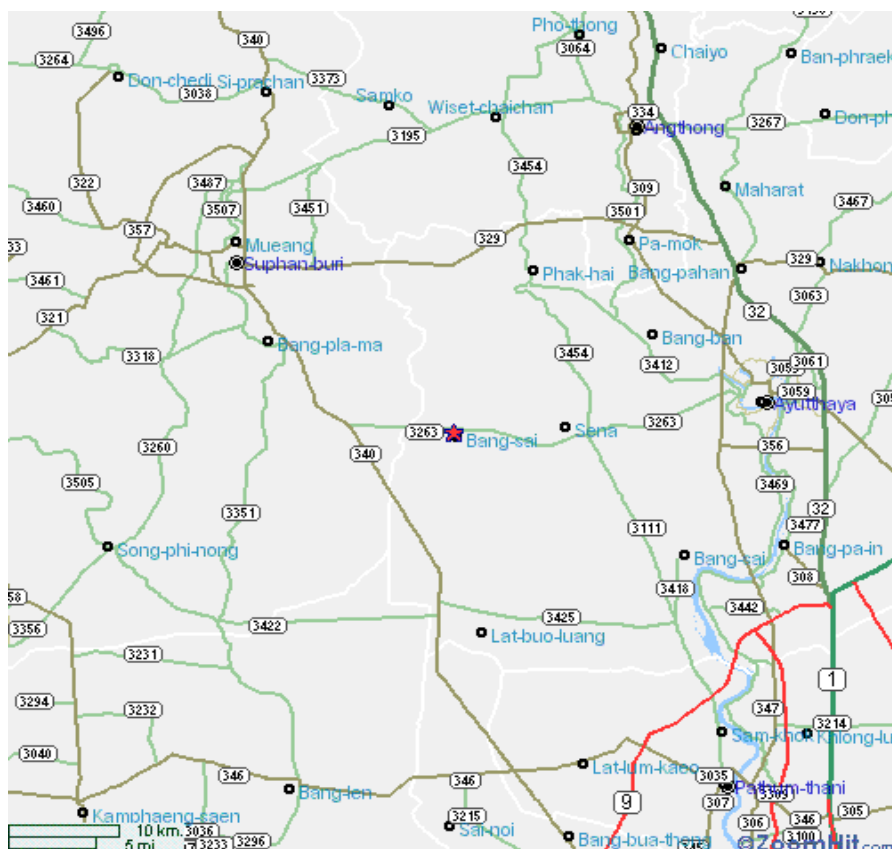
CHAPTER 3

Overview of Rainwater Utilization in Bangsaiy Municipality

3.1 General Profile

3.1.1 General Conditions

Bangsaiy Municipality was selected as the study area. It is one of 34 municipalities in Ayutthaya province and located western from the center of province. In the municipality area, there are 19 villages situated in three sub-districts which are Bangsaiy, Taoloa and Kaewfah. In Bangsaiy, Taolao, Kaewfah subdistricts, there are 4, 9 and 6 villages (Moo) respectively. The area of the municipality is 5.5 km² or 3437.5 Rai³. A map showing location of Bangsaiy district and the boundary of municipality which is illustrated by the dash lines are shown in Figure 3-1 and Figure 3-2 respectively.



³ Rai is a Thai unit of area. One unit of Rai is equal to 1,600 s.q.m.

Figure 3-1: Bangsai Municipality
Source: www.zoomhit.com

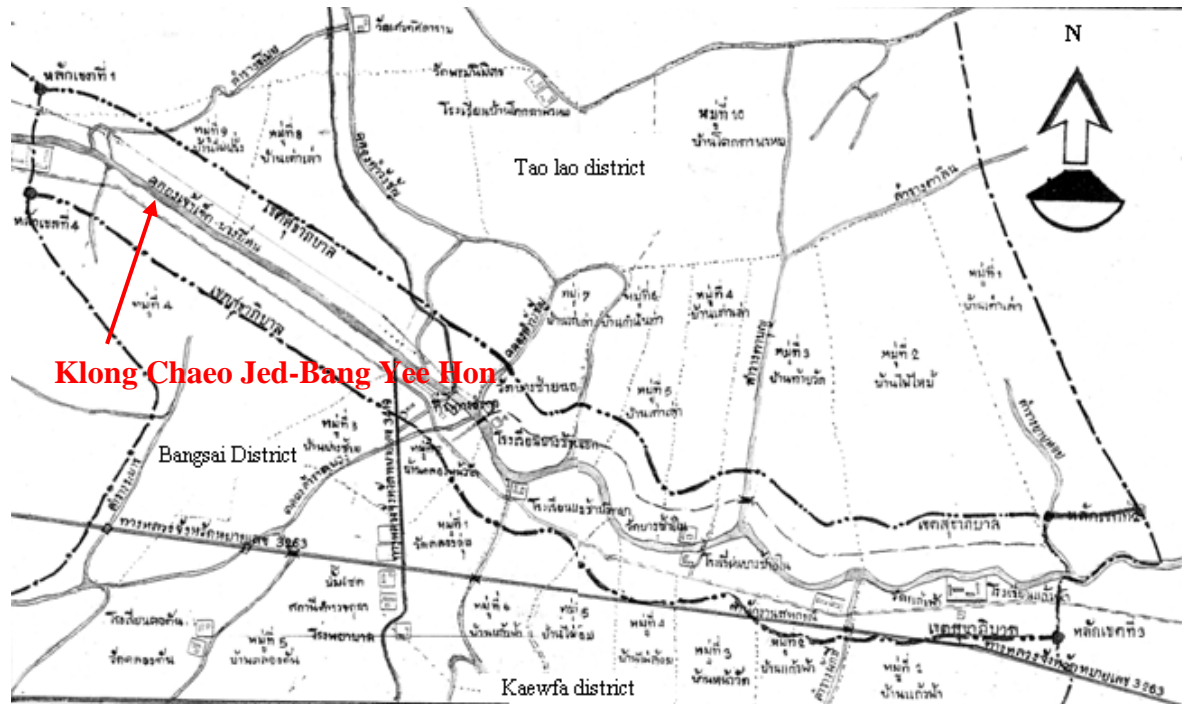


Figure 3-2: Boundary of Bangsai Municipality
Source: Division of Secretary, Bangsai municipality

The study area is located on the flood plains which Klong (canal) Chaeo Jed-Bang Yee Hon passes through the central municipality area and has been served as the main surface water. There are approximately 1,550 households in municipality area with a population of 5,403, out of which 2,646 residents are males and 2,757 are females⁴. In the past, all population lived along the canal because the canal played the important role as the main transportation route and water source for agriculture. Despite being an efficient transportation route in the past, some people have settled in the communities where roads and modern facilities have been constructed nowadays. Thus, there are two main communities which are old canal community and modern city community where roads are more convenient and widely used for transportation.

⁴ This information is based on a census survey in 2008.

Agriculture and farmings are the major occupations in municipality. The main crop is rice field, while fruits and vegetables are planted for domestic consumption in some areas. The agriculture area in Bangsaiy municipality is 1,400 Rai or 40 % of all municipality area (3,500 Rai). The other occupations are wholesale, services, and household industries.

In accordance with development strategies in the past 3 years, fundamental facilities such as roads, sanitary and traffic systems have been rapidly developed. There are four schools which are responsible for elementary and secondary levels. The other public services consist of 1 post office, 2 banks, 1 cooperative market, 1 health station, 1 private clinic, and 2 drug stores. The administrative units of municipality are divided into legislative section and management section and the mayor is responsible in municipal government. The per capita annual gross revenue is in average of 2,000 to 30,000 THB, while the total gross domestic product of the municipality is about 116.2 million THB. The land use in Bangsaiy municipality can be categorized as shown in Table 3-1

Table 3-1: Summarization of Land Use in Bangsaiy Municipality

Type of land use	Area (Rai)	%
Agricultural area	2,292	66.66
Farm	5	0.15
Household	635	18.47
Road	90	2.61
Temple	44	1.29
School	39	1.13
Surface water	100	2.91
Public area	200	5.82
Other	33	0.96
Total	3,438	100

Source: Strategic Plan 2010-2013, Bangsaiy Municipality

3.1.2 Climate and Rainfall

Ayutthaya Province has the same climate as other provinces in the central region of Thailand, that is, under influence of the northeastern monsoon in winter and the southwestern monsoon from the Gulf of Thailand. As a result, the rainy season is very long. The annual average temperature is 26.7 to 28.9°C. The highest temperature is 31°C while the lowest one is 24°C. The average rainfall of the province is approximately 1,342.7 mm. which the average rainfall per month ranges from 5.1 to 269.2 mm. There are three main seasons as follows:

- Rainy Season: The season begins in May or the beginning of June and lasts until October. The rain falls and more frequently falls in August or September. Rainfall in Ayutthaya province is influential due to the southwestern monsoon and depression storms from South China Sea. In October, however, the rain falls less. The rainy season usually lasts approximately for 5 months.
- Winter: Winter begins in November and ends in January. From November, the season is changed from rainy season to winter as the southern monsoon is weakened and replaced by the northeastern monsoon. However, the temperature is not significantly decreased. The winter usually lasts for 3 months.
- Summer: This season begins in February and ends in April. From February, as the northeastern monsoon is weaker, the climate is hot and hottest in April due to the radiation of the sun and the high pressure covering from South China Sea and the Pacific Ocean, which is the origin of the southeastern monsoon blowing to the Gulf of Thailand. However, Ayutthaya province is not very hot as there are many rivers and canals. The summer lasts usually for 4 months.

3.1.3 Water Resources

Noi River is one of several rivers which flows pass Ayutthaya province. It is separated from the right side of Chao Phraya River in Muang District, Chainat province and is merged again with Chao Phraya River in Ratchakham Sub-district, Bang Sai District. The river is totally 145 km long while flowing passes Ayutthaya Province for 30 km. Klong Chao Jed-Bang Yee Hon is the main canal passing through the centre of Bangsaiy municipality. There are other six canals also serving the municipality for the agriculture and consumption purposes which are Lum Wang Chan, Nom Mor Keang, Kum, Nong Sone, Cor Tun and Don Puck Kom. In the past, the flooding period took usually 4-5 months whereas the water level would be highest in December, then it would be decreased. When the water was completely downed, it was the time harvesting period was started. However, such abundance in the flooding period has been lost after the construction of Chainat Dam or Chao Phraya Dam in Chainat Province since 1957 with the purpose to develop the areas on the both banks of Chao Phraya River and other minor rivers, thus there is no more the flooding period at present.

Groundwater is another water resource in this municipality and the main use is mostly for consumption. According to the information of groundwater wells in Bangsaiy District

recorded as shown in Table 3-2, it can be recognized that people consume groundwater as a main source of water only.

Table 3-2: Groundwater Information in Bangsaiy District

Location	Depth of well (m)	Normal water level (m)	Decreasing water distance (m)	Water flow (cu.m./hr)
Klong Kum	168.0	9.0	45.0	3.40
Klong Tun	144.0	9.0	48.0	4.45
Bangsai	168.0	9.0	38.0	3.40
Sai	201.0	18.0	70.0	4.0
Kor Tarn School	156.0	9.0	15.0	22.73
Veteran agriculturist Community	184.5	15.3	8.26	18.01
Moo Sakae Village	192.0	25.0	50.0	10.0
Bangsai Police Station	170.0	9.0	3.0	50.0

Source: <http://map.dgr.go.th>

3.2 Provision of Water Supply and Drinking Water Services

3.2.1 Water Supply

The water resources for domestic use in Bangsaiy Municipality area generally come from groundwater. However, the communities along the canals use water from canal for gardening and washing while groundwater is used for consumption. Generally, authorized organizations such as Department of Groundwater Resources, local administrations or private enterprisers search for groundwater wells and install groundwater pumping systems for the communities. In Bangsaiy Municipality, there are 18 groundwater wells, of which 9 wells have been managed and maintained by the Division of Water Supply of Bangsaiy Municipality while the other 9 wells are under responsibility of village committees where the wells are located in.

The groundwater wells managed by the city municipality are located in Bangsaiy and Taolao sub-districts and serve for 600 households. Each is a medium-sized well which suits for approximately 51-120 households. Out of the 9 wells, there is only one well located in Taolao sub-district which a treatment system has been installed. The water pumped up from the other 8 wells is distributed via piping systems without any treatment. The schematic model of groundwater supply system of Bangsaiy Municipality is illustrated in Figure 3-3. The Bangsaiy Municipality strategic plans of 2010-2012 are emphasized on the improvement of

quality of life including the development of water supply systems. In the plan, it is stated that there are 14 projects relevant to improvement of water supply services being executed as follows:

- 4 projects of constructing new groundwater wells;
- 5 projects of water supply piping systems and groundwater wells maintenance; and
- 5 projects of installing water treatment systems for quality improvement.

At present, the municipality charges water tariff at the rate of 4 THB per cu.m. and the fee for maintaining water meter at 5 THB per month. According data recorded by the municipality in 2009, the average amount of water supply used in first half of the year is 12,400 cu.m./ month and the revenue collected from providing water supply services including water meter fees is 30,616 THB.

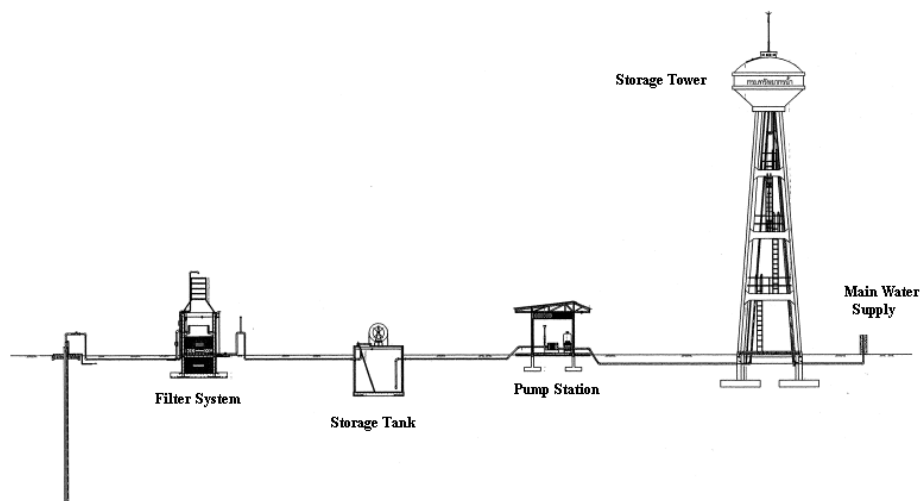


Figure 3-3: Schematic Model of Medium Sized Groundwater Water Supply System
Source: Department of Water Resources (2003)

As mentioned previously, a half of the groundwater wells in the municipal area is administered and managed by village committees where the wells are located. Each village committee for water supply is established to collect fees, regulate policies and maintain the systems. The water supply tariff charged for these communities is 4 THB per cu.m. In some villages, the profits gained from collecting the fees are spent for remuneration of staff who has the duty for collecting the fees and the improvement of water quality such as treatment system installation. Not all the villages are successful in administration and could have profits. Transparency of the administrative system is a key success factor.

3.2.2 Drinking Water

The piped water produced from groundwater is not well treated and qualified for drinking. The water quality is often poor due to excessive contaminations of bacteria and chemicals like cadmium, iron, lead, manganese, and excessive suspension. Apart from using the piped water, rainwater is also used as a source of drinking water. However, quality of rainwater is still doubtful for most people and a further treatment is a common practice. Being as such, majority of inhabitants in municipality treat water before drinking. In general, the inhabitants treat the piped water or rainwater by boiling or purifying it by a small-scale purifying device at home. An alternative in access to drinking water is to buy bottled water in which its commercialized volumes are of 1 liter and 20 liters (1 gallon). Potable water in municipality is produced by private vendors and community-own-enterprises. Retail prices from the private vendors are generally 5 THB more expensive than the community-own enterprises per gallon. This is due to the better quality of production, delivery service and the registration with the authorized organizations such as Food and Drug Administration. Ground water is used as a source for both suppliers. For public institutions like schools and temples, a water purifier and buying bottle water are also common practices.

3.3 *Rainwater and Its Utilization*

Rainwater has been a valuable water resource which can be easily gained on site. In Bangsaiy municipality, rainwater utilization can be categorized into two main purposes including agriculture and domestic consumption.

- *Agricultural purpose*

To minimize land degradation and sustain crop productivity in communities, management and efficient utilization of rainwater is important. The Office of Central Land Consolidation, Department of Royal Irrigation, is responsible for the management of Klong Chaeo Jed-Bang Yee Hon. An irrigation canal and maintenance program has been established in order to control and manage the irrigation water from Klong Chaeo Jed-Bang Yee Hon. Several irrigation basins have been built for water storage in dry season. In accordance with the survey data from the Department of Agricultural Extension in 2006 as shown in Table 3-3, it was found that some farmers also built their own irrigation basins for both agricultural and domestic purposes.

Table 3-3: Number of Private Irrigation Basins in Bangsaiy Municipality

Sub-districts	Number of basins	Number of usable basins	Available water accounted in number of days
---------------	------------------	-------------------------	---

Kaewfah	7	7	2,555
Taolao	16	10	3,650
Bangsai	15	8	2,920

Source: Department of Agriculture Extension (2006)

- *Domestic use purpose*

At present, the water resources provided for domestic use in Bangsaiy municipality area mostly come from piped water systems pumped from the groundwater wells. However, the rainwater harvesting systems have been put in place from the ancestors many thousand years ago. Mortar jars and tanks have been the most popular storage devices found in households and public places even though the purpose for utilization is not for drinking water nowadays. The maximum size of jars found in the municipality has a capacity of 2 cu.m. and two or more jars are used in a household. These rainwater storage devices were received from government organizations about 10 years ago when Royal Thai Government formulated its policy on water resources development in rural area to store the potable water in dry season. Roof catchment systems have been brought to collect rainwater by using rooftop areas in which rainwater can be collected into the jars and tanks to provide individual households with adequate water supply. By directing the rainfall on the roof areas to flow through the simple collection gutter arrangements, water that would otherwise join surface run-off can be gainfully utilized. Prior to the harvesting procedure, it is essential to clean the roof area by rainwater when it starts to rain. The jars may also become breeding places for mosquitoes if the containers are not kept closed. By this reason, the local residents ususally cover the jars and tanks by a lid, net, thin fabric or even mesh. Such practice can also prevent dropping of physical contaminants to keep the stored rainwater clean.