Chapter 4

Environmental Sustainability and Climate Change

Material topics in this chapter

- Water resources management
- Air pollution control
- Waste management
- Climate change and energy management

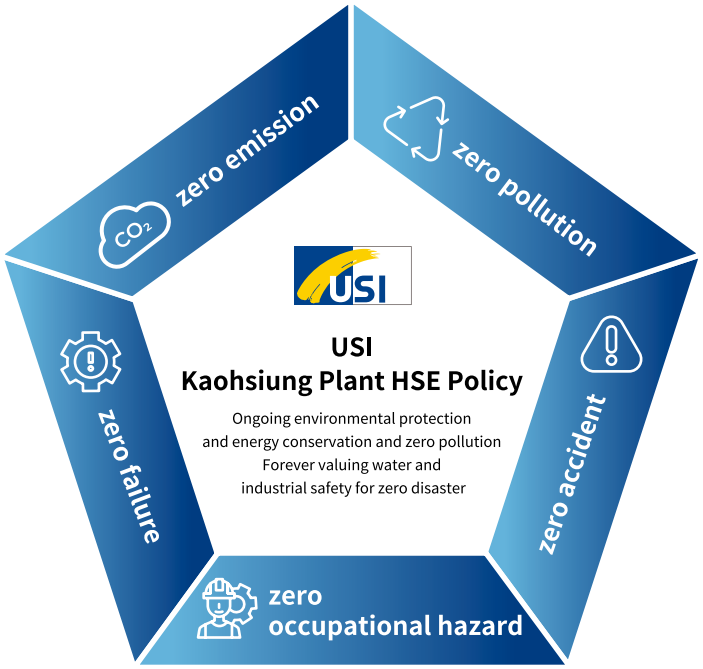
Performance Highlights

- Environmental Expenditure: approx. NT$135.67 million, up by 16.8%.
- Electricity less by 0.75% (2015-2021 average: 1.38%), energy less by 5.10%, carbon less by 2.39%, water less by 4.26%
- Increased materials recycling rate to 12.3%.
- Constant implementation of ISO 14064-1 Greenhouse Gases Inventory and Verification and scope 3 inventory.
- Implementation of the ISO 46001:2019 Water Efficiency Management System and completion of verification.
- Implementation of ISO 14067:2018 Carbon Footprint of Products and verification.

4.1

Environmental management system

In 1998 we established the ISO 14001 environmental management system (EMS), with 100% coverage. EMS provides USI with a good environmental protection framework for controlling and reducing environmental impacts, preventing accidents from impacting the environment, and ensuring legal compliance. Following international trends, we have integrated the EMS and the health and safety system to draw up an HSE (health, safety, and environmental protection) policy and the “five zero goal".



Upholding and realizing the business philosophy of Chairman Wu, we optimize HSE to protect the health and safety of employees and maintain the environment and ecosystem. This is our wish and the responsibility of every employee. To promote sustainable development, fulfill ESG with due diligence, and support clean production and environmental protection, Kaohsiung Plant will make continual improvement of the workplace environment, operation safety, process waste reduction, water efficiency, energy conservation, and carbon reduction in order to achieve the “five zero goal: zero pollution, zero emission, zero accident, zero occupational hazard, and zero failure".

Environmental objectives and management programs

2021 Environmental Protection Targets and Management Programs

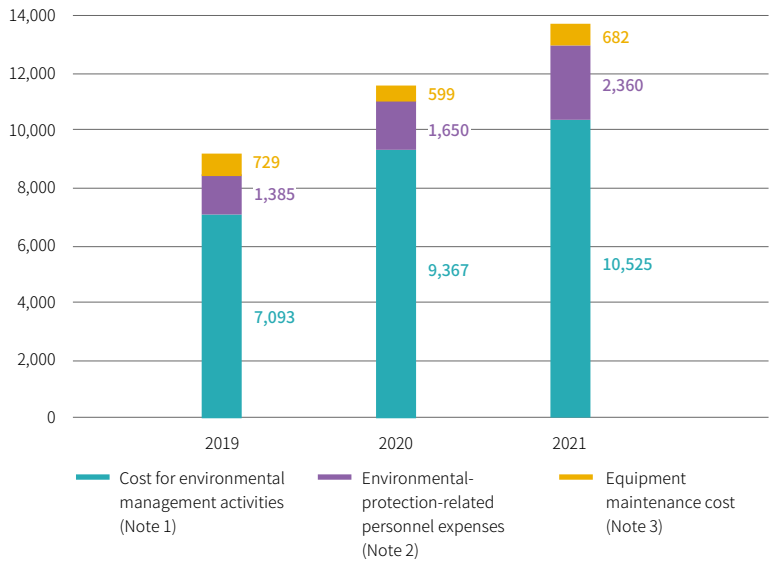
Policy	Goals	Program	Effectiveness
Zero Emission	Reduce the fugitive emissions of VOCs of equipment/component and measured leakage rate <0.5%	Enhancement of equipment/component self-management, periodic inspection and review of maintenance and repair progress, identification and improvement of equipment/component with a high leakage rate, reduction of the quantity equipment/component or replacement of equipment/component with a lower leakage rate or without a shaft, and enhancement of inspection for equipment/component with a high leakage rate and more motions.	2021 measured VOCs leakage rate 0.038%
	Improve process equipment and pipelines to reduce the fugitive emissions of VOCs.	1 Construction and improvement of process emission pipelines 2 Process equipment improvement	1 Improved the process equipment and pipelines of 2 assembly lines to reduce the fugitive emissions of VOCs. Improvement of other assembly lines will continue in 2022. 2 Added 3 tanker unloading arms and completed the improvement of 6 catalyst mixing tanks to effectively reduce the fugitive emissions of VOCs.
	Reduced GHG emissions by 1,004 tCO_2e	Five plant electricity conservation projects	In 2021, electricity was saved up to 1,972,419kWh accumulatively and emissions were reduced up to 1,004 tCO_2e.
	Reduce water discharge by 5,280 MT	Continuous monitoring and reclamation of effluents	In 2021, a total of 10,986 MT of water was reclaimed from the effluent reclamation system.
Zero Pollution	Prevent equipment corrosion from causing the leakage of organic substances	Equipment cooler renewal project	Completed the renewal project to ensure no leakage due to equipment corrosion.
	Improve effluent water quality to 60% effluent standard (COD<60 mg/L)	Effluent Quality Control Enhancement	In 2021, effluent COD was 14.4 mg/L in H1 and 25.5 mg/L in H2
	Complete the construction of the block control and wastewater treatment equipment to prevent wastewater anomalies from occurrence.	1 Improvement of the operation of wastewater treatment plants. 2 Effective block and control abnormal wastewater leakage	1 In 2021, the COD, SS, and grease in effluents complied with the discharge standards. 2 In March 2021, new major separator valves and sampling points were added to effectively block and control wastewater at the source.
	Prevent environmental contamination caused by plastic resin pellet leakage	Prevention and management of plastic resin pellet leakage	1 Enhanced publicity of dust zone cleaning and tanker loading area cleaning. 2 Ensured that the unloading pipe is inserted in the inlet and surroundings are covered with dust screens before unloading in the tanker loading operating process to prevent materials from splashing. 3 Revised and released the WI-KHB-810-51 work instructions of the Finished Product Section and included the plastic leakage management system. 4 Inventoried the leakage prevention and management measures of plastic resin pellets at the processing area and recovered 12.87MT of plastic resin pellets in 2021.

Environmental Expenditures

Our environmental management costs include the cost for environmental management activities, environmental-protection-related personnel expenses, and equipment maintenance cost.

- In 2021, we will actively promote the improvement of process safety equipment, waste treatment, and the professional training of environmental protection personnel.
- In 2021, the total amount of environmental expenditures increased by **16.8%** over 2020 to about **NT$135.67** million.

Environmental Expenses in the Past 3 Years (NT$ 10 thousands)



Note 1: The cost for environmental management activities includes the fees for air pollution control, water pollution prevention, waste disposal, noise pollution prevention, management of toxic and concerned chemical substances, industrial safety improvement, depreciation of fixed assets and others (e.g., cleaning and mowing).
Note 2: Environmental-protection-related personnel expenses include personnel expenses and environmental protection-related training fees.
Note 3: Equipment maintenance cost includes the fees of environmental-related equipment and the fees for equipment maintenance.

4.2

Water resources management

GRI 103-2、103-3

SDG 6

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

In response to global climate change, valuable water resources are reclaimed for reuse through water conservation and emission reduction measures.

Strategy and Approach

1. Reduce pollution and emission through process and source improvement and then end-of-the-pipe treatment promote water resource recycling and reuse.
2. Constantly invest in discharge reduction management, implement water conservation, and water resource reclamation management.
3. Promote the water efficiency management system

Commitment

Annual water conservation >1%
Data scope:
USI coverage 100%

Achievement and Goal

2021 Goals

1. Save energy at 1% each year.
2. Reclaim or reduce water discharge at 5,280 MT.

2021 Projects

1. Water reclamation management
2. Continuous effluent monitoring and reclamation
3. Implement the ISO 46001:2019 Water Efficiency Management System

2021 Achievements

1. Water conservation: 4.26%
2. Reclaimed water: 10,986MT

Sustainable Development Milestone

2022 Goals

1. Save energy at 1% each year.
2. Increase water reclamation to 12,000MT
3. Reduce water consumption by 2,880MT/year through process improvement.
4. Implement and pass the certification of the ISO 46001:2019 Water Efficiency Management System.

3-Year Goals

Further water conservation management

5-Year Goals

Reducing water withdrawal and consumption to enhance water recycling and reuse.

Management

Effectiveness Assessment

1. Water conservation volume
2. Wastewater reclamation volume

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Key Programs of this Chapter

1. Water resources management
2. Promote the water efficiency management system
3. Prevent and manage plastic resin pellet leakage

Water resource management

GRI 303-1:2018、303-3:2018、303-4:2018、303-5:2018

The circular economy is an industrial system designed for recovery and regeneration to replace “end of life” with “recovery" in order to turn waste into resources and thereby achieve waste reduction. By constantly implementing the circular economy, we implement water conservation and drainage reduction through improvement programs to reclaim and recycle valuable water resources for reuse and set the annual water conservation target at “1%". The actual conservation in 2021 was 4.26%. The boundary of water resource and effluent management is the Kaohsiung Plant, with data coverage of 100%.

In terms of water stress distributions, based on the water stress by country in the ‘Aqueduct Water Risk Atlas’ published by the World Resources Institute (WRI), the water stress of Taiwan falls at the low to medium level, with water stress at 10-20%.

According to the 2020 water resources statistics published in the Water Resources Agency Register Statistical Report, MOEA, the water consumption of Kaohsiung City was 280,439 Ml, including 94,101 Ml of water for domestic use or public use, 85,677 Ml of water for industrial use, 80,177 Ml of water for agricultural use, and 20,485 Ml of water for other uses. The 2020 total water withdrawal of Kaohsiung Plant was 1,029.036 Ml, accounting for about 0.4% of Kaohsiung City’s total water consumption. USI withdraws water mainly from tap water supplied by the Pingding Waterworks and Cheng Ching Lake Waterworks for product production, equipment cooling, boiler, domestic use of employees, and other uses. Compared to 2020, water withdrawal in 2021 reduced by about 31 Ml to 998.098 Ml.

2021 Water Withdrawal, Discharge, and Consumption

Total Water Withdrawal 998.098 Ml

Low-medium water stress area　Water stress 10-20%

- Third-party water-fresh water (≦ 1,000mg/L TDS): 998.098 Ml
- No runoff, groundwater, seawater, output water.

Note: 1. Based on NIEA W210.58A, the 2021 TDS was 344mg/L, the 2022 TDS was 372mg/L, fresh water was withdrew.
2. Withdrawal is subject to the readings on the water meter (flow meter).

Total Discharge: 305.265 Ml

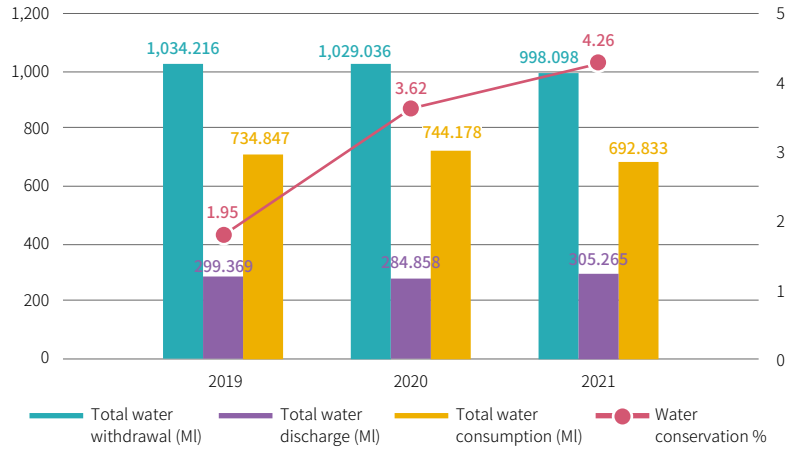
Ammonia nitrogen total volume control area

- Runoff- fresh water (≦ 1,000mg/L TDS): 305.265 Ml
- Discharge contains no groundwater, seawater, and third-party water.
- NH4 in H1 and H2 was 0.78 mg/L and 0.48 mg/L, far below the effluent standard (20 mg/L).

Note: 1. Based on NIEA W210.58A, the 2021 TDS was 863mg/L, the 2022 TDS was 912mg/L, fresh water was discharged.
2. Discharge is subject to the readings on the effluent meter (flow meter).

Total Consumption = Total Withdrawal – Total Discharge = 692.833 Ml.

Water Status in the Last 3 Years



Water conservation and reclamation GRI 303-1:2018

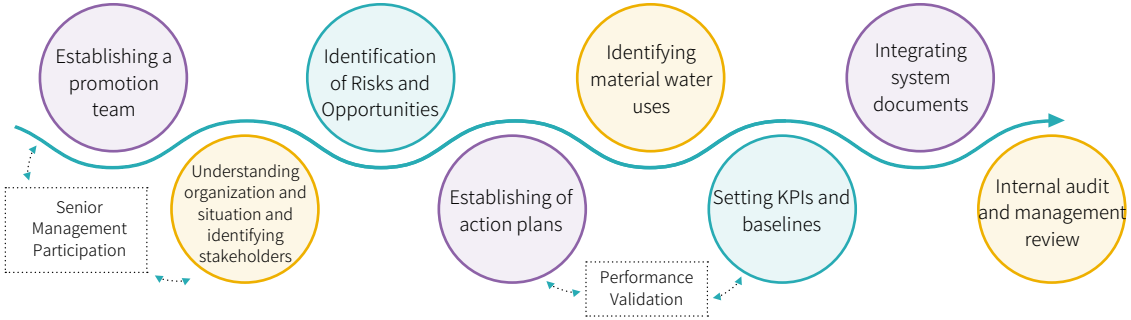
Following the rising water demand, escalating climate change impact, and expanding sustainability pressure, we keep a constant track on water shortages and endeavor to reduce water consumption or enhance water reclamation in response. When the water shortage was severe in Kaohsiung during April-May 2021, the Kaohsiung City Government rationed water supply for industrial use by 7% at phase I and 11% at phase II. In response to the government's industrial water rationing policy and promote water conservation and consumption control, we advocated the cessation of using tap water for irrigation, washing building exterior walls, cleaning ditches, washing cars, and taking shower, which would consume more water. We also enhanced leakage inspection of pipelines and control valves to save water across the plant.

Water reclamation program	Effectiveness
Enhancing the recycling rate of water resources	We have improved the steam condensate recovery system. After the completion and operation of the Kaohsiung Plant's new steam boiler, the condensate reclaimed from steam can be reused in the new boiler for re-use. The water reclaimed is approximately 47,520MT/year. Calculation ▶ The project was completed in 2016. After field tests, we found that the reclamation volume is 6MT/hour. Based on 330 days a year, the annual reclamation volume is 47,520MT.
Recycling spillage water reclaimed from pellet cutting	Spillage water reclaimed from pellet cutting is first transported to the sedimentation tank. Then, it is pumped into the reclaimed water treatment plant before being further transported to the cooling tower for re-use to reduce tap water consumption and process effluents. The water reclaimed is approximately 27,720MT/year. Calculation ▶ The project was completed in 2016. After field tests, we found that the reclamation volume of the system is 14MT/batch. Based on six batches a day and 330 days a year, the annual reclamation volume is 27,720MT.
Continuous monitoring and reclamation of effluents	Continuous monitoring of the in-house effluent quality to enhance effluent treatment and response capacity and ensure that effluents comply with the discharge standards. After reclaiming by the system, effluents are treated before being transported to the cooling tower for re-use to reduce tap water consumption and process effluents. Calculation ▶ Based on the readings of pumps on-site, the total wastewater reclamation in 2021 was 10,986MT.
Detention basin and storm water reclamation channel	Pipelines will be installed from the existing detention basin and storm water reclamation channel to the cooling tower. After filtering by the storm water separator next to the cooling tower, storm water will be re-used by the cooling tower. The water reclamation in 2021 is about 15,914MT. Calculation ▶ The project was completed in 2017 and started operation in 2018. The plant catchment area is 3,500m^2, the tank site dike area is 3,300m^2, Kaohsiung's annual rainfall in 2021 was 2,600mm. Based on a reclamation rate of 90%, the estimated water reclamation is about 15,914MT/year.
MRT Steam Condensate Recovery	Steam condensate is recovered for reuse in the boiler to reduce tap water consumption. The project annual recovery is 17,500MT. Calculation ▶ Steam condensate recovery at 2.2MT/hour. The number of workdays is 330 days/year. The annual recovery is thus 2.2×24×330 ≒ 17,500(MT/year).

Note: The estimated volume of reclaimed and recycled water in 2021 was 119,640MT; the total water withdrawal was 998,098MT; the volume of reclaimed and recycled water was 12% of the total water intake.

Water Efficiency Management System GRI 303-1:2018

In 2021 we implemented the ISO 46001:2019 Water Efficiency Management System and completed system certification in February 2022. By inventorying the current status and ways of water consumption across the plant, through identifying, planning, managing, and improving the risks and opportunities of water with systematic water consumption management, and thereby optimizing water demand management, we effectively achieved the goals of water conservation and discharge reduction to enhance water efficiency and reduce water costs.



In 2022, we will enhance wastewater system management and optimize operation to reduce wastewater discharge and increase wastewater reclamation up to 12,000MT (projected). We will also implement process improvement and reduce MRT steam use to save water up to 2,880MT/year (projected).

Water as a shared resource GRI 303-1:2018

In 2021 we planned the firewater connection project with the plants (Grand Pacific Petrochemical Corporation) in the nearby Dashe Industrial Park. Besides dispatching water to support firefighting through water as a shared resource, this also strengthened the emergency response capability. Currently, Grand Pacific Petrochemical Corporation has connected firewater with TSRC Corporation in a firewater storage tank of about 4,500m^3. Currently, the effective capacity of our firewater storage tank is 4,297m^3. After the completion of the connection project at the end of 2022, the total volume of firewater as a shared resource will be about 8,797m^3.

Effluents Management GRI 303-1:2018

Wastewater from the plant is the main source of effluents from USI. According to KSEPB's effluent runoff discharge permit, effluents that cannot be refused after treatment and comply with the environmental protection laws and regulations can be discharged to the surface water body—Houjing River. According to the data of the Soil and Water Pollution Control Division, Kaohsiung Bureau of Environmental Protection, the 2020 discharge of the effluent catchment of the Houjing River was about 77,280CMD, including 58,832CMD of domestic sewage, 18,341CMD of industrial wastewater, and 107CMD of livestock wastewater. The approved discharge of USI Kaohsiung Plant is 980CMD, accounting for about 5.3% of the industrial wastewater at the effluent catchment of the Houjing River. The total discharge in 2021 was 305.265 Ml.

Wastewater discharge from the plant includes process wastewater and domestic wastewater from employees. Wastewater is transported to the water treatment plant for treatment via wastewater pipelines. The wastewater treatment system includes the pre-treatment and primary (physical) treatment. Through trash screening, oil removal, sedimentation, and chemical treatment, and the sludge treatment unit for wastewater solid-liquid separation, effluents meet the drainage quality before discharge.

To reduce the environmental impact of discharge and promote waster recycling and reuse, besides complying with environmental protection laws and regulations, we optimized the functions of the wastewater (sewage) treatment plant in 2020, including adding the sludge concentration tank, improving the bottom sludge removal system of the sedimentary tank, and building the sludge rinsing system for the flotation system to enhance sludge treatment and collection efficiency. In 2020-2021, we constantly added major separator valves and sampling points to effectively block and control abnormal wastewater leakage to reduce the load of the treatment system and lower the environmental impact of effluents to achieve process source control.

Water quality monitoring and management

GRI 303-2:2018、303-4:2018

Every half a year, we hire environmental analysis organizations approved by the Environmental Analysis Laboratory (EAL) to examine water quality of effluents from our plants, including NH4 required for total volume control. Every year, effluent test items required for reporting are well-followed the effluent standard. According to previously amended and promulgated "Effluent Standards", the water quality control of discharge from the petrochemical industry includes 22 items, including 7 general water quality items and 15 specific water quality items. In our 2020 untreated wastewater and effluent quality tests and analysis, the measurement of 11 specific water quality items were below the method detection limits (MDLs). Hence, the inspection for these 11 items was exempted after reporting to the Bureau of Environmental Protection. In 2021 we continued to enhance the operation of the wastewater treatment plant, and the all water quality items of discharge complied with the regulatory limits.

Additionally, after discharging effluents to the Houjing River in Kaohsiung, a NH4 total volume control area, the NH4 detection limit is below the regulatory requirements over the years. According to the inspection data during January-April 2021 of the Kaohsiung Bureau of Environmental Protection, the detection limit of NH4 at the Houjing River was 11.68 (mg/L). The 2021 NH4 value of the Kaohsiung Plant was far below the effluent standard, with the lowest detected value at below 3.9%.

Results of Water Quality Examination in Last 3 Years

Water Quality Indicator	2019		2020		2021		Effluent Standard (Petrochemical Industry)
	H1	H2	H1	H2	H1	H2	
SS (mg/L)	9.2	24.8	3.7	8.5	9.0	5.7	30
Grease (mg/L)	9.6	8.3	6.3	2.6	6.6	4.5	10
COD (mg/L)	27.4	45.3	28.7	52.8	14.4	25.5	100
NH4 (mg/L)	0.14	0.88	1.27	0.28	0.78	0.48	20

Prevention and Management of Plastic Resin Pellet Leakage

The US Plastics Industry Association and American Chemistry Council co-promote the Operation Clean Sweep (OCS) campaign dedicated to preventing plastic resin pellets, flakes, and power loss from entering the ocean to cause environmental pollution.

In 2020, we implemented the prevention and management of plastic resin pellet leakage through in-house inspection and inventory of plastic resin pellet leakage management. We also arranged education/training for contractors. In 2021, we performed the on-site walk-through inspection of contractors and comprehensive process area inventory to understand the methods that contractors and employees adopted to clean up and prevent the leakage of plastic resin pellets. We also established new or revised related control documents to ensure the collection of plastic resin pellets, flakes, and powder to prevent them from polluting the environment by rainfall or sewage. In 2021, we recovered a total of 12.87MT of plastic resin pellets across the plant.

Operation management
- On-site inspection and review
- Enhancement of employee awareness
- Establishment of procedure documents
- Follow-up of implementation results

Workplace
- Ensure venue ground flatness
- Enclosure installation
- Provision of cleaning equipment for employees

Personnel training
- Education/training
- Enhancement of SOP conformity of employees
- Workplace publicity

Management measures
- Materials unloading management
- Transportation packaging management
- Regional cleaning
- Collection management

4.3 Air pollution control

GRI 103-2、103-3

SDG 11

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

Continuous environment improvement to achieve “zero pollution and zero emission”.

Strategy and Approach

1. Reduce pollution and emission through process source improvement in support of end-of-the-pipe treatment.
2. Constant investment in environmental pollution control (prevention) management.
3. Compliance with the Gaoping total volume control.

Commitment

Enforce zero pollution and zero emission.
Data scope: Kaohsiung Plant

Achievement and Goal

2021 Goals

1. Equipment/component VOC leakage <0.5%.
2. Improve process equipment and pipelines to reduce the fugitive emissions of VOCs.

2021 Projects

1. Reduce equipment/ component VOCs effusion.
2. Improve process equipment and pipelines

2021 Achievements

1. VOCs equipment component leakage: 0.038%
2. Improved the process equipment and pipelines of 2 assembly lines, added 3 tanker unloading arms and improved 6 catalyst mixing tanks to reduce the fugitive emissions of VOCs.
3. No sanction for leakage was found in the equipment/ compoment spot checks inhouse and by the environmental protection competent authorities.

Sustainable Development Milestone

2022 Goals

1. Equipment/component VOC leakage <0.5%.
2. Improve process equipment and pipelines to reduce the fugitive emissions of VOCs.

3-Year Goals

Implement VOCs reduction programs

5-Year Goals

1. Reduction of equipment/component leakage.
2. Reduction of pollutant emissions.

Management

Effectiveness Assessment

1. VOCs test report
2. Emission data

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Chapter Summary

1. Management methods
2. Management performance

Management Approach Description

USI is located in Kaohsiung City within the Gaoping Total Volume Control Area and the level 3 control area of PM_{10}, $PM_{2.5}$, and O_3. Therefore, air quality improvement has always been our prime target. To fulfill our corporate social responsibility, we spare no effort in implementing environmental improvement, hoping to achieve the "zero pollution and zero emission" goals in the five zero's policy and contribute to air quality improvement.

Management Targets

We constantly promote pollution reduction, replace fuels with clean energy, and effectively collect exhaust to control equipment for proper treatment. We also cooperate with the total volume control and reduction of the Gaoping River to achieve the goals of zero pollution and zero emissions. In 2020, the construction and commissioning of the thermal oxidizer (TO) were completed to treat VOCs at high and low intensities with a damage and removal efficiency >99% to effectively reduce VOCs emissions. In 2021, we implemented equipment operation and maintenance training, established the management system, and arranged education and training. After rerouting exhaust emissions through the TO during the annual repair in December 2022, this can effectively reduce exhaust emissions via the flare tower.

Management Approach

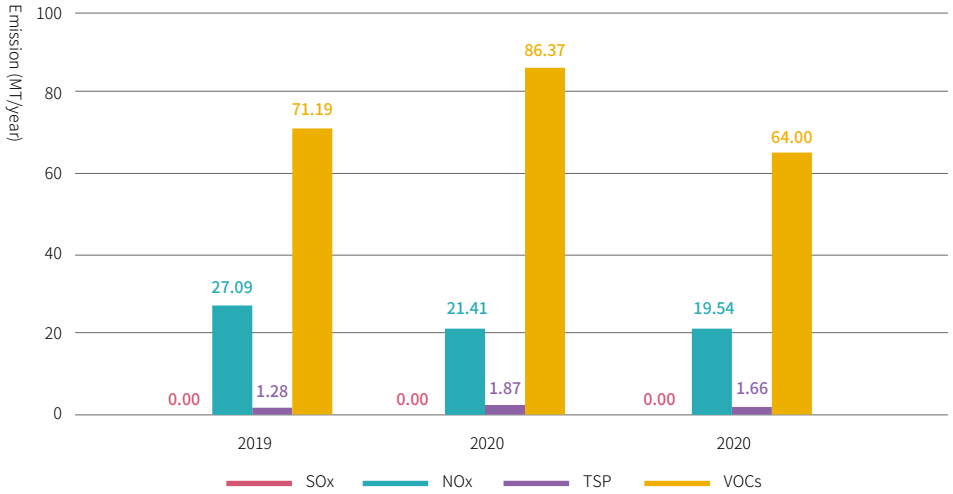
In addition to regularly testing and reporting air pollutants, we have planned the following reduction programs to effectively reduce air pollutants:

VOCs Reduction	We implemented the equipment/component management plan. Besides establishing SOPs and creating master files for equipment/component management, outsourcing quarterly external inspection, and purchasing monitoring and measuring equipment and gauges and performing periodic instrument calibration, all plants also enhance equipment/component self-management, periodically review and follow up the inspection and service progress, run equipment maintenance and repair re-inspection, identify and improve equipment/component with a high leakage rate, reduce the quantity of equipment/component or replace with equipment/component with a lower leakage rate or leakage resistance, and enhance the inspection of equipment/component with a high leakage rate and more motions. 1. In 2021, we continued to implement the management of the fugitive emissions of VOCs for equipment/component. The in-house environmental protection section performed equipment/component spot checks on 468 points and found no leakage. The environmental protection competent authorities performed 3 spot checks on a total of 1,200 points and found no leakage for sanction. In 2022, we will analyze the changes in the trend of VOCs leakage inspection results to facilitate leakage control. 2. In 2021, we built 3 tanker unloading arms and improved 6 catalyst mixing tanks. In 2021-2022, we improved the pipelines for VOCs collection in the process to effectively reduce the fugitive emissions of VOCs.
Effective VOCs Treatment	In 2019, we built a TO system for processing high-intensity VOCs in-house and acting as the standby system of the RTO. The TO system was completed in 2020. The commissioning showed that the reduction rate of high-intensity VOCs at 4ppm is >99.9% and the low-intensity VOCs at 6ppm is >99.3%. In 2021 we implemented the equipment operation and maintenance training, established management systems, and arranged education and training.
Reduction of Pollutant Emissions	1. In 2021 we applied for cancellation of the emergency use of 540Kl of fuel oil by the steam boiler to switch to clean energy--natural gas. 2. In 2021 we planned the boiler NOx emissions reduction program and discussed De-NOx with professional contractors to improve the assessment report.
Emergency Response to Air Quality Deterioration	In response to the deterioration of air quality at all levels, we activated the "Air Quality Deterioration Control Plan" and enhanced equipment patrol and inspection, periodic inspection and maintenance of diesel forklifts, and process reduction for emissions reduction. In 2020-2021, we implemented the air quality deterioration response drill to enhance the response ability of employees and review the opportunity for improvement after the drill.
Managing hazardous air pollutants (HAPs)	In 2022, we will arrange the hazardous air pollutants (HAPs) inspection and establish our own pollutant fingerprint database.

Management Performance GRI 305-7

Major air pollutants emitted by USI include sulfur oxides (SOx), nitrogen oxides (NOx), total suspended particulate (TSP), and volatile organic compounds (VOCs). Fuel burning of the steam boiler is the main source of SOx, NOx and TSP detected in the plant, while RTO, flares, storage tanks, and equipment components are the main sources of VOCs emissions. Over the years, we hired EAL-accredited environmental engineering companies to test USI pipeline emissions, and the emission test results have been consistently well below the EPA emission standards.

Air Pollutant Emissions in Last 3 Years



Note: Air pollutant volume was reported based on the air pollution control fee.

Testing Results of Boiler Discharge Pipes in the Last 3 Years

Pollutant	2019	Standard (announced 2017)	2020	2021	Standard (announced 2020)
SOx(ppm)	ND	100	ND	ND	50
NOx(ppm)	100	150	90	54	100

Note 1: The results of VOCs emissions of Kaohsiung Plant comply with the statutory requirements over the years, with a reduction rate over 95%.

Note 2: ND means not detected.

Testing Results of the RTO Discharge Pipes in the Last 3 Years

Pollutant	2019	2020	2021	Standard
SOx(ppm)	ND	ND	ND	100
NOx(ppm)	2	2	2	150
TSP(mg/NM^3)	5	<1	-	100
VOCs(ppm)	53	52	52	Reduction rate>95% or <150ppm

Note 1: The results of VOCs emissions of Kaohsiung Plant comply with the statutory requirements over the years, with a reduction rate over 97%.

Note 2: According to the regulations, an inspection must be performed before applying for TSP extension (May 2, 2023). No TSP inspection was performed in 2021.

4.4 Waste management

GRI 103-2、103-3

SDG 11、12

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

Continuous environment improvement to achieve “zero pollution and zero emission”.

Strategy and Approach

1. Strengthen the waste management system.
2. R&D of waste reduction.

Commitment

Enforce zero pollution and zero emission.
Data scope: Kaohsiung Plant

Achievement and Goal

2021 Goals

1. Enhance the flow control of waste disposal.
2. Test the waste reduction program in the process.

2021 Projects

1. Audit waste disposal contractors.
2. Waste reduction programs.

2021 Achievements

1. Enhancement of the flow control of waste cleanup and disposal by performing spot checks on 10 waste cleanup contractors and 7 waste disposal contractors, and no nonconformity was found.
2. Process tests were implemented to waste reduction to effectively remove impurities and VA.

Sustainable Development Milestone

2022 Goals

Establishing the waste audit and management systems.

3-Year Goals

1. Establishing the waste audit and management systems.
2. Implementing waste reduction

5-Year Goals

Implementing waste recycling and reuse

Management

Effectiveness Assessment

1. Waste reporting data.
2. Targeted research reports.

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Chapter Summary

1. Management methods
2. Management performance

Management Approach Description

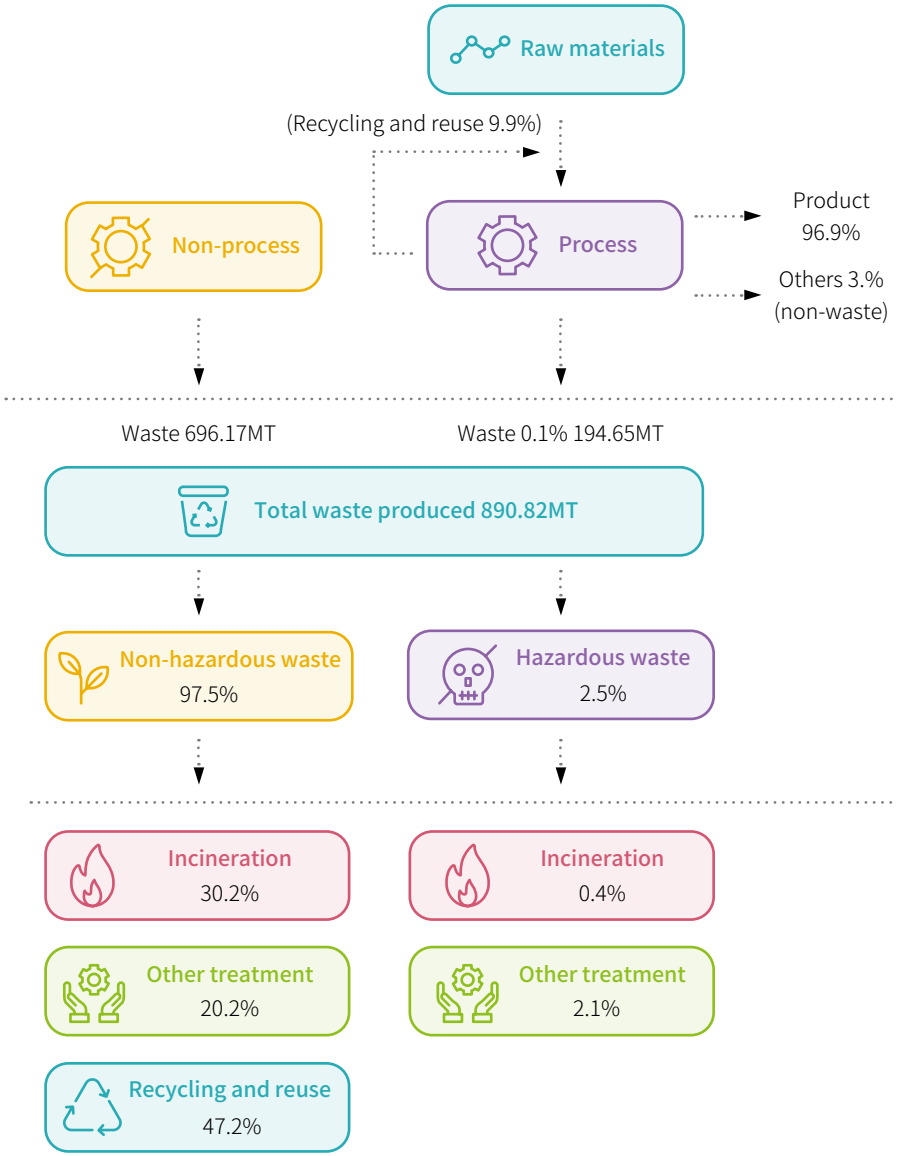
For proper waste disposal, we hire licensed contractors to dispose of such waste according to laws and regulations related to waste disposal. Apart from reviewing the qualifications of contractors and requesting them to provide support documents for proper waste disposal on a regular basis, we perform onsite inspections on contractors to verify their waste disposal performance, in order to perform our supervision obligation.

Management Approach

We produce mostly general industrial waste and dispose of such waste by incineration, physical treatment and cleaning. In recent years, the QC lab has been constantly assessed the reviewed the methods for analyzing hazardous waste management to reduce solvent consumption and effectively reduce the output of hazardous industrial waste. In addition, after washing and processing by qualified contractors, waste plastic containers are crushed and sliced for recycling to achieve the circular economy of resources.

In 2021 we continued with the comprehensive review of waste legitimacy, compared and proofread the monthly report data to facilitate accurate control of waste information. Additionally, industrial waste is sorted by the property of major composition before storing in the storage site, and the storage sites, containers, and facilities are properly labeled. We also built covered waste storage sites equipped with blocking ditches to prevent groundwater and water from runoff contaminations. In 2021, we audited waste storage sites every month, and all sites complied with the related regulations.

Waste Management Process GRI 306-1:2020



Use of Output Waste/Resources

- Waste collection and sorting management
- Periodic online report of waste output and storage.
- Monthly storage zone walk-through inspection to ensure legal compliance.
- Source management review to reduce waste production.
- Promotion of waste reduction programs

Waste Transportation Management

- Online report of the weight of waste disposed out of the plant.
- Real-time tracking system (GPS) of waste transportation
- Retention of tripartite order for outsourced common disposal, control, and delivery.
- Cleaning contractor audit and management

Waste Disposal, Management and Recycling

- Online report of the weight of received waste by contractors.
- Retention of proper disposal documents for reference.
- Contractor audit and management
- Consolidation of resource recycling records

Waste Disposal Contractor Audit and Management GRI 306-2:2020

We only hire licensed waste disposal contractors to clean up and dispose of waste by law. In 2021 we performed spot checks on 10 waste cleanup contractors and 7 waste disposal contractors with the items stated in Annex 2 of the "Regulations Governing Determination of Reasonable Due Care Obligation of Enterprises Commissioning Waste Clearance" (amended on February 23, 2021) to understand the storage, removal, disposal, and recycling of waste of disposal contractors, and no nonconformity was found.

Waste disposal contractors audit and management

1	Basic document review	・Environmental Protection Contractor Permit ・ISO management system
2	Waste storage/ disposal	・Degree of legal compliance ・Compliance with disposal methods and contracts/receipts
3	Waste final disposal	・Verification of final disposal methods and flow ・Compliance with final disposal methods and contracts/receipts

Management effectiveness GRI 306-3:2020、306-4:2020、306-5:2020

We are also committed to waste sorting to classify, collect, and manage recyclable resources. They are weighed and recorded before shipping out of the plant. We also hire licensed contractors to recycle waste metal. In 2021, we recovered 417.66MT of waste metal and hired nearby resource recycling contractors to dispose of the 3.21MT of paper waste. The total volume of waste recycling was 47.2% of all waste, up by 29.3% from 2020. This is mainly because of the replacement of process requirement and the expansion of the R&D building, leading to a higher volume of waste metal. The total waste output in 2021 was 890.82MT. In 2021, no oil, fuel, waste, or chemical substance leakage was reported.

Waste Production, Transfer, and Disposal in the Last 3 Years

Waste	Disposal/Recycling		2019	2020	2021
Hazardous waste	Toxic Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	1.86	1.05	3.46
		Other treatment	17.53	15.67	18.77
Total weight of hazardous waste			19.39	16.72	22.23
Non-hazardous waste	General Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	245.42	201.22	269.40
		Other treatment	240.97	171.14	178.32
	Total weight of non-hazardous waste		486.39	372.36	447.72
	Recycling	Recycling for reuse	230.42	84.92	420.87
		Resource recycling rate (%)	31.3	17.9	47.2
	Total weight of non-hazardous waste		716.81	457.28	868.59
Total weight of waste (MT)			736.20	474.00	890.82

Note 1: Data regarding the production, transfer, and disposal of waste were extracted from the Waste Report and Management Information System of the Environmental Protection Administration. Data of recycling were extracted from in-house records and accounting documents.
Note 2: Waste is transported by licensed cleanup contractors to the qualified disposal contractors for disposal. Waste for recycling was recycled for reuse outside of the plant.

Waste reduction programs

Reinforcement of awareness education	Reinforce the awarerness education of the need for waste sorting and labeling to increase waste recovery volume and reduce the disposal volume of general waste.
Clean production	Strengthen process management to minimize end-of-pipe treatment and reduce the output of sludge and other industrial waste.
Hazardous waste Reduction management	1. After washing and processing by qualified contractors, waste plastic containers are crushed and sliced for recycling. 2. In analysis method improvement, the QC lab skipped the extraction process in inhibitor analysis to stop using solvents. As a result, solvent consumption reduced significantly. In addition, solvents are recovered for reuse in washing to reduce the consumption of washing solvents. In the future, we will continue to assess and review the analysis methods to effectively promote the reduction of hazardous waste.

2019

Recycling and reuse project (NT$700,000)

- Industry-academia collaborative research
- Intermediate product (wax) in the purification process is a marketable product.
- Wax reclamation at 83%, VAM processing efficiency over 90%.
- Enhance carbon utilization to effectively reduce waste production.

2020

Waste reduction planning

- Process reduction test and planning for spent wax
- Separating VAM through mixing and heating to dissolve organic gases in water with water seal to prevent VOCs effusion.

2021

Waste reduction programs (NT$777,000)

- Waste reduction process test-spent wax testing for all products.
- Installation of filtering equipment to remove impurity and effectively reduce residual VAM to below 1%.

By March 2022

Effectively reduced waste by 134.4MT

4.5

Climate change and energy management

GRI 103-2、103-3

SDG 7、13

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

Drawing up of related energy conservation and emissions reduction measures, enhancing climate change responsiveness, reducing GHG emissions, lower operating cost, raise process efficiency, and enhance competitiveness.

Strategy and Approach

Reduce unit product energy consumption and GHG emissions

Commitment

Annual electricity conservation >1%
Data scope: USI coverage 100%

Achievement and Goal

2021 Goals

Implement 8 energy conservation and carbon reduction projects to reduce electricity by 0.75%

2021 Projects

Implemented 5 energy conservation projects.

2021 Achievements

Implemented 5 energy improvement projects to reduce electricity by 0.75%, with an annual conservation rate (2015-2021) of 1.38%, energy by 5.10%, and carbon by 2.39%.

Sustainable Development Milestone

2022 Goals

1. Each year: 1% electricity less, 1.2% energy less, and 1.5% carbon less.
2. Implement 10 energy conservation projects to reduce electricity by 1.71%
3. Implement GHG inventory

3-Year Goals

1. Build the AI intelligent management platform to advise energy conservation operations.
2. Annual average energy conservation 2020-2025: 1.2%

5-Year Goals

Green energy development.

Management

Effectiveness Assessment

1. Unit product energy consumption.
2. Energy conservation volume.
3. Energy review and identification table (monthly)
4. HSE/Energy Management Committee meeting (quarterly)
5. GHG inventory.

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Key Programs of this Chapter

1. TCFD climate change risks and opportunities.
2. Factory smart energy management system
3. Carbon footprint

*Commitment and target of annual electricity conservation rate: Based on the energy conservation targets set for energy users and the regulations of the implementation plan, energy users are required to save electricity by over 1% each year on average during 2015-2024.

Management Performance

Climate Change: Addressing climate change brings the opportunities for sustainable development

TCFD Climate Change Risks and Opportunities

Following the execution of the Glasgow Climate Pact at the UNFCCC COP26, Taiwan has announced amending the Greenhouse Gas Reduction and Management Act into the Climate Change Adaptation Act. After re-assessing our own carbon emission structure, we set a new carbon reduction target to 27% less emissions over 2017 by 2030, actively implement corresponding countermeasures and management mechanisms, request domestic core manufacturers to plan and implement the relevant action plans, and actively engage in the Group's renewables planning. In 2021, we already developed solar generation of nearly 5MW.

To adapt to the impact from climate change, we identified climate risks and opportunities and assessed the potential financial impact based on the climate-related financial risk disclosures developed by the Task Force in 2019 on Climate-related Financial Disclosures (TCFD) created by the Financial Stability Board (FSB) in order to set contingency plans based on the identification outcomes. In November 2020, we became one of the 1,846 global TCFD supporters. GRI 102-12

Please visit https://www.fsb-tcfd.org/supporters/ for details.

USI TCFD Framework

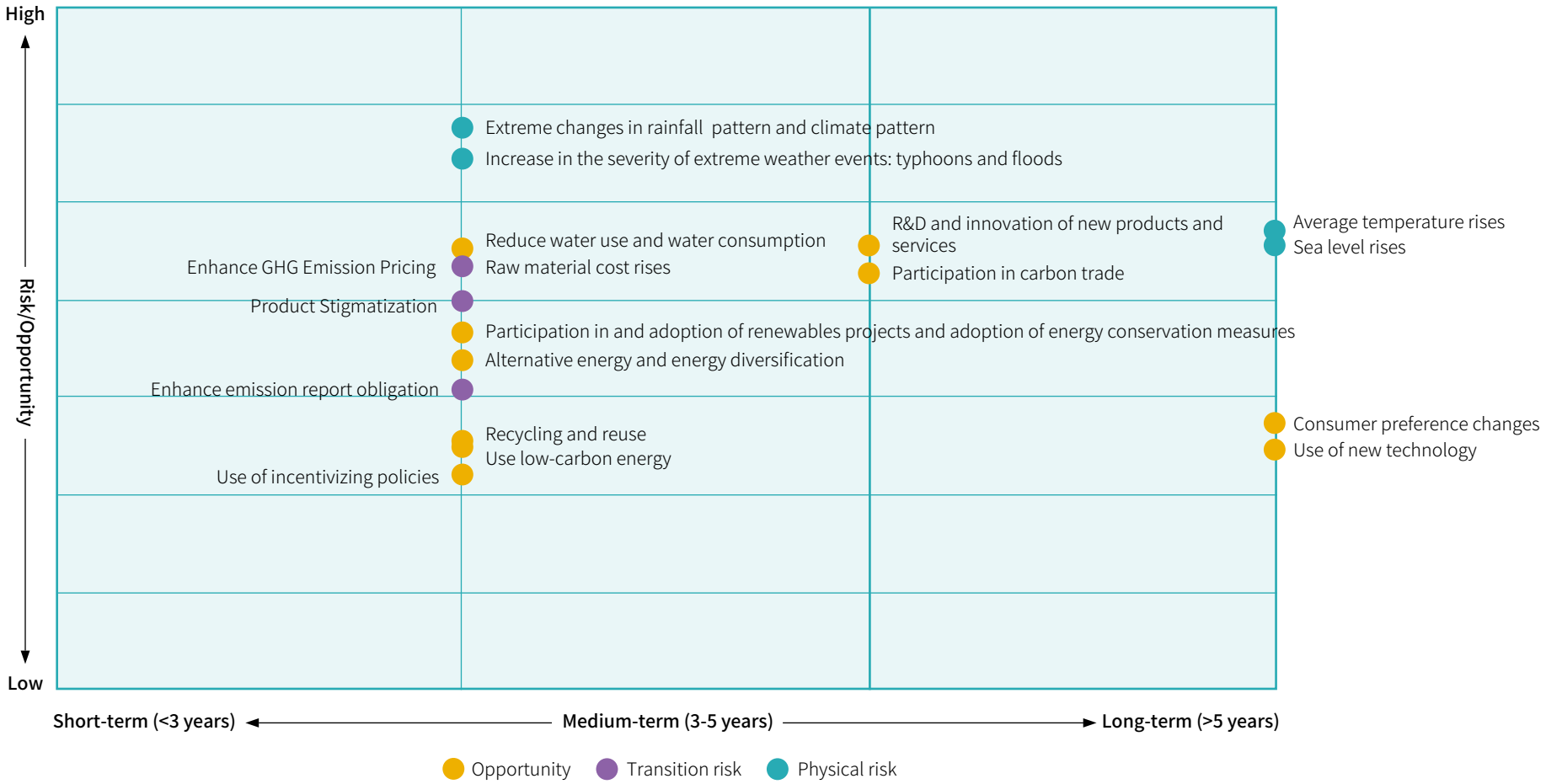
Governance	The Board	The Board is the top overseeing unit of climate change management and periodically reviews climate-related risks and opportunities each year.
	ESG Committee	The ESG Committee established under the Board is chaired by an independent director, with the president being the deputy chair. Each year the Committee assess the plan for promoting climate change adaptation, review its effectiveness, and report the review results to the Board.
	Group Environmental Quarterly Review Meeting	The Division of Equipment Preventive Maintenance and Environmental Risk Control is the Group's top management for energy management. It reports the planning and progress to the Group's chairman each quarter and make decisions on energy management.
Strategy	Identification of Risks and Opportunities	Identify climate-related risks and opportunities and material items based on the likelihood and impact of each item.
	Assessment of Potential Financial Impact	Assess the potential financial impacts of identified material risks and opportunities.
Risk Management	Implementation of TCFD	Identify risks and opportunities based on the TCFD framework, communicate with all responsible units, and confirm by senior management.
	Submission of Identification Results	Each year the ESG Committee meeting is held to report the identified material risks and opportunities and present countermeasures.
Indicators and Targets	Group Energy Management Targets	The group sets the annual average energy conservation by a minimum of 1.2% during 2020-2025. The target is reviewed every three years
	Group carbon reduction targets	Carbon reduction by 27% in 2030 (base year 2017)
	Climate-Related Response Strategy	Equipment renewal, construction of renewables equipment, optimization of production scheduling, planning building aircon, energy management system, extreme weather events contingency plans
	GHG Emissions Disclosure	Disclose the data of scopes I and II emissions in the ESG report every year and review the causes for changes periodically.

※Please refer to 2.3 Risk Management for the details of the risk management process and mechanism.

Identification of Climate-Related Risks and Opportunities

The impact of climate change on USI's operations has been increasing. To tackle the potential risks and capture the potential new business opportunities, we have spared no efforts in implementing programs to enhance energy conservation and carbon reduction, improving production efficiency, and replacing old equipment with high-efficiency equipment. We adopted the TCFD method to identify the transition risk and physical risk in business transformation and the emerging opportunities from climate change. As a result, we identified 8 major risks and 10 major opportunities. In the future, we will review the countermeasures every year and develop a resilient climate change culture.

Map of Climate-Related Risks and Opportunities



Potential Financial Impact of Risks and Opportunities and Countermeasures

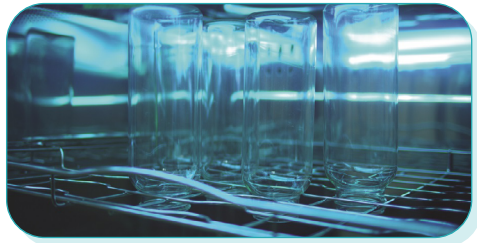
Type	Climate Related Risk	Time Range	Risk Level	Potential Financial Risk	Countermeasures	USI Specific Description
Transition	Enhance GHG Emission Pricing	Short-Medium Term	Medium-High	↑ capital expenditure ↑ operating costs	1. Implement the energy management system. 2. Invest in green power, energy conservation, and carbon reduction equipment, and increase the expense of carbon fee.	Own-brand manufacture (ODM) is our core business. The electricity cost accounts for 7.9% of the total production cost. The annual electricity conservation target at 1% and energy conservation at 1.2% can help save over NT$5 million. With reference to the example of Singapore, based on the carbon fee of NT$100/MT, the annual expense on carbon fee will exceed NT$15 million.
	Raw material cost rises	Short-Medium Term	Medium-High	↑ capital expenditure ↑ operating costs	Accelerate AI production scheduling to enhance efficiency and reduce material losses from number plate change.	Ethylene is our major material. To increase ethylene sources, we invested in the Gulei Project (nearly NT$8 billion) and the Ethylene Storage Tank Project of Kaohsiung Intercontinental Container Terminal Project (NT$906 million).
	Product Stigmatization	Short-Medium Term	Medium-High	↓ asset value ↓ revenue	1. Accelerate transformation 2. Invest in green energy equipment and use green products. 3. Recycling and reuse of plastic materials.	In 2020, we approved a budget of NT$110 million for building the R&D building to accelerate the R&D pace.
	Enhance emission report obligation	Short-Medium Term	Medium-High	↑ operating costs	1. ISO 14064-1 and promote Scope 3 and the product carbon footprint verification under ISO 14067. 2. Enhance website and media disclosures.	1. We invested about NT$56,000 in ISO 14064-1 guidance and verification (2019-2021). In 2021 we invested about NT$26,000 in implementing product carbon footprint verification under ISO 14067. 2. Invested IT workforce in website construction to disclose related information.
Physical	Extreme changes in rainfall pattern change and climate pattern	Short-Medium Term	Medium-High	↑ capital expenditure ↑ operating expense	1. Build an AI water information system to establish countermeasures based on the precipitation in reservoirs. 2. Implement the ISO 46001 Water Efficiency Management System. 3. Improve the wastewater reclamation system and enhance operational management to increase the capacity of water reclamation.	1. In case of water shortages, we need to purchase water from outside. In case of water scarcity, we need to reduce production line output or shut down operations. It is estimated that water purchase will increase production costs by over NT$0.1 million/day. In case of production line shutdown, the loss will increase to about NT$2.5 million/day. In case of operation suspension, the loss will be over NT$10 million/day. 2. In 2021 we invested about NT$32,000 in implementing the ISO 46001 Water Efficiency Management System. 3. In 2021 a total of 10,986MT of water was reclaimed, and the volume will increase to 12,000MT in 2022.
	Increase in the severity of extreme weather events: typhoons and floods	Short-Medium Term	Medium-High	↑ capital expenditure ↑ operating expense	Build flood control and drainage facilities.	To reduce the loss on operation suspension caused by floods, we progressively plan budgets of about NT$14 million to build flood control and drainage facilities. Otherwise, the loss on operation suspension will be about 650MT/day.
	Sea level rises	Long-term	Medium-High	↑ capital expenditure ↑ operating expense	1. Raise the equipment foundation. 2. Build flood control and drainage facilities.	Countermeasures corresponding to the rainfall pattern change and extreme weather events such as typhoons and floods.
	Average temperature rises	Long-term	Medium-High	↑ capital expenditure ↑ operating expense	1. Use eco-friendly sunshield coatings, reduce the fugitive emissions of VA gases, and reduce aircon uses. 2. Modify cooling towers with inverter control. Enhance the heat insulation of pipelines and equipment.	Countermeasures corresponding to the rainfall pattern change and extreme weather events such as typhoons and floods.

Type	Climate Related Risk	Time Range	Risk Level	Potential Financial Risk	Countermeasures	USI Specific Description
Resource Efficiency	Reduce water use and water consumption	Short-Medium Term	Medium-High	↑ capital expenditure ↓ operating costs	1. Invest in wastewater reclamation equipment. 2. Improve process equipment and operation to reduce steam use. 3. Constantly develop water conservation programs.	1. In 2020 a total of NT$1.6 million was invested in the reclamation of condensate from the process steam to reclaim up to 17,500MT of water. In 2022 we will improve process operation to reduce steam use to save water up to 2,880MT/ year (projected). 2. Constantly develop water conservation programs.
	Recycling and reuse	Short-Medium Term	Medium-High	↑ revenue ↓ operating costs	1. Wax recycling and reuse 2. Materials recycling improvement	1. The cost of wax recycling equipment is NT$776,574. In 2021, the profit from wax recycling was NT$71,430. 2. Materials recycling: 12.3%.
Energy source	Participation in carbon trade	Medium-Long Term	Medium-High	↑ operating costs	Constantly trace related laws and regulations and seek transaction opportunities.	Constantly trace related laws and regulations and seek transaction opportunities, and participate in related seminars from time to time.
	Use low-carbon energy	Short-Medium Term	Medium-High	↑ asset value	Engage in renewables programs within three years.	Constantly assess and seek appropriate programs to engage in renewables programs within three years.
	Use of new technology	Long-term	Medium-High	↑ asset value ↓ operating costs	1. Constantly enhance process carbon efficiency. 2. Engage in high-performance investments. 3. Purchase Green Mark equipment	In 2021, we activated the smart factory system to constantly keep track on equipment energy consumption.
	Use of incentivizing policies	Short-Medium Term	Medium-High	↓ capital expenditure	Coordinate with the Renewables Incentivization Regulations	Propose corresponding actions according to the Renewables Incentivization Regulations
Products and Services	R&D and innovation of new products and services.	Medium-Long Term	Medium-High	↑ asset value ↑ revenue ↑ capital expenditure	Cultivate new markets and engage in industrial transformation, and develop plastic-reduced and low-energy-consumption products.	In 2020 we invested in a new R&D center to cultivate new markets and engage in industry transformation.
	Consumer preference changes	Long-term	Low-Medium	↑ revenue	Develop CBC new materials	Develop CBC new materials in response to the pandemic.
Resilience	Participation in renewables projects and adoption of energy conservation measures	Medium-Long Term	Medium-High	↑ asset value ↓ operating costs	Constantly participate in related activities.	Constantly participate in related activities, engage in local procurement, and implement green procurement.
	Alternative energy and energy diversification	Medium-Long Term	Medium-High	↑ asset value	Invest in green power.	Actively seek suitable sites for green energy development. In 2021, we invested in solar generation of about 5MW.

Companies within the group constantly invest in innovative materials and products to reduce the impact from climate change

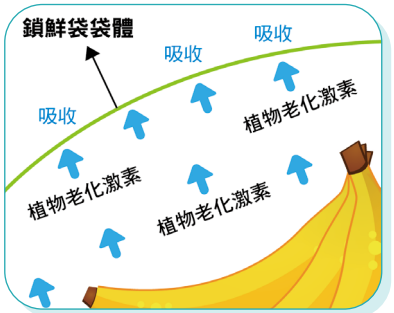
ViviOn™ Cyclic Block Copolymer (CBC)

The new cyclic block copolymer (CBC) is a medical plastic characterized by its high UVC penetrability. It is suitable for making reusable food containers and tableware. By integrating with UVC disinfection, it enhances UVC disinfection validation and extends product lifespan to reduce environmental impacts and enhance living quality. Additionally, adding a small quantity of CBC to PE/PE can increase the stiffness and rigidity of PE/PP films to reduce the overall consumption of packaging materials by thinning films.



USii Zipper Bag

According to the FAO statistics, up to 45% of fruit and vegetables are soiled or spent during their lifespan. We develop a technology to keep fruit and vegetables fresh by absorbing their spoilage agents to extend their lifespan and thereby reduce food wastage. In addition, the reusable PE bags can indirectly reduce resource wastage.



Water-based sunshield coatings

In 2019, we developed different colors of water-based sunshield coatings with the industry. When using on chemical storage tanks, they can effectively block heat transmission to reduce 80% of time for water spray for cooling in summer. Besides saving water, they help maintain the quality and stability of chemicals in the tank.

USii Zipper Bag-Bag for Foods

When the cut of meat comes in contact with air, oxidation takes place to deteriorate meat. Hence, blocking oxygen is key to meat preservation. We develop a food zipper bag that can block oxygen 500 times better than any other technology in the market for total oxygen blockade to mitigate meat oxidation and thereby improve meat preservation quality. Additionally, it is reusable to extend the extend meat preservation time.

High-liquidity injection HDPE-LH5590

In 2021 we successfully developed the high-liquidity injection HDPE product LH5590 (MI: 90g/10min) ahead of the industry. It is the HDPE product with the highest melt index (MI) in the market so far. Its high liquidity property can significantly shorten the processing time, increase productivity, reduce process energy consumption, and thereby lower environmental impact and reduce production costs for customers.

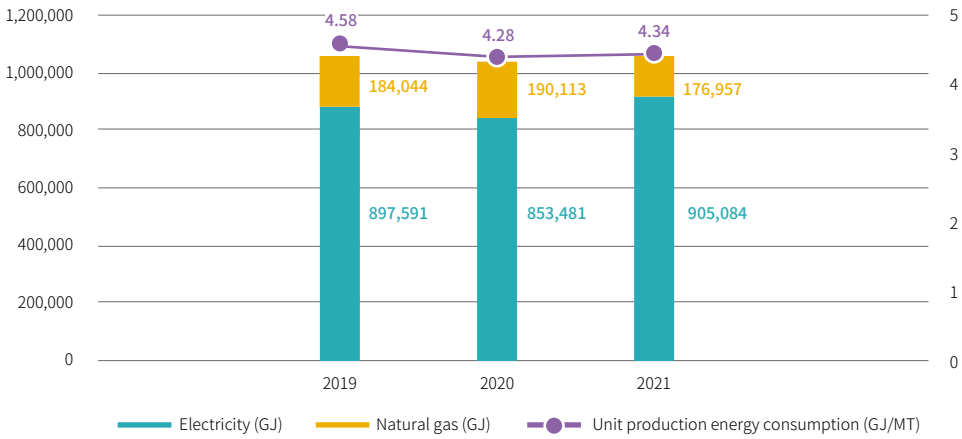
Energy management GRI 302-3

● Group Energy Management Targets

In 2019 we set the energy management target at 7.2% less in 6 years during 2020-2025. We kept tracking the international trends and national policies to make dynamic reviews and requested all USI businesses to maintain an average of 1.2% less each year, with plants planning related action plans. To effectively manage energy performance and make continual improvement, we implemented the ISO 50001 EnMS at all USI plants. By 2021, 9 plants have passed ISO 50001 certification. In 2022, one plant will implement the system. Through constant energy conservation and carbon reduction, we hope to demonstrate our influence to reduce environmental impact.

Every year USIG holds the “plant technology exchange meeting” and several and “northern/Kaohsiung plants resource integration meetings” for plants to share resources and exchange technologies to improve performance in energy conservation and carbon reduction. At the “plant technology exchange meeting” in December 2021, the group organized the case sharing in the form of competition based on the subjects of “HSE", “predictive maintenance”, and “energy conservation and carbon reduction”. Through case submission and documentary review, 7 cases eventually entered the final for senior officers and all presenting plants to elect the top 3 cases. The group chairperson also presented the certificate and bonus to winners in order to encourage technology improvement within the group through competition and mutual learning.

Energy Consumption and Unit Product Energy Consumption in the Past 3 Years



Note 1: As diesel consumption is far lower than that of electricity and natural gas, it cannot be shown in the chart. Please refer to the table below for details.
Note 2: Energy consumption does not include the consumption of the CBC plant (which is at the test run stage).

Energy Consumption and Unit Product Energy Consumption in Last 3 Years GRI 302-1

Energy Type	Unit	2019	2020	2021
Electricity	GJ	897,591	853,481	905,084
Natural gas	GJ	184,044	190,113	176,957
Diesel	GJ	458	527	581
Total consumption	GJ	1,082,093	1,044,121	1,082,623
Production	MT	236,410	244,162	249,402
Unit product energy consumption	GJ/MT	4.58	4.28	4.34

Note 1: Referring to the Energy Heating Value Per Unit Product Table announced by the Bureau of Energy, Ministry of Economic Affairs, the conversion factor of energy consumption of electricity, LNG, and diesel is as follows: 860 kcal/kWh, 9,000kcal/m^3, and 8,400 kcal/L; where 1 cal = 4.187 kJ.
Note 2: Sources of natural gas and electricity consumption: fuel bill statistics.
Note 3: Source of diesel consumption: Material collection forms.
Note 4: Only non-renewables is used.
Note 5: Energy data coverage rate=100%.
Note 6: Energy consumption does not include the consumption of the CBC plant (which is at the test run stage).

● Factory smart energy management system

After applying to IDB for the Factory Smart Energy Management Demonstration Guidance Program in 2020, we engaged in active construction. With the assistance of IDB and Taiwan Green Productivity Foundation (TGPF), we progressively achieved the KPIs of energy management system.

1. Establish energy performance indicators and baseline requirements.
2. Develop the data collection and analysis and control and management capabilities of plant personnel.
3. Practice the application of smart production and management.
4. Provide decision-making references of corrective action for management.
5. Reduction of management workforces and costs.
6. Discover the room for improvement of energy conservation and references for improvement of energy performance supervision.

In March 2021, we were selected as a demon-stration plant for the smart energy management system. Besides sharing the results of energy conservation and arranging onsite demonstration for other businesses in the same industry, Kaohsiung Plant earned critical acclaim from them. In October 2021, we were invited by the Taiwan Chemical Industry Association to share our practice in energy conservation and carbon reduction using the ISO 50001 Energy Management System with other members.

To extend the spiritual framework of the energy management system, we selected the AI Energy Conservation Assessment--Chiller System as the target in 2021, hoping to further enhance energy efficiency using IoT data as the implementation strategy in the big data era.

Assessment of directions for energy conservation Chiller
Targets Chiller W-237 (eccentric chillers x 3)

Energy conservation target
Analyze process and chiller historical data to recommend the optimal energy conservation para-meter configuration of each month.
Provide operational instructions for onsite personnel to lower energy consumption without affecting product quality.

Modernized data analysis and visualization
Near-synchronous data display with the distributed control system (DCS)
Integrate DCS+ and onsite tests to assess more sophisticated systems

Up-to-date
Real-time updated and recommended operation solutions for onsite personnel.

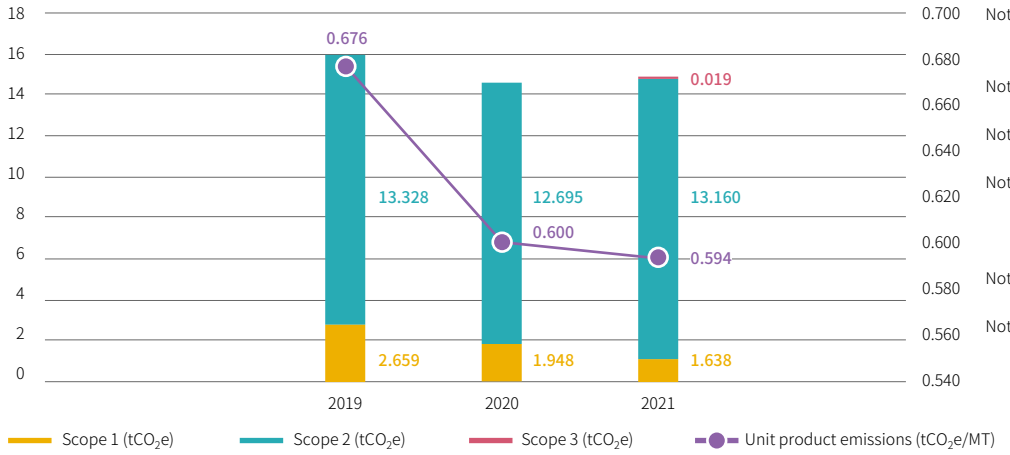
User operation and customization
Energy portfolio optimization
Baseline automation construction
Energy conservation parameters recommendation

● GHG management GRI 305-1、305-2、305-3

Based on the ISO 14064-1:2018 GHG inventory standard and the GHG Emissions Inventory and Registration Guidelines of EPA, we performed GHG inventory, consolidation, and system establishment with the assistance of external experts. We set organizational boundary for GHG inventory based on the "operational control method", The organization has 100% of GHG emissions from facilities under its operational control. GHGs under inventory include CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3. The emission coefficients are cited from EPA's GHG Emission Coefficient Management Table V.6.0.4, and the global warming potential (GWP) is reported based on IPCC's AR5 (2013).

In 2021, the direct (Scope 1) GHG emissions were 16,380tCO_2e, the energy indirect (Scope 2) GHG emissions were 131,790tCO_2e, and the combined direct and indirect GHG emissions were 148,170tCO_2e. We will continue to implement energy conservation and carbon reduction measures to progressively plan and implement the inventory of other indirect (Scope 3) GHG emissions to effectively review the environmental impact of CO_2 in order to achieve the win-win of environmental protection and profit together.

GHG Emissions in the Past 3 Years



Note 1: Scope 1 refers to major emission sources including stationary combustion, mobile combustion, process, and fugitive emissions.
Note 2: Scope 2 refers to indirect emissions of purchased electricity.
Note 3: Scope 3 refers to the indirect emissions produced from the treatment of solid and liquid waste.
Note 4: The electricity emission coefficient is subject to the latest data announced by the Bureau of Energy: 0.509 tCO_2e/MWh for 2019-2020 and 0.502 tCO_2e/MWh for 2021.
Note 5: Diesel containing no biofuel was used in 2021. The combustion emission of biofuel was 0 kgCO_2e.
Note 6: Verification according to the ISO 14064-1:2018 standard by SGS Taiwan Limited.

● Energy conservation and carbon emissions targets and performance GRI 302-4

The 2021 targets and performance for energy conservation and carbon emissions and the 2022 targets for energy conservation and carbon emissions are tabulated below:

Year	2021		2022
Item	Targets	Performance	Targets
Electricity Conservation (%)	0.75	0.75	1.71
Energy Conservation (%)	0.58	5.10	7.36
Emissions Reduction (%)	0.67	2.39	4.07
Water Conservation (%)	3.63	4.26	3.63

Note 1: Energy conservation types were reduction of electricity and LNG consumption.
Note 2: Emissions reduction covers emissions from energy consumption.

The table below shows the programs and performance of energy conservation and emissions reduction in 2021. The energy conservation volume reported to the Bureau of Energy in 2021 was 1,972,419 kWh, equivalent to 1,004tCO_2e. GRI 305-5

Item	Type	Program	Energy Saved kWh/Year	Carbon Reduced tCO_2e/year	Period (2021)
1	Electricity Saving	Improved the C/E/F FKC water pump with the high-efficiency motor.	2,272	1.2	Jan-Apr
2	Electricity Saving	Low-pressure steam condensate recovery	11,171	5.7	Jan-Dec
3	Electricity Saving	Process Exhaust Recovery	1,084,007	551.8	Jan-Dec
4	Electricity Saving	Suspension of TO	691,545	352	Oct-Dec
5	Electricity Saving	Demand bid	183,424	93.4	Jan-Dec
Total			1,972,419	1,004	

Note 1: Electricity to emission conversion coefficient is 0.502tCO_2e/MWh.
Note 2: Based on the 2021 Report on the Annual Energy Saving Audit System of Energy Users of the Bureau of Energy.
Note 3: Electricity conservation of item1 was calculated based on the design value/measured value and operating time of equipment before and after replacement.
Note 4: The energy conservation volume of items 2-4 is converted based the measured value or flowmeter readings, operating duration with the heating value.
Note 5: Energy conservation volume: 1kWh = 64,345 GJ. Energy conservation types included electricity and LNG.

The energy conservation program reported to the Bureau of Energy in 2022 included the high-efficient motor replacement for the dicing pumps and chillers; renewal of the freezers and cooling water pumps; compressor inlet pressure reduction; compressor operating pressure reduction; compressor backflow pipeline addition; steam consumption reduction of suspended equipment and recovery towers; and modification of exhaust processing. A total of 4,564,644kWh of electricity is projected to conserve in 2022, with a conservation rate of 1.71%.

Electricity Conservation Rate in the Past 3 Years

Item	2019	2020	2021
Electricity Saved (kWh)	3,355,494	4,230,976	1,972,419
Electricity Conservation (%)	1.33	1.67	0.75

Note 1: Source: Based on the 2021 Report on the Annual Energy Saving Audit System of Energy Users of the Bureau of Energy.
Note 2: Subject to the energy audit equation of the Bureau of Energy, reported energy saved divided by the total electricity consumption.

Energy conservation and carbon reduction plan

Forestation Adoption Program

In response to energy conservation, carbon reduction, and environmental protection, we promoted the "Forestation Adoption Program" in collaboration with the Experimental Forest, College of Bio-Resources and Agriculture, National Taiwan University to grow more trees with the technical assistance of professional teams. Additionally, the program allows the public to understand the benefits of growing trees for CO_2 adsorption by soil and water and its importance to environmental protection.

In December 2021 we signed the agreement to donate NT$9 million for forestation through adopting 7,500 trees occupying area of about 5 hectares for a term of 20 years, with a total carbon fixation capacity of 1,350tCO_2e, equivalent to the capacity of about 3.5 Daan Parks. (According to the Council of Agriculture, the per hectare carbon adsorption of forests is 15tCO_2e/year. The area of Daan Park is 25.8 hectares, i.e., its annual carbon adsorption capacity is about 384.6tCO_2e.)

Cross-Sector Collaborative GHG Reduction Program

In response to the government's Cross-Sector Collaborative GHG Reduction Program 2020-2021, we supported and actively implemented energy conservation and carbon reduction affairs for two consecutive years with outstanding achievements, earning us the certificate of appreciation from the Kaohsiung Bureau of Environmental Protection. In 2021, we sponsored Dawan Junior High School to replaced the energy-efficient fluorescent lamps at the sports ground. A total of 3,628 kgCO_2e of GHG is projected to reduce.

Supported "Earth Hour", a global energy conservation activity.

During 20:30-21:30 on March 27, 2021, we joined the "Earth Hour" activity with the world by turning off the landscaping lights of the plant exterior walls and unnecessary lighting fixtures in order to advocate the idea that everyone, regardless of age and socioeconomic status, has the ability and responsibility to protect Earth in climate change.

We supported the government's energy conservation and carbon reduction policies and activities in real action. Besides reducing energy use and lowering the cost, we also hope to encourage the public and businesses to value energy conservation and carbon reduction by setting an example through participating in Earth Hour.

During the activity, we turned off a total of 98 skyline lamps and 1 signboard lamp to save about 1.18kWh of electricity, reducing carbon by about 0.6kgCO_2e.

● Product carbon footprint

In 2021 we promoted the product carbon footprint standard and verification. Based on the data of lifecycle assessment, the GHG emissions from direct and indirect activities or accumulated in the product are considered according to the product lifecycle from materials acquisition or natural resource production to disposal at the end of life is considered. Verification for conformity to the ISO 14067:2018 product carbon footprint standard was completed on EVA, the target product, according to ISO 14064-3:2006. The declared/functional unit is per kilogram (including package).

Lifecycle GHG Emissions

Declared Unit of Emissions of Target Verification Product ($kgCO_2e$)				Functional Unit Emissions ($kgCO_2e$)
Lifecycle Stage	Materials	Manufacturing	Total	
EVA®UE2828	2.270	0.689	2.96	2.96
EVA®UE649-04	2.128	0.689	2.82	2.82
EVA®UE659	2.223	0.689	2.91	2.91

● Low-carbon office building for USI Headquarters

The energy management system was implemented at USI Building in 2019 to implement building energy conservation and carbon reduction through scientific and digitized management. By analyzing and diagnosing electricity consumption with the energy management system, we proactively implemented building and office energy conservation and carbon reduction in terms of four aspects: equipment improvement, operation improvement, management improvement, and awareness education.

In the future, we will assess the replacement of old-styled chillers with high-efficient chillers for the building. Through constantly aircon temperature control and management and aircon compressor on/off time adjustment, the overall electricity consumption of the USI Building and offices was 7.43% less than that of 2020, with significant effect. We hope to change the energy use concept of employees through a series of measures for employees to develop energy conservation and carbon reduction habits.

4.6

Raw materials management

Our main products are: LDPE, EVA, HDPE, and LLDPE. Major raw materials include ethylene, VAM, and butene. Major secondary materials include Iso-Paraffin Solvent, propylene, n-Hexane, and isopentane. Raw materials are only used by Kaohsiung Plant, with a coverage rate of 100%.

In the product manufacturing process, we are committed to enhancing the recovery efficiency of raw materials, hoping to reduce raw materials consumption. Recovery methods included the improvement of the high-pressure recovery system, monomer refine tower (MRT), connection of new and existing tanks, installation of the condenser at the frontend of the ethylene purification tower (EPT), addition of the compressor leak gas recovery system, and others at Plant II. As a result, the recovery rate of raw materials increased from 12.2% in 2020 to 12.3% in 2021.