Project "Integration of Solid Waste Management Tools into specific settings Of European and Asian Communities**" (ISTEAC)**

Hanoi University of Science

Report of the period: 5/1/2004 - 5/3/2004

1. BASIC DATA

1.1 Country : Vietnam

1.2 Project name : Integration of Solid Waste Management Tools into specific settings of European and Asian Communities" (ISTEAC)

1.3 Programme : ASEAN-EU University Network Programme

1.4 Contract number : ASE/B7-301/1997/0178-19(74016)

1.5 Contract period : 5/1/2004 – 5/1/2006

1.6 Participating Institutions: Aristotle University of Thessaloniki (Greece); Dresden University of Technology (Germany); Hanoi University of Science (Vietnam) and Miriam College (The Philippine)

1.7 Name of co-ordinator at Hanoi University of Science:

Prof. Dr. Nguyen Thi Diem Trang

1.8 Advance payment from ISTEAC project: 11 164, 03 euro

1.9 Activity in this period: Literature review on waste composition and generation

2. CONTENT OF THE REPORT

2.1 Literature review

The report aims to notice the following issues:

- The laws and regulations for solid waste management in Vietnam
- Generation and characteristics of solid waste
- The waste processing and control
- The future directions on solid waste management in Vietnam

A. Laws and regulations for solid waste management

The environmental situation of Vietnam was for the first time reported in the year 1994, from then exists every year the Annual Report on "Environmental Status". This issue reveals that the environmental management has been started not far away; therefore a lot of things need to be done.

However, the ISTEAC project pays attention only on Solid Waste Management. In which *laws and regulations for solid waste management* maybe an important issue. There are some current regulations:

- "Urgent measures to manage solid waste in urban and industrial areas" dated 3/4/1997.
- Decision dated 16/7/1999 by the Prime Minister promulgating Regulation on hazardous waste management.
- Regulation on Clinic Waste Management was issued by the Ministry of Health in 1999.

The current system of legal documentation is still inconsistent and inadequate. There is still a lack of necessary legal instruments, instructive documents, and especially absence of a system of National Standards on solid waste.

B. Generation and characteristics of solid waste

**** Agricultural wastes***

The major waste and residues from agriculture are animal manure from the farmers' houses, the crop residues as well as residues of agro-chemicals.

Manure wastes have not been estimated yet because these are recycled in-situ. Crop residues have not been estimated as yet for the whole country. The application of agro-chemicals is increasing. However the concentration of agro-chemicals in soil is still lower than the permissible limit.

**** Municipal wastes***

The generation rates of solid waste depend on the category of urban area and range from 0.35 kg/p.d. to 0.80 kg/p.d.

The average quantity of solid waste generated from towns and cities was 16,237 tones/day in 1996 and 19,315 tones/day in 1997. This figure increased to 22,210 tones/day in 1998. The collection efficiency was 40 - 70 % of generated wastes in big cities and 20 - 40 % in small towns. The amount of sewage sludge received for dumping into landfill everyday was estimated at 822 tones/day.

Specific gravity of solid waste plays a decisive role in choosing the collection equipment and transport modes. It ranges from 400 - 580 kg/m^3 such as in Ha Noi, Da Nang: 420 kg/m^3; Hai Phong: 580 kg/m^3; Ho Chi Minh City: 500 kg/m^3.

Composition of urban solid waste is very diverse and is characteristic for each town. Generally there are some common characteristics as follows:

- Composition of organic origin accounts for high rate (50.27% - 62.22%);
- Contains a lot of soil, sand and fragment of brick, stone, etc;

- High moisture content, low specific heat energy (900 Kcal/Kg).

Table 1:Composition of solid waste in several cities in Vietnam in 1998

% In weightily

No.	Composition	Ha Noi	Hai Phong	Ha Long	Da Nang	Ho Chi Minh City
1	Organic compounds	50.10	50.58	40.1- 44.7	31.50	41.25
2	Plastic, rubber, leather	5.50	4.52	2.7 - 4.5	22.50	8.78
3	Paper in all kinds	4.20	7.52	5.5 - 5.7	6,81,400	24.83
4	Metal	2.50	0.22	0.3 - 0.5	1.40	1.55
5	Brick, stone, ceramics	1.80	0.63	3.9 - 8.5	1.80	5.59
6	Soil, cobble, and Other solid matters	35.90	36.53	47.5 - 36.1	36.00	18.00
Water content		47.7	45 - 48	40 - 46	39.05	27.18
Ash content		15.9	16.62	11.0	40.25	58.75
Density, ton/m^3		0.42	0.45	0.57 – 0.65	0.38	0.412

Source: Report " *State of Environment in Vietnam*" - 1999 – NEA

*** Hazardous wastes**

There is no classification of hazardous waste in Vietnam. Most hazardous wastes are not treated or are treated in a very primary way and then dumped together with municipal wastes at landfill sites (Medical waste & industrial waste).

The daily production of hazardous waste from hospitals is estimated at about 50 - 75 tones (comprising 22 % of hospital waste). Medical Waste composition from different regions in Vietnam (1998) is shown in table 2. Average bulk density of the hospital waste is 150 kg/m^3; Water content is 42%; Calorific value is 2,150 kcal/kg.

Table 2: Medical waste composition in Vietnam

Hospital Waste Composition	Ratio (%)	Containing Hazardous Materials or not?
Organic waste	52.9	No
PP, PE, PVC bottles and bags	10.1	Yes
Bandage, plaster	8.8	Yes
Metal, cans	2.9	No
Glass, syringes, medicine tubes	2.3	Yes
Syringes and syringes needles	0.9	Yes
Waste paper, cartons, paper	0.8	No
Human parts for lab analysis	0.6	Yes

Soil, cobble, china, and other solid matters	20.9	No
Total	100.0	
Total of Hazardous Items	**22.6**	

Source: Report on " *Medical Waste Management* " by Ministry of Health (MoH) - 1998

According to statistical data in the four big cities: Ha Noi, Hai Phong, Da Nang and Ho Chi Minh city, the amount of industrial solid waste is about 15 - 26 % of municipal solid waste. In the industrial solid waste, about 35 - 41 % of solid waste are hazardous.

Composition of industrial solid waste is very complex, depending on the raw materials, technological processes and final products of each production center and its related services. The daily production of hazardous waste from industries in 1997 is roughly estimated at about 1,930 tones/day (comprising 19 % of industrial waste). This figure increased to 2,200 tones/day in 1998 and 2,574 tones/day in 1999.

The hazardous waste generated from major industrial sectors in several cities in 1998 is shown in table 3.

Table 3: Generated industrial hazardous wastes in several cities in Vietnam (Ton/Year)

Provinces/City	**Electrical/ Electronic**	**Mechanical Industries**	**Chemical Industries**	**Light Industries**	**Food Processing**	**Others**	**Total**
Ha Noi	1801	5005	7333	2242	87	1640	**18108**
Hai Phong	58	558	3300	270	51	420	**4657**
Quang Ninh	-	15	-	-	-	-	**15**
Da Nang	-	1622	73	32	36	170	**1933**
Quang Nam	-	1554	-	-	10	219	**1783**
Quang Ngai	-	-	-	10	36	40	**86**
Ho Chi Minh City	27	7506	5571	25002	2026	6040	**46172**
Dong Nai	50	3330	1029	28614	200	1661	**34884**
Ba Ria - Vung Tau	-	879	635	91	128	97	**1830**
Total	**1936**	**20469**	**17941**	**56261**	**2574**	**10287**	**109468**

Source: Report "*Statistics and prediction of generated hazardous wastes and Recommendation for Master Plan of HW treatment plants in Vietnam*" by Center for Research- Investment Consult for Rural Development, 1999.

C. The waste processing and control

****Collection and transportation***

In general, solid wastes are not segregated at source. They are collected together and transported to the treatment sites. The collection efficiency is 40 - 67 % of generated wastes in big cities and 20 - 40 % in small towns. Average collection rate is only about 53.4%.

There is still inconsistency in technology for collection and transportation, with a mix of different forms:

Solid wastes from streets and public locations are collected manually, using manual sweeping and loading into handcarts for transportation to transfer stations;

Handcarts or waste collection vehicles running through streets according to a planned schedule collect solid wastes from households;

Solid waste from hospitals, business and industrial centers and construction sites are collected and transported under specific contracts.

****Treatment and disposal of solid wastes***

Most solid waste is disposed at open landfill sites. The rate of recovery for recycle and reuse is around 13 % -20 %, mainly done by scavengers, who collect plastic, paper, metal and glass. Recovery rate of solid waste from sources to treatment location is rather high. However, waste picking activities are completely spontaneous without any form of organization and management.

About 1.5 % - 5 % of the total generated wastes are recycled by composting to produce fertilizers and soil conditioner.

The existing landfill sites are not controlled for hazardous matter, stinking smells and leachate, which are potential sources of pollution for land, water and atmosphere. Landfill sites of urban areas in the Mekong Delta are still suffering from flooding in rainy season, which may lead to unexpected negative impacts to the environment. The sanitary landfills are required for environmental protection, as there is no liner in the bottom and on the walls, no leachate collection and control or gas system, and no cover layer and no fence on traditional landfills.

The toxic wastes from hospitals and industries are not treated before dumping with domestic waste at the landfill. Several hospitals have installed incineration system to treat medical hazardous waste. Two incinerators are used for treatment of residues from shoe manufacturing industries with a capacity of 16 tons/day.

Treatment facilities for industrial hazardous wastes should be created by applying the following methods:

- Chemical/Physical treatment
- Stabilization
- Solidification

Facilities for the treatment of medical hazardous waste should be created by applying the thermal treatment process or sterilized methods.

D. The future directions on solid waste management in Vietnam

The Government of Vietnam has planed a long-term development for solid and hazardous waste management. The National Environmental Action Plan 2001 -2005 (NEAP) is focusing on five programs, among them *Program 2* concerning: Improve solid waste management capacity, especially hazardous waste management in densely populated urban areas and industrial zones. This program includes the following action:

****Develop a national strategy for solid and hazardous waste management***

The strategy will include the development of sanitary landfills, instead of traditional dumpsites, improved urban planning regulations and hazardous waste management guidelines. The strategy will identify institutional relationships and administrative requirements, financial requirements for addressing priorities and HRD implications.

****Develop sanitary landfills***

Main population centers will develop sanitary landfills, according to the following time schedule:

- 2002: Hue, Haiphong, Danang
- 2003: Dongnai, Quinhon
- 2004: Baria-Vungtau, Nhatrang, Halong
- 2005: Thainguyen, Thudaumot

In addition, waste separation will be promoted throughout the country in an attempt to reduce the necessity for new landfills and expensive treatment facilities. By the year 2005, waste separation will be in place in at least 20 major centres in the country.

Recycling, re-use and reclamation of waste products will be promoted and private sector involvement will be encouraged. At least ten private sector enterprises will be in operation by the end of the plan period.

**Improve hazardous waste management*

Vietnam is still predominantly an agricultural society. However, hazardous waste is becoming a major problem. The main source for hazardous waste in industrial production, in particular metallurgy and chemical industry. Hazardous waste treatment facilities will be developed in Hanoi, Danang and Ho Chi Minh City, to act as collection and treatment locations for the three major development zones of the country.

**Increase the involvement of private sector*

The development of private sector capacity for collection and transportation of solid waste and hazardous waste will be encouraged. By the year 2005, at least ten cities will have a privately run waste collection and transportation system. This will require financial incentives, and a list of economic policy instruments will be prepared in 2002 that will be used to promote private sector involvement. Studies will also be carried out in 2002 and 2003 to determine opportunities to increase cost recovery associated with collection and disposal of solid waste.

**Improve hospital waste management*

There are currently 815 state-owned hospitals in operation and three private hospitals, but few of these have adequate waste treatment facilities.

Not all hospital waste is hazardous, and it is estimated that only 16% of their solid waste needs special treatment. Before the end of 2005, environmental management systems will be introduced in all hospitals, as well as a number of private health clinics in the country. This will include waste separation guidelines and training and awareness about sanitation and environmental issues.

Solid hazardous waste could be incinerated, but the running cost of incinerators is prohibitively expensive. A study will be carried out by MoH and NEA/MoSTE in 2001 and 2002 to determine alternative, appropriate technology options for hospital solid waste management. Incinerators will be installed at twenty main hospitals during the plan period, especially those that deal with infectious diseases. This will include 3 hospitals in Hanoi and HCMC respectively, and 12 general hospitals in rural provinces. The cost the actual plants will be covered through ODA, but Government will ensure that the running costs of the facilities are included in the budget for the respective hospitals.

The study will also determine the most cost-effective and environmentally appropriate means of treating wastewater from hospitals, and recommendations will be provided. By 2005, at least forty hospitals will have effective wastewater treatment facilities.

****Raise awareness***

PPC will implement public education programs and awareness campaigns in major cities to prevent indiscriminate and illegal dumping of hazardous waste. During the period 2001 - 2005, programs will be implemented in the following cities and rural areas:

- By 2003: Hanoi, Dongthap
- From 2002 to 2004: HCM city, Quangninh
- From 2003 to 2005: Haiphong, Quangngai

In addition, MoH and NEA/MoSTE will develop and implement targeted education programs for decision-making staff in all Provincial Departments of Health, Departments of Transportation and hospitals.

Table 4: Targets of EAP Program 2

Action	***Target***
Prepare national strategy of hazardous waste management	Report produced in 2002
Develop sanitary landfills	Ten sanitary landfills developed before 2005
	Waste separation in place in at least twenty cities in 2005
	At least ten private sector recycling, reuse and reclamation enterprises in operation by 2005
Install hazardous waste treatment facilities	Three sub-national treatment facilities in operation before 2005
Increase private sector involvement	At least ten private sector waste handling contracts in operation before 2005
	Economic incentives identified and published in 2002
	Cost recovery studies carried out in 2002 and 2003
Improve hospital waste treatment	EMS systems introduced in all hospitals before 2005
	Incinerators installed in 30 hospitals before 2005
	Wastewater treatment study carried out in 2002

	Appropriate wastewater treatment facilities in operation in 40 hospitals before 2005
	All new hospitals or upgraded hospitals have adequate waste treatment facilities.
Raise awareness	Six public awareness campaigns on solid waste and hazardous waste management by 2005

2.2 References

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