



Vietnam:

SOLID WASTE TREATMENT TECHNOLOGY

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I. Summary

During last several years, the Vietnamese Government has focused increasing attention on the problem of solid waste management. Consequently, investment in technologies for waste collection and incineration of hazardous hospital waste has become a priority. However, the collection and separate treatment of hazardous industrial waste is still neglected.

As Vietnam's rapid industrialization and urbanization has increased, so has the output of Vietnam's hazardous solid waste. The average rate of solid waste collection is only about 53 percent for the whole country, of which the collection rate in urban areas is 71 percent and in rural areas less than 20 percent. Technology and facilities for waste collection are inadequate and outdated. There is still no separation of waste at the source or separation of hazardous waste from municipal solid waste sites. In addition, the technology for solid waste treatment fails to meet general sanitary requirements.

Annually, Vietnam spends about USD \$950 million to dump solid waste on 5,000 hectares of land. Only 13 out of 64 cities have landfills that meet national sanitary standards. With increasing amounts of solid waste generation and problems associated with leachate from improperly constructed and managed landfills, solid waste management has become a top government priority in Vietnam.

II. Market Data

1. Generation and characteristics of solid waste

Last year, Vietnam generated over 15 million tons of waste from various sources, out of which 80 percent is from municipal sources, 17 percent is from industrial waste sources, and the balance is from hospital waste. The main challenges in solid waste management cited by Vietnamese municipalities include the lack of equipment, capital and public awareness. In addition, there is a dearth of facilities and responsible entities to treat and dispose of many types of hazardous waste.

Waste generation: <i>million tons/year</i>	2005	2010	2020
Municipal Waste	12.8	21	42
Industrial Waste	2.6	2.76	9.66
Medical Waste	0.016	0.019	0.022
Total	15	23.779	51.682

The weight of solid waste is the main determinant of the type of collection equipment and transportation used for particular sites/cities. For example, in Hanoi, the range is from 400 - 580 kg/m³ in Ha Noi, in Da Nang the weight is 420 kg/m³; in Hai Phong it is 580 kg/m³; and in Ho Chi Minh City is 500 kg/m³.

1.1. Municipal solid waste

Across Vietnam, the composition of urban solid waste varies and reflects each town's level of development, customs and habits. Generally, there are some common characteristics such as:

- Organic composition accounts for a high rate (50.27% - 62.22%);
- A high level of soil, sand and fragmented brick and stone;
- A high moisture level and low specific heat energy (900 Kcal/Kg).

Composition of municipal waste in several cities in Vietnam, % in weight

No.	Composition	Ha Noi	Hai Phong	Ha Long	Da Nang	Ho Chi Minh
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

Source: Report 'State of Environment in Vietnam'

1.2. Medical waste

There is no classification of hazardous waste in Vietnam. Most hazardous waste is not treated or is treated poorly and then dumped together with municipal waste at landfill sites. The average bulk density of the hospital waste is 150 kg/m³, water content 42%, and caloric value 2,150 kcal/kg.

Medical waste composition in Vietnam

Hospital Waste Composition	Ratio (%)	Hazardous or not?
Organic waste	52.9	No
PP, PE, PVC bottles and bags	10.1	Yes
Bandages, plaster	8.8	Yes
Metal, cans	2.9	No
Glass, syringes, medicine tubes	2.3	Yes
Syringes and syringe needles	0.9	Yes
Waste paper, cartons, paper	0.8	No
Human body parts for lab analysis	0.6	Yes
Soil, cobble, china, and other solid matter	20.9	No

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

1.3. Industrial waste

About 35-41 percent of industrial solid waste is hazardous. The 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.

Hazardous waste generated from major industrial sectors is shown below.

Generated industrial hazardous waste in several big cities in Vietnam (Tonnage / 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	27	7506	5571	25002	2026	6040	46172
Dong Nai	50	3330	1029	28614	200	1661	34884
Ba Ria	-	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 Centre for Research- Investment Consult for Rural Development.

2. Waste processing and control

2.1. Collection and transportation: In general, solid waste is not segregated at the source. It is collected together and transported to treatment sites. The collection efficiency is 40 - 67 percent of generated wastes in big cities and 20 - 40 percent in small towns. The average collection rate is only about 53 percent. There is still inconsistent methods of collection and transportation of solid waste across the country, ranging from:

- Solid waste from streets and public locations are collected manually, using manual labor to sweep and load waste into handcarts for transportation to transfer stations;
- Solid wastes from households are collected by handcarts or waste collection vehicles running through streets on a planned pick-up schedule;
- Solid waste from hospitals, industrial centers and construction sites is collected and transported under specific contracts.

2.2. Treatment and disposal of solid waste: Most solid waste is disposed at open landfill sites. The rate of recovery for recycling and reuse is around 13 - 20 percent, which is carried out by random scavengers, who collect plastic, paper, metal and glass. The recovery rate of solid waste from

sources to treatment locations is rather high. However, waste picking remains an informal activity in the economy, without any major organization undertaking this process.

Existing landfill sites are not controlled for hazardous matter, thus potent odors and leachate there can present possible sources of pollution of land, water and the atmosphere.

Landfill sites of urban areas in the Mekong Delta still suffer from flooding in the rainy season, which lead to adverse impacts on the environment.

Although sanitary landfills are required for environmental protection, appropriate conditions are not met. Specifically, there are no liners at the bottom of the sites, no leachate collection capabilities, no cover layers, and no fences at traditional landfills.

The toxic waste from hospitals and industries are not treated before dumping them with domestic waste at landfills. Only several hospitals have installed incineration system to treat medical hazardous waste.

III. Major projects and best prospects

Best prospects

- Solid waste treatment and recycling facilities.
- Plants to convert waste to compost.
- Landfill leachate treatment technology and equipment.

The largest end-users for imported solid waste equipment are government-executed, foreign-financed ODA projects for major cities and provincial towns. Usually the implementing agency for solid waste management projects is the local provincial or urban environmental company.

Major projects

1. US-based California Waste Solutions, Inc., has applied for approval to develop and operate the Da Phuoc Solid Waste Treatment Complex as a large-scale sanitation project in Ho Chi Minh City. The 128-hectare waste treatment complex project is touted as one of the key waste treatment plants in the city's environment protection strategy until 2020. The project, which requires USD\$ 426.5 million in investment, includes a plan to sort out and treat waste for recycling at a daily capacity of 6,000 tons, a fertilizer factory that uses organic waste as production material, and a dumping site.
2. An investment license was given to Lemna International, Inc. headquartered in Minnesota to build a USD \$36 million solid waste treatment plant. The state-of-the-art facility will be located in the city's northwestern outlying district of Cu Chi and be able to handle 1,200 tons of waste a day. In the initial phase, it will handle 600 tons of waste a day. More than 65 percent of the waste will be reprocessed into organic fertilizer and the remainder will be recycled or dumped in a sanitary landfill. Construction of the plant is expected to begin in the second half of 2006 and

work on the first phase will be finished within 10 - 13 months. After the licensed period of 30 years, Lemna will transfer the plant to the city. Lemna also plans to build similar facilities and sell solid waste treatment equipment in other parts of Vietnam.

3. Earthcare Technologies headquartered in Arkansas has formed a joint venture company, Saigon Earthcare, to build a solid waste treatment plant in the Cu Chi District of Ho Chi Minh City. In the first phase, the plant will receive 500 tons of solid waste a day to convert to fertilizer at average annual capacity of 62,400 tons. The plan for second phase of the project will be to treat 2,000 tons of solid waste per day.
4. A USD 16.5 million project is planned to collect gas from Go Cat landfill in Ho Chi Minh City and convert into electricity of which 60 percent of the cost is provided by the Dutch government and, 40 percent is from Ho Chi Minh City's budget. The technology and equipment for the project will be provided by Ballast Nedam (Holland).
5. A USD \$48 million plant will be built in Thanh Hoa town to convert municipal solid waste into electricity. The plant will have capacity to treat 360 tons of waste a day into 12MW of power. The investor is Nanovo Energy Inc., from Canada.
6. A USD \$4 million plant is planned in Bim Son town in Thanh Hoa province by AE Toan Thich Thien Company to treat 150 tons of solid waste a day and convert it into compost for agricultural usage. The technology and equipment will be supplied by Germany.
7. Vung Tau City in Ba Ria-VungTau Province will build its sixth solid waste treatment facility. The planned capacity for this new plant will be 600 – 1000 tons a day and convert the waste into compost, recycling materials, plywood, etc. Prior to this project, the province has built three factories in Ba Ria, Phuoc Hoa and Song Xanh. Vietsopetro, a joint venture in the oil and gas sector, is building its own solid waste treatment plant in this province. A small plant to treat waste is also under construction in Con Dao Island.

IV. Market Entry Consideration

Laws and regulations for solid waste management include:

Directive No. 199/TTg dated 3/4/1997 on "Urgent measures to manage solid waste in urban and industrial areas"

Circular No. 1350/TT-KCM issued in 1995 giving instruction to implement the Governmental Decree No. 02-CP dated 5/1/1995 defining the commodities and services banned from commercial business and the commodities and services allowed for commercial business under certain conditions on the domestic market.

Decision No.155/1999/QD-TTg 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 an absence of a system of National Standards (TCVN) on solid waste. Existing legal documents in different areas sometimes overlap with each other, even conflicting with legal documents in environment, which hampers the work of environmental protection and waste management. Recognizing the problems, the new national Law on Environmental Protection, which was passed by the National Assembly in November 2005, will be effective in July 2006.

Financing for projects in the environmental sector in general, and the solid waste sector in particular, will continue to come mainly from the Official Development Assistance (ODA) sources. The regular contact with ODA office and Vietnam's Ministry of Planning and Investment is very important. The main Ministry responsible for environmental issues in Vietnam is the Ministry of Natural Resources and Environment (MONRE).

For More Information

The U.S. Commercial Service in Vietnam can be contacted via e-mail at: vo.thuy@mail.doc.gov; Phone: (84.8) 8250490; Fax: (84.8) 8250491 or visit our website: www.buyusa.gov/your_office.

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