

Feasibility and Effective Evaluation of Household Wastewater Treatment System Based on Urine Separation in Lake Biwa watershed

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Abstract

Recently eutrophication in Lake Biwa has been one of the most important problems in Lake Biwa watershed. One of the reasons for the eutrophication is an increase in pollutant loads contained in household wastewater. Therefore, household wastewater treatment system (WWTS) has become more important for lake management. The main household WWTS in Lake Biwa watershed is sewage WWTS, which is central WWTS. However, in thinly populated region central WWTS is not appropriate because the cost necessary for construction of pipe is not economical. In such region, Gappei-Johkaso has been installed as a decentral WWTS. However, Gappei-Johkaso cannot remove phosphorus and nitrogen, which are the cause of eutrophication. Therefore, the alternative decentral WWTS for Gappei-Johkaso is necessary.

As a decentral WWTS, Ecological Sanitation (ecosan) has recently been suggested to be a new concept of household WWTS. Eco-san WWTS is urine-separating WWTS based on the idea that urine, faeces and graywater have different characteristics and can be dealt as a fertilizer or be treated more efficiently if they are not mixed. With eco-san WWTS, urine and faeces are separated from graywater and treated as a fertilizer, which decreases the release of nitrogen and phosphorus into water body. Therefore, the objective of this thesis is to propose the urine-separating WWTS appropriate for the situation of Lake Biwa watershed and to evaluate the effect of such system.

In chapter 2, the situation and problems of the household WWTS in Lake Biwa watershed is described in order to clarify the background of the research and to point out the bad influence of Gappei-Johkaso on Lake Biwa. In chapter 3, the urine-separating WWTS is introduced together with its advantage as the substitute for conventional decentral WWTS. Chapter 4 gives a suggestion on the new decentral WWTS based on urine-separating WWTS appropriate for the situation of Lake Biwa, following with the influence of conventional decentral WWTS used in Lake Biwa watershed, including Gappei-Johkaso, Tandoku-Johkaso

and human waste treatment center, and the new WWTS based on urine-separation. When comparing with Gappei-Johkaso, the urine-separating WWTS can reduce pollutant load of phosphorus by 26 to 34%, nitrogen load by 33 to 36% and COD load by 2 to 7%. Chapter 5 shows a case study in order to illustrate the feasibility and effective evaluation of urine-separating WWTS. The comparing result with the case that all of the decentral WWTS is exchanged into Gappei-Johkaso shows that urine-separating WWTS can reduce phosphorus load by 44% and nitrogen load by 71%.

Moreover, the pollutant load discharged from both decentral WWTS and sewage WWTS are evaluated. It can be explained that 80% of the phosphorus load is derived from decentral WWTS thus the installment of urine-separating WWTS can be very effective for alleviation of eutrophication.

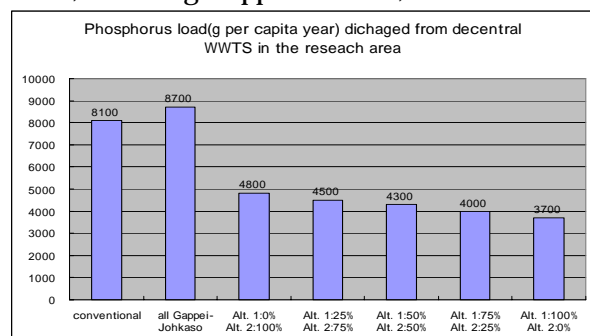


Figure 1 Comparative evaluation of urine-separating WWTS and conventional WWTS