

# Wastewater Management and Water Environment in Vietnam

Dr. Nguyen Viet Anh<sup>1</sup>

## Abstract

*Vietnam covers an area of 329,566 km<sup>2</sup>, with a population of about 78 million. Approximately 23 % of the population is living in urban areas. There are 61 provinces/cities with 623 towns and cities. Environmental problems have brought difficult challenges for Vietnam. This is against a background of a poor country, serious degradation of the environment, long-term harmful effects on the environment and nature caused by many years of war, urgent social problems including poverty, diseases, illiteracy and malnutrition. All need to be addressed at the same time whereas investment sources are very limited.*

*Vietnam is undergoing industrialization and urbanization. The associated socio-economic development causes strong pressure on natural resources and the environment. Environmental pollution is becoming an urgent problem. Municipal and industrial wastewater is the main cause of water pollution in the cities and this problem is increasing. Wastewater and rainwater are not treated. The survey data of water quality of the rivers which run through urban areas in 1996 - 2001 show that the concentrations of BOD<sub>5</sub>, COD, NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup> are 2 - 4 times higher than permissible values. Further, total coliform is a hundred times higher than the permissible value. In several samples traces of pesticide chemicals were also found. In other samples the concentration of lead and mercury was several times higher than the permissible value. Some rivers were heavily impacted by wastewater resulting in a concentration of BOD<sub>5</sub> and COD 5-7 times higher than the permissible value for class A water supply (domestic water) and 3-4 times higher than the permissible value for class B (non-domestic water supply).*

*Water supply capacity has increased from 1.95 million m<sup>3</sup> d<sup>-1</sup> in 1990 to nearly 3 million m<sup>3</sup> d<sup>-1</sup> in late 2001. There is a very low percentage of the population with access to adequate sanitation, especially in rural, peri-urban and poor urban areas. Urban sewerage and drainage systems are still inadequate and are degrading. In most cities and towns floods and inundation occur in the rainy season. Existing sewer networks in cities have been built for surface water drainage only.*

*The percentage of the population served by water supply is 60-70%, with an average per capita usage of 40 - 50 l d<sup>-1</sup> (equal to 40 - 50% of the standard demand). Non-revenue water ranks from 30 to 70 % in the cities. Up to the year 2000, about 25 million people from rural areas had access to clean water supply (42% of the total rural population).*

*In order to give directions for sewerage and drainage activities the Vietnam Government has approved the Orientation for the Development of Urban Sewerage (ODUS) with long-term objectives to 2020 and immediate objectives to 2005.*

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<sup>1</sup> Center for Environmental Engineering of Towns and Industrial Areas (CEETIA), Hanoi University of Civil Engineering. Add. CEETIA, DHXD, 55 Giai Phong Road, Hanoi, Vietnam. Tel. (+84)-4-8698317, 091320.9689. Fax. (+84)-4-8693714, E-mail. [thnhueceetia@hn.vnn.vn](mailto:thnhueceetia@hn.vnn.vn)

*An increase in resources from the state budget for the construction and rehabilitation of sewerage and drainage systems and capacity building for companies engaged in the management of operation and maintenance of the systems has led after 3 years of implementing ODUS to a significant increase in the number of urban sewerage and drainage projects funded by ODA. Starting with the Hanoi Sewerage and Drainage project (Phase I) the construction of which commenced in 1998 with ODA funds mainly from Japan and with a total budget of USD 200 million, there have now been 10 out of 61 cities and provincial towns of Vietnam with ODA funded sewerage and drainage projects with a total budget of over USD 1 billion from the Governments of Japan, France, Denmark, Belgium, Switzerland and international financial institutions like the World Bank and the Asian Development Bank. Projects are in various phases of implementation. Centralized wastewater management has been the norm in municipal engineering circles for more than 100 years. Based on the "Pipe it away first, then think about what comes next" philosophy, centralized management is the structure of choice in most cities and countries. However, there are a number of disadvantages to centralized wastewater management systems.*

*Combining all kinds of wastewaters and occasionally run-off 'storm' water leads to a highly complex mixture and a wide variety of pollutants widely varying in composition and concentration. Thus, effective removal of the pollutants becomes very difficult. The costs for the installation of sewer systems are almost an order of magnitude higher than the cost of building treatment facilities. In many cases, delays of water investment projects often occur due to lack of money. Very high operation and maintenance costs are also a big challenge for the municipal authorities, especially when cities are in the river delta and flat coastal areas, where pumping stations are required and sewers are installed with limited slope. Inadequate operation and maintenance of the network of sewers may lead to sewer clogging, local flooding, pipe leaks, and, as a consequence, to pollution of soil and groundwater, or increases of the hydraulic loading of the treatment plant. Pipes and tanks of higher capacity are needed. These are the reasons that wastewater management projects in most of cities and towns are facing delays.*

*But approaches may be changing. Most small communities have found conventional systems to be hugely expensive and have begun to investigate decentralized concepts. The decentralized concept is based on a simple premise that wastewater should be treated (and reused, if possible) as close to where it is generated as is practical. CEETIA has been developing suitable low-cost technologies for decentralized wastewater and fecal sludge treatment. In the CEETIA laboratory a study is carried out on the treatment of domestic wastewater using a baffled septic tank with anaerobic filter. This could be the most feasible option for on-site wastewater treatment in residential areas of Vietnam. The data indicates that baffled septic tanks with or without anaerobic filter could effectively treat black sewage in Vietnamese conditions.*

*Removal efficiencies for COD from 43.24 - 94.92 % (average 74.85%), for BOD from 47.13 - 90.87 % (average 71.47%), for SS from 37.40 - 97.18 % (average 71.14%) have been achieved. This could help in the improvement of wastewater management practices in Vietnam. Decentralized schemes of wastewater management are proposed for medium and small cities in Vietnam.*

**Key Words:** BOD, decentralized wastewater management, wastewater treatment, water pollution.