Pollution & Resource Management


WASTE MANAGEMENT

Introduction

Waste Management

The Company is committed to waste management through the most efficient use of resources, with the objective of reducing waste generated from production. This approach is guided by the 4Rs principle: reducing waste volumes through reduced consumption (Reduce), reusing waste materials (Reuse), recovering waste for further use (Recover), and recycling waste into reusable materials (Recycle).

- Also supports the overall advancement of the national circular economy through the reporting of waste management and waste data
- Reflects resource efficiency and the ability to manage costs associated with the disposal of waste arising from business processes
- In addition, it helps build confidence that the business can appropriately control and reduce adverse impacts from business processes that may affect communities and society

4Rs for Sustainable Waste Management

- **Reduce** — Reducing waste volumes through reduced consumption
- **Reuse** — Reusing waste materials
- **Recover** — Recovering waste for further use
- **Recycle** — Recycling waste into reusable materials

We believe that effective waste management is a foundation for sustainable business growth, together with the care of the environment, communities, and society

Waste Management Targets

Based on the operations of the entire Group (100% Coverage), a target has been set for 2025 to reduce non-hazardous waste.

At least 90% of the Company's total waste must be managed in accordance with the 4Rs principle, and another target to which the Company gives significant importance is Zero Landfill.

Implementation Approach

Waste Management

Waste management. Reviewing the waste management proportions across the Group (100% Coverage) in 2025, it was found that the proportion of waste reused and recycled (reuse, recycling, composting, animal feed) was 73.20%; the proportion of waste sent to off-site recovery processes for reuse was 26.53%; the proportion of waste converted into fuel energy (alternative fuel / blended fuel) (Recovery) was 0.27%; and the proportion of total waste sent to landfill was zero, or zero waste to landfill.

Waste Management Proportions Across the Group (100% Coverage) in 2025

Reused and Recycled (Reuse, Recycling, Composting, Animal Feed)	Sent to Off-site Recovery Processes for Reuse	Converted into Fuel Energy (Alternative Fuel / Blended Fuel) (Recovery)	Total Waste Sent to Landfill
Percent	Percent	Percent	
73.20	26.53	0.27	Zero (Zero waste to landfill)

Hazardous Waste Management

For hazardous waste, although the volume is very small, the Company still places importance on strict hazardous waste management measures in compliance with the law, because hazardous waste, if not properly managed, may affect the environment and communities surrounding the Company. Therefore, the following measures are implemented:

1. Hazardous waste is properly stored before being sent for disposal in strict compliance with the law.
2. Hazardous waste is clearly labeled as Visual Control or visual management.
3. Communication and knowledge on hazardous waste management are provided to employees in the organization.

Performance Data

- In 2025, the Company generated a total waste volume of 2,933,551,303 kilograms. This comprised a total of 2,932,719,813 kilograms of non-hazardous waste, or 99 percent of the total waste volume, and a total of 831,490 kilograms of hazardous waste, or 1 percent of the total waste volume.

- A comparison of the data shows that, in 2025, the total waste volume was 2,933,551,303 kilograms, which was higher than in 2024, when the total waste volume was 1,466,092,703 kilograms, or nearly doubled year-on-year. This was because, in 2025, the Company significantly increased its production capacity from the previous level, resulting in a corresponding increase in waste generated from the production process. However, the Company continues to manage such waste with maximum efficiency and dispose of it properly in compliance with applicable laws.

- It was found that all of the Company's waste could be managed in accordance with the 4Rs principles in its entirety. Compared with the target set that waste must be managed in accordance with the 4Rs principles at no less than 90 percent of total waste volume, the Company performed 10 percent better than the target set.

Waste Generation from Operations: 2023–2025

(Outside operation site)

Waste Volume

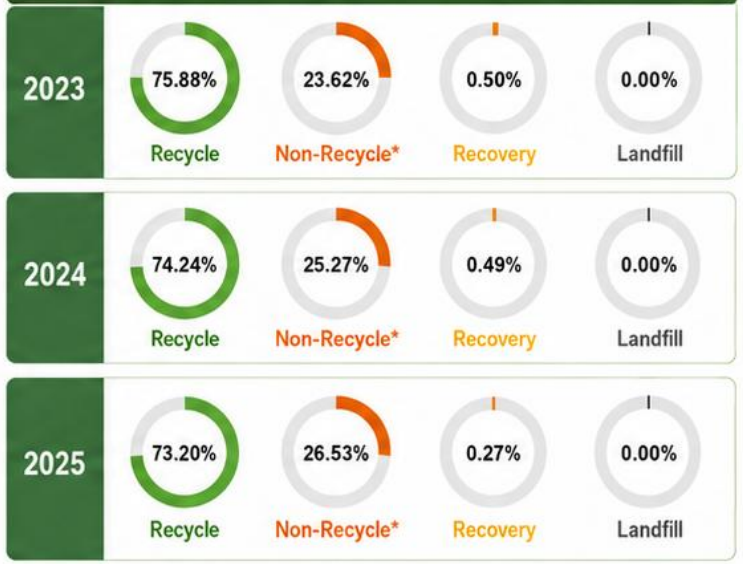
Waste Management Performance, 2023–2025

2025 Summary

Total Waste Volume (kg)	Total Non-Hazardous Waste Volume (kg)	Total Hazardous Waste Volume (kg)	Recycle	Non-Recycle*	Recovery	Landfill
2,933,551,303	2,925,978,533	831,490.00	73.20%	26.53%	0.27%	0.00%

Items	2023	2024	2025
Total Waste Volume (kg)	1,247,791,291	1,465,901,383	2,933,551,303
Total Non-Hazardous Waste Volume (kg)	1,247,740,321	1,465,847,343	2,925,978,533
Total Hazardous Waste Volume (kg)	50,970.00	54,040.00	831,490.00
Proportion of Total Waste Volume Sent to Recycle (%)	75.88%	74.24%	73.20%
Proportion of Total Waste Volume Managed by Other Methods (Non-Recycle)* (%)	23.62%	25.27%	26.53%
Waste Converted into Fuel Energy (Alternative Fuel / Blended Fuel) (Recovery) (%)	0.50%	0.49%	0.27%
Proportion of Total Waste Volume Sent to Landfill (%)	0.00%	0.00%	0.00%

Total Waste Management Proportions (%)



* Waste and refuse managed by other methods: Biological treatment to be used in the biogas production process (outside the operational boundary)

* BBGI Group has disclosed waste and waste management reporting in accordance with GRI Universal Standards: GRI-306-5 / GRI306-4 / GRI306-5. Further details are available in the environmental statistics

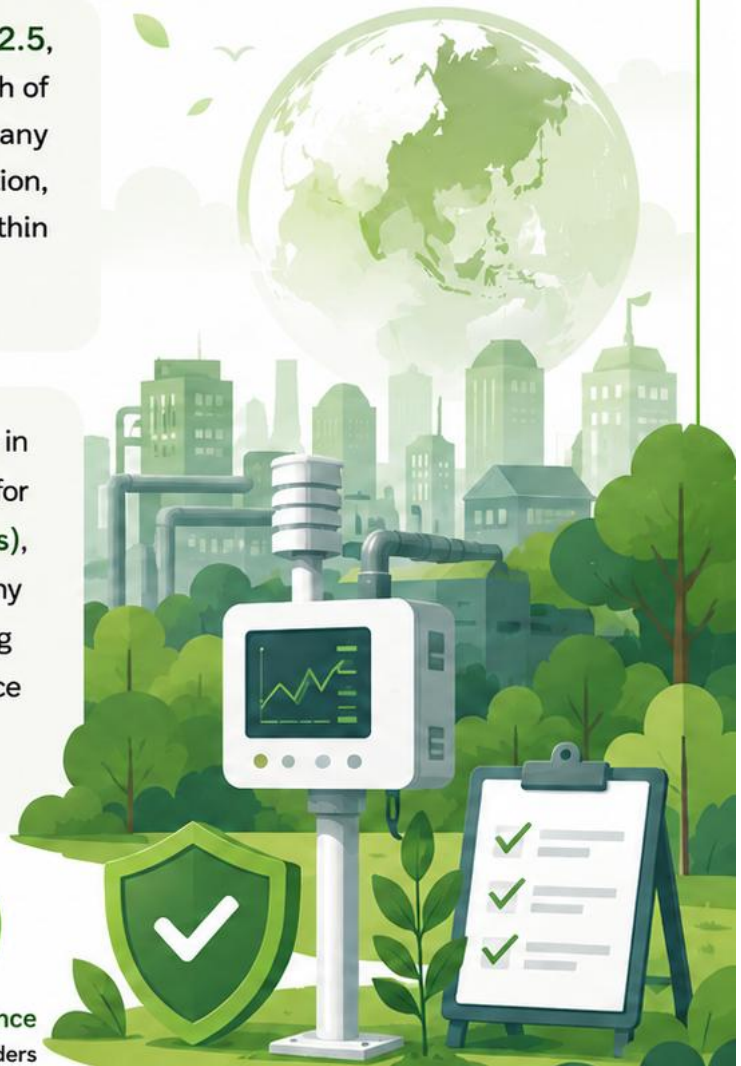
https://www.bbgigroup.com/th/sustainability/environment-dimension

POLLUTION MANAGEMENT

Introduction

Thailand is currently facing severe air pollution problems, particularly from **PM2.5**, smoke, and the dispersion of volatile organic compounds, which affect the health of people nationwide. Although the volume of pollutants emitted by the Company does not exceed the standards prescribed under the Ministry of Industry notification, the Company continues to place importance on air quality management both within its operating facilities and in surrounding communities.

The Company has therefore established a management plan to control air quality in accordance with the **US EPA MACT** standard, which is the United States standard for controlling emissions of hazardous air pollutants (**Hazardous Air Pollutants: HAPs**), in order to reduce air pollutant emissions that may affect stakeholders. The Company has developed an effective air quality control system by setting targets, conducting measurements, and regularly monitoring air quality, to ensure strict legal compliance while continuously building confidence among stakeholders in all respects.



Set Targets for continuous improvement

Measure using standardized instruments

Monitor Air Quality regularly

Comply with the Law strictly

Build Confidence among stakeholders

Air Pollution Management Targets

Because the Company has operations that emit air pollutants through the stacks of its plant boilers, it has set a target for 2025 not to exceed the **US EPA MACT** standard, which is the standard for controlling emissions of **Hazardous Air Pollutants (HAPs)** in the United States, issued by the **US Environmental Protection Agency (US EPA)** under the **Clean Air Act (CAA)**, which is more stringent than the standard in Thailand and is internationally recognized.

Air pollutant emissions	Target* 2025 (Ton/year)
Total Suspended Particulates (TSP) from combustion (Ton/year)	13
Nitrogen oxides (from combustion) (NOx) (Ton/year)	74
Sulfur dioxide (from combustion) (SOx) (Ton/year)	103
Carbon monoxide (CO) (Ton/year)	45

*Emission/Pollution (Ton) = [(Emission concentration x MW/24.45) Volumetric gas flow rate (Nm3/hr.) x Hours Emitted (Hour/Year) / (109)
; Emission concentration unit = ppm at % O2 Actual
; MW ; NOx = 46 SOx = 64 , CO = 28
; The Company uses a flow rate of 30,000 Nm3/hr. and operation hours of 8,760 Hour/Year

Implementation Approach

Environmental Quality Monitoring and Air Pollution Management

For a Better Environment, Employee Safety and Community Confidence

Air | Odour | Noise | Lighting | Safety | Community

1 Environmental Quality Monitoring

The Group conducts environmental quality monitoring in office areas and around operating sites at least once per year. In 2025, it was found that **air quality**, **odour**, **noise** and **lighting** were within normal limits in accordance with legal requirements, and no incidents of hazardous chemical leakage were found, particularly hydrocarbon leakage from business operations.

Monitoring Results 2025

Air quality	Odour	Noise	Lighting
Within normal limits	Within normal limits	Within normal limits	Within normal limits

No incidents of hazardous chemical leakage were found, particularly hydrocarbon leakage from business operations

2 Air Pollution Reduction Measures and Risk Control

The Group has implemented measures to reduce air pollutant emissions, including the installation of a **CO_2 Scrubber** to capture ethanol vapour and impurities, reducing **VOCs/odour**, and a **Flare System** to prevent odour and air pollutants arising from biogas generated in the production process, in order to avoid impacts on communities surrounding the plant and to maintain the working environment for employees.

CO_2 Scrubber
Captures ethanol vapour and impurities
Reduces VOCs/odour

Flare System
Prevents odour and air pollutants arising from biogas generated in the production process

No impact on communities surrounding the plant boundary

Maintains the working environment for employees

3 Biogas Management from Wastewater Treatment Ponds

The wastewater treatment ponds in the bioethanol business generate high levels of biogas for energy production. Such gas contains methane, which is flammable, and inhalation may also be harmful to the body. Therefore, the Group strictly controls the cover, or **Gas Holder**, to prevent leakage and conducts regular inspections, so as to avoid impacts on the environment, employees and surrounding communities.

- High biogas content for energy production
- Contains methane, which is flammable
- Inhalation may also be harmful to the body

- Well-controlled cover or Gas Holder to prevent leakage
- Regular condition inspections
- No impacts on the environment, employees and surrounding communities

Performance Data

Air Pollutant Emissions

- In 2025, the Group had air pollutant emissions from combustion of Total Suspended Particulates (TSP) of 9.16 tons/year, Nitrogen oxides from combustion of 22.63 tons/year, Sulfur dioxide from combustion of 12.72 tons/year, and Carbon monoxide of 45 tons/year. All of the aforementioned air pollutant emissions did not exceed the targets set in accordance with the US EPA MACT standard, as shown in the table.

- A comparison between 2025 and the previous year, 2024, found that Total Suspended Particulates (TSP) from combustion increased by 114%, but still remained within the target set. Meanwhile, Nitrogen oxides from combustion decreased by 26%, Sulfur dioxide from combustion decreased by 82%, and Carbon monoxide decreased by 28%. This was because the Company increasingly used biogas, a renewable energy source, as the primary fuel for steam production, resulting in improved air pollutant emissions from the plant boiler stack ventilation system as well.

Summary of air pollutant emissions (Ton/year)

Air pollutant emissions	Target* 2025	2023	2024	2025	Change compared with 2024	
					Ton/year	Percentage (%)
Total Suspended Particulates (TSP) (Ton/year)	13	2.11	4.27	9.16	↑ +4.89	+114
Nitrogen oxides (from combustion) (NOx) (Ton/year)	74	54.27	30.59	22.63	↓ -7.96	-26
Sulfur dioxide (from combustion) (SOx) (Ton/year)	103	15.01	69.81	12.72	↓ -57.09	-82
Carbon monoxide (CO) (Ton/year)	45	35.72	63.16	45.44	↓ -17.72	-28

Note*

*Emission/Pollution (Ton) = [(Emission concentration x MW/24.45) Volumetric gas flow rate (Nm3/hr) x Hours Emitted (Hour/Year) / (109)
; Emission concentration unit = ppm at % O2 Actual
; MW ; NOx = 30 SO2 = 40 , TSP = 50, CO = 60
The Company uses Flowrate = 30,000 Nm3/hr and Operation Hour = 8,760 Hour/Year

RESOURCE MANAGEMENT

Resource Managements

Use of Renewable Materials and Green Energy

Driving Natural Resource Management for Environmental Sustainability

The Company recognizes that natural resources are finite and critical to ecosystem balance. Accordingly, we are committed to managing natural resources efficiently to maximize effectiveness. We promote the use of renewable energy sourced from resources that can be naturally replenished, as a form of green energy contributing to environmental sustainability. Through these efforts, the Group has adopted different types of renewable energy as follows.

Renewable Material Used (Renewable Material Used) in 2023-2025

Renewable Material Used	2023	2024	2025
Total Renewable Material Used* (Ton/year)	1,526,686.23	1,419,529.89	1,412,496.78

Sources of Renewable Materials

Sugarcane | Rice Husk | Wood Chips

Converted into Green Energy

In 2025, the Company used natural resources that can be replenished and converted into green energy from sugarcane, rice husk, and wood chips, with a total renewable material usage of **1,412,496** tons/year. When compared to 2024, which was 1,419,529 tons/year, the Company's total renewable material usage decreased by **0.5%** from the previous year.

Year 2025
1,412,496
Ton/year

Decreased
0.5%
from 2024

THANK YOU