



Sustainable
Lifestyles & Education
PROGRAMME



IGES Institute for Global
Environmental Strategies



Environment Protection
Research Center

Baseline Survey Report

Survey about the water demand and habit of household in Danang city

Project:

A new approach to reducing greenhouse gas (GHG) emission through changing lifestyle toward water and electricity saving in urban households in Danang, Vietnam.

Organized by

Danang University of Science and Technology (DUT)
Environmental Protection Research Centre (EPRC) - DUT

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1. Goals

The achieved data of the water use (water devices and electric equipment) in the daily activities of selected and demonstrated households in Danang city.

Assess the effectiveness of the water use equipment and propose the passive/ active measures to promote on water saving in households

2. Content

2.1. Objectives

Water supply system and devices of households are surveyed and monitored. For details, there are: water indoor network; Measure the water use in different purposes; Measure the electrical appliances using water in houses.

2.2. Contents of survey

Selected the households:

- Selection criteria: (i) *The consent of the household;* (ii) *Water consumption;* (iii) *Water supply system of household.*
- Selection process: Based on the list of 150 surveyed households through the questionnaire, screened and selected 30 potential households to meet the above requirements. Discuss with household's owner about the measurement and select 15 households to monitor water and energy consumption.

Implementation:

- Install the monitoring equipment, flow meters and counter for each type of equipment in the household/apartment. For details: (i) *Water consumption: Kitchen, shower, toilet, faucet, laundry & other (cleaning house and garden);* (ii) *Electrical appliances using water: kettle, pump, washing machine & water heater*
- Instruct the house owners to record the data from flow meter, counter of installed devices. Monitoring time: 7 days continuously (cover the weekend).
- Collect data for observation, data processing and write report.

Implementing time: November 14th 2017 to April 2nd 2018.

2.3. Measurement methods

Survey the water network indoor: Discuss with household members and field-check the water equipment in specific house.

Determine water/ electricity consumption

Water consumption and purposes, based on the monitoring data per each using activity and the number of daily use. Meter and installing pictures in kitchen, faucet, shower, toilet faucet, etc. shown as follows:



Counter



Flow meter



Electricity meter Fluke 43



Electricity meter Fluke 1736

Figure 1. Meters



Flow meter for kitchen



Install meter for faucet



Measure shower/ bath



Counter
in toilet

Flow meter

Figure 2. Measurement of water appliances

Data processing, evaluation and proposed measures

Data processing from the observed data in different purposes, compare with the water consumption through Danang Water Company (DAWACO) water meter (or water bills).

Evaluate the amount of electricity/water consumed: based on the type of electrical/water appliances has installed, the needs and habits, as well as the satisfaction of the users.

3. Results

3.1. Indoor water system network

Household

Water supply network: there are some water network types that household in Danang city installed (Fig. 3). In order to preventing the shortage water or low-pressure incident from Dawaco system, water storage (in top or bottom house) would be used with pump.

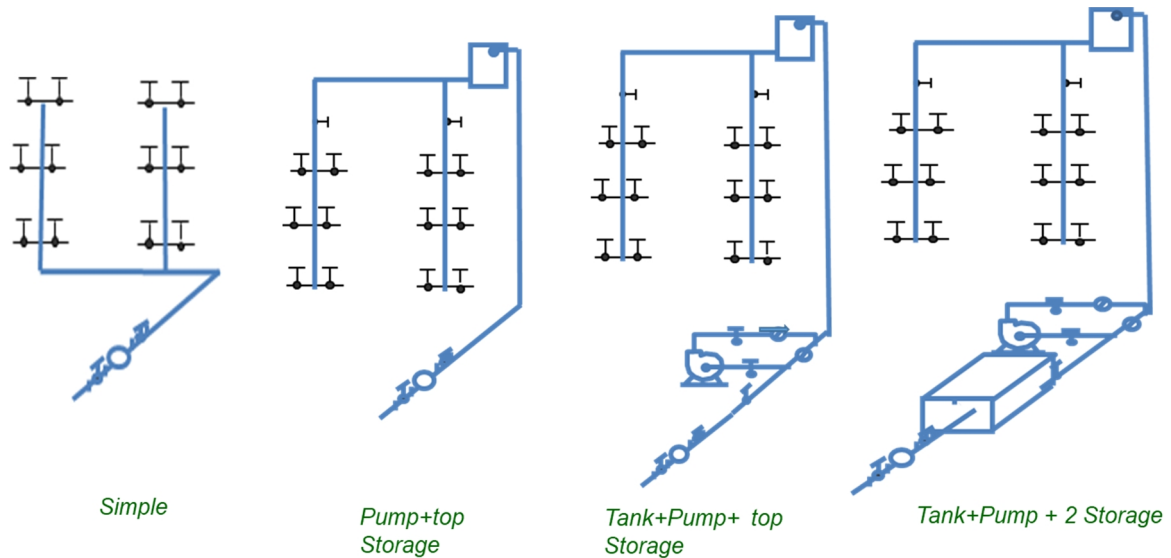


Figure 3. Water supply network diagrams of household

In each house, the monitoring water consumption was conducted and check the different between observed data and DAWACO meter. There are some cases of high different (10% and above) as shown in Table 2, the suggestion of detail check and careful investigation were taken place and show that there are the leaking position or broken pipes in the houses.

3.2. Water use habit and consumption

Water demand

The results of the average water consumption of each type of equipment used in 15 households and the water flow with the mean, maximum and minimum values shown in Table 1.

Table 1. Water consumption in different activities

Activities	Flows	Mean	Max	Min.
	(L/d/household)	(L/d/cap)	(L/ d/cap)	(L/ d/cap)
Toilet	91.1	21.5	58.6	1.5
Shower	121.6	28.7	69.7	6.9
Faucet	23.5	5.6	10.0	0.0
Laundry	104.2	24.6	81.6	8.9
Kitchen	139.1	32.8	112.3	13.5
Others	41.4	9.8	40.9	0.0
Total	520.9	123.0		

The results show that the average water use per capita per day is 123 L/d/cap, 12% lower than the city average (140 L/d/cap).

Water use habits

Details of monitoring results for water use habit shown in Table 1 and Fig.4. Water use habits classified in the survey: Toilet; Shower; Faucet; Laundry; Kitchen; and other purposes.

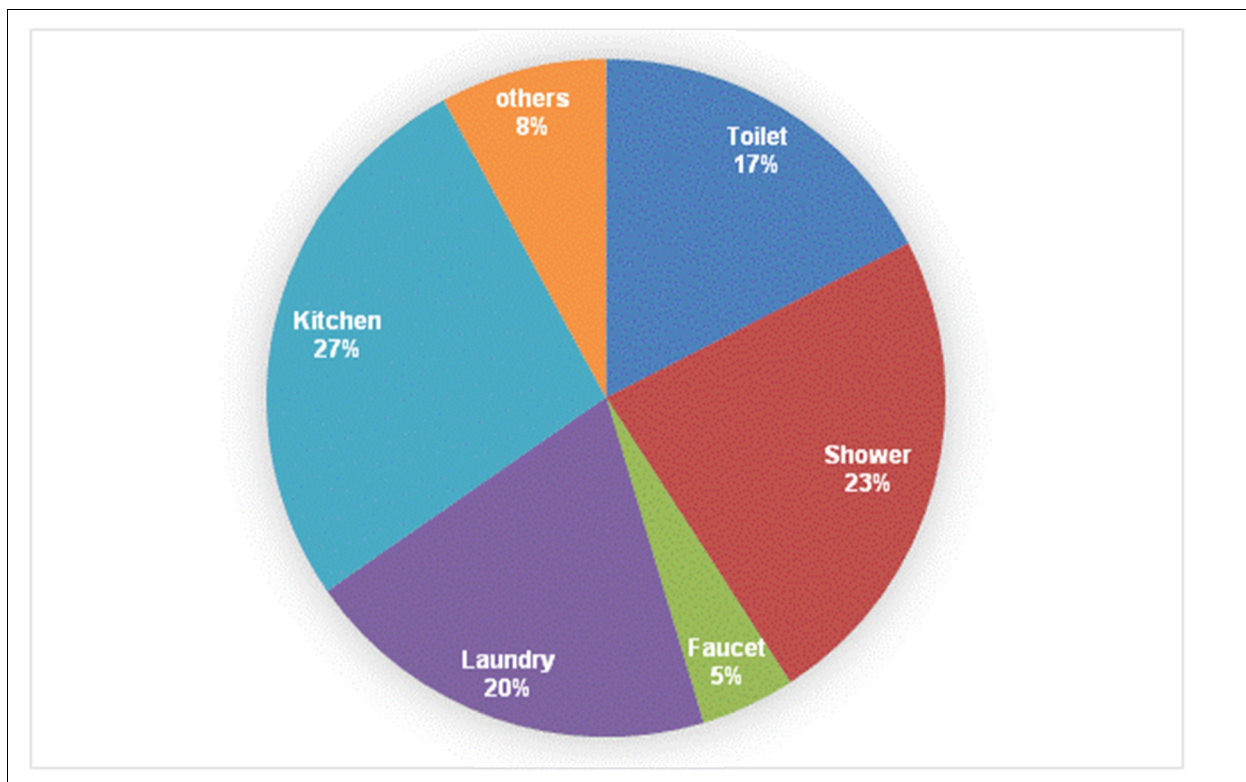


Figure 4. Water use rates for household purposes

The data show that 4 activities have the highest and similar water consumption, Kitchen (around 27%), shower (23%), Laundry (20%) and Toilet (17%).

For details, the data of water use in 15 household shown in Fig.5, 6

The results show that the average water use for kitchen is the most with average 32.8 L/d/cap, while it takes around 20% in total for water use in shower, laundry and toilet purpose.

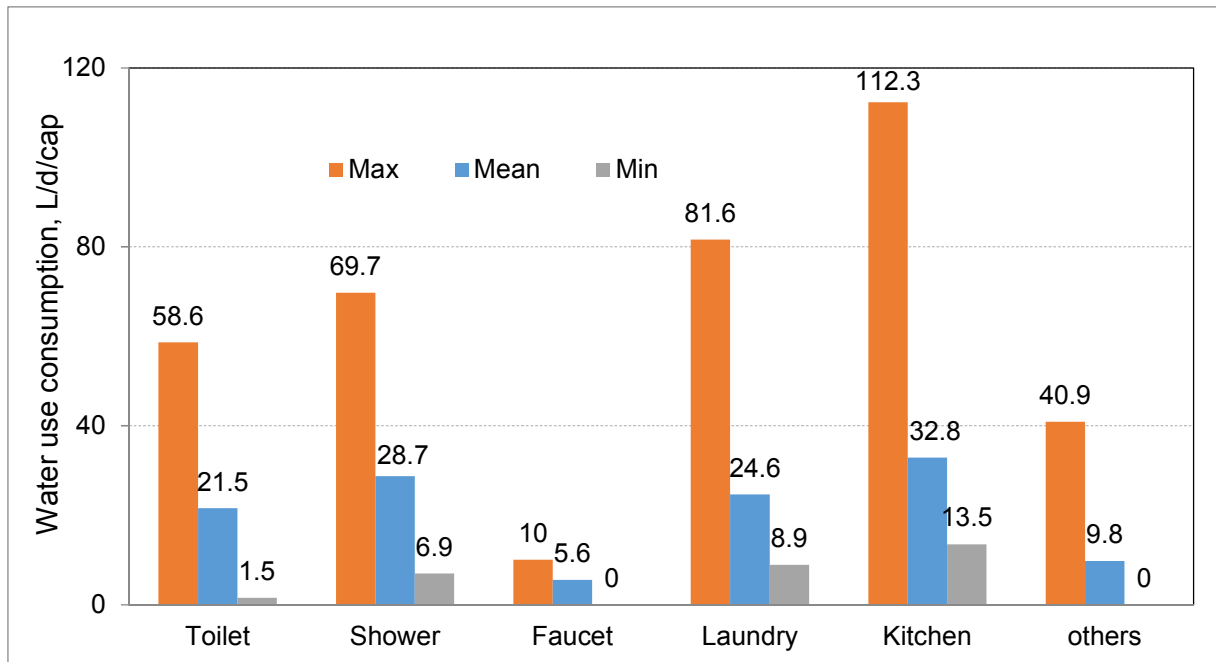


Figure 5. Water use in different purposes

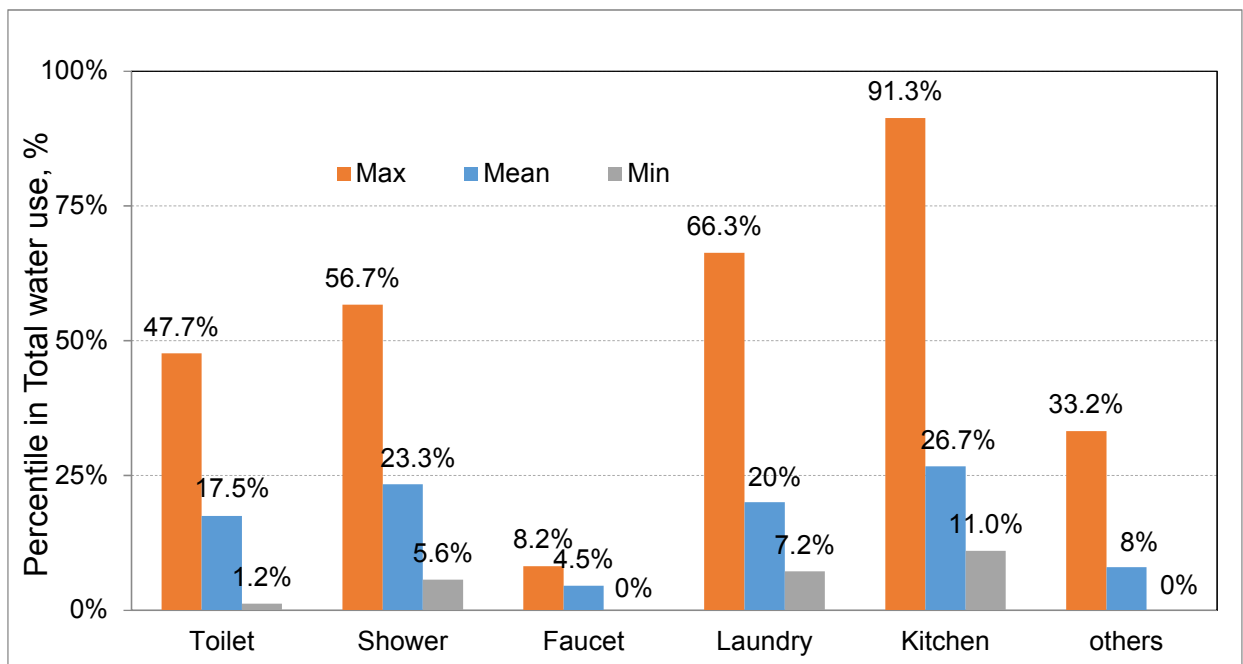


Figure 6. Rate of water use in different purposes

The average values from 15 surveyed households indicate that water use habit of kitchen (clean vegetable/food; dishes) has the similar quantities of toilet and shower that were considered as the highest water consumption purpose. There are some high peak in surveyed data and it also helpful information in order to conduct the detail investigation of leaking or broken

water pipe/appliances. And, the results also shown the basic dataset for implementing the saving-water action in next step.

GHG emission calculation

Through the survey, the water use and electricity for the electrical appliances using water (washing machine, pump, etc.) data are collected and used in calculating the GHG emission (**Table 2**).

The calculation method is presented in *GHG report* with the practice and reference parameters.

In this survey, the average GHG emission from 15 households is 0.82 kgCO₂e/hh/d.

Table 2. Surveyed household summary

No.	Name household	Water system network type	Average water use (L/d/cap)	Water consumption		Different (%)	Reasons	Suggestion for passive measures	Estimation of potential water and energy save through suggestion	GHG emission (from water and electrical appliances using water)
				From Dawaco meter (L/d)	Monitoring (L/d)					kgCO ₂ e/d/hh
1	Pham Thi Ha	Bottom tank-->Pump-->top tank> use	273.2	805.8	682.9	15%	Leaking from storage	Replace the toilet tank; Use the saving water nozzle, shower Use LED light	15% water for toilet, 10% water in shower, 5% water in faucet	0.85
2	Pham Anh Tuan	Storage tank-->use	106.7	428.6	320.2	25%	Leak in toilet + broken valve	Replace washing machine Use the saving water nozzle, shower Use LED light	25% water for replace valve, 10% water in shower, 5% water in faucet	0.71
3	Pham Thi Hong Thanh	Direct (from water supply)	105	415.7	420	-1%		Use the saving water nozzle, shower Use LED light	10% water in shower, 5% water in faucet	0.70
4	Nguyen Lan Phuong	Storage tank-->use	90.2	703.6	360.6	49%	Leak in input pipe	Use the saving water nozzle, shower Use LED light	13% water in shower, 7% water in faucet	0.74
5	Pham Phu Thanh Son	Direct (from water supply)	120.6	378.6	361.8	4%		Use the saving water nozzle, shower	10% water in shower	0.73
6	Duong Van Buong	Bottom tank-->Pump-->top tank> use	98.8	742.9	593	20%	Unidentified		10% water in shower, 7% water in faucet	0.81
7	Khuong Anh Loan	Storage tank-->use	154.8	867.1	619.2	29%	Unidentified		10% water in shower, 5% water in faucet	0.82
8	Dao Ngoc Hung	Storage tank-->use	87.9	451.4	439.6	3%		Use the saving water nozzle, shower Use LED light	13% water in shower, 8% water in faucet	0.76
9	Nguyen Van Vui	Direct (from water supply)	159.8	661.4	639	3%		Use the saving water nozzle, shower Use LED light	7% water in shower, 5% water in faucet	0.83
10	Nguyen Thi Tai	Storage tank-->use	110.3	672.9	661.5	2%		Set up solar water heater Use the saving water nozzle, shower Use LED light	8% water in shower, 7% water in faucet	0.84

No.	Name household	Water system network type	Average water use (L/d/cap)	Water consumption		Different (%)	Reasons	Suggestion for passive measures	Estimation of potential water and energy save through suggestion	GHG emission (from water and electrical appliances using water) kgCO2e/d/hh
				From Dawaco meter (L/d)	Monitoring (L/d)					
11	Tran Quoc Son	Direct (from water supply)	109	330	326.9	1%		Use the saving water nozzle, shower Use LED light	10% water in shower, 7% water in faucet	0.72
12	Nguyen Dinh Quoc	Direct (from water supply)	136	595.6	544	9%	Leak in toilet	Use the saving water nozzle, shower Use LED light	8% water in shower, 8% water in faucet	0.80
13	Nguyen Quang	Direct (from water supply)	126.3	658.6	631.7	4%		Use the saving water nozzle, shower Use LED light	8% water in shower, 6% water in faucet	1.13
14	Nguyen Van Loi	Bottom tank-->Pump-->top tank> use	127.1	536.4	508.5	5%		Use the saving water nozzle	11% water in faucet	0.78
15	Pham Bao	Bottom tank-->Pump-->top tank> use	117.3	1639.3	704	57%	Leak in valve and underground pipe	Use the saving water nozzle, shower	10% water in shower, 5% water in faucet	1.15

3.3. ***Suggested measures***

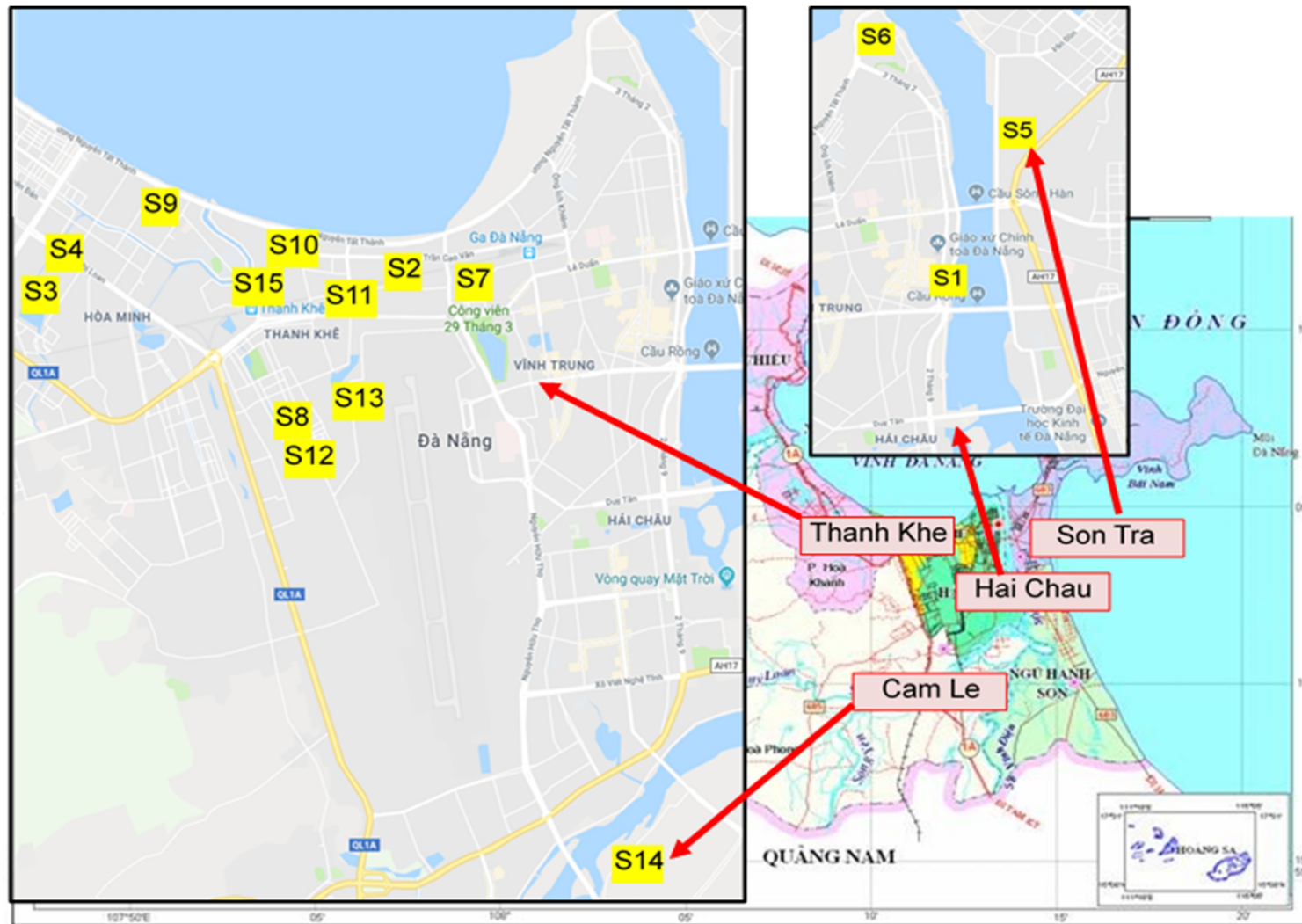
Through the surveyed data of 15 household (Table 2), some suggested methods are supposed to apply in specific house. In order to reduce the water use and people behavior in daily water-using life, the suggestions changes will be implemented with the suitable way for citizens.

- Passive measures: audit water use in household if case water use over more 15% of average value; Use the saving water nozzle (faucet and kitchen washbasin) and shower;
- Active measure: prepare the guidebook, leaflet, video to show for citizen (household/schools/etc.);

4. **Conclusions**

- The results of survey show the water demand and habits of people in their daily activity;
- However, the water use of household is still wasteful due to low water price, the leakage of pipes broken equipment, some devices (tap, shower, toilet, etc.) have the high consumption.
- The awareness measure should be focused on: *(i) Passive*: guide household in checking the leakage, replace with the water-saving equipment; *(ii) Active*: explain and clarify to improve the people's awareness in the importance and implementation of water-saving activities in daily life.

Appendix



Location of 15 surveyed households



Install and measure the kitchen washbasin



Install and measure shower



Install and measure the saving water nozzle for garden irrigation



Install LED light (toilet)



Replace bath with bucket by the shower



Install and measure the saving water nozzle



Install the solar water heater

Pictures of survey in households