

## **Component Three**

### ***Residuals***



## COMPONENT THREE

### RESIDUALS

Residuals are flows of solid, liquid, gaseous materials and energy that are discarded, discharged or emitted by establishments and households through processes of consumption, production or accumulation. Residuals may be discarded, discharged or emitted directly to the environment or be captured, collected, treated, recycled or reused (*UN FDES, 2013*).

The volume of residuals released and its characteristics such as the type, source, location and trends over time have different impacts both on human and the environment. Thus, environment statistics on residuals can be used for evidence-based policy making particularly to environmental regulations to mitigate its impacts on human sub-systems.

The compilation of environment statistics on residuals have links to environmental accounts following the framework of the System of Environmental-Economic Accounting (SEEA) 2012 – Central Framework particularly on emissions to air, emissions to water (effluents), and accounting for solid wastes.

The environment statistics on residuals, likewise, have several links to the different Sustainable Development Goals such as: Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture; Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable; Goal 12: Ensure sustainable consumption and production patterns; Goal 13: Take urgent action to combat climate change and its impacts; Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development; and Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (*Sustainable Development Knowledge Platform*).

Residuals cover four subcomponents, namely: emissions to air, generation and management of wastewater, generation and management of waste and release of chemical substances. The CPES 2016 covers fourteen (14) out of the nineteen (19) core statistics under the Component Three on Residuals. The five (5) remaining core statistics still needs to be compiled when data become available such as indirect Greenhouse Gas emissions, total municipal waste collected, amount of municipal waste treated by type of treatment and disposal, and total hazardous waste collected.

### 3.1 Emissions to Air

Emissions to air are gaseous and particulate substances released to the atmosphere by establishments and households as results of production, consumption and accumulation processes. Air emissions can be directly measured or estimated using indicators on fuel and other material input data, and emission factors. Results of emissions are estimated as inventories by type of source, by process, and by economic activity.

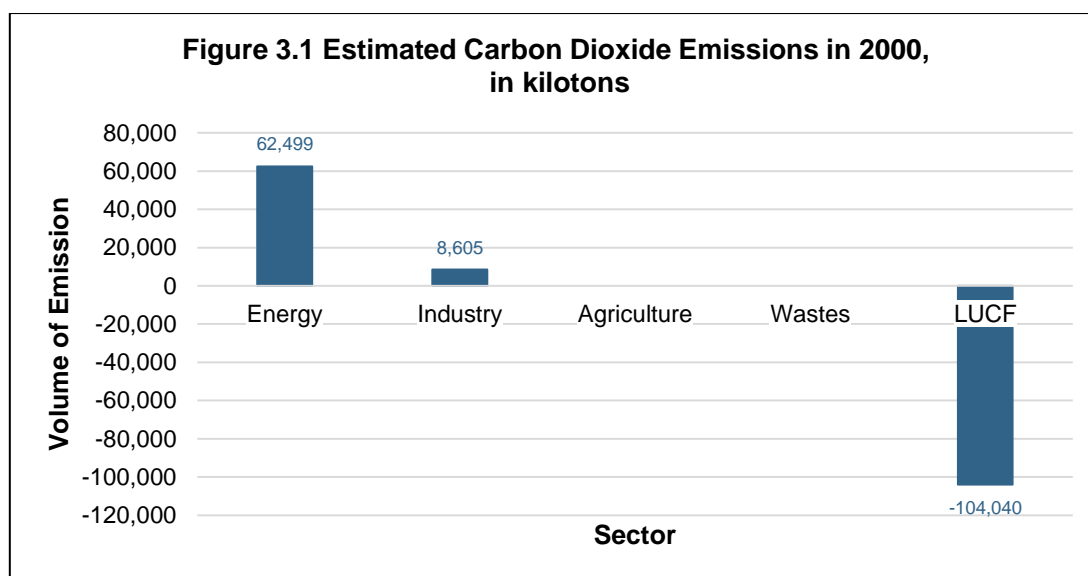
Statistics on greenhouse gas emission is useful as it tends to increase the capacity of the atmosphere to hold heat, one of the drivers of global climate change. The compilation of variables on emission to air provides link to various environmental accounts such as Emission to Air, Energy Accounts and Material Flow Accounts using the System of Environmental-Economic Accounting Central Framework (*UN FDES, 2013*).

Greenhouse Gas emission inventories are compiled based on the guidelines developed by the Intergovernmental Panel on Climate Change, under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC). The Philippines ranks third globally when it comes to climate change vulnerability, and is more exposed due to its geographical location and environmental situation. In addition, the Philippines is seen to be more susceptible to extreme events and natural calamities due to climate change (*Second National Communication to the United Nations Framework Convention on Climate Change, 1999*).

In December 1999, the Philippines reported an initial GHG Inventory of 1994 which was included in the CPES 2014 compilation. An update of the GHG inventory for 2000 was used as basis for CPES 2016. Emissions to air covers greenhouse gas inventories based on the guidelines developed by the Intergovernmental Panel on Climate Change (IPCC).

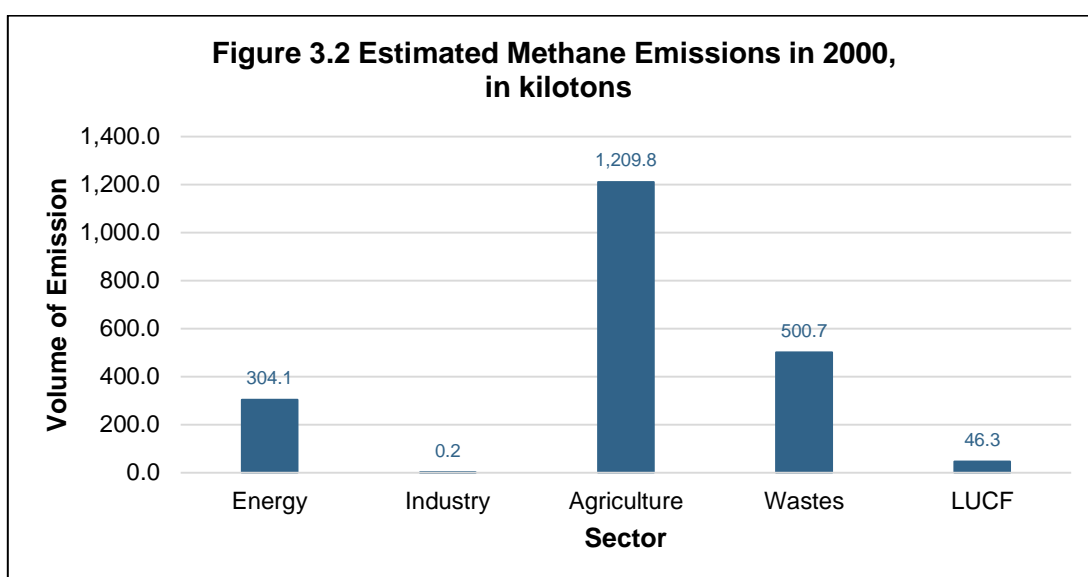
Under this topic, three (3) out of five (5) core statistics were reported: Carbon dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), and Nitrous Oxide (N<sub>2</sub>O). These data were obtained from the Climate Change Division of the Environmental Management Bureau (EMB).

The GHG inventory only covers direct emissions of greenhouse gases by sector. The following figures show how much air emission are released by the different sectors. The Philippines had a total of 71.1 thousand kilotons of carbon dioxide emission, with 62.5 thousand kilotons attributed to the energy sector and the remaining 8.6 thousand kilotons to the industry sector. However, as seen in Figure 3.1, the Land Use Change and Forestry (LUCF) sector sequestered about 104 thousand kilotons of carbon dioxide. Both the agriculture and wastes sectors had no recorded carbon dioxide emissions.



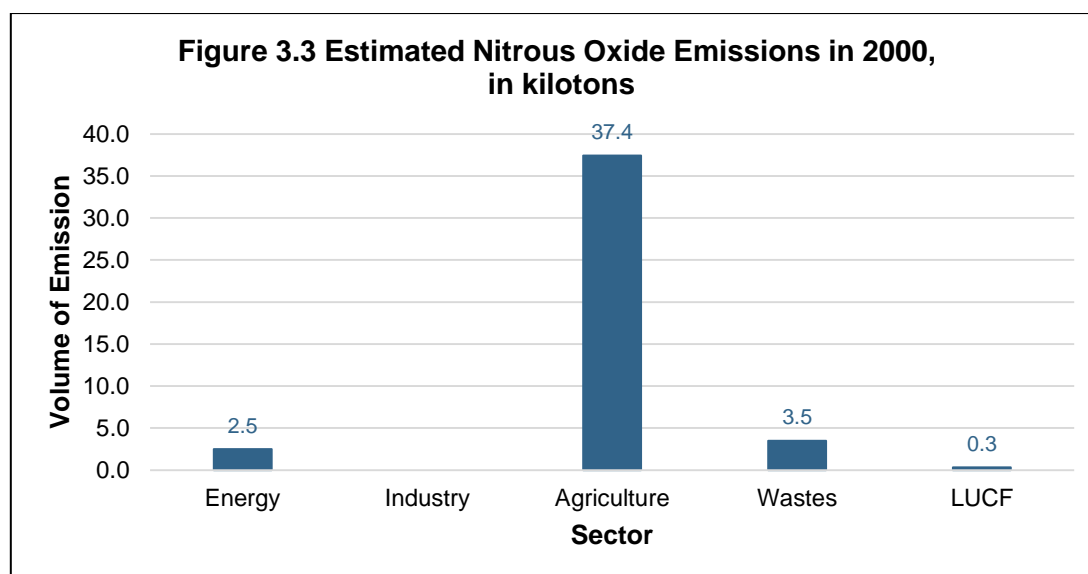
**Source:** Climate Change Division – Environmental Management Bureau

Meanwhile, a total of approximately 2.1 thousand kilotons of methane were emitted in the country. Figure 3.2 shows that the agriculture sector had the highest emission of 1.2 thousand kilotons with the industry sector posting the lowest at 0.2 kilotons.



**Source:** Climate Change Division – Environmental Management Bureau

The total nitrous oxide emission in the country was estimated at 43.8 kilotons. Similarly with the methane emission, the agriculture sector was the highest contributor of nitrous oxide emissions with 37.4 kilotons. On the one hand, the LUCF sector had the least nitrous oxide emission with 0.3 kilotons while the industry sector had no recorded emissions (Figure 3.3).



**Source:** Climate Change Division – Environmental Management Bureau

Overall, the Philippines had a total of 21.8 thousand kilotons of greenhouse gas emissions in 2000, net of the sequestered carbon by the LUCF sector.

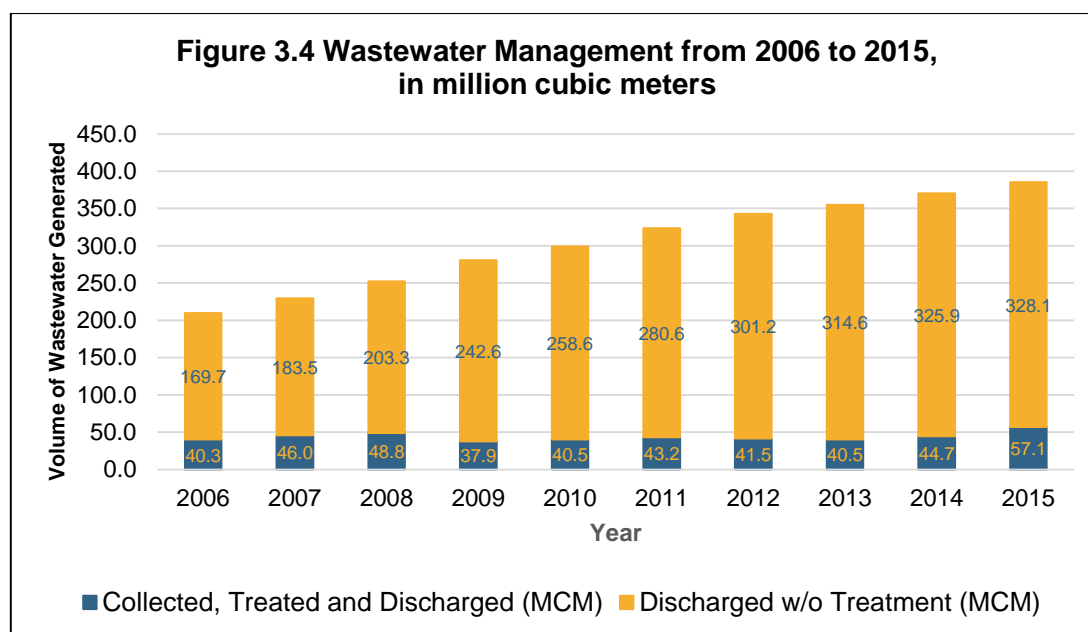
### 3.2 Generation and Management of wastewater

Wastewater is discarded water no longer required by the owner or user. They are either discharged into sewers, received by treatment facilities, discarded to the environment or reused without prior treatment.

This subcomponent focuses on the generation and management of wastewater. This would be the first compilation of statistics on wastewater in the series of CPES publications. It only covers areas serviced by Maynilad Water in the West Zone of Metro Manila. Statistics on wastewater generated, wastewater collected, wastewater treated and discharged, wastewater discharged without treatment and number of wastewater facilities are the core set of indicators based on the FDES. For CPES 2016, data reported were volume of wastewater generated, collected, treated and disposed, and volume of wastewater disposed without treatment. Number of wastewater disposal facilities was also included in this report.

According to Maynilad Water, the wastewater they collected is treated before being discharged to the environment. The data on wastewater generated is estimated using a generally accepted return rate of 80 percent. The volume of wastewater generated consists of the volumes of wastewater collected, treated and discharged and discharged wastewater without treatment.

Figure 3.4 shows that for the period 2006 to 2015, the wastewater generated increased to 385.2 million cubic meters (mcm) in 2015 from a level of 210.1 mcm in 2006. The volume of collected, treated and discharged wastewater also increased by 16.8 mcm, from 40.3 mcm in 2006 to 57.1 mcm in 2015. An increase in the volume of discharged wastewater without treatment was also recorded, from 169.7 mcm in 2006 to 328.1 mcm in 2015.



Source: Maynilad Water Services, Inc.

### 3.3 Generation and management of waste

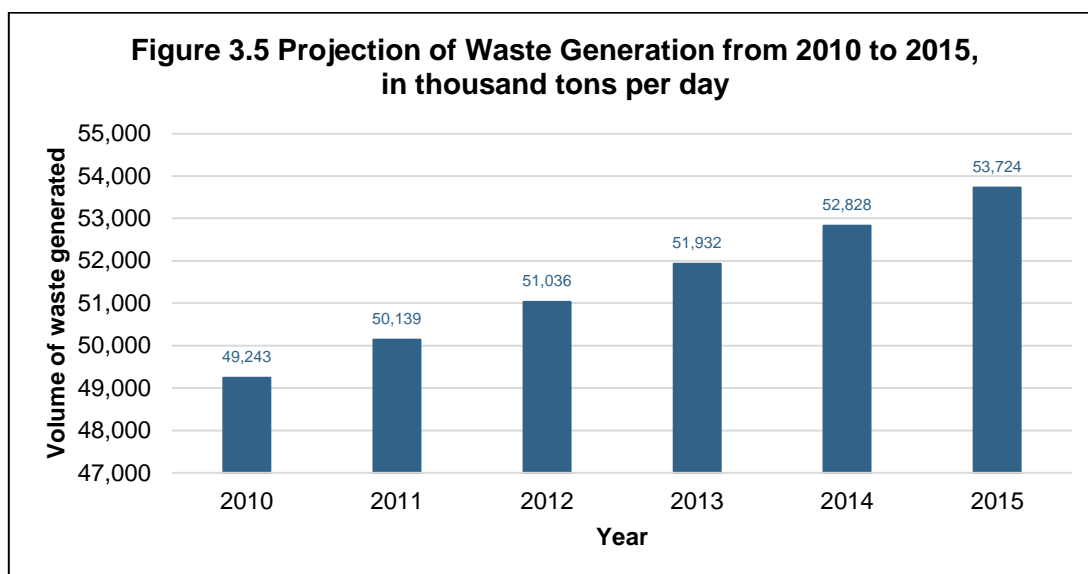
Wastes are discarded materials that are no longer required by the owner or user. It includes materials in solid or liquid state but excludes wastewater and emissions to air, water or soil (UN FDES, 2013).

Generation of waste answers questions of who creates it and how much, while management of waste answers where does waste go. The compilation of statistics on the generation of waste is important because solid waste disposed on land and water have negative impacts on human and the ecosystems. Human activities, in the course of production and consumption process, directly affect the environment and often lead to environmental changes in form of depletion and degradation. In order to reduce the amount of waste generated, it is important to increase the portion of waste that is recycled and reused as material or energy source. This is essential to ensure sustainable consumption, production and natural resource management.

The generation and management of waste is related to the physical flow accounts (flows from the economy to the environment) of the SEEA 2012 Central Framework, particularly on accounting for solid waste and environmental protection expenditures.

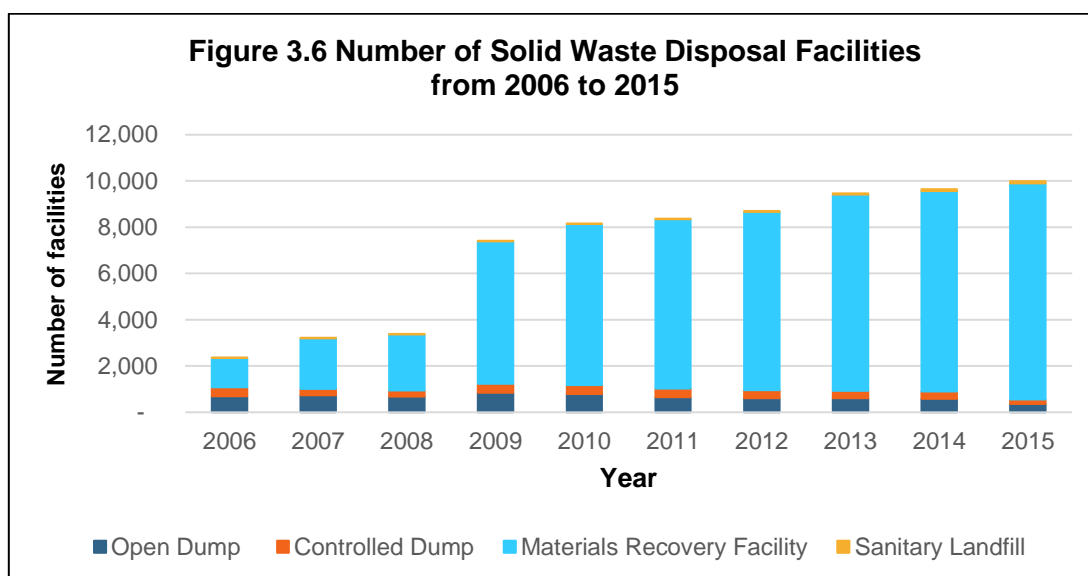
In the Philippines, the Solid Waste Management Division (SWMD) of the EMB is the primary office in charge of implementing Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000 (NSWMC, 2014). The compendium reports proxy indicators for the following core statistics: amount of municipal waste generated; amount of hazardous waste generated; amount of hazardous waste treated by type of treatment disposal; number of hazardous waste treatment and disposal facilities; and amount of recycled waste.

Figure 3.5 presents the projection of waste generation, in thousand tons per day, for years 2010 to 2015. During the six-year period, there was a steady increase in the volume of projected waste generation, from 49.2 thousand in 2010 to 53.7 thousand in 2015. The waste projection is derived as waste generation rate per capita multiplied by the population.



**Source:** Solid Waste Management Division - Environmental Management Bureau

There are several types of solid waste disposal facilities in the country. It includes open dumpsite, controlled dumpsite, materials recovery facility (MRF) and sanitary landfill. For the past ten years, the number of solid waste disposal facilities is continuously increasing (Figure 3.6). A 62 percent increase in the total number of solid waste disposal facilities in 2015 was observed compared to that in 2006. MRF operations increased significantly from one thousand facilities (53.8 percent) in 2006 to 9.3 thousand facilities (93.5 percent) in 2015 with the reduced operations for dumpsites.

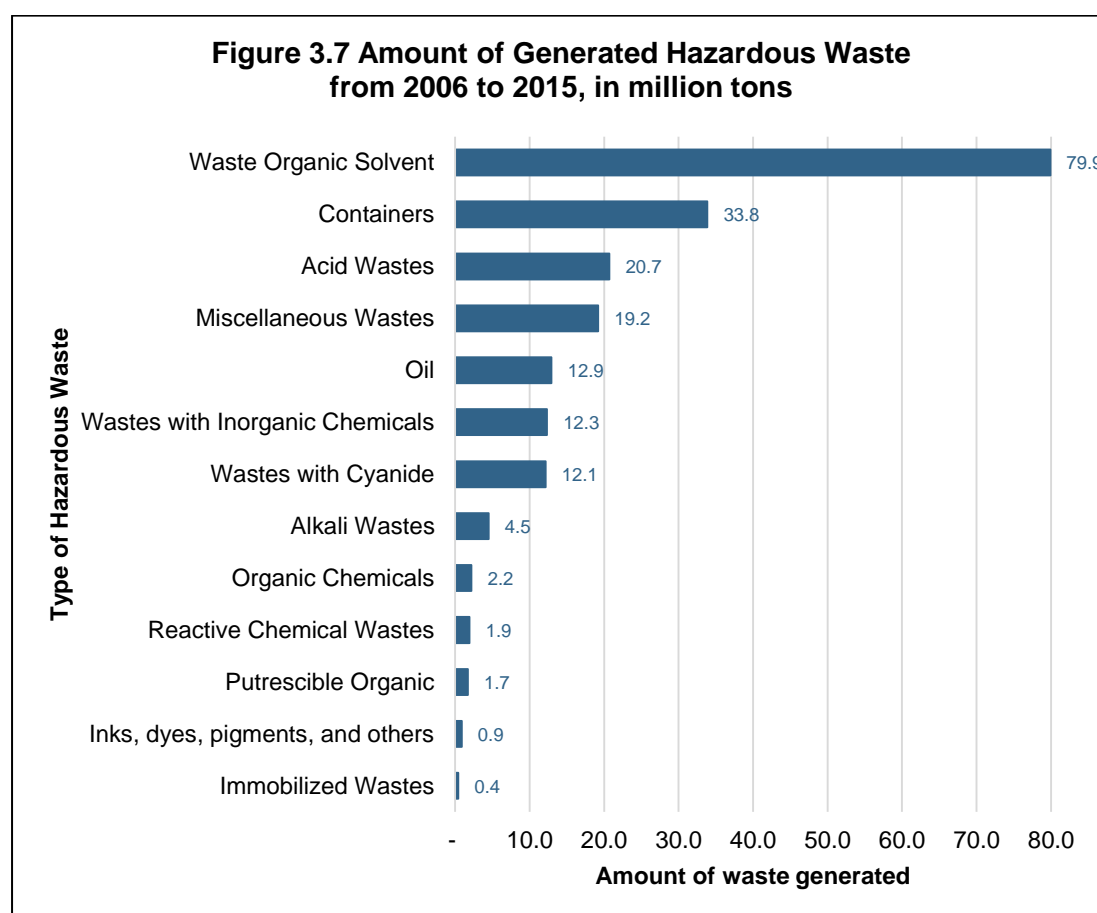


**Source:** Solid Waste Management Division - Environmental Management Bureau



Hazardous waste is a special group of waste that, due to its toxic or other hazardous character, requires special management and is controlled by law in many countries (*UN FDES, 2013*). In the Philippines, the management of hazardous wastes is governed by the Republic Act No. 6969, known as the “Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990”.

As seen in Figure 3.7, there are 13 types of hazardous wastes (*see Annex for descriptions*). Among these, waste organic solvent had the highest amount generated with 79.9 million tons of waste for the period 2006 to 2015, collectively. About 98.4 percent of these wastes were generated by Region III (Central Region), 1.3 percent by Region IVA (CALABARZON) and the remaining 0.3 percent by other regions (excluding ARMM). Meanwhile, immobilized wastes had the lowest amount of waste generated (0.4 million tons).



**Source:** Hazardous Waste Management Section - Environmental Management Bureau