

Vietnam's Solid Waste Sector Outlook and Engineering Opportunities

Rapid economic growth has spurred urbanisation and industrialisation in Vietnam, increasing consumption and consequently magnifying Vietnam's solid waste management issue. Increased waste generation per capita compounds to the existing issue of increasing population. A lack of institutional capacity and insufficient state-derived resources leads to inefficient and low-capacity collection and disposal systems, low collection rates and inadequate waste management facilities.

The National Solid Waste Management Strategy sets ambitious goals for:

100% of urban areas to have solid waste treatment works by 2025

100% of the domestic solid garbage in urban areas and craft villages to be collected and treated in accordance with the environment protection standards by 2025

Plus 45/63 cities and provinces have derived their own master plans for solid waste management.

Financial Mechanisms

Currently, the government provides support of VND240,000 - 400,000 (US\$11-18) per tonne for waste treatment.

Private investment has increased, accounting for US\$114.2 million ~ 55% of the total funding. In HCMC, 50% of municipal solid waste (MSW) is collected by private firms or cooperatives.

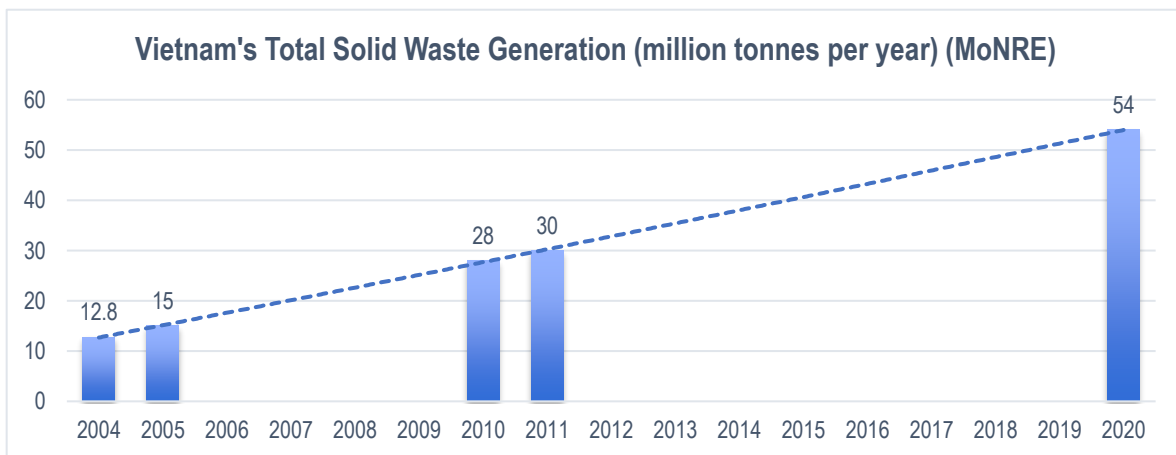
Self-managed waste collection teams work independently with households at a monthly fee of VND10,000 – 20,000 (US\$0.47 – 0.95).

MSW GENERATION RATES

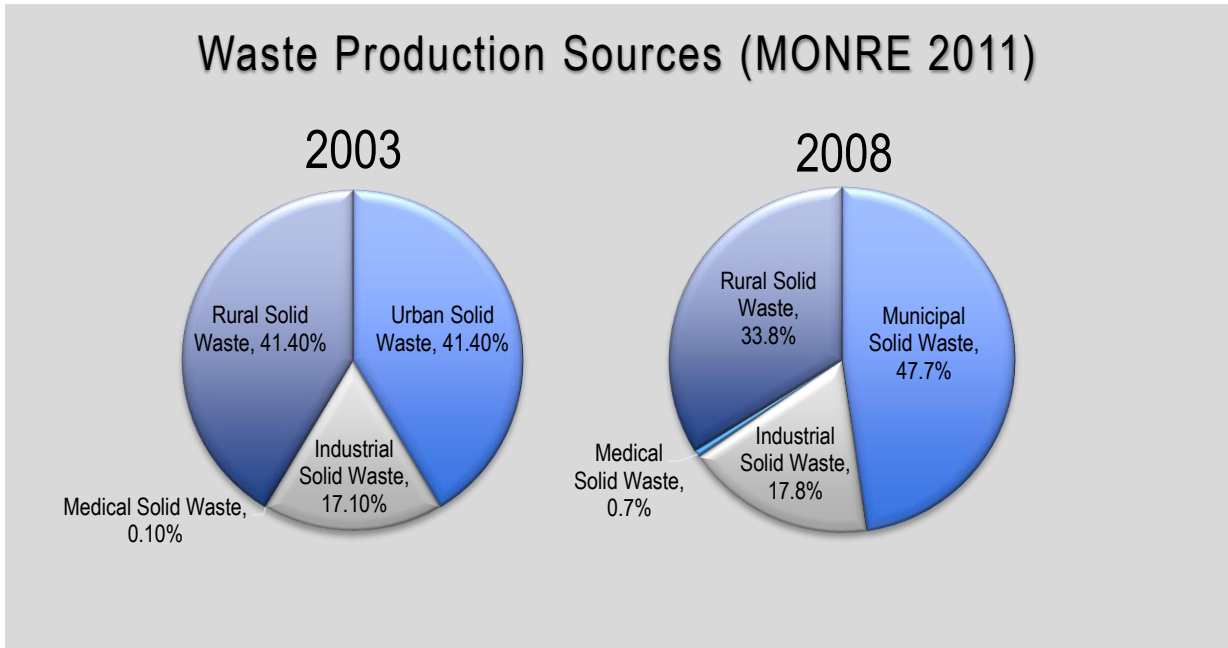
In **2004**, MSW generation per capita was 0.70 kg/day in urban areas and 0.30 kg/day in rural areas (Vietnam Environment Monitor, World Bank 2004).

In **2015**, MSW generation per capita was 1.33 kg day⁻¹ in urban areas and 0.48 kg day⁻¹ in rural areas (DONRE, 2015& Hanoi Statistical Office, 2015). Note this statistic was determined from Hanoi data and has been assumed to be relatively consistent across the nation. With a predicted population of 96.5 million in 2020 and production of 54 million tonnes solid waste per year, that's equal to an average generation rate per capita of 0.56 kg/day.

The amount of solid waste in Vietnam increased from 12.8 million tons in 2004 (Vietnam Environmental Monitor), to 15 million tons in 2005, to 28 million tons in 2010 and 30 million tons in 2011 (MoNRE 2010). This figure is forecasted to reach 54 million tons in 2020 (MoNRE 2010).



Urban areas make up only 34.2% of the total population (World Bank 2016) but produce more than 50% of the country's MSW (Vietnam Environmental Monitor 2004). Approximately 31,500 tonnes of solid waste are produced in urban areas each day (report from the Centre for Environmental Monitoring Portal under the Vietnam Environment Administration, 2014).



Most data regarding waste generation are collected in the urban areas and industrial zones. Since rural areas lack a complete collection system, the waste generation rate in the rural areas has not been fully calculated.

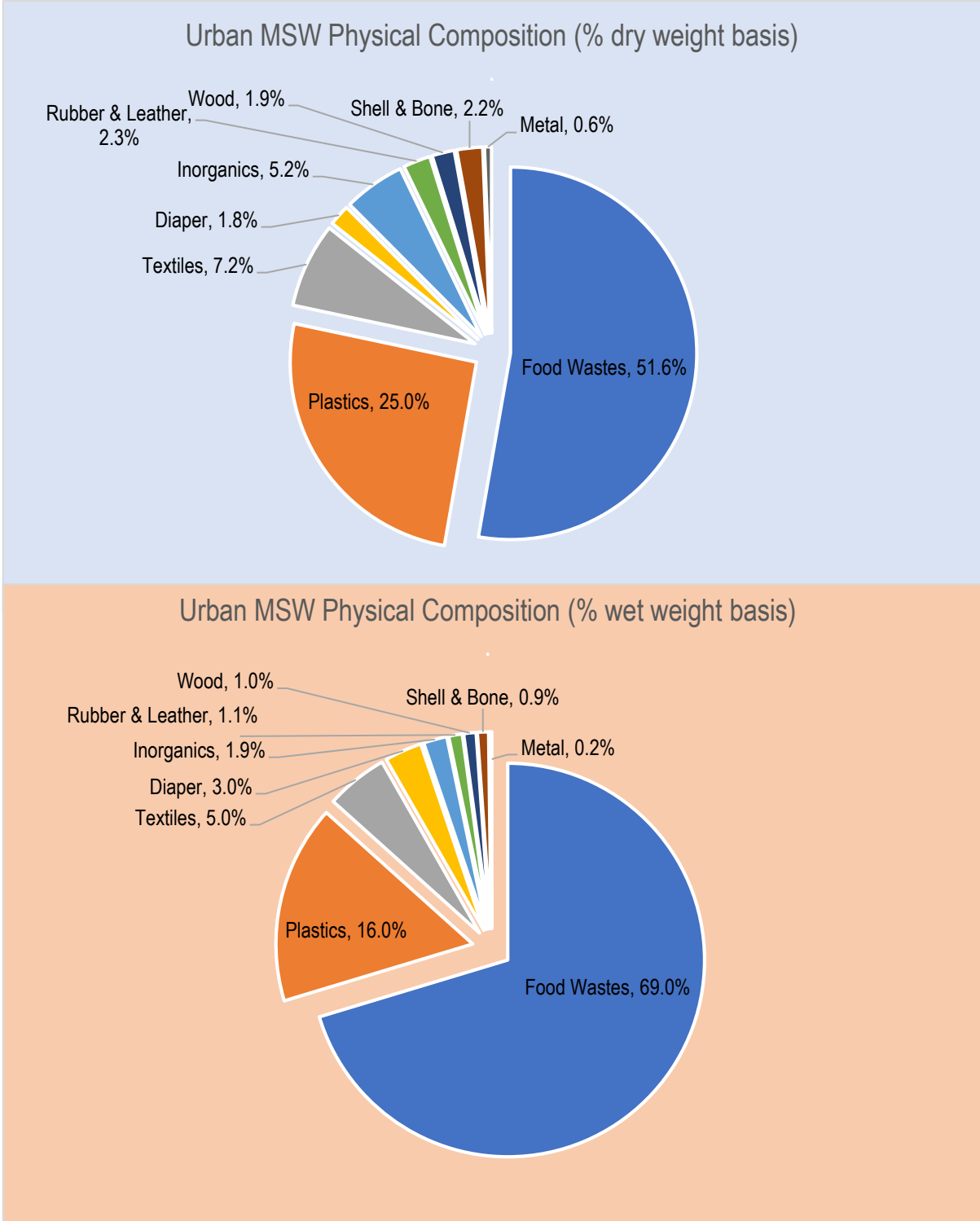
Generation is highly dependent on region, depicted in the map of MSW Generation in Vietnam by province (Vietnam Environment Monitor 2004).



MSW COMPOSITION

Solid waste from rural areas has a higher proportion of organic matter, approximately 60 to 75% (VEM 2004). In urban areas, where people are more affluent, the waste has only 50% organic matter with an increase in non-degradable materials such as plastic, metals and glass (VEM 2004).

Municipal solid waste from the urban areas in 2012 was 54-79% organic and 8-18% recyclable waste (Nguyen 2013).



Source: Climate and Clean Air Coalition Municipal Solid Waste Initiative. Samples was taken from Phuoc Hiep landfill in 2012. Organic waste averagely accounts for 69% by wet weight and 51.6% by dry weight.

MSW COLLECTION

The Centre for Environmental Monitoring Portal, under the Vietnam Environment Administration (2014) deduced;

- **84% of solid waste is treated in urban areas**, an increase of 3 per cent compared to 2010.

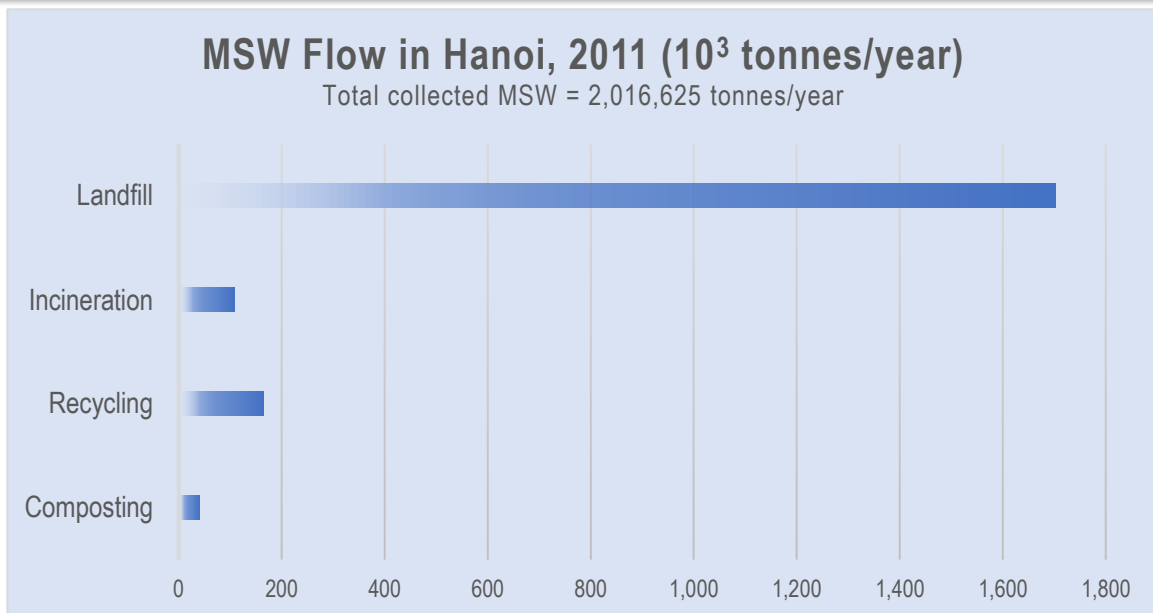
MONRE's 2011 National Environment Report deduced;

- Nearly **70% of Vietnam's population live in rural areas, however waste collection in rural areas is only at 40-55%**

Where the collection system operates, municipal solid waste is collected daily by URENCO through small-sized trolleys. Solid waste from the municipal areas is usually temporarily stored at convenient locations before being transported to the final treatment facilities or landfills (Thanh & Matsui 2011, 2). At present, hazardous municipal waste and non-hazardous waste are not being collected and treated separately. For hazardous waste, 74.2% of the enterprises sign a contract with licenced agencies to transport and dispose of waste in order to comply with the current regulations on hazardous waste disposal (Cleantech Market Vietnam Report 2013, 28). Over 90% of solid waste in the industrial parks is collected.

Most of the solid waste produced in urban areas is not classified at its source. Organic and inorganic wastes are often mixed together. Additionally, there is very little recyclable material left once the waste reaches the treatment plants, as scavengers and garbage collectors have already collected the recyclable material including cans, PET bottles, scrap metal, wiring, plastic bags, and paper to sell.

MSW DISPOSAL



Source: Hanoi URENCO. Solid waste management report. Hanoi state urban environment one member limited company, Vietnam; 2011.

Landfill and Dumping

Landfilled solid waste covers **~80%** of collected solid waste

Vietnam has more than 450 landfills... **85%** of these are **not sanitary**

(Vietnam Environment Administration)

Of the 98 operating centralized landfills in large cities, only 17 sites are sanitary

(WHO, Health Ministry, and UNICEF, 2011)



Most provinces have neither sanitary landfills nor waste treatment plants, plus many landfills are near full capacity. In most unsanitary landfills the waste is spread, compacted, disinfected by spraying powdered lime, deodorised by spraying with EM and then a thin layer of soil is rolled over the ground surface (Cleantech Market Vietnam Report 2013, 26).

Due to the insufficient MSW collection system rubbish is openly dumped, a widespread practice in poor urban areas and rural areas.

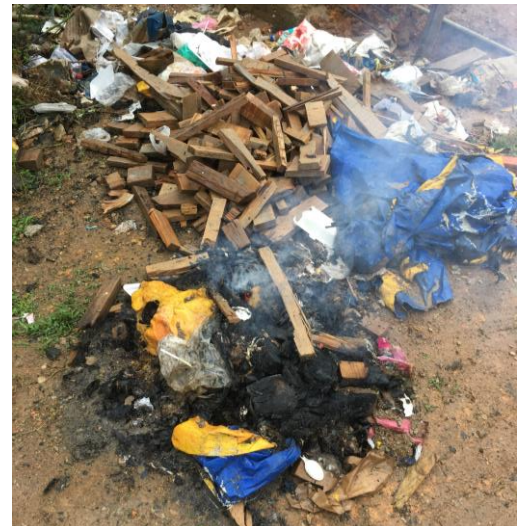
Incineration

Vietnam has a mere 26 solid waste treatment plants with total capacity of 6,000 tonnes per day (report from the Centre for Environmental Monitoring Portal, under the Vietnam Environment Administration 2015).

Incineration demands combustion of material with high calorific value and low moisture content. As household waste is typically of low calorific value and high moisture content, the pre-treatment process is costly. The burning of waste is preferred to landfill as it uses a very small land area. Both landfill and incineration pose environmental threats in their toxic pollution of air, water and soil.

About 50% of hazardous medical waste is ensured to be treated in incinerators. However, the proper maintenance and efficient operation of incinerators is affected by limited funding.

Municipal waste combustion is mainly applied in insanitary landfills, burning the waste using oil when it is dry. It is estimated that about 50% of the waste taken to insanitary landfills is burnt in open air, causing serious pollution (Cleantech Market Vietnam Report 2013, 26).



Small-scale open trash burning is not uncommon, particularly in rural areas.

Recycling



Vietnam relies on a community driven recycling system in which recyclable materials (paper, plastic, metals, etc.) are collected at household level for small profits. The waste scavengers are crucial in the waste management system for sorting waste at source, classifying it and selling to scrap dealers who then sell the waste to recycled product companies. In Hanoi, 1/5th of municipal waste is recycled (Nguyen 2012, 7).

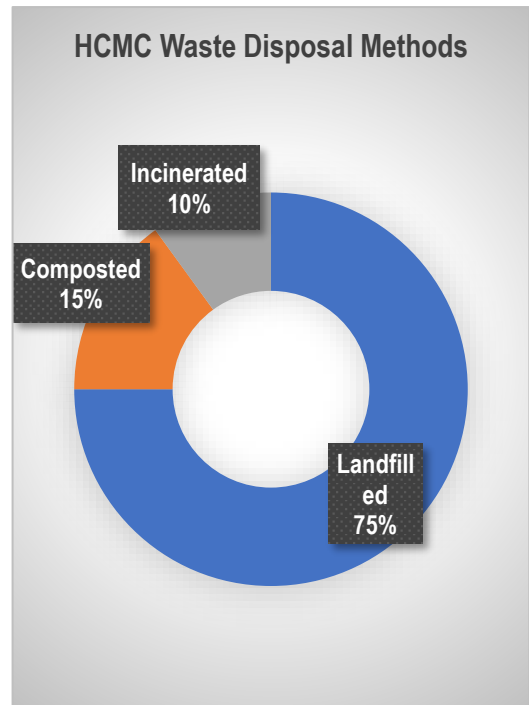
AREA STUDY

HCMC Metropolitan Area

HCMC’s 18 million people discharge an average of **7,500 tonnes/day** of MSW, increasing by 7 – 8% annually. The daily **collection rate** is **90%** of which 75% is landfilled, 15% is treated with compost recycling technology and 5-10% with waste burning technology. (The People’s Committee of HCM City’s solid-waste treatment plan to 2025). The city’s policies aim to reduce 50% of landfilled waste volume by 2020.

As the city has no large recycling plants, solid waste must be purchased and sorted at nearly 1,000 small-scale and household facilities and recycled at 10 recycling plants.

The city has two treatment complexes, the Da Phuoc Complex in Binh Chanh District and the Phuoc Hiep Complex in Cu Chi District. Two other complexes were closed in the past decade due to full capacity (The People’s Committee of HCM City’s MSW Treatment Plan to 2025). The Cu Chi Tunnel can handle almost 6.5 million tonnes of waste in 9 years with an average capacity of receiving and treating 2,000-2,500 tons of waste/day (Cleantech Market Vietnam Report 2013, 26).



Hanoi Metropolitan Area

Hanoi’s 7 million people generate about **6,500 tonnes/day** of MSW with a **collection rate** of **85%**, of which 84% is sent directly to landfills (Analysis of the environmental benefits of introducing municipal organic waste recovery in Hanoi city, Vietnam).

Hanoi currently has 5 centralised waste treatment areas in operation. Hanoi’s landfills were not constructed in compliance with technical standards and three of them are nearly full and going to stop receiving waste. (Cleantech Market Vietnam Report 2013, 26).

Quang Nam Province

The main Central province has 20 landfills of which only six are considered hygienic. The province has only one waste treatment plant in Hoi An with a capacity of 55 tonnes/day. Landfill has become overloaded, while waste transport is unhygienic and foul-smelling, causing widespread air, soil and water pollution. Tam Hai sea now contains toxic levels of pollutants due to increasing waste effluents.

RECENT INVESTMENTS

July 2017: The **Asian Development Bank (ADB)** signed an agreement with Danang City to develop a new land fill and waste treatment facility to supplement the current city's landfill which will be fully utilised by 2020. To be completed as a series of public-private partnerships.

July 2017: The **Empire Group and ViDe Bridge Limited Company of Vietnam** announced plans for a MSW-to-electricity project using advanced technology in Danang. The two companies signed a cooperation agreement with the Intec GmbH Group and Juvema fund on the project's implementation at the Vietnam-Germany economic forum. The first phase of the project will treat 400,000 tonnes of waste a year to produce 350 million kWh of electricity and 24,000 tonnes of coke, while reducing 500,000 tonnes of CO₂.

July 2017: **Viet Nam Energy Environment Industrial Technology's** MSW treatment factory started construction in the Mekong Delta province of Tra Vinh. The US\$3.48 million investment supports a factory that covers an area of 150,000m² and utilises Sankio incinerators imported from Japan to reach a capacity of 150 tonnes/day MSW.

April 2017: **Japanese CAN Holdings Ltd** discussed with Thanh Hoa provincial leaders its plan to construct a waste treatment plant in the province. Funded by Japan International Cooperation Agency (JICA), the plant will be built on an area of 1,386m² at Nghi Son Economic Zone with a final capacity of 100 tonnes/day.

Dec 2016: **Hong Kong-based China Everbright International Limited** received the investment certificate to develop the first waste-to-energy plant in the Mekong Delta, worth an investment of \$47 million. The processing capacity of 400 tonnes/day MSW will power a 7.5MW power generator, expected to annually generate 60 million kWh of green electricity.

Dec 2016: **Japanese Kume Group** plans to invest in a waste to organic fertiliser plant in Hung Yen in partnership with JICA.

October 2016: The Prime Minister approved a plan for solid waste management in key economic zones in the north until 2030. Under the plan, a waste treatment plant will be built in Hanoi covering 257ha with a capacity of around 6,000 tonnes/day. The plan will also define five other solid waste treatment facilities at the provincial level to provide treatment services for localities with a capacity of 11,500 tonnes/day.

OPPORTUNITY: WASTE-TO-ENERGY

A report of the Ministry of Natural Resources and the Environment (2013) showed that 50-70% MSW contains the recycle compounds to re-generate new energy. Vietnam Energy Association reports also concluded that Vietnam's waste could generate up to 1 billion kWh in 2020 and 6 billion kWh in 2050.

The Nam Son Waste Treatment Complex in Hanoi was inaugurated early 2017 as Vietnam's first waste-to-energy plant with capacity of 75 tonnes of waste per day. Worth a total of US\$29 million, US\$22.5 million came through non-refundable aid from Japan's New Energy and Industrial Technology Development Organization (NEDO). The technology and equipment were provided by the Japanese company Hitachi Zosen.

HCMC's Binh Tan district hosts Go Cat waste-to-electricity plant which has been piloting waste treatment processes and technologies since April 2017. The facility utilises 100% Vietnamese technology, invested by Hydraulic – Machine Ltd Company and HCMC Urban Environment Company. The Urban Environment Company has sold electricity to HCMC Electricity Corporation at the price of US 7.38 cents per kWh. A project is now in development to convert domestic waste to electricity at a capacity of 1000 tonnes per day, producing 20MW per day.