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WATER ENVIRONMENT AND WATER POLLUTION CONTROL IN VIETNAM: OVERVIEW OF STATUS AND MEASURES FOR FUTURE

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ABSTRACT

Vietnam is under rapid industrialization-modernization process. There is well-known formulation from world-wide experiences is that if GDP has doubled then the environmental pollution level increases for 3-4 times. But, in Vietnam, after last decades of intensive socio-economical development with GDP doubled from 1990 to 2000 the surveyed data show that the general tendency of pollution in Vietnam is increasing at a rank from 1.3 - 1.5 times. However Vietnam is still facing great challenges of environmental security and natural resources vulnerability. This paper presents major concerns of water environment in Vietnam in a integrated view with national socio-economical development for the last decade. Besides, author indicates key issues that are under consideration by the country in water pollution control and environmental protection in general.

Key words:

Development, environment, industries, pollution control, urban areas, water quality.

I. OVERVIEW OF SOCIO-ECONOMICAL DEVELOPMENT IN LAST DECADES AND CONSEQUENT PRESSURES ON ENVIRONMENT

Since the "Renovation" policy of 1986, the Vietnamese economy has significantly developed, registering an average annual growth rate in GDP of > 7% in the period 1990 - 2002.

According to data from the General Department of Statistics, there were 592,948 industrial enterprises in Vietnam in 1998, comprising 881 enterprises with foreign investment, 575 central state-owned enterprises, 1,246 local state-owned enterprises and 590,246 private enterprises. While in June 1996 there were only 16 industrial zones their number increased to 66 by June 1999.

The process of urbanization in Vietnam has grown very rapidly. In 1990, there were only 500 large and small urban centers that have grown at present to 623 including 5 classes based on their scale. The urban population has increased from 19% to total population in 1986 to 20% in 1990 and 23.5% in 1999. As forecasted, it will be 30 - 33% in 2010 and increasing to almost 40 - 45% by 2020. Cities and urban centers attract uncontrolled flows of people from rural areas to move in searching for jobs, more income and higher quality of life. Hence, increasing loads on resources and environment in urban areas are becoming more and more serious.

From agricultural sector, food production is expected to reach 40 mio. tones in 2010, including 35 mio. tones of rice. Livestock will be increased from 20% to 30% of agricultural products.

Although many programs have been launched to improve rural environmental sanitation, the existing conditions of environmental sanitation of rural areas in Vietnam are still critical, especially in poverty stricken rural areas. It is estimated only 50% of rural population has access to safe potable water (*MARD, 2002*).

In 2000, GDP in Vietnam reached 430 USD per capita, with ratio of industrial - construction is 34.5%, service is 40%, and agriculture - forestry and fishery is 25%. According to our forecast, the annual economic growth rate of Vietnam in period 2001 - 2010 should reach 7.0 - 7.2%, bringing GDP of the country up to 860 USD per capita. In order to achieve the mentioned goals i.e. GDP will double in compared with GDP in 2000 the ratio of Industrial sector should reach 40% GDP, with annual growth 10 - 11%. Energy plays important role in

industrial development. Up to 2010 the growth of energy including thermal gas, coal and nuclear energy is planned for 1.4 times more than GDP growth. Total number of industrial parks and export processing zones in 2010 is expected nearly 100, i.e. 1.5 times more than current situation.

Vietnam will pay efforts for encouraging of tourism, including infrastructure basics development. It is estimated that up to the year 2010 6 - 7 mio. Foreign tourists will visit Vietnam annually bringing 5 - 6 bio USD of total income. At the same time, that will create more pressures on resources and environment, including in sensitive areas.

II. WATER RESOURCES

2.1. Surface water

Vietnam has a high rainfall and a dense river-streams system; therefore, surface water resources are very abundant. There are 16 river basins with an area of over 2,000 sq. km, of which 9 basins are over 10,000 sq. km in area. These 9 basins contribute more than 80% of the total area of basins in the whole country. The total annual average volume of surface water is 880 bio.c.m. Of which, 75% of the said volume is contributed from Red River and Me Kong River basins, while the water volume generated within Vietnam is 325 bio.c.m. Rainfall in Vietnam, however, is irregularly distributed during the year and over different regions of the country. There are frequent droughts in the provinces of northern midland and central land (particularly in south of central land) and in Tay Nguyen plateau.

As non-treated industrial wastewater and urban wastewater is discharged into the waterways, organic water pollution is a serious problem in some rivers such as Cau and Nhue rivers (in the North), Sai Gon and Dong Nai rivers (in the South).

2.2. Ground water

Ground water is mainly present in loose, disconnected sediment layers generated from the Fourth Period or layers embracing carbonate stone, carbonate stones alternated with young basalt or with other mixed components. It has been estimated that the potential reserve of ground water can be 48 bio. c.mpy (17-20 mio. cmpd). At present, every year about 1 bio. c.m. (app. 2.3 mio. cmpd) of ground water is being exploited.

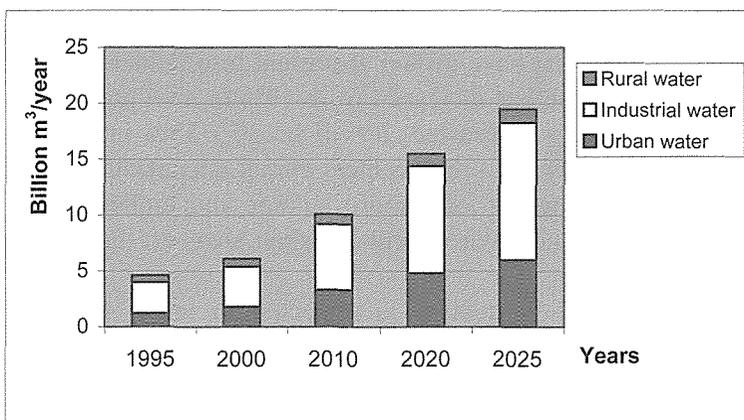


Figure 1. Trend of water consumption demand in Vietnam (WB, 1996)

2.3. Inland water pollution

Rapid urbanization and industrialization has resulted in growing demand for water. However, the water supply is still insufficient, creating intense competition among consumers and increasing its unplanned exploitation. Moreover, pollution of water also contributes to the decline in water supply.

Currently about 90% of old enterprises do not have wastewater treatment facilities. Most of industrial areas are not equipped with centralized wastewater treatment plants. Only one third from 70 industrial parks already set up with environmental protection facilities.

The lakes, ponds and canals in many cities and provinces such as Hanoi, Ho Chi Minh, Haiphong, Haiduong, Bacninh, Bacgiang, Hue, Dongha, Quangnam-Danang, Quangngai, etc. are affected by untreated domestic wastewater as well as industrial wastewater. The water quality in those canals is heavily polluted. In some places concentration of BOD₅, COD are 10 times higher than permissible values for receiving water bodies - class A or 3 - 4 times higher than permissible values for class B, Vietnam Standard TCVN 5942 - 1995.

Most of the monitored rivers are found to be polluted with substances like N and P, from 4 to nearly 200 times compared with national standard for quality of water source category A and from 2 to 20 times in compare with water source category B. Organic pollution in Sai Gon, Vam Co Dong rivers and canals is very serious while it is rather severe in Dong Nai river. Quality of water in rivers in the central region is still relatively better.

The water resource management is facing a number of problems and constraints. The principles that “the polluter has to compensate and rehabilitate the pollution” and “every beneficiary has to pay” are still theoretically stated in the documents and not put into practice. Recently, in 2003, Vietnam Government has issued the Circular on collection of wastewater fee. This is an advance step toward pollution control by using economic tools. According to the Circular the polluter is charged 100 - 300 VND for each kilogram of BOD or COD, 200 - 400 VND for kg TSS, 10 - 20 mio. VND for each kg mercury, 300 - 500 thousands VND for each kg Lead, 600 - 1,000 thousands for each kg Arsenic or Cadimum in wastewater discharged.

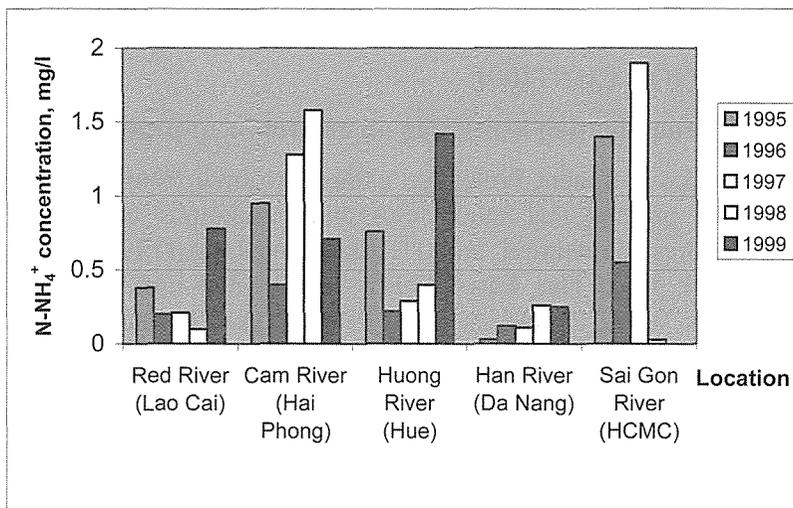


Figure 2. Changes in N-NH₄ concentration in rivers in major cities of Vietnam (State of Environment Report. NEA - CEETIA, 2002)

2.4. Ground water pollution

The major urban areas in Vietnam are allocated in Red river delta, Me Kong river delta and coastal areas. The geological features of these areas are weak, with high water table. There are 30% of cities supplied with ground water for domestic purposes. The growing exploitation of ground water in some cities and towns has lead to a sharp fall in ground water levels. This has not only decreased water availability and polluted the water source (through salt infiltration) but has also resulted in subsidence of the ground in some places. A research has been conducted by Hanoi Department of Science, Technology and Environment (DOSTE) and Hanoi Construction Department (DOC) since 1990. The monitored data show that the level of ground has been lowed down 10 - 30 mm per year. For ground water quality, the major

pollutants are iron and nitrogen ammonia. However some of cities are facing problems of manganese, salinity, organic compounds, as well as toxicants such as arsenic contamination.

2.5. Marine water pollution

There are about 18 mio. people living in rural and urban areas on the sea shores in Vietnam. Most of wastes from these populated places are discharged to the sea through different ways. Pollution is becoming more serious after big floods where pollutants are washed out together with the effluents. Active mining industry and illegal resources exploitation contribute to marine water pollution significantly. The surveyed data shows increasing concentration of pesticides, nutrients, zinc, oil as well as Coliforms in the marine water.

2.6. Pesticides and agro-chemicals

In agriculture, use of fertilizers, pesticides, and poor sanitation situation are most critical issues. The rate of use of chemical fertilizers per hectare of cultivated land in Vietnam is averaging around 126 kg (N + P₂O + K₂O) per hectare in the plains, and it is lower in midlands and mountainous areas. Over the years, the damage caused by pests has been increasing. Therefore, the use of pesticides in agriculture increases with each passing day.

**Table 1. Average agro-chemicals used in Vietnam, kg per hectare
(State of Environment Report. NEA - CEETIA, 2002)**

Before 1985	1986 - 1990	1992	1994	1996	1998	2000
0.3	0.4 - 0.5	0.67	0.68	1.08	1.41	1.12

III. WATER POLLUTION CONTROL

3.1. Developing and promulgating legislation on environment protection

The Vietnam Law on Environment Protection came into force from January 10, 1994. The Government has also promulgated other laws and regulations concerning environment protection such as Forest Protection and Development Law (1991); the People Health Protection Law (1989); Land Use Law (1993); Law of Oil and Petrol (1993), Mineral Resources Law (1996), Water Resources Law (1998); Dykes Protection Ordinance (1989); Criminal Affair Law (reformed 1999); Ordinance of Resources Taxes (1989); Ordinance of Aquatic Resource Protection (1989), Ordinance of Radiation Safety and Control (1996); Ordinance of Vegetation Protection and Quarantine (1993), etc. Hundreds of legal documents to elaborately instruct the implementation of the above laws and ordinances have been issued by the Government, the MOSTE and other line ministries.

3.2. Formulating and implementing environmental protection policies and action plans

The Government has promulgated a series of policies in order to protect the environment and ensure sustainable development. These include the policy of prohibition in production, transport and use of fire-crackers, policy of land and forest entrustment for people, policy of reforestation in bare hills, policy of stimulation in using cleaner technologies, policy of biodiversity protection, policy of closing natural forest, etc. Vietnamese Government has issued National Strategy for Rural Clean Water Supply and Sanitation for the period up to 2020. The National Strategy for Environment Protection for the period 2001-2010 has been set up. Currently, Agenda 21 for Sustainable development and achieving MDGs are being developed. Besides, Vietnam now is preparing the National Strategy for Pollution Control.

3.3. Development of the institutional system of environmental management

In 1993, the National Environment Agency (NEA) was established under the Ministry of Science, Technology and Environment (MOSTE) in order to exercise nation-wide the state management of environmental protection activities. The Environment Management Divisions attached to the provincial Departments of Science, Technology and Environment (DOSTE) were established. Some districts and towns also have certain cadre for environmental management. In addition, functional units for environmental management have been established in some line ministries and economic sectors.

In 2002, the Ministry of Natural Resources and Environment (MONRE) has been established. Environmental management authorities are under re-organization process for more effective operation. However, generally speaking, the capacity of environmental management institutions in Vietnam remains weak and disproportionate to their tasks.

3.4. Environmental pollution control

Since 1994, after the promulgation of the Law on Environmental Protection, a number of significant efforts have been made by responsible institutions to control the air, inland water, sea water and soil pollution; to manage and to treat solid waste, especially hazardous wastes; to deal with the enterprises considered as serious polluters, and to timely respond to environmental disasters/occurrences such as sea oil spillages. Environmental impact assessment has been carefully carried out for all the socio-economic development projects as well as for all the existing industrial establishments operating before the promulgation of the Law on Environment Protection. Environmental inspection has been undertaken both at provincial and national levels.

3.5. Environmental monitoring

A National Network of Environmental Monitoring managed by the MONRE was established since the end of 1994. By 2002, the national network comprised 19 stations responsible for environmental monitoring at 63 locations with a frequency of once every 2 - 3 months. Basic parameters of air environment, water environment (inland and sea water), land environment, solid wastes, and noise caused by transportation and radioactivity are monitored and measured by these stations. In addition, some other institutions like Water Resource, Hydrometeorology, and Hydrogeology also carry out water and air monitoring for sectoral research and management purposes.

The most of data presented in current paper is from monitoring activities by CEETIA and other institutions. CEETIA is research, education and consulting institution in Hanoi University of Civil Engineering. The Regional Environmental Monitoring Station under the Ministry of Natural Resources and Environment (MONRE) is based at CEETIA. Since 1996 CEETIA has been given the task to prepare Vietnam Annual State of Environment Report (SOER) for the MONRE.

3.6. Environmental education

Programs of environmental education, training and awareness enhancement have been carried out as follows:

- Education to improve awareness on environmental protection for communities through media such as broadcasting, television, journals and other publications.
- Launching educational campaigns on environmental protection for communities through celebration of special events such as the World Environment Day, Clean up the World Day, Week for Clean Water and Environmental Sanitation, the Green and Clean Month, Exhibition on Environmental Protection, competition of composing music/poems on environmental protection, etc.

- Incorporating environmental education into training curricula of national education system from kinder garden to primary, high school, college and university levels.
- Training and education for the human resources for environmental management.

IV. MEASURES TOWARD WATER POLLUTION CONTROL IN NEAR FUTURE

4.1. Pollution prevention

- Setting up a system of legislative documentation as well as supporting policies for adequate pollution control.
- Development of comprehensive and appropriate system of environmental quality standards.
- Rising of public awareness.
- Integration of environmental issues into socio-economical development plans at different levels.
- Involvement of enter-prizes in cleaner production campaigns.
- Development of comprehensive environmental monitoring network and database management system.
- Conducting environmental planning at different level including macro levels such as national, local and sectoral, using strategic environmental assessment, and assurance of commitments and follow-up activities after EIA report.
- Setting up of integrated river basin management models for all major rivers.

4.2. Pollution mitigation

Currently Vietnam registered more than 4,000 locations as heavy polluting points that are under needs for urgent treatment, including industrial enterprises, landfills, hospitals, pesticides and chemical hazards warehouses, etc. Some of them will be stopped, relocated, or assisted to renovate existing backward technology and/or to build up waste treatment facilities. Wastewater collection and treatment should be done at first, for urban and industrial areas, as well ad for centralized handcraft villages. Vietnam tries to build up wastewater treatment plants for 100% national level cities and industrial parks.

In order to give directions for sewerage and drainage activities, on March 5, 1999, the Vietnam Government has approved the Orientation for the Development of Urban Sewerage (ODUS) in Vietnam to 2020 and the immediate objectives to 2005. The rise in investment sources from the state budget for construction and rehabilitation of sewerage and drainage systems and capacity building for companies engaged in management of operation and maintenance of the systems, the salient feature after 4 years of implementing the ODUS is the significant increase in the number of urban sewerage and drainage projects funded by ODA. Starting with the Hanoi Sewerage and Drainage project of phase I, whose construction was commenced in 1998 with USD 200 millions. ODA fund mainly from Japan, there have been now 10 out 61 cities and provincial towns of Vietnam having ODA funded sewerage and drainage projects with total budget over USD 1 billion from the Government of Japan, France, Denmark, Belgium, Switzerland and international financial institutions like World Bank, Asian Development Bank. Projects are under implementation at various phases.

V. CONCLUSIONS

For the conclusion the following remarks could be devoted:

- Environmental protection is the common cause of the whole nation.
- Water pollution control should follow the main principle of prevention and should be linked with pollution treatment, environmental improvement and bio-diversity.
- Domestic/ private resources mobilization and co-operation should be promoted.

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