Field surveys of water use in residential sector and the structure analysis

in Da Nang city, Vietnam

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1. Background and objectives

In Da Nang city, Vietnam, water demand has been increasing with economic development and population growth. Water supply capacity of the city is closed to be limited and water shortage is considered to happen. To supply water enough for a long period, future water demand is needed to be understood specifically. In order to do so, future water demand forecast is important based on current situation of water use. Thus, objectives of this study are set to understand water use characteristics in residential sector, which accounts for 70% of water supply in Da Nang city, and analyze some factors which affect water demand.

2. Material and Methods

Two kinds of survey, which were water use characteristics survey and water use amount survey, were carried out in the rainy season of 2011 (from September to October) and the dry season of 2012 (from August to September) in Da Nang. 308 households were selected to carry out questionnaire surveys. It was conducted in Vietnamese language to collect information related with water use characteristics such as ①water source, ②water use frequency, ③ equipment and home appliances for water use and ④application. Water use amount survey was conducted at 97 households which use tap water. Tap water consumption per capita per day (L/ca/d) was measured during the survey and water use amount for each purpose was investigated.

Social factors of each household and water use characteristics which affect to amounts of water use were defined as independent variables, and the relationship with amounts of tap water use for each purpose was analyzed with multi-regression analysis. With the regression formula obtained through the analysis, amount of future water use for each purpose was estimated and water use amount (L/ca/d) was calculated. Finally, future water demand was calculated using the forecasted future population.

Figure1. Water use amount in 2012 and future forecast (2025)

3. Results and Discussions

As the result of water use characteristics survey, water use characteristics such as water source were understood. In case of water source, many households were using multiple sources, mostly tap water. 94% of households used tap water and 39% used ground water. Tap water consumption was 102 L/ca/d on average.

As the result of multi-regression analysis, water use frequency was shown as the main factor which gives a remarkable impact on the amounts of tap water use for any purpose. In addition, water source had a huge influence on the amount of water use for toilet and bathing while household size showed some relationship with the amount of water use for laundry, cooking and dish cleaning. **Figure 1** shows the amount of water use and the value of future forecast (2025) for each purpose of household sector in Da Nang. The amount of tap water use per capita per day in household sector in 2025 was estimated as 150 L/ca/d which is 1.5 times higher than the current supply amount. In addition, the estimated trend of increasing water demand in household sector is shown in **Fig. 2**. Future water demand in 2025 was forecasted as 219,000 (m^3/d) which is approximately 2.5 times of that in 2011.

Figure.2 The trend of tap water demand in household sector in Danang city

4. Conclusion

In this study, the factors which influence on the amount of water use were understood quantitatively. In addition, it was estimated that water demand in household sector in Da Nang will increase 2.5 times as of today through next 15 years; therefore,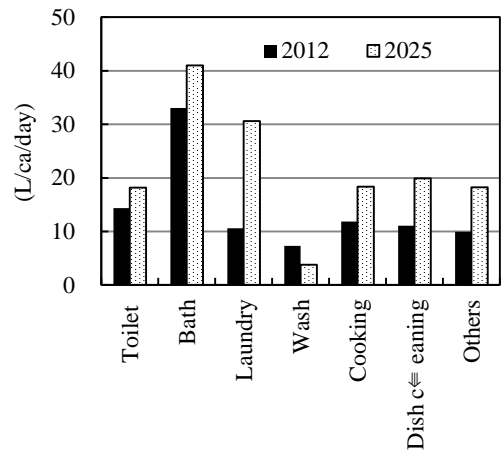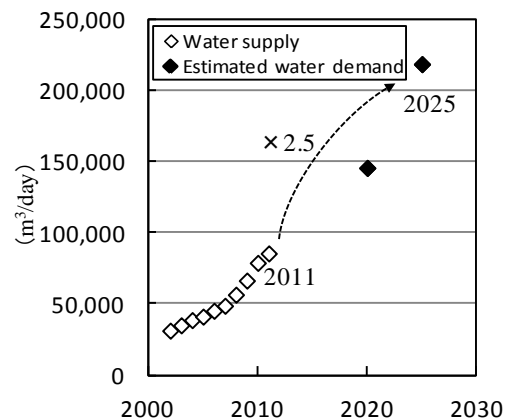 it is necessary to secure water resources for the future.