

【Grant-in-Aid for Scientific Research(S)】
Science and Engineering (Engineering II)



Title of Project : Development of Resources Oriented Sanitation System Based on the Concept “Don’t Mix” and “Don’t Collect” Wastewater

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Research Area : Environmental Engineering

Keyword : Water and Sanitation; Onsite and Differentiable water treatment

【Purpose and Background of the Research】

Although access to safe drinking water and basic sanitation are taken up together in Target 10 of the Millennium Development Goals, sanitation has been attracting less attention, funding and human resources than water supply. Since it is well known that “up to 5.5 billion people will be without sanitation by the year 2035, if sanitation provisions continue to be installed based on the current standards”, the new approach to achieve the Millennium Development Goals is required. In the so-called developed countries, resources oriented water and wastewater system is also requested for developing sustainable society.

Since the sustainable water and wastewater system fulfill the following requirements such as energy efficiency, resources recovery, and controlling micro-pollutants, we are proposing a new sanitation system based on the concept, “Don’t mix” and “Don’t collect” wastewater. In this model, as showing the following figure, the fractioning of household wastewater into three types is essential. Thus, reduced-volume black water, higher-load and lower-load gray water are new concepts that are intended to introduce in this model. Here, the treatment of black water conceives a change in the traditional way of using the WC; in other words, the use of water in the WC is thought just to clean the toilet, not to transport the toilet wastes; this is a very important change that it is possible by using a composting-toilet (dry-toilet). The essential and new concept is to treat separately the three fractions of household wastewater.

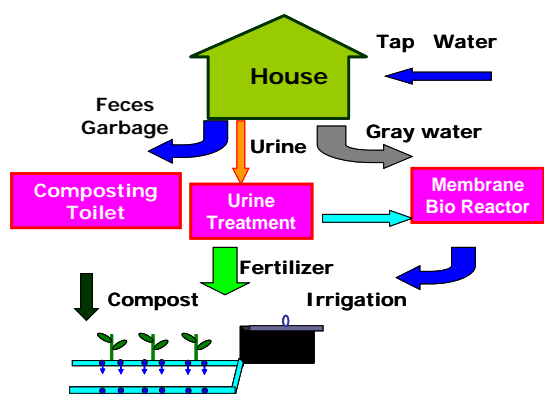


Figure 1 The model of the onsite differentiable treatment model for rural area in Japan
 The benefits of using an onsite wastewater differentiable treatment system may be analyzed from the viewpoints of water and soil contamination prevention, conservation of resources, reduction of health risk for population, and economics. Such benefits may be the following: Separating black water gives

1)recovery and recycle of nutrients; 2) elimination of micro-pollutants in urine; 3)elimination of sources of pathogens; 4)reduction in human health risk; 5)reduction of wastewater flow; 6)conservation of water resources; 7)small unit for higher-loaded gray water treatment. On-site treatment gives no requirement of pipes. And the system creates material cycle (organic matter and nutrients) and new social system such as M&O NPO or company.

【Research Methods】

The project will follow the technology innovation cycle such as unit process development, pilot plant study and evaluation and then unit process development. Unit processes developed in the project include low-cost composting toilet; natural treatment system for graywater reuse; membrane bio-reactor for graywater; urine treatment system. Pilot plants will be operated in Indonesia and Chichibu city.

【Expected Research Achievements and Scientific Significance】

The concept of sustainability includes physical parameters such as water cycle; material cycle; energy consumption; economy and also includes social aspects, and this concept shows the direction of our society in this century. New sanitation system based on the sustainability is important not only to developing countries but developed countries. Especially in developing countries, the infrastructure of the society is planning, the new sanitation system has a possibility to be installed there in no time. The technical information on the new sanitation system by scientific research from laboratory experiments and from data obtained by demonstration plants will give a impact to decision makers of all the countries and this may create the paradigm shift.

【Publications Relevant to the Project】

- M.A.Lopez Zavala, N.Funamizu and T. Takakuwa: Onsite Wastewater Differentiable Treatment System: Modeling Approach, *Wat.Sci.Tech.*46(6-7), 317-324 (2002)
- M.A. Lopez Zavala and N.Funamizu: Design and operation of the bio-toilet system, *Wat. Sci. Tech.* 53(9), 55-61, 2006
- S.Hotta and N. Funamizu: Biodegradability of fecal nitrogen in composting process, *Bioresource Technology*, 98(17), 3412-3414 (2007)-

【Term of Project】

FY2009-2013

【Budget Allocation】

83,100 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.eng.hokudai.ac.jp/labo/UBNWTR/SE/>