

WASTE HANDLING

Reuse, recycling and recovery

SOLID WASTE

Reuse and Recycling

Reuse and recycling is already common practice in many households. A study of households in Hanoi in 1998 found that people reuse items that would otherwise become household wastes, either within the home by giving the items away, or by selling them in second-hand markets and repair shops⁶. Households routinely separate recyclable wastes such as metals and paper for sale to itinerant buyers, or sell them directly to local depots. Reusable and recyclable wastes are also being separated by waste pickers, and then sold to the recycling business. Promoting source separation for increased recycling throughout the country would likely lead to significant savings in municipal waste disposal costs.

Vietnam's potential for recycling is high.

Little information is available on the national amount of waste recycled in Vietnam every year. However, it is known that approximately 20 percent of the municipal waste in Hanoi is recycled. Although this rate is higher than that of other East Asian cities such as Bangkok, Manila and Beijing, there is a potential to recycle at least two times more, as shown by rates in Singapore, Seoul, and Hong Kong (Table 6). For municipal wastes, the government can subsidize recycling and treatment facilities, and it is important to build up municipal capacity to recycle wastes. The private sector should be encouraged to manage and recycle industrial and hazardous wastes, which are usually not managed by municipalities. Eco-industrial parks and waste exchange options could minimize the costs for industrial and hazardous wastes (Box 7)

The informal recycling sector has a significant financial impact on local economies.

The informal sector collects the majority of the recyclable and reusable waste in urban areas. In

Table 6. Recycling rates of municipal waste in Asian cities

City	Recycling
Hong Kong ¹	36%
Seoul ²	45%
Singapore ³	39%
Manila ⁴	13%
Bangkok ⁵	15%
Beijing ⁶	<10%
Hanoi ⁷	18-22%

Source: (1) HK Environment protection Dept.; (2) Yoon, 2002; (3) UNESCAP; (4) Philippines Environment Monitor; (5) Thailand PCD Recycling study, 1998; (6) Inst. Global Env. Strategies; (7) Di Gregorio 1997, 1999.

Box 7. Eco Industrial Parks and Waste Exchanges

Bien Hoa I Industrial Zone was established in 1963 as one of Vietnam's first industrial zones. It contains 88 enterprises from eight industrial sectors. Fourteen of these enterprises reuse their own solid waste by-products (such as metal shavings, glass, and plastic containers) in their manufacturing lines, and five enterprises exchange their wastes with other factories in the industrial zone. Many of the factories also sell their wastes to recycling operations outside the industrial zone. Efforts are under way to establish a waste exchange center that would maintain a database of solid waste by-products available within the industrial zone. Solid waste exchanges are one of the important activities that characterize enterprises in eco-industrial parks. Other key characteristics include exchanges and internal reuse of liquid wastes and waste heat, and minimization of material and energy inputs.

Source: Environmental Protection Magazine, No. 1+2/2004

⁶ C. Ferguson (1998) *The Household Reuse Economy in Hanoi, Vietnam: A Conceptual Model*. University of Toronto

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1995, the value of recyclable materials traded by the informal sector in Ho Chi Minh City was estimated to be VND 135 billion, which amounted to VND 15 billion less than the city's total budget for waste management that year⁷. In Hai Phong, the value of plastics, paper, metal, and glass traded was estimated to be VND 33 billion in 2000⁸. The most recyclable materials were plastics (valued at VND 11 billion), followed by paper (VND 10 billion), and metals (VND 8.5 billion). A 1996 survey of the informal sector in Hanoi estimated that 18 to 22 percent of all waste was being diverted from the landfill by the informal recyclers. Given that roughly 1.4 million tons of waste are produced in Hanoi every year, savings on disposal costs from recycling currently range from VND 38 billion to 47 billion.

The Decision 03/2004 of MONRE allowing the import of waste as materials for domestic production has facilitated the local recycling business to tap recyclable materials from the wider region. However, it is critical to strengthen monitoring and enforcement to ensure that the imported waste will be handled in compliance with environmental regulations.

At least 80 percent of non-hazardous industrial waste from selected industries is recyclable and the potential savings are high. Although there have been no national studies on the amount of industrial waste recycling, individual case studies suggest that industrial waste recycling is widespread. For example, a 2002–03 survey of 29 textile manufacturing enterprises found that waste from 72 percent of

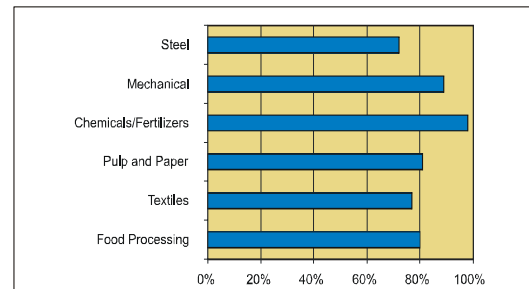
the sampled factories could be recycled⁹. The survey also estimated that roughly 825,000 tons of non-hazardous industrial waste are generated by the six industries listed in Figure 9. If each industry recycled 50 percent of their potential, the savings in disposal costs would amount to approximately \$3.5 million.¹⁰ Additionally, it has been shown that artisans and workers at craft villages are very successful at recycling, as they reuse over 90 percent of their solid, recyclable wastes (Table 7).

Table 7. Recycling in Craft Villages

Materials recycled	Inputs to recycling production (tons/year)	Products (tons/year)	% recycled
Plastics	25,200	22,900	90.9
Paper	51,700	45,500	80.0
Metals	735,000	700,000	95.2
Total	811,900	768,400	94.6

Source: INEST, 2003. Project KC08-09

Figure 9. Potential for recycling industrial waste



Note: The sample size varies from 8-49 factories per sector.

Source: MoI 2002-2003 survey.

⁷ CENTEMA 2002.

⁸ JICA (2001) *The Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam*

⁹ Le Minh Duc, 2004. *Consultant report based on MOI survey 2002-2003, submitted to WB*

¹⁰ WB staff estimate based on data from 9 URENCOs, assuming the cost for disposing non-hazardous industrial waste is \$10/ton, the same as for municipal waste.

Composting and recovery

Composting is potentially a very useful form of recycling of organic waste to produce a clean soil conditioner, and could help to increase the recovery rate of recyclable materials. This could contribute to a more efficient municipal solid waste system, but it is not yet widespread for a number of reasons, including inadequate attention to the biological process requirements; poor feed stock and poor quality of the fertilizers; and poor marketing experiences. To support composting, the development of a strong market for intensive agriculture is needed (Table 8).

The effectiveness of centralized composting facilities could increase considerably. Centralized composting facilities are large-scale waste management plants that draw on an urban

area for their organic waste supply. Several of these facilities are currently operating in Vietnam (Table 8), but no data are available on their cost-effectiveness. The compost produced at these plants often contains broken bits of glass and metals, and is therefore difficult to sell¹¹. Since centralized composting plants in other Asian countries have failed when relying on mixed municipal waste as their main feedstock,¹² source separation initiatives are being tested in Vietnam. In Hanoi, for example, wastes from markets or separated household wastes from test areas are being used as clean sources of organic matter. (Box 8). In addition, without successful composting, efforts to expand or sustain source separation will be less convincing, although it can still be targeted to recyclable materials and general awareness purposes.

Table 8. Status of selected Centralized Composting Facilities in Vietnam

Location of Facility	Capacity (tons/day)	Opened	Source of Organic Waste	Status
Cau Dien, Hanoi ¹	140	1992; expanded in 2002	Market and street waste	Operating. Sells three products with different quality for 800, 1200, and 2000 VND/kg.
Nam Dinh City ¹	250	2003	Mixed municipal waste	Operating. Compost provided to farmers free of charge.
Phuc Khanh, Thai Binh ¹	75	2001	N/A	Operating.
Viet Tri City, Phu Tho Province ¹	35.3	1998	N/A	Operating. Sells 3 products with different quality for 200, 250 and 900 VND/kg
Hoc Mon, Ho Chi Minh City ¹	240	1982 closed 1991	Mixed municipal waste	Closed due to difficulties in selling compost
Phuc Hoa Tan Thanh, Baria-Vung Tau ¹	30	N/A	N/A	Operating.
Trang Cat, Hai Phong City ²	50	2004	Septage, sewers, mixed municipal waste	Trial period.
Thuy Phuong, Hue (with seraphin technology) ¹	159	2004	Mixed municipal waste	Operating. Sells compost for 1100 VND/kg to coffee and rubber farmers.

Sources: (1) Nguyen Thi Kim Thai, 2004. Consultant report submitted to WB ; (2) WB Three cities sanitation project

¹¹ Nguyen Thi Kim Thai, 2004. Consultant report submitted to WB.

¹² Hoornweg et al. (1999) *Composting and its applicability in developing countries.*

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Old landfills have been used as sources of income. Organic waste decomposes naturally in landfills and, if it is not contaminated by glass, heavy metals, or other pollutants, can be recovered for use as a soil conditioner. A private enterprise has extracted waste from the Dong Thanh landfill in Ho Chi Minh City and separated out organic matter, which was then sold as a soil conditioner for 400 VND/kg.¹³ This practice has been banned in Vietnam due to its potential health and environmental impacts.

Agricultural cultivation wastes are reused for several different purposes. In rural areas, most wastes from agricultural cultivation are reused. However, the nature of reuse varies from the North to the South, as shown in Figure 10. In the northern provinces, more cultivation wastes are used as fuel for cooking and also for heating, primarily due to the colder climate. Local procedures have been developed for reusing waste from rice straw, corn stems, coconut trees, sugar cane, cashew nuts, and other products.

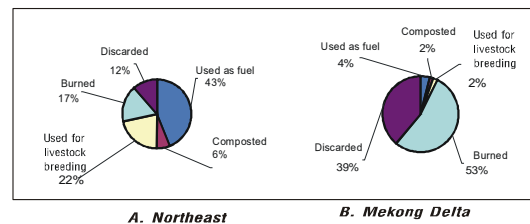
Composting and recovery of landfill gas can reduce air pollution, helping address global warming. Landfill gas is produced by the degradation of organic matter in waste and contains approximately 50 percent of methane, a potent greenhouse gas (Table 9). Landfill gas can be collected and used as a fuel for electricity generation or industrial processes. Composting can also reduce landfill gas emissions by removing organic matters that would otherwise degrade under landfill conditions. The reductions in greenhouse gas emissions from these activities are eligible to receive “carbon credits” under the Clean Development Mechanism of the

Box 8. Source Separation for Composting

In Gia Lam, a suburban district of Hanoi, the Ministry of Science and Technology is supporting a pilot project on source separation of household wastes being conducted by Gia Lam Urban Environmental Enterprise. Over 13,000 households from Sai Dong, Duc Giang, and Yen Vien communes are participating in the project, which started in 2001. Waste is being separated in two categories, organic and inorganic (sometimes referred to as “wet” and “dry”). Wet waste is transported to Hanoi’s Kieu Ky dumping site for composting. The program is successful, as only about 5 percent of the waste sent for composting contains inorganic waste. Other similar initiatives in three villages of Trau Quy Commune in Gia Lam District have shown that between 90-95 percent of households are willing to separate their wastes and that 75-85 percent of the waste is being separated correctly. Residents of urban areas seemed to be less enthusiastic about source separation. A similar effort carried out in Hoan Kiem, a downtown area, showed only 74 percent of the 7,000 residents were satisfied.

Source: Dao Chau Thu, 2004. Consultant report submitted to WB ; Nguyen Thi Thuc Thuy, 2004. Report on Source separation in Vietnam

Figure 10. Use of Cultivation Wastes



Source: NEA, 2000

Table 9. Conditions Suitable for Recovery of Landfill Gas.

Condition	Preferable	Not preferable
Amount of waste	>1,000,000 tons of waste in place	<500,000 tons of waste in place
Depth of landfill	>10m	<5m
Disposal practices	Sanitary landfilling, waste compaction, daily cover and leachate drainage system	Open dumping of waste, fires, and high moisture
Waste pickers	No waste pickers living on site	Waste pickers in contact or interfering with landfill gas equipment

¹³ VIWASE (2002) Master Plan for Solid Waste Management in Ho Chi Minh City up to 2020.

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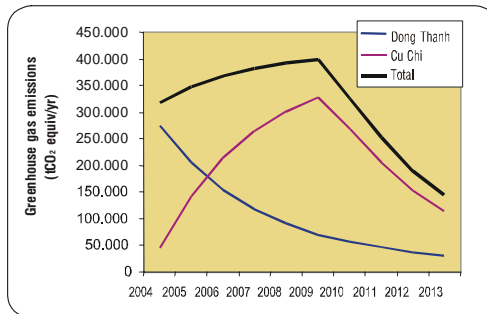
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United Nations Framework Convention on Climate Change. These credits can be sold in international markets, resulting in revenues for landfill operators (Box 9). According to the WB Carbon Finance Unit, carbon finance has the potential to increase the Internal Rate of Return (IRR) of waste management projects by 5–10%. This is compared to biomass (2–7%), gas flaring in the petroleum industry (2–4%), energy efficiency and district heating (2%), bagasse (0.4–3.6%), wind power (1–1.3%), and hydropower (0.8–2.6%)

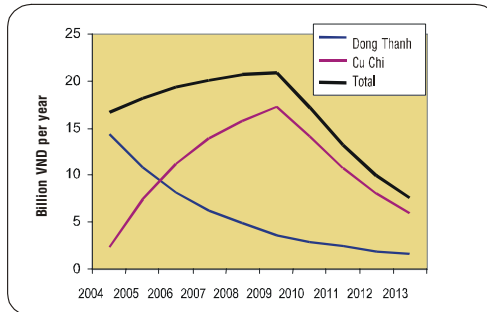
Box 9. Providing global and local benefits through better landfill management

Ho Chi Minh City is considering the development of two landfill gas recovery projects. The first is in the Dong Thanh landfill, which was closed in 2003, and the second in Cu Chi landfill, the new waste disposal site for the city once Dong Thanh is closed. Over a 10-year period, it is estimated the project could reduce the equivalent of 3 million tons of CO₂ emissions, generate roughly 301 GWh of electricity, and result in 164 billion VND in revenues from the sale of carbon credits.

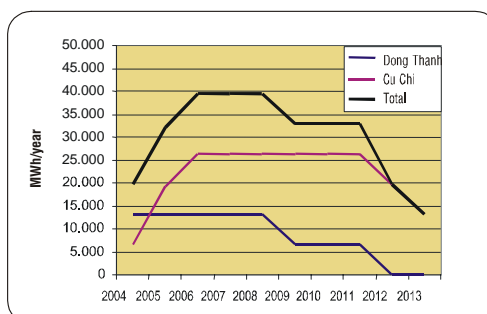
Reduction in Greenhouse Gas Emissions



Revenues from sale of Carbon Credits



Electricity Generation



Source: Data based on the project design document for the Ho Chi Minh City Landfill PCF project, 2003.