



Centre for **Water Technology** and **Policy**

The University of Hong Kong

Final Report

Environment and Conservation Fund Student Ambassador Scheme

for the Smart Water Auditing Project

Sponsored by:



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Faculty of Engineering
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1. Introduction

Throughout the Student Ambassador Scheme of the Smart Auditing project 2021-22, 15 student ambassadors and their families participated and implemented water conservation measures in their individual household using the SMAN Analyser.

Student Ambassadors participated in workshops to gain knowledge about water governance and water resource management in Hong Kong. They participated in training sessions and learned how to install, utilize and maintain the SMAN Analyser, and carried out their data collection and analysis exercise. Based on data collected during the baseline period and through continuous monitoring of the level of water use over time via the project's mobile website, students implemented their water conservation plan and monitored results. At the end of the project, Student Ambassadors shared their results and experience of their water conservation plans.

Overall, our Student Ambassadors have achieved great results through this year's scheme.

2. Project objectives

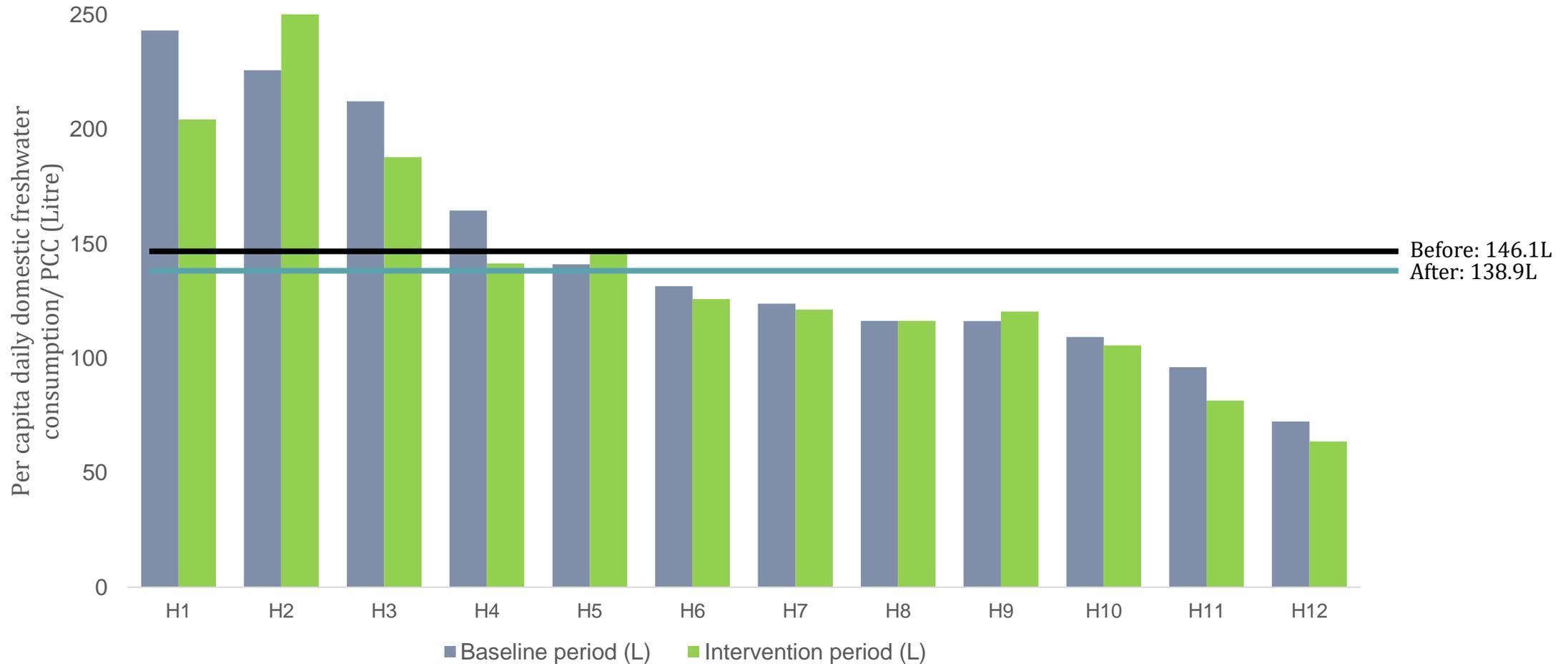
The Student Ambassador Scheme of the Smart Auditing project is an action oriented awareness raising activity that applies the knowledge of the Centre of Water Technology and Policy on conducting water auditing and a novel method of engagement, to induce actual and lasting changes in water attitudes and water conservation behavior among participants.

The overall project objectives are:-

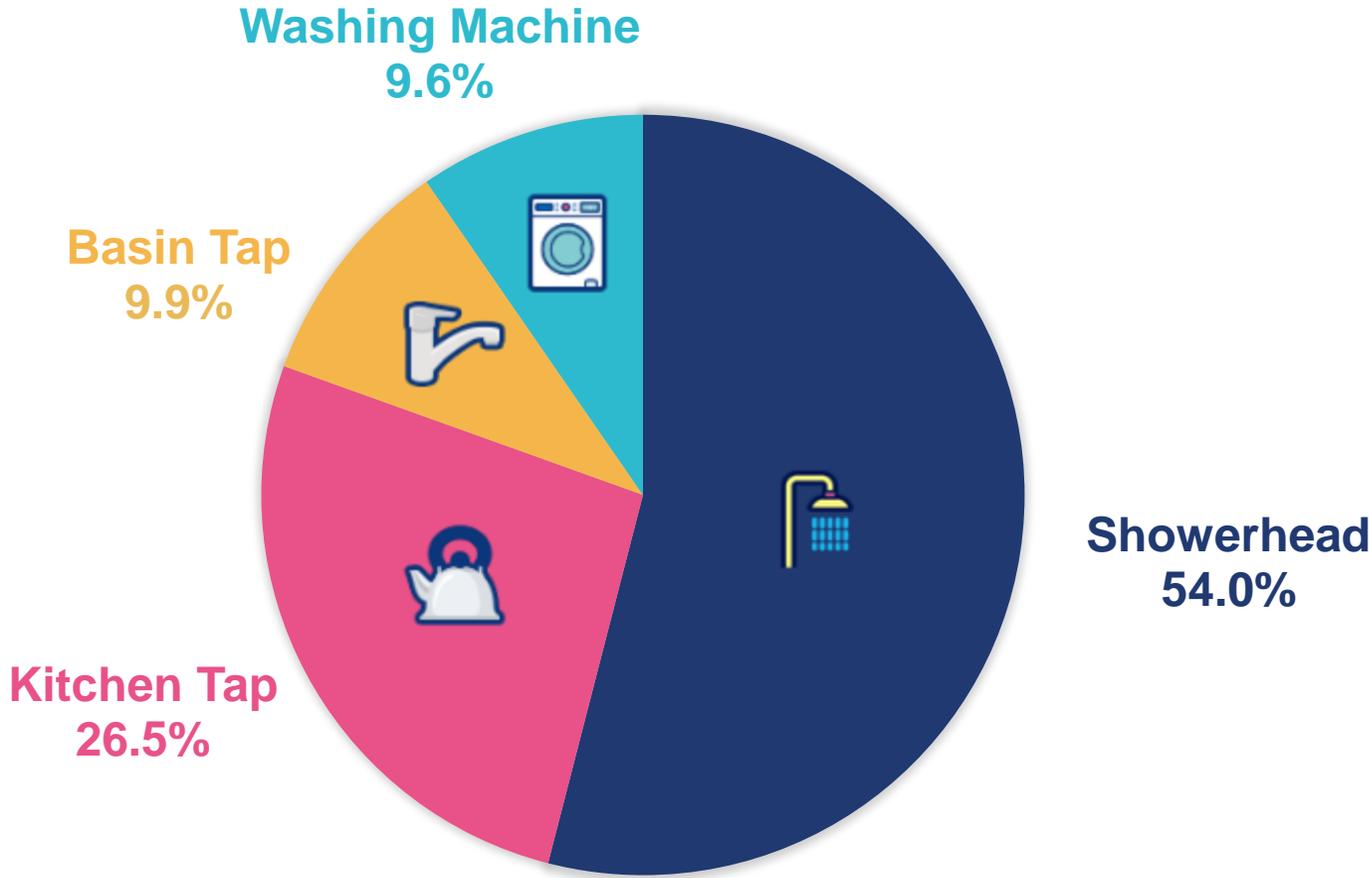
- To provide real-time feedback on the amount of daily domestic water consumption to motivate effective water conservation actions
- To share with the HKU Community regarding the knowledge on promoting and sustaining water conservation behaviors at home

3. Results

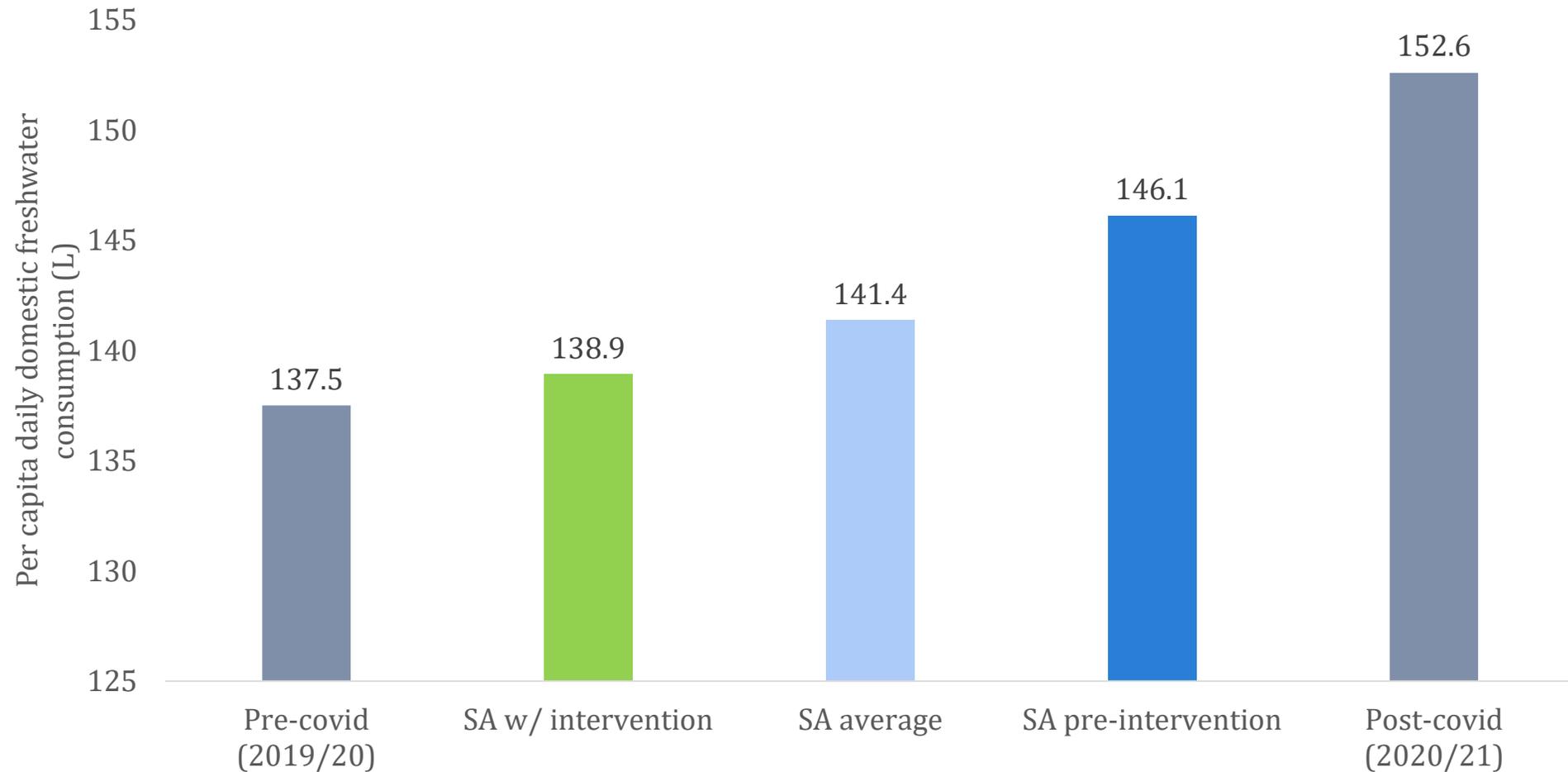
On average, our students ambassadors and their family members have cut water consumption by ~5% (or 7.2L).



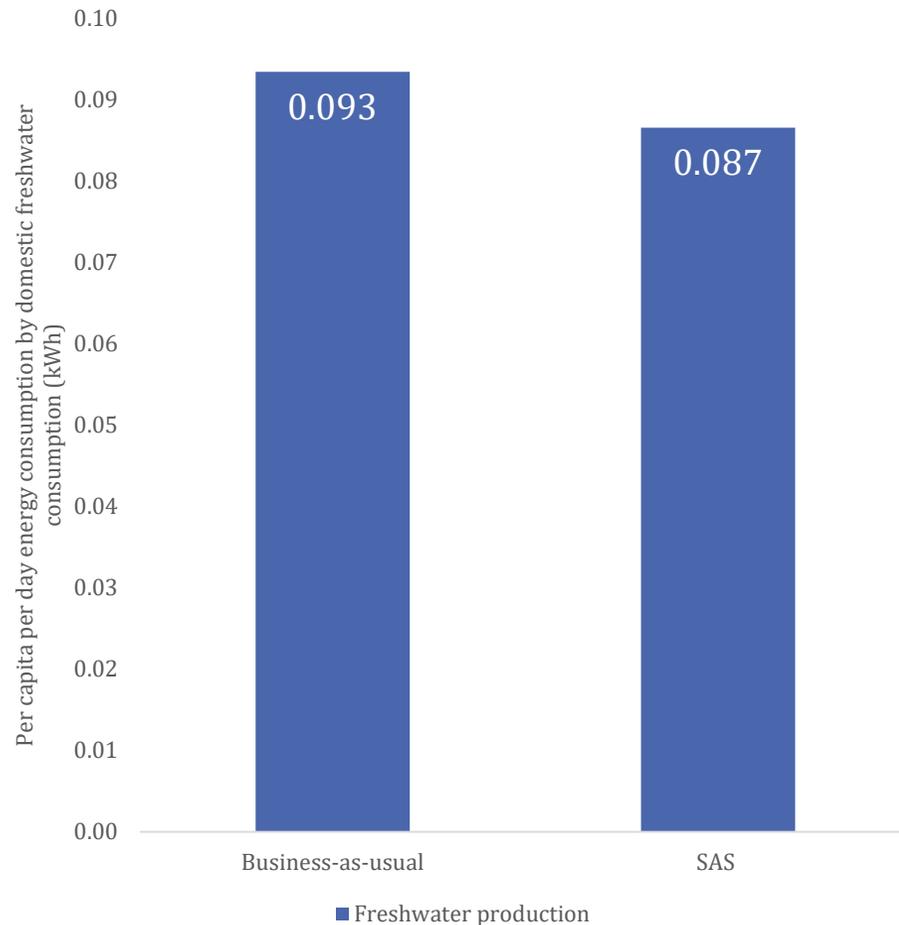
Showering and kitchen use were major water consuming end-uses.



How our student ambassadors compared with the rest of the Hong Kong population?

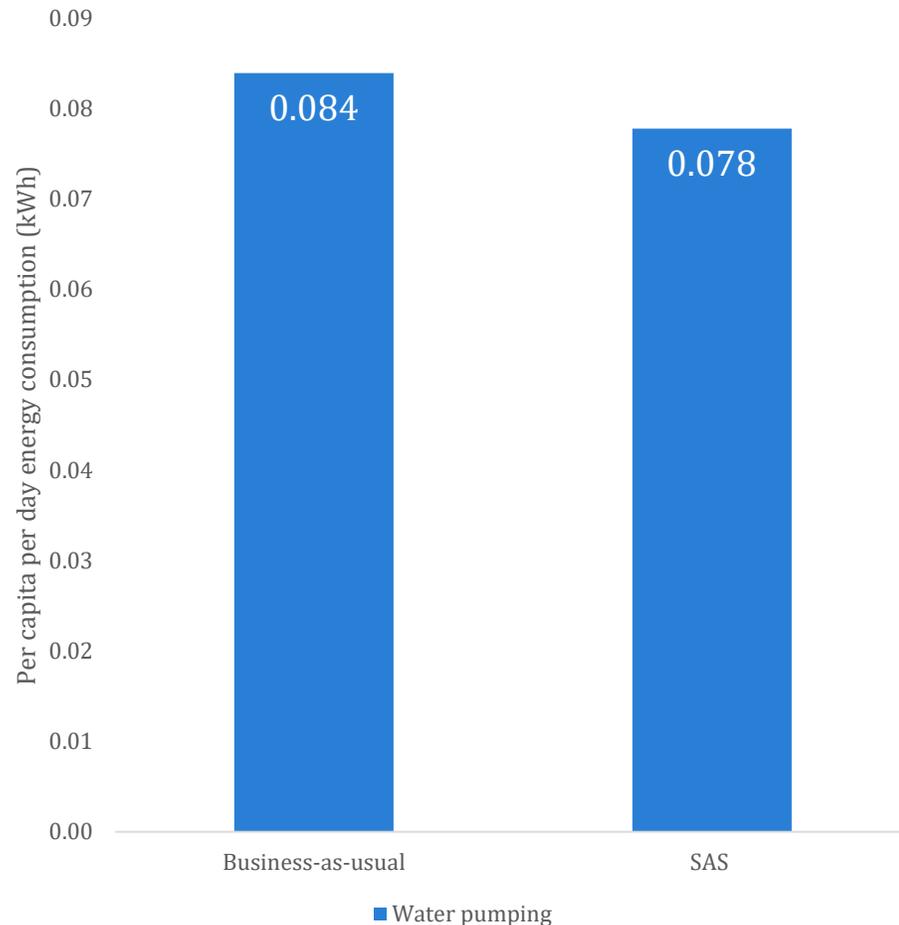


3.1 On freshwater production



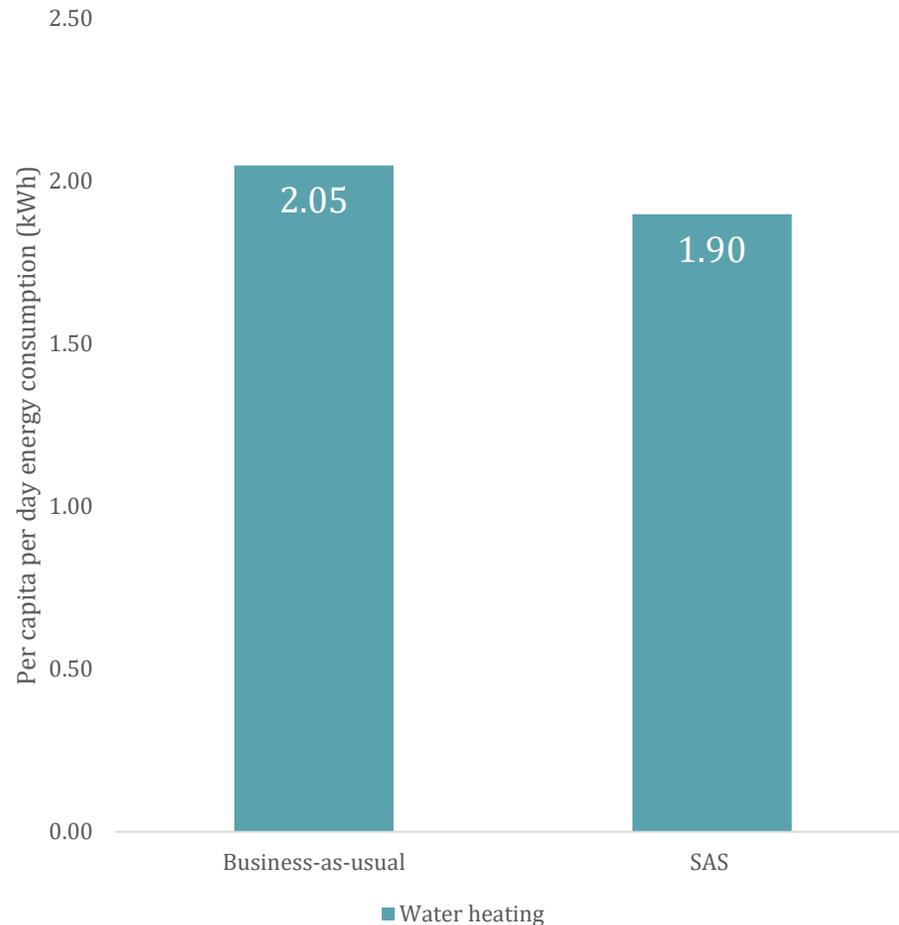
- An average HK person uses 153L (Or 0.153 m³) of water at home every day.
- Our SAs used 7.3% less.
- Electricity consumption required for production of freshwater is 0.612 kWh/m³.
- Per capita per day energy savings by domestic freshwater consumption: **0.007 kWh (or 7 Wh)**.

3.2 On water pumping at the building level



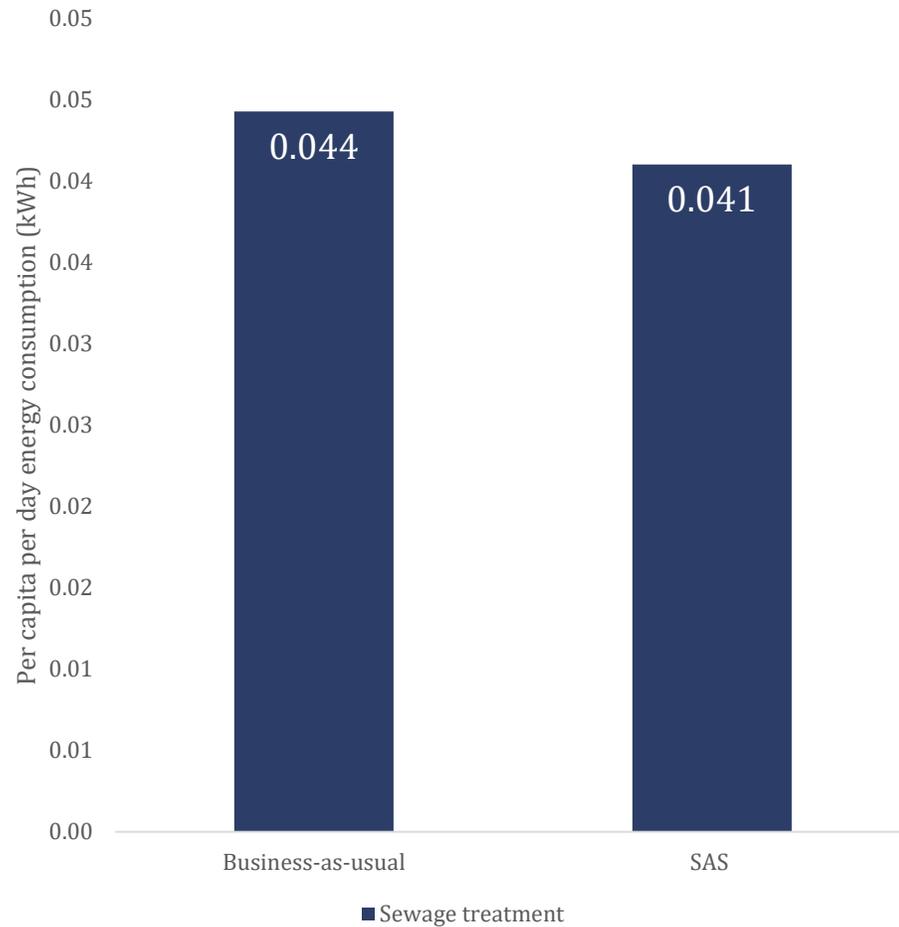
- Water pump systems consume **16%** of the communal energy use in a residential building (2014/15 figure).
- Average energy used in communal areas of a 41-storey domestic block with 799 flats is 536 kWh per flat.
- Per capita per day energy used for water pump systems
= $536 \text{ kWh} \times 16\% \times 2.8 \text{ persons} \div 365 \text{ days}$
= 0.084 kWh
- Per capita per day energy savings by water pumping: **0.006 kWh (or 6 Wh)**.

3.3 On water heating



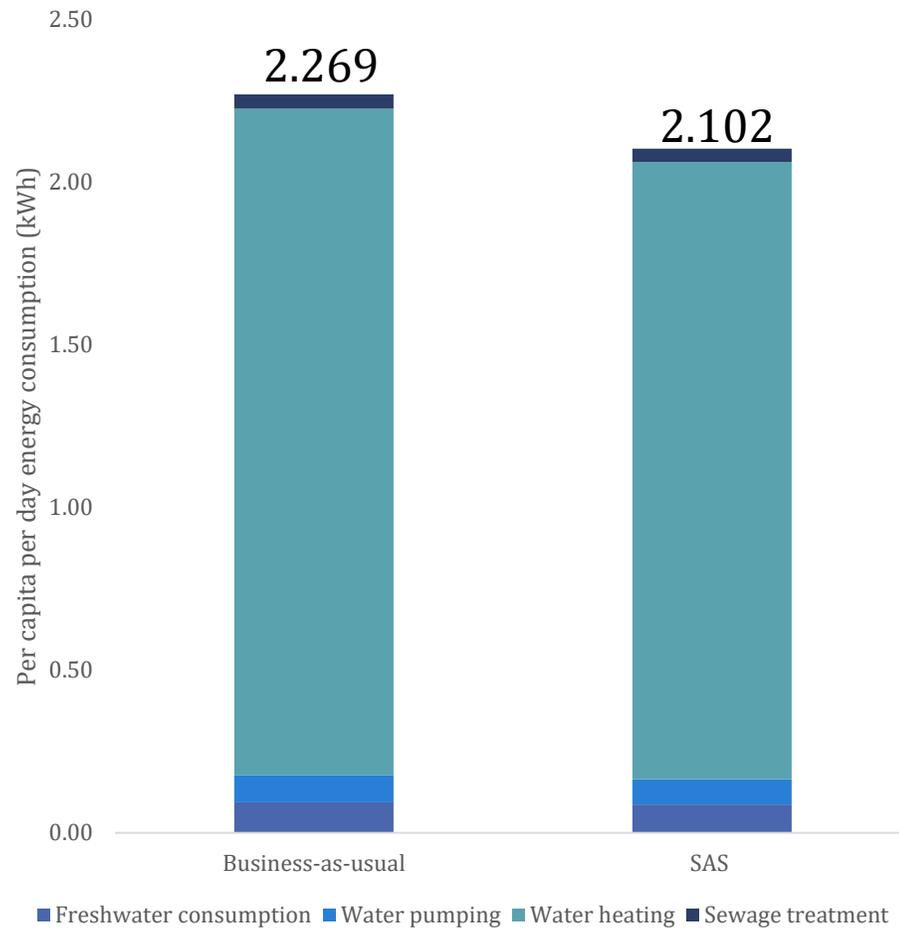
- 23% of the energy used for water heating (to serve showering, laundry and cooking purposes).
- Within the residential sector, the energy consumed by each capita was 8.9 GJ (or 2472.2 kWh) in 2020
- Per capita per day energy used for water heating
= $2472.2 \text{ kWh} \times 23\% \div 365 \text{ days}$
= 2.047 kWh
- An average shower (54 litres of water) could use 3.2 kWh of energy
- Per capita per day energy savings by water heating: **0.150 kWh (or 150 Wh)!**

3.4 On sewage treatment



- Electricity consumption per unit volume of sewage treated is 0.29 kWh/m³.
- Per capita per day energy savings for sewage treatment: **0.003 kWh (or 3 Wh)**.

3.5 Contributions to energy savings and GHG emissions



- 41 SAs and family members

- May – August 2022

- **Total Energy saved: 621.2 kWh**

- **GHG emissions less:**

= 621.2 kWh x territorial wide default value
0.7kg/kWh

= 434.8 kg (0.435 tonnes)

3.5.1 A saving of 621.2 kWh means...



16.7 incandescent lamps
switched to LEDs

- A 9 watt LED bulb produces the same light output as a 43 watt incandescent light bulb.
- Assumes an average daily use of 3 hours
- An incandescent bulb consumes 47.1 kWh per year, and an LED bulb consumes 9.9 kWh per year
- $34 \text{ watts} \times 3 \text{ hours/day} \times 365 \text{ days/year} \times 1 \text{ kWh}/1,000 \text{ Wh}$
= 37.2 kWh/year/bulb replaced

3.5.2 A saving of 621.2 kWh means...



694 hours of air
conditioning

- Per hour Energy Consumption by a Grade 1 Energy Efficiency Label Window Type Air Conditioner is around 895W

3.5.3 A saving of 621.2 kWh means...



- A typical solar panel is about 1.7m tall by 1m wide.
- The annual generation capacity of 10 panels with capacity of 2.5kW is 2,500 units/kWh.

Annual energy generated
by 2.5 solar panels

3.7 In terms of savings on water bills...

Business-as-usual (PCC = 152.6L)

For 63.5m ³	Rate (HK\$/m ³)	Vol. to be charged at the tier(m ³)	Sub-Total
1 st tier: First 12 m ³	0.00	12.00	0.00
2 nd tier: 12m ³ -43m ³	4.16	31.00	128.96
3 rd tier: 43m ³ -62m ³	6.45	19.00	122.55
4 th tier: 62m ³ -63.5m ³	9.05	1.483	13.42
		Total	264.93

Our student ambassadors (PCC = 141.4L)

For 58.8 m ³	Rate (HK\$/m ³)	Vol. to be charged at the tier(m ³)	Sub-Total
1 st tier: First 12 m ³	0.00	12.00	0.00
2 nd tier: 12m ³ -43m ³	4.16	31.00	128.96
3 rd tier: 43m ³ -58.8m ³	6.45	15.82	102.04
4 th tier: N/A	9.05	0.00	0.00
		Total	231.00

Only \$34.01 less per billing cycle!

Acknowledgement

Our team at HKU would like to acknowledge the following organizations:

- ECF for providing funding supports and ECF officers who had worked closely with our team;
- Faculty of Social Sciences and Faculty of Engineering for being the supporting organization for logistical supports and publicity;
- Water Supplies Department for being a supporting organization and allowing the use of water meters and the kind assistance provided;
- Professor Danny Lam, the Principle Investigator, for the guidance and intellectual leadership; Dr Frederick Lee and Dr Edith Ngai for guiding the workshops;
- Our student participants and their families for their participation and providing insights with their innovative research efforts.