



CLEAN CITIES, BLUE OCEAN

Initial Solid Waste Management Assessment (ISWMA) | Vietnam



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Note: This report was developed by Clean Cities, Blue Ocean to inform the program's approach. The report was developed through desk research and represents the best available data accessible to the program.

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Acronyms and Abbreviations

| | |
|-------------|---|
| 3Rs | Reuse, Reduce, and Recycle |
| ADB | Asian Development Bank |
| AFRM | Alternative Fuels and Raw Materials |
| CCBO | [USAID] Clean Cities, Blue Ocean |
| DISED | Da Nang Institute for Socio-Economic Development |
| DPC | Da Nang People’s Committee |
| DoNRE | Department of Natural Resources and Environment |
| DoC | Department of Construction |
| DoIT | Department of Industry and Trade |
| DoST | Department of Science and Technology |
| DPI | Department of Planning and Investment |
| DURENCO | Da Nang Urban Environmental Company |
| ENDA | Environment and Development in Action |
| EPA | Environmental Protection Agency under DoNRE |
| HEPCO | Huế Urban Environment and Works State Limited Company |
| ISWMA | Initial Solid Waste Management Assessment |
| IWC | Informal Waste Collectors |
| MRF | Material Recovery Facility |
| MONRE | Ministry of Natural Resources and Environment |
| MSW | Municipal Solid Waste |
| MW | Megawatt |
| MWRP | [USAID] Municipal Waste Recycling Program |
| NGO | Non-Governmental Organization |
| PET | Polyethylene terephthalate (plastic) |
| PPP | Public-Private Partnership |
| SWM | Solid Waste Management |
| UNDP | United Nations Development Program |
| URENCO | Urban Environment Company |
| USAID | United States Agency for International Development |
| VND | Vietnamese Dong (currency) |
| WWF-Vietnam | World Wide Fund for Nature (Vietnam) |

I. Introduction

On August 28, 2019, Tetra Tech was awarded the Clean Cities, Blue Ocean (CCBO) program, a five-year contract from the U.S. Agency for International Development (USAID) Bureau of Economic Growth, Education, and Environment. CCBO is the agency’s flagship program to respond to the global crisis of marine plastic pollution. The objectives of CCBO are:

Objective 1: Promote reduce, reuse, recycle (3Rs) and strengthen local and regional markets for recycled plastics

Objective 2: Build social and behavior change (SBC) for 3Rs and sustainable solid waste management (SWM)

Objective 3: Increase capacity and effective governance of SWM and 3Rs systems; and

Objective 4: Support international fora, public-private partnerships (PPPs), and multi-stakeholder alliances.

The following presents the Initial Solid Waste Management Assessment (ISWMA) for the program’s four engagement sites in the Socialist Republic of Vietnam (see Figure I). They are:

- Biên Hòa (in Đồng Nai Province);
- Da Nang City (Class-I municipality);
- Huế (in the Thua Thien-Huế Province); and
- Phú Quốc District (in Giang Province).

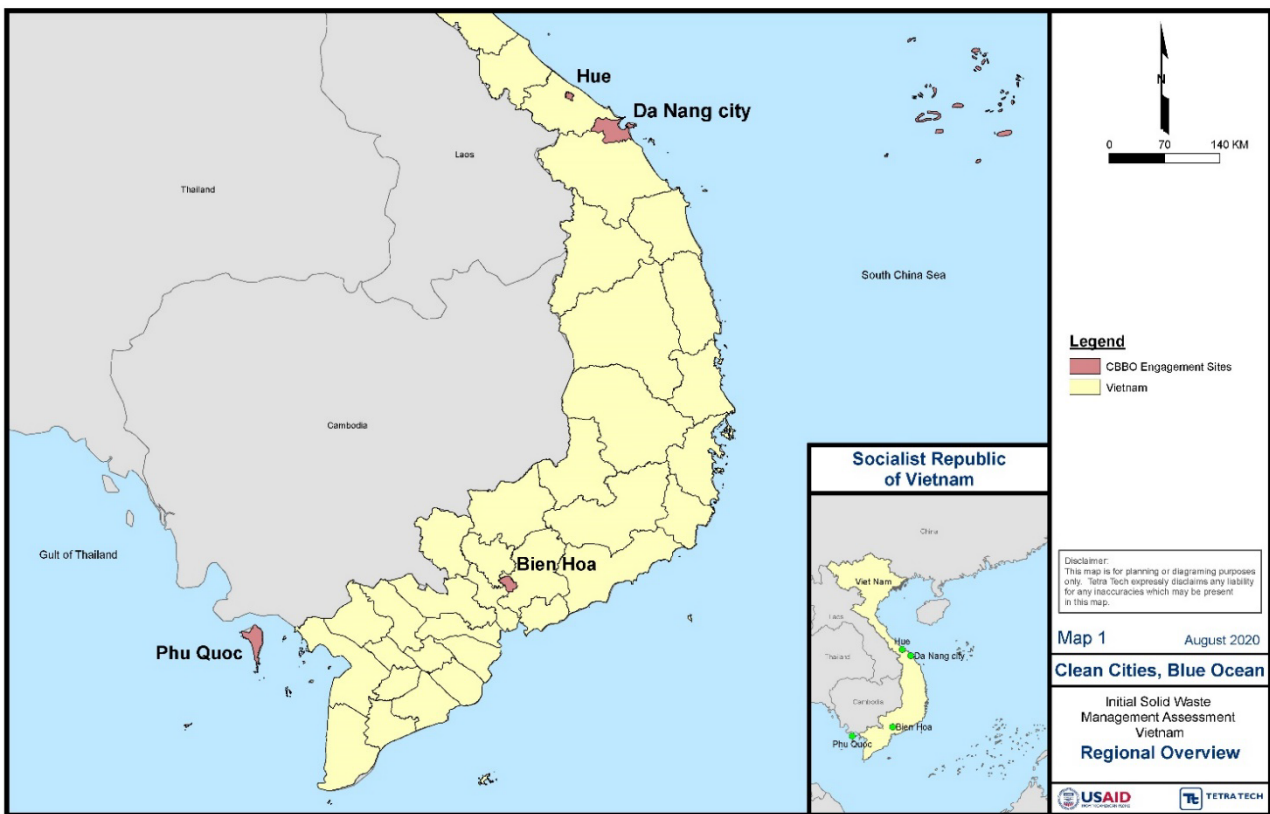


Figure I. Map of Vietnam and CCBO Engagement Sites

This ISWMA was developed to establish a current understanding of 3Rs/SWM in Vietnam and aid CCBO in supporting Vietnam to build capacity to reduce plastics pollution in the ocean and improve the environment and advance urban SWM planning and management. The ISWMA's main objectives are to:

- Identify the existing components of the 3R/SWM systems in each of the engagement sites;
- Assess and determine those areas that are expected to need improvements;
- Identify additional information that is needed to support implementation for improved systems; and
- Provide recommendations that will ultimately inform the program's Year One and subsequent Work Plans as well as local SWM Plans for each engagement site.

Due to the coronavirus pandemic and resulting international travel restrictions, this report has been developed through extensive desktop research, using the websites of multiple governmental agencies (state, provincial, and city), institutions, non-governmental organizations (NGOs), news media, Google Earth, and other relevant websites. A full list of sources is included in Section 6. When international travel resumes and local lockdowns are lifted, CCBO plans to update and validate data and findings, as needed, to ensure accuracy and obtain the support and validation from its local partners. It should be noted, that because reported data could not be verified directly by the CCBO team, when data from different sources (including governmental agencies) appeared to contradict one another or were, in our experience, likely inaccurate, it was stated as such in the document.

2. Current Status of Solid Waste Management in Vietnam

Vietnam is a rapidly growing country in Southeast Asia with a population of about 100 million, with tremendous growth in urban areas. Its S-shape configuration features an extensive eastern coastline (3,260 kilometers long), which provides ample opportunity for plastic leakage into the South China Sea.¹ The country also experiences substantial rainfall in all regions—sometimes torrential—ranging from 120 to 300 centimeters each year.² About 90 percent of that rain³ occurs during the summer, leading to flooding and improperly disposed of plastics being carried into the ocean.

The governing area of the country is divided into 58 provinces and five municipalities. Provinces are divided into provincial municipalities, townships, and counties. These are further divided into towns or communes. The centrally controlled municipalities are subdivided into districts and counties, and then further divided into wards. Governance in Vietnam is led by the Communist Party of Vietnam, which is involved in all branches of the country's politics and society.

¹ Ronald J. Cima, ed. *Vietnam: A Country Study*. Washington: GPO for the Library of Congress, 1987. www.countrystudies.us/vietnam

² Ibid

³ Ibid

2.1 National Laws and Regulations Impacting 3Rs and SWM

Vietnam law first addressed the 3Rs and SWM with the *Law on Environmental Protection (No. 55/2014/QH13)*, approved in 2005 and revised in 2014. The law was the first relevant to all environmental protection issues including waste.⁴

Since, sustainable SWM has become one of the seven priority programs of the *National Strategy for Environmental Protection until 2010 and vision toward 2020*,⁵ and more recently, the country outlined its approach toward waste in the *National Strategy on Integrated Solid Waste Management until 2025, Vision to 2050 (Decision No. 2149/QĐ- TTg)*. This strategy identified several goals, including the following specific targets by 2025:

- 85 percent of the waste from households in urban areas will be collected and treated in an environmentally sound manner; 60 percent of which will be recycled, reused, recovered energy or produced organic fertilizer.
- 50 percent of cities (which have their own recycling facilities) will have households segregate waste at source.
- 80 percent of the total generated non-hazardous industrial waste will be collected and treated in an environmentally sound manner, of which 70 percent will be reused and recycled.
- 100 percent (of the 439) landfills that were causing severe environment pollution will be handled, as listed in *Decision 64/2003/QĐ-TTg* (dated April 22, 2003, by the prime minister).

As of today, these goals have not yet been met, however, momentum has been built in Vietnam to push improvements for 3Rs/SWM systems and numerous environmental activities that are supporting continual progress. For example:

- In December 2017, Vietnam officially joined the list of 127 countries adopting a resolution of the UN Environment Assembly on addressing plastic waste and marine debris;
- In December 2019, Prime Minister Nguyễn Xuân Phúc issued the *National Action Plan on Marine Plastic Waste Management by 2030* that aims to reduce 75 percent of plastic debris in the ocean in the next 10 years and, in 2020, launched an implementation plan to support these actions; and
- Under the prime minister's *Decision 1055/QĐ-TTg*, dated July 2020, the plan aims to minimize vulnerability and risk of climate change impacts by strengthening adaptability of the community, economic sectors, and ecosystems.

Vietnam's Ministry of Natural Resources and Environment (MONRE) is responsible for environmental affairs, including management of solid waste. Other agencies are also charged with managing aspects of national solid waste, including the:

- Ministry of Construction (MOC): responsible for the development of master plans, standards for waste treatment facilities, and management of construction and demolition waste;

⁴ https://www.giz.de/de/downloads/giz2018_Vietnam-Country-Profile_web.pdf

⁵ Ibid

- Ministry of Agriculture and Rural Development (MARD): responsible for agricultural and rural waste;
- Ministry of Health: responsible for waste from hospitals and medical establishments; and
- Ministry of Industry and Trade: responsible for industrial waste.

At the provincial and local levels, the People’s Committees or Municipal People’s Committees, the Department of Natural Resources and Environment (DONRE), and the Department of Construction (DOC), are involved in 3Rs/SWM. Together with the formal waste collection system, the informal waste sector is also engaged in waste collection, transportation, and recycling activities.

2.2 Solid Waste Management Systems and Capacities in Vietnam

While actual implementation of 3Rs/SWM practices have not always met the goals established by Vietnam’s national policies, progress has been made. This section describes CCBO’s understanding of that progress.

Solid Waste Generation and Characterization

It is estimated that in 2016, over 19 million tons of waste was generated in Vietnam, of which 60-70 percent was generated by urban areas. CCBO suspects (based on its experience) that this is an underestimate. An estimation of the composition of the waste stream shows it contains recyclable materials, and similar to other South Asian countries, plastics are a large component of the waste stream (10 percent)—second only to organics (55 percent).⁶

| MSW composition | |
|--------------------------|-----|
| Organic | 55% |
| Plastic | 10% |
| Paper and paper products | 5% |
| Glass | 3% |
| Metal | 6% |
| Rubber | 4% |
| Others | 17% |

Figure 2. Vietnam's Waste Composition, 2016 (Source: GIZ)

Collection

A significant number of households in Vietnam have their waste collected—particularly in urban areas where about 85 percent receive collection, versus 40-55 percent in rural areas.⁷ In the past, many urban local government units had a government-run department that was responsible for SWM (in addition to other tasks such as street sweeping), but many of these agencies have been converted into private companies. Currently, it is common for the solid waste service company of a city to be called [City] Urban Environmental Company (URENCO). CCBO believes that Vietnamese cities with higher levels of collection may be attributed to the early formation of these operations.

Collection and transportation of domestic waste, especially in urban areas, is commonly accomplished through loosely coordinated cooperation by the private companies and the informal waste collector community. Collection of recyclables may also be performed under this form of cooperation. It is more likely, however, that recyclables are collected by the informal community and sold through an informal and inefficient value chain network.

⁶ https://www.giz.de/de/downloads/giz2018_Vietnam-Country-Profile_web.pdf

⁷ Ibid

Recycling

Recycling of waste and scraps for reuse has existed in Vietnam for only a few decades and until now, these activities have not been well organized and have occurred on a small scale.⁸ It is difficult to estimate the rate of recycling in Vietnam due to a lack of data, but sources generally agree recycling rates are low—estimated at around 10 percent. Recyclable materials include metals (the most valuable) and varying grades of paper and plastics. Among the plastics collected for recycling, polyethylene terephthalate (PET) plastic—the type water and soda bottles are made of—appears to be the most valuable and therefore is collected in the largest quantities.

Recycling is rarely part of the formal collection system, which instead relies heavily on market forces to incentivize informal waste collectors (IWCs) for aggregation. Unfortunately, the lack of value chain infrastructure for recyclables keeps prices low and small local scrap dealers typically make very little—about 10,000-20,000 VND (US \$0.50-1.00) per day.⁹ As a result, local scrap dealers pay very little to local collectors, who may come from underrepresented and vulnerable populations that include migrant women or former prisoners. As a result, despite the national law’s requirement for source separation of recyclables, only small quantities of recyclables are being collected.

Reuse and Reduction Programs

Currently, there are few examples of wide-scale reuse and reduction programs, but some do exist. These include refillable water bottle stations and promoting the use of reusable bags instead of plastic.

Markets/End Uses for Plastics

The value chain for marketing of plastics in Vietnam usually starts with IWCs who collect plastics from customers, street scavenging, or from mining waste at dumps/landfills. The collected materials are often sold to very small junk shop dealers that may provide a small amount of processing (i.e., cap and label removal) and sorting (by color and resin type.) End markets are limited and mainly located in urban areas, thus transportation to these sites is often a challenge.

Vietnam’s growing population creates an ever-growing demand for plastic, so plastic resin is imported to make plastic products. In 2018, the expected import volume of plastic resin into the country amounted to approximately 5.7 million tons, while domestic supply could only satisfy 0.57 million tons.¹⁰ This suggests that improving collection and developing sufficient processing capacity may initially be more critical than establishing new end markets—especially since Vietnam has announced that it plans to stop importing scrap plastic by 2025.

CCBO has learned about some ongoing recycling initiatives in Vietnam, including a URENCO partnership with an EverGreen Labs consultant and EverGreen Social ventures to work on a pilot project on plastic

⁸[researchgate.net/publication/262066396_SUSTAINABLE_SOLID_WASTE_MANAGEMENT_IN_DANANG_VIETNAM_THE_3R_REDUCE_REUSE_AND_RECYCLE_APPROACH_FOCUSING_ON_COMMUNITY_PARTICIPATION](https://www.researchgate.net/publication/262066396_SUSTAINABLE_SOLID_WASTE_MANAGEMENT_IN_DANANG_VIETNAM_THE_3R_REDUCE_REUSE_AND_RECYCLE_APPROACH_FOCUSING_ON_COMMUNITY_PARTICIPATION)

⁹ https://www.researchgate.net/publication/329936567_Recycling_in_Vietnam

¹⁰ <https://www.statista.com/statistics/1096641/Vietnam-import-volume-plastic-resin/>

waste recycling in CCBO's engagement site of Da Nang. The project will cover 300 square meters at the Khanh Son dump and will have a designed capacity to process 160 tons of plastic waste each month.

Disposal

Vietnam has recognized the need for improving its disposal options for waste, and through legislation and the help of foreign aid and investment, sanitary landfills are being built. The most current information found indicates that, as of 2018, there were 203 sanitary landfills in the country, but at least 457 dumps also existed¹¹—the most common form of waste management. 85 percent of waste is buried without treatment.¹²

There are also fledgling waste-to-energy (WTE) industry power plants in Vietnam. Nam Son in Hanoi has a capacity of 1,930 kilowatts and the Go Cat waste handling project in Ho Chi Minh City has a capacity of 2.4 megawatt (MW). In Soc Son, Hanoi, a \$29.2 billion Vietnam-Japan government-to-government project is producing 1.93 MW of electricity.¹³ The city of Da Nang also recently announced plans to build a WTE plant by 2022. Vietnam is generally accepting of WTE and other technologies with space use as a criterion.

Financial & Cost Recovery Arrangements

According to GIZ's country profile of Vietnam, in its 2018 Circular Economy Briefing Series the *Deutsche Gesellschaft für Internationale Zusammenarbeit*, waste management funding in Vietnam is generally insufficient and imbalanced. Details include that:

- Provincial waste management spending is often met by central and local state budgets.
- Almost 90 percent of the budget is spent on waste collection and transportation; very little is left for waste treatment and disposal.
- Cities also collect a 'sanitary' fee for waste management service delivery from waste generators. The fee ranges around VND 21,000 (US\$0.90) per household per month in urban areas and US\$0.70 in rural areas. The waste fee is equivalent to 0.5 percent of the average household expenditure.
- The waste fee covers less than 60 percent of the total waste management cost (in some municipalities it is enough to cover only 20-30 percent of the total operation cost).
- A proposal by the Ho Chi Minh City People's Committee on the adjustment of the sanitary fees for households in 2013-2014 was rejected. In 2018, however, USAID's grantee under the Municipal Waste Recycling Program (MWRP), Environment and Development Action (ENDA) contributed to the passage of Decision 38/2018 through advocacy and technical assistance. This legislation increased the fees paid to independent waste collectors by households—an increase

¹¹ https://www.giz.de/de/downloads/giz2018_Vietnam-Country-Profile_web.pdf

¹² <https://aecnewstoday.com/2019/more-needed-Vietnams-waste-to-energy-power-policies-not-powerful-enough/>

¹³ Ibid

from \$1 per month to \$2 per month, which increased monthly income by about 65% as compared to 2017.¹⁴

In addition, CCBO has found that disposal facility owners collect charges from collectors and transporters who have service contracts, but disposal prices must be approved by the provincial government (or the Ministry of Finance if it is a regional facility), according to Article 26.

3. Current Status of 3R/SWM in CCBO Engagement Sites

3.1 ISWMA Summary

Through the ISWMA, high-level information has been gathered on each of its engagement sites in Vietnam, covering 3R/SWM governance, waste generation, recycling, disposal, and supporting education and outreach. The ISWMA provides information not only on current capabilities of each of the sites but identifies critical gaps that should be filled and presents related recommendations and next steps. The following summary provides a brief overview of the system capacities and gaps found across the engagement sites.

Waste Generation and Processing

Across each of the sites, daily waste generation ranges from 140 to 1,300 tons, increasing in line with population sizes—with the exception of Biên Hòa (see Table 1). Biên Hòa, with a population similar to Da Nang, is reported to generate almost half the amount of daily waste of Da Nang—potentially because of Biên Hòa’s lower economic status.

Table 1. Baseline Waste Generation Estimates Across CCBO Engagement Sites

| CCBO Engagement Sites | Areas (#) | Population | Per Capita (lbs./day) | Waste Generation (Tons/Day) | Waste Generation Projections (Tons/Year) |
|-----------------------|-----------------------|------------|-----------------------|-----------------------------|--|
| Biên Hòa | 29 Wards 1 Commune | 1,250,000 | NA | 750 | 280,000 |
| Da Nang | 8 Districts | 1,200,000 | 2.2 | 1,300 | 475,000 |
| Huế City | 27 Wards | 590,000 | 2.2 | 220 | 80,000 |

¹⁴ Reducing Mismanaged Plastic Waste by Organizing Independent Waste Collectors, USAID MWVRP, May 2020. <https://urban-links.org/wp-content/uploads/20200520-MWVRP-Vietnam-ENDA-Fact-Sheet.pdf>

| | | | | | |
|-------------------|---------------------------------------|---|-----|-------------------|--------|
| Phú Quốc District | 3 Metro Areas with 7 Wards & Communes | Residents 101,000 Tourists 2,000,000 | 1.2 | 160 ¹⁵ | 50,000 |
|-------------------|---------------------------------------|---|-----|-------------------|--------|

Because field visits were not able to be completed as part of the ISWMA, many of the operations/facilities listed below were found using Google Earth and Maps (especially for dumps, landfills, and sanitary landfills), which provided visual examples of the landfills. It should be noted that the facilities/operations listed in Table 2 are only those that were identified as formal and/or established facilities/operations.

Table 2. Existing Operations/Facilities at CCBO Engagement Sites

| CCBO Engagement Sites | Recycling Facility (#) | Junk Shop (#) | Dump (#) | Landfill (#) | Sanitary Landfill (#) |
|-----------------------|------------------------|---------------|----------|--------------|-----------------------|
| Biên Hòa | 0 | 2 | 1 | 0 | 0 |
| Da Nang | 0 | 2 | 0 | 1 | 0 |
| Huế City | 1 | 1 | 0 | 0 | 1 |
| Phú Quốc District | 0 | 0 | 2 | 0 | 0 |

Informal Solid Waste/Recyclables Management in Engagement Sites

Solid waste management in Vietnam depends upon the efforts of thousands of IWC, including women, children, and the elderly. This also includes multiple levels of buyers, formal and informal. Extreme poverty and lack of education have created a dependency on solid waste as a source of income for many of these communities. In order to source the systemic cause of plastic waste leakage in each of the engagement sites, solid waste from all sectors needs to be tracked from generation through final disposal. Waste management efforts through scrap pickers and buyers alone are not sustainable; materials with no value, and even those that at one point had value and then lost that value, may end up in the streets, streams, rivers, and ocean.

3.2 Biên Hòa

As shown in Figure 1 in Section 2, Biên Hòa is located in the Dong Nai Province of Vietnam, about 20 miles northeast of Ho Chi Minh City. The Class II city consists of 29 wards and one commune. Biên Hòa is home to an estimated population of 1,250,000.¹⁶ The area of Biên Hòa is comprised of approximately 100 square miles (sq. mi.) with a population density of 10,830 people per sq. mi. (see Figures 1 and 3). As such, Biên Hòa's population density is 26 percent higher than that of the city of Los Angeles (approximately

¹⁵ <https://urbanisthanoi.com/hanoi-development/14261-the-growing-trash-mountains-threatening-phu-quoc-s-tourism#>

¹⁶ Wikipedia, 2018.

8,000 people per sq. mi.), the second most populated city in the U.S. Biên Hòa has heavy industry areas and is home to six industrial zones including one thought to be the oldest industrial zone in Vietnam, established in 1963.

Biên Hòa is known for its large stockpile of dioxin-contaminated Agent Orange, which had been sprayed over the area as a defoliant during the Vietnam War.¹⁷ In 2019, the U.S. and Vietnam began a 10-year cleanup of the site, which has become one of the biggest and most complicated remediation projects globally.

In regard to SWM, creating incentives for recycling has become a priority in local waste management after receiving attention from the Vietnamese government. As such, waste exchange and eco-industrial parks have been promoted in Biên Hòa. The city has introduced the concept of industrial ecology to combine environmental improvement and economic development of local enterprises, industrial zones, and parks.¹⁸ According to the Vietnam Environment Monitor 2004, some of these enterprises are reusing their own solid waste byproducts such as metal shavings, glass, and plastic containers.¹⁹ Other companies exchange their waste with other operations in their industrial zone. Some enterprises also sell their waste to recycling operations. Efforts are being made to establish a waste exchange center that would maintain a database of the availability of solid waste byproducts within the industrial zone.

3.2.1 Governance

Because the Vietnam law requires each city to develop a solid waste management plan (SWMP), CCBO expects that Biên Hòa has begun development of plans to close its dump and establish alternative 3Rs/SWM practices, or initiated improvements to its systems, but was unable to locate related documentation in conducting the ISWMA. Additional analysis of national law and local compliance will be completed through a follow-on CCBO gap analysis report.

3.2.2 Waste Generation

With a population of approximately 1,250,000, Biên Hòa generates an estimated 770 tons per day, or roughly 1.2 pounds of solid waste per capita, according to a 2009 World Bank report.²⁰ Based on waste generation calculations developed through the ISWMA, an estimated 280,000 tons of waste are projected for Biên Hòa in 2020.

3.2.3 Waste Collection

Collection in Biên Hòa consists of formal collectors and IVCs. IVCs collect waste from households, sort for recyclables, and transport remaining waste to meeting points. According to CCBO research, formal workers are employed by Sonadezi Environment Company and are responsible for street sweeping, collection of waste on main streets, and transportation of waste to landfills and treatment stations in other districts of Dong Nai Province.

¹⁷ Petrlik et al., 2019.

¹⁸ Kojima et al., 2009.

¹⁹ World Bank, MONRE, and CIDA, 2005.

²⁰ RCEE Energy and Environment JSC, 2009.

Sonadezi Environmental Company has invested in landfills which has limited competition for the transportation and treatment of waste. As a result, IWCs have contracted with Sonadezi for waste collection from the aggregation points they bring their waste to and pay 11 percent of their total income from collection fees to Sonadezi. IWCs' income is based on the collection fees and profits from recyclables, and they work independently—currently without regulation.

For these reasons, waste collection has not yet reached 100 percent and has contributed to environmental contamination, including in the Dong Nai River.

3.2.4 Recycling System

Material Recovery Facilities

No material recovery facilities were identified in Biên Hòa as part of this ISWMA.

Junk Shops

Two junk shops were identified in Biên Hòa: Phe. BH. 30.4 Junk shop and Quốc thịnh nguyên Junk shop (see Figure 3).

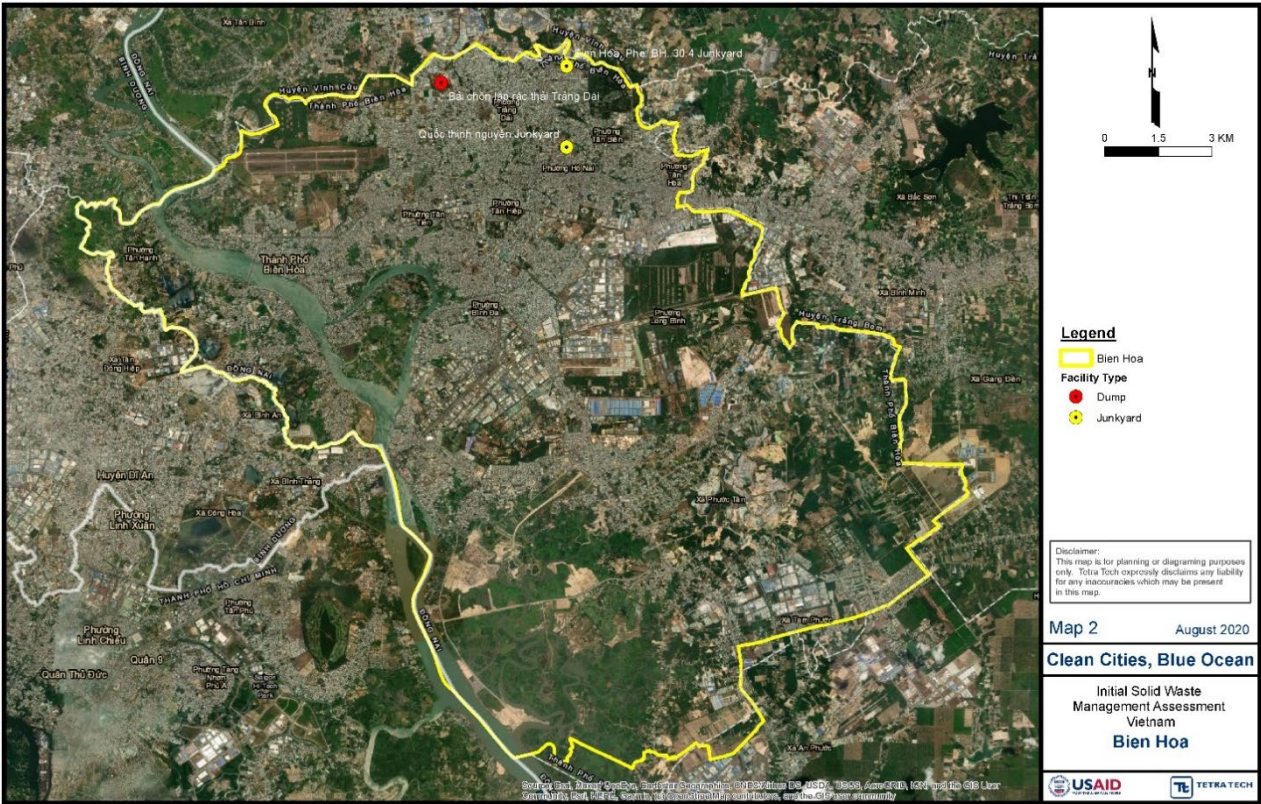


Figure 3. Map of Biên Hòa junk shops

Recycling Plants

In 2008, a waste recycling plant was established in Biên Hòa by Dong Xanh Environment Company. The waste recycling plant was designed to treat organic waste from the Trang Dai landfill. However, due to odors, local residents demanded closure of the plant.

3.2.5 Waste Disposal

Bãi chôn lấp rác thải Trảng Dài was identified as one of the garbage dumpsites in Biên Hòa (see Figures 3 and 4), but during its research phase CCBO also learned of multiple open dumpsites that are known for causing pollution and other odor issues.

A few small-scale facilities have also been established for the incineration of certain solid wastes in Biên Hòa, and some communities burn waste informally.



Figure 4. Bãi chôn lấp rác thải Trảng Dài dumpsite (Google Aerial View 1-2020)

3.2.6 Education and Outreach

In the development of this ISWMA, education plans or instructions for 3Rs/SWM in Biên Hòa were not able to be identified, but some environmental education campaigns have taken place. According to a 2018 article from the Dong Nai Newspaper, Nestle Vietnam Company, Ltd., with its factories in Biên Hòa Industrial Park 2 and Amata Industrial Park, gifted 10,000 recycled non-baked bricks to build a primary school in Biên Hòa City's Tan Bien ward in September 2018, in partnership with MONRE.²¹ The recycled bricks were made from the company's waste during production, and supported MONRE's "Making the

²¹ Dong Nai Newspaper, 2018.

world cleaner” campaign, which aims to raise public awareness of environmental protection among students.

3.3 Da Nang

Da Nang is a Class-I municipality²² and the fifth largest city in Vietnam by population, with an estimated population of 1,200,000.²³ Da Nang is one of Vietnam’s five direct-controlled municipalities and falls under the administration of the central government. It is situated in the south-central coast region along the South China Sea, making it an important port city for the country (see Figures 1 in Section 2 and 5). A highly urbanized city, it is situated at the mouth of the Han River. Da Nang is approximately 500 square miles (sq. mi.) and has a population density of 2,400 people per sq. mi., with most of the population residing in the eastern portion of the city along the bay/coast.



Figure 5. Map of Da Nang

Da Nang’s economy is highly dependent on the tourism sector and is regarded as a transportation hub for central Vietnam. The city recorded nearly 8.7 million visitors in 2019.²⁴ There are multiple construction projects underway, including several beachfront resorts. Da Nang is an established industrial center with many industries including machinery, electronics, building materials, chemicals, shipbuilding, and textiles.

²² One of five municipalities in Vietnam. Municipalities have special status equal to provinces and are controlled by the central government.

²³ USAID, 2019.

²⁴ Da Nang Department of Tourism, 2019.

Da Nang has a tropical monsoon climate with two seasons: a rainy season from September through March and a dry season from April through August.

3.3.1 Governance

In 2018 the Da Nang City People's Council passed *Resolution 204/NQ-HDND*, announcing its focus on domestic SWM. Subsequent planning led to *Decision 1577/QD-UBND* in 2019, which outlined the council's plan on waste segregation in Da Nang through 2025. The plan's major components:

- Require domestic solid waste segregation at source into four categories (recyclables, hazardous, bulky, and ordinary waste);
- Establishes the kind of street containers to be used (with two compartments) and directs the districts to determine where containers would be placed at the street level for collection;
- Outlines a schedule for implementing pilot collection programs in seven districts;
- Announces a plan to construct two transfer stations; and
- Presents a budget of VND 3.6 million for operations and a capital budget of VND 220,594 million.

Improving 3R/SWM is only one of many improvements Da Nang hopes to achieve. In March 2020, Prime Minister Nguyễn Xuân Phúc signed *Decision No. 393/QĐ-TTg*, which approved the Adjusted Master Plan for socio-economic development of Da Nang City toward 2020, with a vision to 2030. This establishes the goal of developing Da Nang as an environmental-friendly city focusing on three primary pillars: tourism, high-tech industry, and marine economy.²⁵ The plan sets a number of goals, including 100 percent rate of waste collection and treatment, and 80 percent of wastewater being treated before being discharged into the environment.

3.3.2 Waste Generation and Composition

Da Nang generates an estimated 1,300 metric tons (1,200 tons) per day, or roughly 1.0 kg (2.2 lbs.) of solid waste per capita.²⁶ Based on waste generation calculations developed through this ISWMA, an estimated 475,000 tons of waste are projected for Da Nang in 2020. The results of a 2019 waste composition study for Da Nang (Figure 6) illustrated that organic waste accounts for the highest portion at approximately 68 percent, followed by plastic at 11 percent.²⁷ Other recyclable materials of significance related to municipal solid waste include paper, wood, and metal.

²⁵ Official Danang Tourism Website.

²⁶ Da Nang Today, 2019.

²⁷ Vietnam Business Council for Sustainable Development and U.S. Business Council for Sustainable Development, 2019.

| Material | Hanoi | Hai Phong | Hue | Da Nang | Hochiminh city | Average |
|------------------|------------|------------|------------|------------|----------------|----------|
| Organic waste | 57.30 | 56.37 | 77.10 | 68.47 | 63.67 | 64.58 |
| Paper | 5.95 | 4.98 | 1.92 | 5.07 | 7.34 | 5.05 |
| Wood | 4.57 | 4.32 | 0.59 | 2.79 | 4.39 | 3.33 |
| Plastic | 10.96 | 12.81 | 12.47 | 11.36 | 14.19 | 12.36 |
| Leather & rubber | 0.18 | 1.48 | 0.28 | 0.23 | 0.69 | 0.57 |
| Metal | 0.56 | 0.36 | 0.40 | 1.45 | 0.48 | 0.65 |
| Glass | 3.47 | 1.52 | 0.39 | 0.14 | 0.63 | 1.23 |
| Ceramic | 0.82 | 0.86 | 0.79 | 0.79 | 0.76 | 0.80 |
| Oil & sand | 5.86 | 3.02 | 1.70 | 6.75 | 1.84 | 3.83 |
| Coal slag | 2.72 | 5.88 | 0.00 | 0.00 | 0.42 | 1.80 |
| Hazardous waste | 0.49 | 0.05 | 0.00 | 0.02 | 0.04 | 0.12 |
| Sludge | 2.98 | 2.15 | 1.46 | 1.35 | 2.41 | 2.07 |
| Other | 0.31 | 2.50 | 0.00 | 0.03 | 0.09 | 0.59 |
| Total | 100 | 100 | 100 | 100 | 100 | - |

Figure 6. Solid Waste Composition (Source: MONRE, 2011)

3.3.3 Waste Collection

It is estimated that on average, 750 tons of conventional waste is collected per day in Da Nang,²⁸ or about 250,000 tons per year.²⁹ This is approximately 58 percent of the current waste generation.

The Da Nang Urban Environment Company (DURENCO) and the Da Nang Department of Natural Resources and Management are the two main local agencies in charge of SWM. The City of Da Nang relies on a combination of formal and informal services to have waste collected from its 276,000 households³⁰ (see Figure 7).

DURENCO performs the formal component of the city's waste collection system. It uses a fleet of compaction-bodied (compressed waste) trucks that collect from 240 to 660 liters (almost one cubic yard) containers placed on the main streets where trucks can access and empty the waste into the vehicles. There is also direct pickup and hauling by DURENCO from transfer stations. Research suggests that DURENCO charges and collect fees from residents/businesses for services (at a rate determined by the Da Nang People's Committee.)

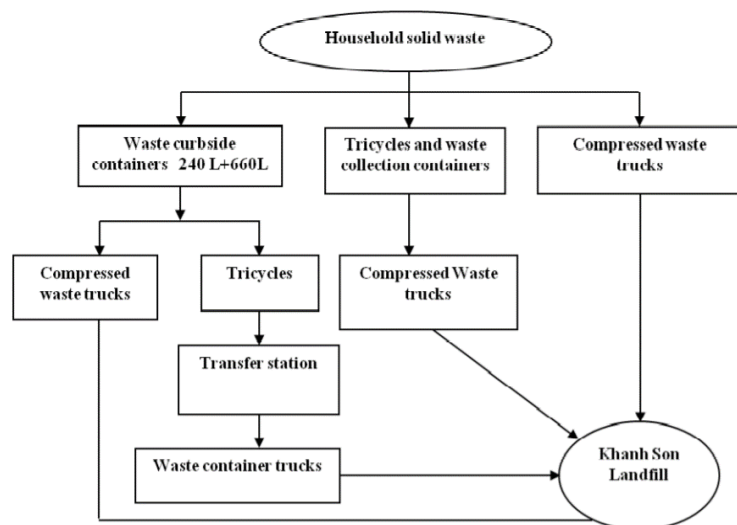


Figure 7. Current Process of Collecting SW from Households in Da Nang (Sardina. Facts and Figures, 2013)

²⁸ Pinang, 2017.

²⁹ researchgate.net/publication/262066396_SUSTAINABLE_SOLID_WASTE_MANAGEMENT_IN_DANANG_VIETNAM_THE_3R_REDUCE_REUSE_AND_RECYCLE_APPROACH_FOCUSING_ON_COMMUNITY_PARTICIPATION

³⁰ <https://tuoitrenews.vn/news/society/20200903/da-nang-to-test-representatives-of-over-71000-households-for-covid19/56542.html>

According to work performed in 2019 by the United Nations Development Program (UNDP) Accelerator Lab, IWCs thoroughly cover waste collection in the city, but their work has not been recognized by the government, nor included in any plans by the city. IWCs go into neighborhoods on foot or using tricycles to collect waste from households and transport it to the containers on the main route or to transfer stations. ISWMA research suggests that DURENCO charges these IWCs to transport the waste they collect from these centralized locations to the Khanh Son landfill.

Transfer Stations

Da Nang City has five transfer stations in operation: Do Xu, Dau Moi Market, Nguyen Duc Trung, Hoa An, and Hoa Tho. Each transfer station is located within three to six miles of the Khanh Son landfill (as shown in Figure 5 in the previous section). There are about 200 additional collection points operating throughout the city.³¹

3.3.4 Recycling System

Da Nang has set lofty goals to recycle at least 70 percent of solid waste by 2020, becoming one of the greenest cities in the world.³² It was not until 2019, however, that Da Nang approved its plan on waste segregation through 2025, which establishes the piloting of waste segregation (paper, plastics, and metals) in certain districts with an expansion of the program expected to follow. The 3.7 million VND for this plan also included building two transfer stations, compartmentalized public containers, and distribution of individual containers to households. In 2019, about 140,000 local residents received guidance on waste segregation at source.³³

Prior to this plan, activities related to the collection, trade, and recovery of recyclables were not carried out by local authorities.³⁴ Currently, no central organization is responsible for managing recycling activities. As a result, almost all recovery and recycling facilities are unorganized, small, and privately-owned. Recyclables are collected from households, curbside containers, and Khanh Son landfill by unauthorized waste pickers, scavengers, or itinerant buyers.

ISWMA research discovered that Da Nang has about 1,000 street waste collectors and scavengers and over 400 waste collection facilities (i.e., depots, microbusiness). The value chain for marketing of plastics is very hard to track, but it appears that plastics pass through many hands with minimal processing or value added before finding its way into a feedstock commodity. This system mostly contributes to the recycling of high-value plastic waste but ignores low-value plastic waste.

The Da Nang government is the first urban area in the country to promote "no plastic bottles" at state offices and buildings.³⁵ According to the vice-director of Da Nang City's Natural Resources and Environment Department, Dinh Quang Cuong, as of 2018, 75 percent of state buildings in the central city stopped using plastic bottles, with recycling bins were installed in public areas.

³¹ WEHRLE, 2018.

³² <https://ardprojects.egnyte.com/navigate/file/f1b3cf7a-ad4c-4524-b2d3-18a1c46aebb6>

³³ <https://en.vietnamplus.vn/first-plastic-waste-project-to-launch-in-da-nang/165846.vnp>

³⁴ Dao et al., 2013.

³⁵ VietnamPlus, 2019

3.4.5 Processing

Material Recovery Facilities

Larger recyclables processing facilities are rare. The Tetra Tech team was only able to identify one in Da Nang as part of this ISWMA.

Recycling Center

Two recycling centers were identified in Da Nang: Thu Mua Phế Liệu and Công ty TNHH MTV Thương mại và Dịch vụ Bách Túng. The location of these centers was not able to be confirmed as part of this ISWMA.

Junk Shop

Two junk shops were identified in Da Nang: Bê vàng and Bò khô Cô Hoa, the location of which were not able to be confirmed as part of this ISWMA. It is understood that many junk buyers stand on the street and buy recyclables.

Waste Processing

Da Nang Today, a Vietnamese news agency, stated that Da Nang in 2016 invested 190 billion VND (approximately \$8,200 USD) into building the first waste treatment plant, which would have had a capacity of 700 metric tons (770 tons) per day.³⁶ Unfortunately, the waste treatment plant failed to process any waste due to poor technology.

Waste to Energy

According to a 2019 news article by Asian news source, AEC News Today, Da Nang recently announced plans to build its first waste-to-energy project at Khanh Son.³⁷ The 2.3 trillion VND (approximately \$100 million USD) project will utilize the first phase of an already existing garbage recycling plant, and process about 1,000 tons of trash per day beginning in 2022. This waste-to-energy power project comes after Da Nang City and the Asian Development Bank (ABD) signed an agreement to develop a waste treatment facility as well as a new landfill using a PPP model.

Plastic Recyclables Processing

URENCO has partnered with an EverGreen Labs consultant and EverGreen Social ventures to work on a pilot project on plastic waste recycling in Da Nang.³⁸ The project will cover 300 square meters at the Khanh Son dump and will have a designed capacity to process 160 tons of plastic waste each month. It is also the first project to specialize in recycling nylon bags, single-use plastic straws, cups, and styrofoam with hi-tech equipment.

³⁶ <https://vietnamnews.vn/society/468667/residents-long-for-khanh-son-dumps-closure.html>

³⁷ AEC News Today, 2019.

³⁸ Vietnam Plus, 2019.

3.3.6 Waste Disposal

Da Nang has one major disposal facility known as the Khanh Son dump/landfill, where approximately 950 to 1,000 tons of municipal solid waste (MSW) is delivered on a daily basis. It is located in Hoa Khanh Nam ward, Lien Chieu district as shown in the map on Figure 5 and in an aerial view in Figure 8. It appears from the images that some landfill covering is taking place. To this day, however, there are citizen complaints of the foul odors coming from the site. The Khanh Son dump is operated by DURNECO and was expected to be full in May 2020. The site closure has been delayed and is now scheduled for 2022.³⁹



Figure 8. Khanh Son Dump (Google Aerial 5-2020)

3.3.7 Education and Outreach

According to a report by the UN Habitat, Da Nang's Socio-Economic Development Plan has emphasized awareness campaigns with objectives such as the promotion of source separation, the 3Rs, waste management fee payment, and environmental education.⁴⁰ Of note is a '5 R' communication campaign, "Recycle, Reduce, Re-use, Refuse, and Repair" is being carried out in local communities, schools, residential quarters, and offices throughout the city.

3.4 Huế City

As shown in Figure 1 in Section 2, Huế City is located in the Thua Thien-Huế Province, about 20 miles northwest of Da Nang. Huế City is a Class-I, highly urbanized city situated along the banks of the Perfume

³⁹ Da Nang Today, 2020.

⁴⁰ UN Habitat.

River, just a few miles inland from the South China Sea, as shown in Figure 9. The city has 27 urban wards and is home to an estimated population of 455,000.⁴¹ The area of Huế City is approximately 27 square miles (sq. mi.), with a population density of 13,000 per sq. mi. For comparison, Hong Kong, one of the most densely populated cities in the world, has a population density of 17,311 people per square mile.⁴² While Huế would easily fit into the Wall Street Journal’s list of the 50 most densely populated cities, its density falls between that of Sapporo, Japan (density 12,981 per square mile), number 45 on the list and number 44, Tel Aviv, Israel (13,150 per square mile).⁴³



Figure 9. Map of Huế City

Huế City is known for its historical significance and associated monuments dating back to the 4th century, including the ruins of the ancient city of Kandapurpura and the Imperial City, the seat of Emperor Nguyen. These and other historical monuments make Huế City a tourist destination with more than two million visitors per year (contributing to its waste problem.)

3.4.1 Governance

According to the ADB, Huế City and Thua Thien Huế Province in 2014 formulated a vision for integrated, sustainable development of the city and translated it, with assistance from the ADB, into the GrEEEn City Action Plan (GCAP) of Huế City.⁴⁴ The city’s Department of Planning and Investment’s GCAP approach enables Huế City to respond to environmental degradation, inefficient resource consumption, inequitable

⁴¹ Wikipedia, 2018.
⁴² World Population Review, <https://worldpopulationreview.com/countries/hong-kong-population>. 2020.
⁴³ <https://247wallst.com/special-report/2019/07/08/the-50-most-densely-populated-cities-in-the-world/3/>
⁴⁴ Asian Development Bank, 2014.

growth, and increased risk of climate change and natural disasters. The action plan proposes the development of a landfill in Huong Binh.

Huế Urban Environment and Works State Limited Company (HEPCO) is the office in charge of the city’s waste collection, transportation, and treatment.

3.4.2 Waste Generation and Composition

With a population of approximately 500,000, Huế City generates an estimated 250 tons per day (TPD), or roughly 1.0 kg (2.2 lbs.) of solid waste per capita.⁴⁵ Based on waste generation calculations developed through this ISWMA, an estimated 80,000 tons of waste are projected for Huế City in 2020.

The composition of solid waste for Huế City is shown on Figure 10, with organic waste accounting for an extremely high portion at approximately 77 percent followed by plastic at 12 percent.⁴⁶ The only other material of significance as it relates to municipal solid waste is paper.

| Material | Hanoi | Hai Phong | Hue | Da Nang | Hochiminh city | Average |
|------------------|------------|------------|------------|------------|----------------|----------|
| Organic waste | 57.30 | 56.37 | 77.10 | 68.47 | 63.67 | 64.58 |
| Paper | 5.95 | 4.98 | 1.92 | 5.07 | 7.34 | 5.05 |
| Wood | 4.57 | 4.32 | 0.59 | 2.79 | 4.39 | 3.33 |
| Plastic | 10.96 | 12.81 | 12.47 | 11.36 | 14.19 | 12.36 |
| Leather & rubber | 0.18 | 1.48 | 0.28 | 0.23 | 0.69 | 0.57 |
| Metal | 0.56 | 0.36 | 0.40 | 1.45 | 0.48 | 0.65 |
| Glass | 3.47 | 1.52 | 0.39 | 0.14 | 0.63 | 1.23 |
| Ceramic | 0.82 | 0.86 | 0.79 | 0.79 | 0.76 | 0.80 |
| Oil & sand | 5.86 | 3.02 | 1.70 | 6.75 | 1.84 | 3.83 |
| Coal slag | 2.72 | 5.88 | 0.00 | 0.00 | 0.42 | 1.80 |
| Hazardous waste | 0.49 | 0.05 | 0.00 | 0.02 | 0.04 | 0.12 |
| Sludge | 2.98 | 2.15 | 1.46 | 1.35 | 2.41 | 2.07 |
| Other | 0.31 | 2.50 | 0.00 | 0.03 | 0.09 | 0.59 |
| Total | 100 | 100 | 100 | 100 | 100 | - |

Figure 10. Solid Waste Composition (Source: Pathway 21 Facts and Figures, 2019)

3.4.3 Waste Collection

Huế City’s municipal solid waste is managed by Thua Thien-Huế Province, and HEPCO—a state-owned company—is solely responsible for MSW collection and transportation in Huế City. In 2013, about 96,700 tons (approximately 260 TPD) of MSW was collected for landfilling or processing and 31,900 tons (approximately 80 TPD) of hazardous waste for incineration.⁴⁷

Collection service coverage is estimated to be between 95 and 97 percent. Compactors and sweeper trucks collect garbage each day from 6:00 a.m. to 6:00 p.m. Dustbins, hand carts, tricycles, and containers are also used, along with water trucks. No recyclables are collected by HEPCO. According to the Huế

⁴⁵ Trang, 2016.
⁴⁶ Vietnam Business Council for Sustainable Development and U.S. Business Council for Sustainable Development, 2019.
⁴⁷ Asian Development Bank, 2014.

GrEEEn City Action Plan, waste collection fees are relatively low — VND 20,000 (US\$0.95) per month for households and VND 30,000 (US\$1.33) per month for businesses.

Huế City’s dustbin system was originally applied as a trial in three model areas in 1999 and has since expanded to the whole northern area of Huong river.⁴⁸ Dustbins are located in fixed points, where residents can bring waste to dispose. From there, compactor trucks collect the waste and transport it for treatment or disposal.

Through door-to-door collection by handcarts, residents are also able to dispose of their waste on pavement or in front of their homes. Then, collection workers use handcarts to go door-to-door and collect the waste. When handcarts reach full capacity, they are transported to designated mini transfer stations for treatment or disposal.

3.4.4 Recycling System

Although there are some small-scale initiatives and innovative projects for waste management, the 3Rs model is not yet widely accepted or applied in Huế, except with the support of specific, funded projects. There are no established city-wide waste separation systems, waste classification programs, or recycling incentives.

Material Recovery Facilities

No material recovery facilities were identified in Huế City as part of this ISWMA.

Processing Facilities

The Thuy Phuong Waste Treatment Plant, owned by the Tam Sinh Nghia Corporation, has been operating in Huế City since 2007. The facility separates waste into three categories (compostable organics, plastic waste, and metals) utilizing various types of material separation equipment and manual sorters and has a capacity of 200 TPD. As shown in Figure 11, the facility recovers materials primarily for composting and use in recycled plastic



Figure 11. Thuy Phuong Waste Treatment Plant
(Source: International Forum on Green Technology and Management, Tho, 2014)

⁴⁸ Trang, 2016.

products, with minimal residual waste going to the landfill. Because waste collection occurs during the night, Thuy Phuong Waste Treatment Plant and Thuy Phuong sanitary landfill operate during the night, when waste collection occurs.

Junk Shop

Thu mua phế liệu Phú Diên was the only junk shop identified in Huế City, although its location was not able to be confirmed as part of this ISWMA.

3.4.6 Waste Disposal

Huế City has one sanitary landfill that is located about seven miles south of the city, as shown in Figure 9 (previous section) and in an aerial view in Figure 12. The Thuy Phuong sanitary landfill, which began operating in 1998, is operated by HEPCO⁴⁹ and receives approximately 200 TPD.⁵⁰

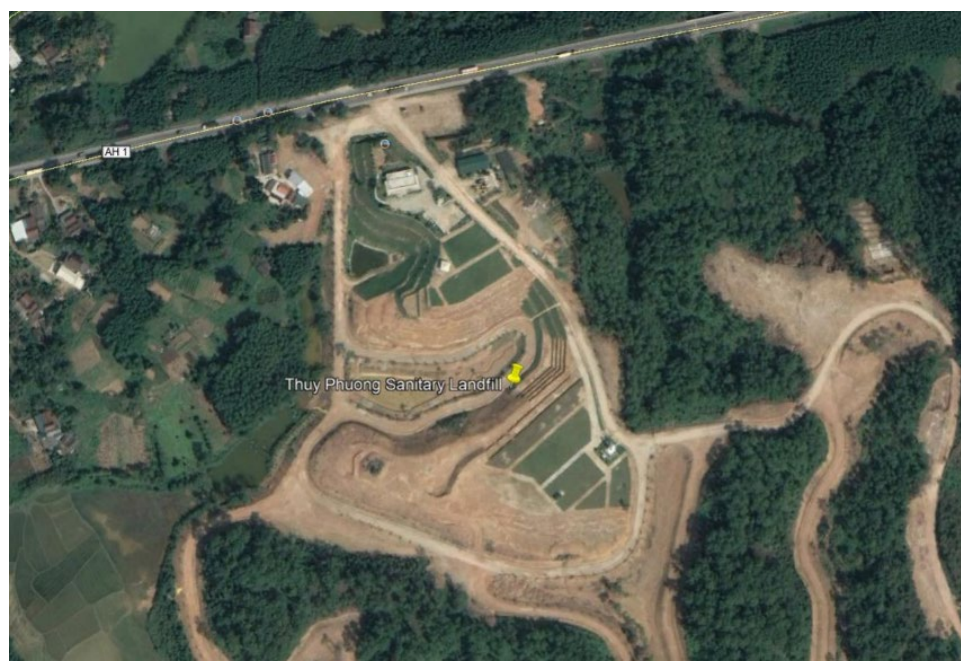


Figure 12. Thuy Phuong sanitary landfill (Google Aerial 2-2020)

3.4.7 Education and Outreach

In 2018, the Centre for Social Research and Development, a local NGO in Vietnam, conducted the project “City to River to Coast,” funded by USAID’s MWRP, which aimed to reduce and recycle plastic waste in and around Huế City by promoting the 3Rs and introducing waste segregation at selected local schools, advancing public involvement in the five percent reduction target, and through media publicity.⁵¹ The project raises community awareness of the damage caused by plastics pollution in oceans and organizes

⁴⁹ Lieu, 2009.

⁵⁰ Trang, 2016.

⁵¹ USAID.

students from high schools in Huế City and a school from an adjoining coastal village in beach clean-up exercises. As of 2019, the project has implemented a range of awareness-raising activities and set up source separation systems at six local schools. Similar to other awareness-raising projects, however, it does not seem to have established the necessary support for the daily repeated behaviors necessary for sustained 3R behavior.

3.5 Phú Quốc District

Phú Quốc District is the largest island in Vietnam, along with 21 smaller islets (see Figure 1 in Section 2). The district is comprised of approximately 230 square miles (sq. mi.) and has a population density of 470 people per sq. mi. (see Figure 13). Phú Quốc is located in Kien Giang Province and divided into three metropolitan areas: Downtown Dương Đông, North Cửa Cạn, and South An Thới. The island also includes seven wards and communes: Bãi Thơm, Cửa Dương, Dương Tơ, Gành Dầu, Hàm Ninh, Hòn Thơm, and Thổ Châu. The city has approximately 100,000 permanent residents and attracts an estimated two million tourists each year.⁵²

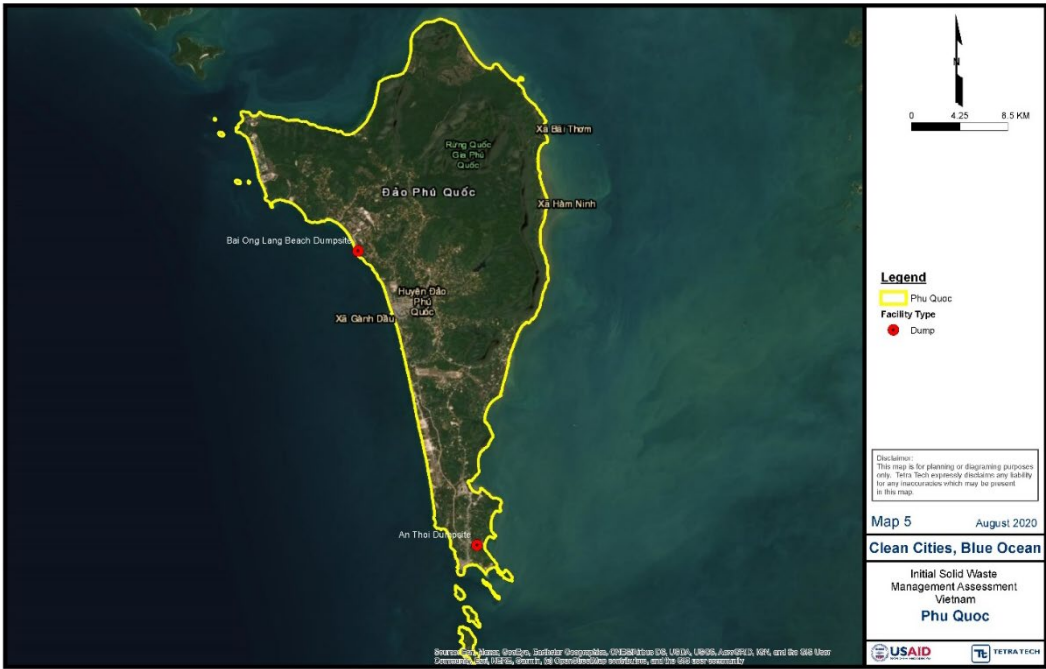


Figure 13. Map of Phú Quốc District

Phú Quốc’s economy is centered on its rapidly growing tourism, agriculture, and fishing sectors; however, its SWM infrastructure is not developing at the same pace as tourism and plastic consumption.

The sea around Phú Quốc is one of the richest fishing grounds in Vietnam. In 2007, Phú Quốc Marine Protected Areas were established along the island to protect coral reef zones, seagrass beds, and mangrove forests, all of which are important to several aquatic species. Despite efforts to promote

⁵² Kerber, 2018.

environmental conservation on the island, plastic waste pollution continues to be a prominent issue in Phú Quốc.

3.5.1 Governance

Phú Quốc's government is particularly concerned about plastic pollution. The island's plastics action plan proposes to ban single-use plastic in government institutions in 2020, as well as at tourist attractions, hotels, and night markets by 2025.⁵³

3.5.2 Waste Generation and Composition

With a population of approximately 100,000, Phú Quốc generates an estimated 130 metric tons (140 tons)⁵⁴ of waste per day. According to a 2014 research paper, the daily waste generation rate in semi-urban areas of the island is estimated to be 0.53 kg per capita.⁵⁵ Based on waste generation calculations developed by the ISWMA, an estimated 50,000 tons of waste are projected for Phú Quốc in 2020.

3.5.3 Waste Collection

Phú Quốc's waste is collected by the public works management board, which collects waste daily in the two larger towns of Duong Dong and An Thoi, in Duong Dong's harbor and river, and along main roads. Some communes within the island are serviced every two days.⁵⁶ The informal sector also provides collection.

According to a 2014 feasibility study report, only 67 percent (70 tons) of the 104 tons of generated waste was being collected on the island.⁵⁷ No separation of waste is carried out, meaning all materials are mixed together when collected.

3.5.4 Recycling System

The little amount of aggregation of recyclables taking place on Phú Quốc is carried out by the informal sector, with materials presumably sold to local junk shops—although ISWMA research was not able to locate any specific shops.

Manufacturing of products made with recyclable plastics could not be found within the district. However, ISWMA research discovered that Upp! UpCycling Plastic, a Dutch environmental technology firm, and Toan Hai Van JSC, a subsidiary of Vietnamese developer TTC Land, signed a memorandum of cooperation and deployment in April 2019 for the construction of a cyclic plastic waste disposal plant in Phú Quốc.⁵⁸ Recycled plastic waste would be processed by Upp! UpCycling Plastic. The two companies are establishing

⁵³ GreenHub grant concept paper submitted to CCBO.

⁵⁴ Nguyen, Vo, Le, Phan, Tran, 2019.

⁵⁵ Karagiannidis et al.

⁵⁶ Kerber, 2018.

⁵⁷ Institute for Global Environmental Strategies, 2014.

⁵⁸ Vietnam Economic Times, 2019.

a joint venture with the objective of converting plastic waste (from the sea, beach, and landfill) into materials that can be used for building local resorts and hotels or infrastructure. The plant will have a capacity of 3,000-4,000 tons per year in 2020.⁵⁹ It was scheduled to start operating in November 2019, however no update confirming the start of operation was found as part of this ISWMA.

Material Recovery Facilities

This ISWMA was unable to identify any large material recovery facilities in Phú Quốc.

3.5.5 Waste Disposal

A formalized and informal disposal system co-exist within the island. Open burning and burying are common practices regardless of whether bins exist, and almost every household has a fireplace and a small hole in the backyard.⁶⁰ Households along the river and coastline also dispose of their waste directly into these bodies of water, further contributing to marine pollution.

Most waste is dumped at one of two sites: one dumpsite that is located east of An Thoi town, and one dumpsite in the Bai Ong Lang Beach area, as shown in Figures 14 and 15, respectively.



Figure 14. An Thoi dumpsite (Google Aerial 2-2020)

⁵⁹ Upp! UpCycling Plastic Website.

⁶⁰ Kerber, 2018.



Figure 15. Bai Ong Lang Beach dumpsite (Google Aerial 3-2020)

In 2017, the Phú Quốc Waste Treatment Plant—a 10-hectare waste treatment center, located in the fishing village of Ham Ninh—was developed, designed to dispose of 200 tons (220 U.S. tons) of waste each day.⁶¹ The treatment plant was built by Global Renewable Energy Joint Stock Company and cost VND 230 billion (US\$9.89 million). By October 2017, the waste treatment plant began a trial run, but stopped the process two months later due to malfunction and was forced to close for upgrades. Operations resumed, but several local residents set up barriers to block garbage trucks from entering the waste treatment plant since it already contained 300 tons of unprocessed garbage that was contaminating their communities.⁶² As a result, the waste treatment plant ceased operations again.

3.5.6 Education and Outreach

To help protect the native environment and address plastic waste issues, World Wide Fund for Nature (WWF)-Vietnam initiated the “Phú Quốc - Toward a plastic waste-free island” project.⁶³ Sponsored by USAID under MWRP and implemented by WWF-Vietnam, the project works with several different stakeholders such as the local government, communities, businesses, and schools who are expected to reduce single-use plastic and support a plastic waste-free island within a public-private partnership platform.

The project collaborates with the district’s People’s Committee to commit the island to reduce single-use plastic. More than 60 teachers and school representatives from over 30 schools have attended a two-day training on plastic waste and have begun implementing plastic-reducing practices into their schools’

⁶¹ Vietnam News.

⁶² Grimwood, 2018

⁶³ USAID.

policies. Two villages — Da Chong in Bai Thom commune and Bai Bon in Ham Ninh commune — are enhancing their waste management systems by collecting and segregating plastics.

Across Phú Quốc, USAID grantees are engaging with fisherfolk, tourist services, market vendors, hotels, and restaurants to increase recycling and incorporate sustainable waste reduction and management practices into their businesses.⁶⁴ USAID's MWRP is connecting private sector enterprises to municipal partners to generate innovative approaches to waste management and establish new partnerships.

4. Gender

Women in Vietnam are even more central to SWM and recycling than in other countries. In Vietnam, women are not only waste generators and waste pickers, they are also waste collectors in the formal SWM sector, junk buyers and sellers, recyclers, and sometimes government decision-makers. Older women, in particular, are waste buyers and may stand on streets in cities waiting for residents to bring recyclables, waste pickers, and recyclers.

In 2006, WIEGO reported that more than two-thirds of waste workers are women, who earn less than men working in the waste sector, and 9 percent of waste pickers are children. These groups tend to be socially marginalized. They frequently live on or near garbage disposal sites, and thus are exposed to environmental and safety hazards. A few efforts have been carried out to provide micro-credit to female waste pickers, and to reduce the number of children working at waste dumps.⁶⁵

Data are difficult to find remotely, but it appears that like other countries, women in Vietnam are missing in the middle levels of waste management (owners of private sector waste collection businesses).

The parastatal Yemeni Women's Union has been instrumental in working in the 3Rs, together with at least one local NGOs (MWRP May 2020).

Almost 3,000 Vietnamese villages specialize in crafts, most of which buy cities' plastic waste and recycle it through upcycling, making it into pellets or fuel (Lieu and Twan 2014; Nguyen 2016; WIEGO 2006). Both women and men in these villages work in buying and recycling waste.

It has been very difficult to learn the gender of local and national government SWM and 3R decision-makers. However, based on the gender distribution in other areas of the environment in Vietnam, it is likely that women are represented in government decision-making positions regarding SWM.

⁶⁴ USAID.

⁶⁵ <https://globalrec.org/law-report/vietnam/>

5. Additional Information/Data Required

In order to develop a more detailed ISWMA, additional information and data will be required - as outlined throughout this report. Additional data will enable the ISWMA to establish high confidence in the critical information being presented such as existing waste generation, collection, recycling, and final disposal data.

The following lists some of the information that will be needed depending on the priorities identified by this ISWMA:

- Solid Waste Management Plan – There are no indications that local governments (Engagement Sites) have any type of waste management plan. Need to verify that indeed that is the case.
- Solid Waste Generation – Need to identify breakdown of tons of waste generated by each sector including residential, commercial, and industrial.
- Per Capita Generation – Verification of publicized calculations is needed, specifically for Biên Hòa, which per capita waste generation seemed low for a highly urbanized area.
- Identification of collection methods for all sectors at each engagement site.
- Collection – Identify collection method and associated volumes (recovered materials and residual).
- Existing Waste Management Processes/Infrastructure – Identification/verification of active:
 - Waste Pickers,
 - Organized Collectors,
 - Junk shops (Primary and secondary),
 - Junk Buyers, and
 - Organics Processing.
- Permitted/Certified Operations/Facilities – Identify permitting/certification process for the various types of operations/facilities. Available mechanisms to shut down operations/facilities.
- Recovered/Recycled Material Quantities – Tons received, recovered, and residual as applicable. Types of materials recycled. The identification of processors, brokers, or end-users.
- Programs or initiatives involving reuse or reduction of materials.
- Solid Waste Disposal – Total tons disposed on a daily and annual basis and associated tipping fee at:
 - Dumps,
 - Landfills, and
 - Sanitary Landfills.
- Existing Active and Inactive Open Dumps – Estimated waste in-place calculations to assess proper closure of dumpsites.
- Waste Pickers – Need to identify the number of waste pickers associated with junk shops, dumps, and landfills.
- Outreach and Education – Need to identify all existing/current publicly funded education and outreach efforts and NGO's with focus on SWM.
- Regulatory Enforcement and Penalties – Need to identify enforcement actions and penalties if any by any of the engagement sites.
- An understanding of funding and financial systems as well as fee structures and how fees are collected.

- Field Observations – It is obvious that solid waste at CCBO engagement sites is not properly managed, field observations should be focused on set-out, aggregation, collection, and processing (resource recovery).

6. Recommendations and Next Steps

The 3R/SWM systems in all four engagement sites are developing. Planning is the key to maintaining any momentum. Unfortunately, this ISWMA was only able to find evidence of solid waste planning by the local governments (but not full solid waste plans) in Huế City and Da Nang. There was, however, evidence of planning in the form of assistance by many foreign NGOs. This is particularly apparent in Phú Quốc (e.g., WWF) and Da Nang (e.g., UNDP and GIZ). Private sector investment is also evident.

Improving universal collection and management of waste will be the foundation of reducing plastics from leakage and ocean pollution in the future. The promising news is that, in all four sites, there appears to be some form of formal collection for waste, but the degree of household coverage, however, varies. It seems that Huế City and Da Nang have good coverage (of taxpaying households) but in Biên Hòa and Phú Quốc, although they have some formal collection, it is not clear whether all households are included. Those that do not have formal collection manage their waste via informal collectors or by burning or burying their waste on their sites. This is of particular concern in Phú Quốc because the small population of about 100,000 swells to up to 4 million if tourists are included.

Collection by the formal sector in the CCBO's engagement sites seems to generally take the form of providing bins/containers along main streets of the city, often supported by the IWCs who provide more the door-to-door collection services. The coordination between the formal and informal groups vary. For example, HEPCO of Huế City contracts with each IWC and is paid by them to take the waste from the bins on main-routes and transfer and dispose of it.

The IWCs play an important role in minimizing the quantities of materials that become aggregated and managed at all the sites. In fact, the collection of the majority of materials that currently find their way into the recycling system relies heavily on the efforts of these independent workers. While this has its benefits, it is largely inefficient (lacking transparency and economies of scale) and operates outside each local government's solid waste system. The challenge for CCBO's engagement sites will be to capture the skills and knowledge of this workforce by linking it (either through licensing or contractual arrangements) into the LGU's plans for improving its 3R/SWM system.

Processing of waste into marketable components is only occurring at the Thuy Phuong Waste Treatment Plant in Huế. More needs to be learned about the effectiveness of this process and whether the recovered materials are marketable.

There still appears to be insufficient markets for readily recyclable plastics (even if they were to be collected) within reasonable transport distance of the CCBO sites. Interest in expanding recyclable plastic markets, however, is evident – especially in Da Nang (and perhaps Huế). The key to drawing investors into this space will be to provide consistent, reliable aggregation of enough, quality resins to make it economically sustainable. Signs of potential for recycling of film and flexible plastics, were discovered in Da Nang. This is being done by ReForm to make plastic shingles and boards. Development of this and other

entrepreneurial endeavors may provide some opportunities to reintroduce these materials back into the circular economy.

Formal waste disposal is generally controlled by private (and/or semi-state owned) hauling companies. The use of sanitary landfills is occurring in Huế City and Da Nang. Biên Hòa and Phu Quac appear to be relying on dumpsites and by individuals burying/burning of waste.

The formal sector seems to be paid directly by the LGU (at times at a fixed price, like in Da Nang). Therefore, they have little incentive to establish separate collection of recyclables (which would only add cost to their operations with minimal return on the sale of the materials.) This suggests that the directive to establish collection and processing of recyclable materials falls squarely as a responsibility of the LGU.

Initial Site-Specific Recommendations:

Phú Quốc District –

- Work with Phú Quốc stakeholders to establish a sanitary landfill
- Engage and develop capacity for resort staff to develop and manage collection (and segregation systems, if markets are available)
- Explore if the IWCs can be identified and establish a mapping of the value chain for plastics

Biên Hòa –

- Work with Biên Hòa stakeholders to establish a sanitary landfill
- Explore if the IWCs can be identified and establish a mapping of the value chain for plastics

Da Nang –

- Work with the IWCs, DURENCO, Da Nang People’s Committee and staff to look for ways to incorporate the IWC into Da Nang’s collection system.

Huế –

- Support Huế City efforts to formalize and incorporate IWC into Huế’s collection system.
- Determine if the Thuy Phuong Waste Treatment Plant owned by the Tam Sinh Nghia Corporation is operating and effectively separating and recovering materials by processing unsegregated waste.
- Determine if those who lived around the Imperial City have been relocated and whether they have waste services.

This ISWMA has learned a lot through its online research and will build upon this knowledge as CCBO program progresses. In addition to the above site-specific recommendations there are also, however, some immediate steps that the team believes should be taken and recommends the following be considered in this initial phase of the CCBO program in Vietnam.

Recommendations:

- Continue to research and better understand the existing 3R/SWM systems in the engagement sites.
- Work within the communities to develop a network of government officials, civic society, citizens, workers, NGOs, private sector and other entities that have been involved in the current systems and can help improve them.

- Work with these stakeholders to increase their capacity to develop sound 3R/SWM systems.
- Focus on identifying which household and businesses currently have waste collection service and who needs to be serviced. Then, support LGUs to develop and improve the services needed to create efficient collection, aggregation and transport of materials as part of a sound 3R/SWM system.
- Learn more about the funding for the 3R/SWM systems and work with stakeholders to consider additional or alternative revenue generation and financing options to support improvements to their systems.
- Seek ways in which to expand and develop the markets for plastics (those that are currently valuable and those that are not) and bio-degradable materials.
- Support the communities in updating and revising their SWMP to improve their 3R/SWM systems.
- Engage stakeholders and the private sector to seek mutually beneficial means of building the infrastructure needed in improved 3R/SWM systems (MRFs, compost facilities, anaerobic digestion, sanitary landfills or other appropriate technologies.)
- Learn more about existing social behavior of engagement site communities within the 3R/SWM systems and seek appropriate ways to create awareness for increasing material separation at the source.
- Develop a network and understanding of the current circumstances for youth and women in the engagement sites and begin to formulate a path toward improving them as part of the 3R/SWM planning process.
- Review existing laws, policies and regulations pertaining to 3R/SWM systems and support additions or revisions that would support the 3R/SWM planning and implementation process.

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8. Glossary of Terms

Dump or Open Dump – A facility where waste is disposed by both the public sector and private individuals in an uncontrolled manner. Such sites generally lack even minimal environmental controls and can have a significant negative impact on the local community.

Junk Shops – Informal solid waste management operations typically operated by individuals out of residences or small street facing lots with canopies.

Landfill – A landfill typically means that a site has undergone some type of siting process to ensure that its environmental impacts to the community are minimized. Generally, a disposal site falling into this category involves the excavation of land to create a “cell” and the waste is covered with soil on a regular basis to minimize odors and vectors. However, it may or may not include modern environmental controls such as methane and leachate collection systems, proper drainage for stormwater run-off and other controls. Minimal equipment is on site to compact the waste to preserve the capacity of the site.

Sanitary Landfill – A sanitary landfill is typically an engineered facility built to accommodate known or projected waste streams over a long-term horizon. A site of this variety typically goes through a rigorous siting and environmental impact process, before being designed and constructed by engineering and solid waste professionals. A sanitary landfill has environmental systems in place to control methane and other air emissions, leachate, stormwater run-off and daily cover material and includes monitoring systems to maintain metrics for operating and reporting requirements. Such facilities are operated with modern equipment, including compaction of the waste to optimize the available “airspace” based on a “fill plan” or “fill sequence that places an economic value on the airspace.

Transfer Station/Material Recovery Facility (U.S.) – For the purposes of this document a transfer station is a facility where waste is aggregated by both the public sector and private individuals (self-haul) in a controlled manner. Materials separation occurs utilizing manual labor and automated equipment if possible. Recyclables are baled and sent to market. Residual waste is then transferred into larger vehicles and taken to a landfill for final disposal. This may include multiple streams including commercial and residential waste, recyclables, organics, and construction and demolitions debris.