

## 外国語要旨

学位論文題目 Efficacy of and Public Acceptance on Rainwater Use in Households

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In many areas of the world, household water demand exceeds the capacity of the public water supply. The use of alternative water resources is considered as a useful way to address this issue. Rainwater is an especially attractive alternative resource, because it is easy to store and use, and doesn't require complicated treatment.

In this study, the efficacy of rainwater use was evaluated by investigating the possibility of rainwater use in quality and quantity aspects. The Public acceptance, which was expected to be essential for expanding rainwater use, was also investigated. Its changeability by knowledge increase regarding to rainwater use was also assessed. Furthermore, the actual situation of rainwater use in households was investigated based on the quality of stored rainwater and the opinions of the users.

The required water quality for rainwater use differs among areas, and there is not any clear quality standards to use rainwater for each purpose. The current study examined the required quality for using rainwater, and it was compared with the existing results of stored rainwater. The results suggested that stored rainwater removing first flush could be used for outdoor and toilet. In case of using rainwater for laundry, its potential would be decided by users' acceptance on the influence of the rainwater quality on washing would decide. However, it was difficult for bath purpose to use without any disinfection.

The potential to cover the water demand by rainwater use have been discussed using the average or the specific values of variables such as the roof area for catching rainwater and the water demand. This conventional approach couldn't describe the difference of these variables among households. In this study, a probabilistic approach was suggested to describe the probabilistic distribution of the potential based on the probabilistic distributions of these variables. This approach was applied to three areas (i.e., Tokyo (Japan), Hanoi (Viet Nam), Galle (Sri Lanka)), and its usefulness and the potential of these areas were evaluated. The results showed that the new approach exhibited that approximately 60% of the households failed to achieve the potential that was estimated using the conventional approach in case of Hanoi. In addition, the required tank volume depended on the required coverage, the household size, and the area. Covering toilet water demand totally was difficult in households having five persons in Tokyo and Hanoi, although it was

possible in Galle. Hence, Galle was the most suitable area among these three areas to use rainwater.

The public acceptance was investigated for each purpose by questionnaire survey on people living in Galle, Sri Lanka. The less the potential of contact to water or intake of water was, the more the public accept rainwater use. The factors of the acceptance depended on purposes and differed from that on other water resources. Additionally, knowledge increase regarding quality, volume and cost when using rainwater was observed as a way to change the public acceptance on rainwater use for toilet, laundry, bath and washing basin. Especially, the acceptance of the users that originally didn't accept increased. The factors of the acceptance change also differed among purposes.

The actual situation of rainwater use was investigated targeting Galle located in Sri Lanka. The removal volume of first flush from the targeted system was 2.3 mm, and it was considered to be enough for using rainwater for outdoor, toilet, and laundry. In addition, it was found that adding chlorine to the stored rainwater was effective to ensure sanitary quality, to prevent mosquito growth, and to use rainwater as well as supplied water. From an interview survey to the rainwater users, it was confirmed that the quality of life would be maintained even when rainwater was alternatively used.

In conclusion, it was suggested that the possible purposes of rainwater were outdoor, toilet, and laundry. Especially, the acceptance on rainwater use for outdoor and toilet is relatively high, so that the potential of rainwater use for these usages is expected to be high. In addition, it was found that it would be effective to increase public knowledge for acceptance increase. Regarding to the effectiveness of rainwater use, it differed among required coverage of water demand, household size, and areas. The probabilistic approach suggested in this research would be useful to understand the effectiveness taken in consideration of these factors. This approach was applicable for all areas where the probabilistic distribution of roof area or water demand can be estimated. The present suggestion expected to be useful for planning rainwater use and water demand management.