

# **STUDY ON NUTRIENTS MANAGEMENT FOR IMPROVING RESOURCES-ORIENTED SANITATION SYSTEM IN HANOI**

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## **1. BACKGROUND AND OBJECTIVES**

Hanoi, the capital of Vietnam, has faced rapid modernization. It leads to the improper management of waste and wastewater in the city and the collapse in use of locally available resources, resulting in the deterioration of environmental sanitation and the huge consumption of chemical fertilizers. The manner of waste management and fertilizer consumption has been changing recently. Therefore, its time transition should be comprehensively understood

The purpose of this study is to identify the time transition of domestic waste and wastewater management in a sub-urban community in Vietnam to provide a basis for sustainable management of sub-urban wastes and improvement of environmental sanitation. Material flows were developed in nitrogen and phosphorus from 1980–2010, and then the effects of waste management intervention under different scenarios were evaluated.

## **2. METHODOLOGY**

Firstly, a door-to-door interview survey was implemented for 100 households on the management of kitchen waste, wastewater, human excreta, and livestock excreta, as well as the consumption of chemical fertilizer through 1980–2010. Then, the nitrogen and phosphorus flows were established for the whole study area based on the waste and wastewater stream and unit composition data of each object. Finally, impacts of waste management intervention were evaluated on reduction of chemical fertilizer consumption and nutrients load to the environment based on three waste management scenarios: 1) scenario 1 employing septic tanks for human excreta treatment, 2) scenario 2 employing composting for human and livestock excreta, 3) scenario 3 employing anaerobic digestion for human and livestock excreta.

## **3. RESULTS AND DISCUSSION**

The current nitrogen and phosphorus flows showed that as of 2010, the total nutrients inputs to the agriculture were 19,174 kg-N/year and 4,753 kg-P/year, in which 51% of nitrogen and 69% of phosphorus were derived from chemical fertilizer. Local resources of human excreta and livestock excreta in 2010 were used for agriculture with high recycling ratios: 55% of nitrogen and phosphorus from human excreta and 35% of those from livestock excreta.

From 1980 to 2010, significant changes of nitrogen and phosphorus flows were observed. The chemical fertilizer consumption decreased from 1980 to 2000; however, from 2000 to 2010, it has increased by 36% for nitrogen and by 20% for phosphorus in total agricultural inputs. The total nutrients load to the water bodies in 2010 was 3,396 kg-N/year and 751 kg-P/year, which were approximately 700% of nitrogen and 606% of phosphorus in 1980.

A scenario study revealed that the scenario employing anaerobic digestion for human and livestock excreta is highly recommended for this hamlet, in which chemical fertilizer consumptions could be decreased by 47% for nitrogen and 21% for phosphorus from chemical fertilizer, and nutrients load to water bodies could be reduced by 73% and 54%, respectively.

## **4. CONCLUSIONS**

This study assessed the quantitative data of nitrogen and phosphorus flows with time trend from 1980–2010, as well as evaluated the effects of waste management intervention in terms of nutrients. These could be a basis for sustainable management of sub-urban waste and wastewater in Hanoi.