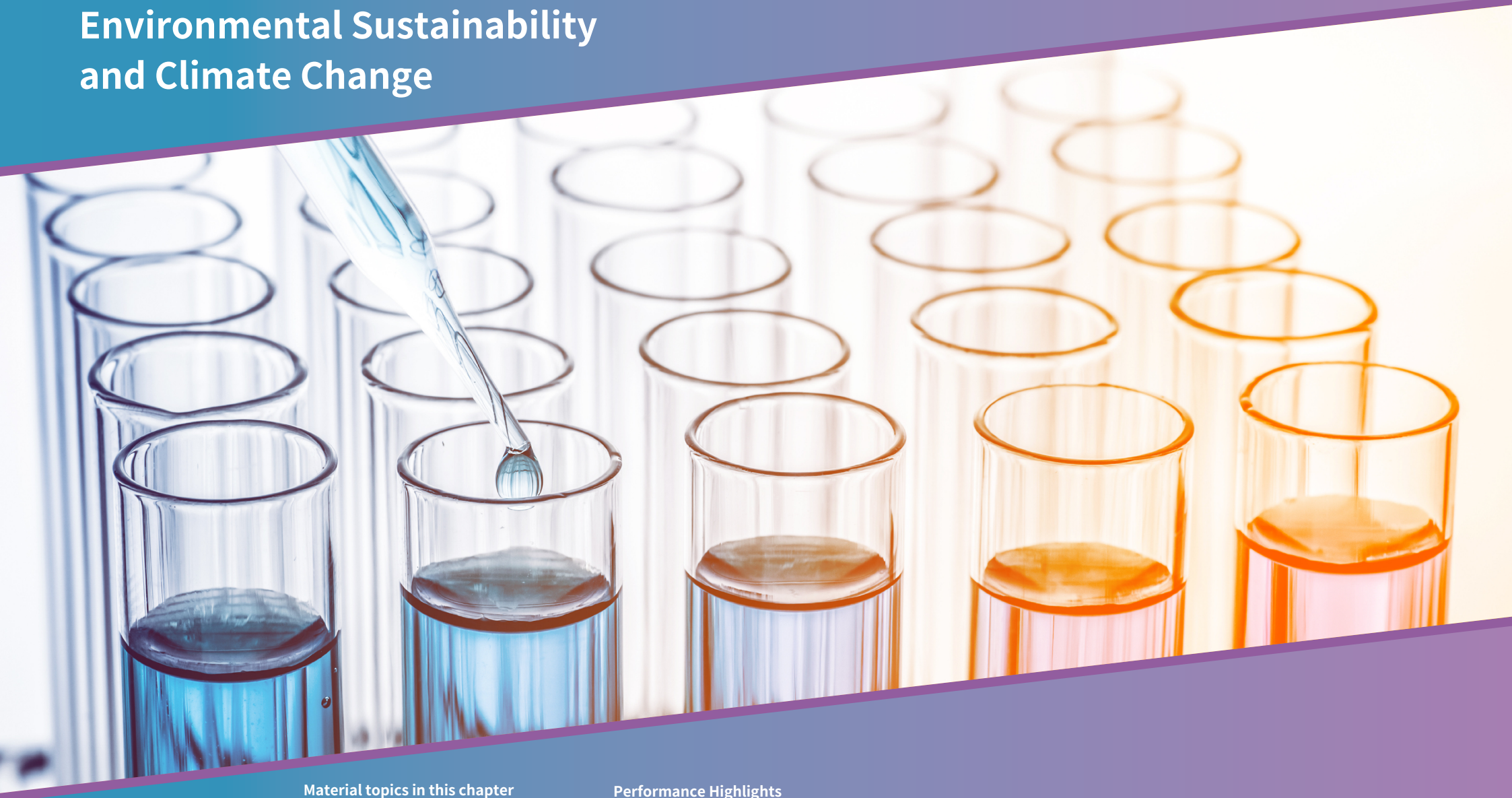
Chapter 4

Environmental Sustainability and Climate Change



Material topics in this chapter

1. Water resources management
2. Air pollution control
3. Waste management
4. Climate change and energy management

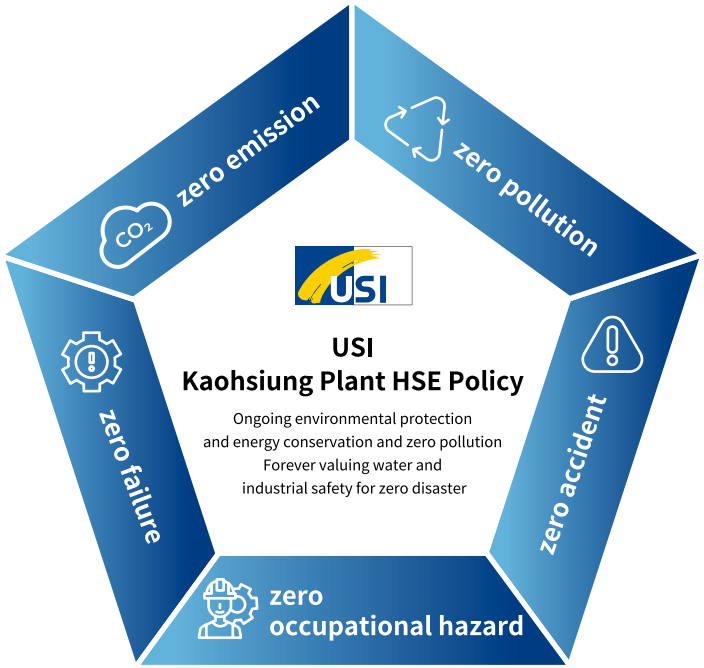
Performance Highlights

- Environmental Expenditure: approx. **155.730** million
- Electricity reduced by **1.31**% (2015-2022 average: 1.37%), energy decreased by **5.84**%, carbon decreased by **3.08**%, water decreased by **5.65**%
- Increased materials recycling rate to **13.1**%
- Continuous implementation of ISO 14064-1 Greenhouse Gases Inventory and Verification and Scope 4 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 occupational safety and health, environmental protection, energy conservation and carbon reduction 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".




Certificate TW04/00491 / 證書 TW04/00491

The management system of / 下述組織

USI Corporation
台灣聚合化學品股份有限公司

NO. 330, Fong-Jen RD., Jen-Wu district, Kaohsiung city, Taiwan, R.O.C.
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has been assessed and certified as meeting the requirements of
的管理系統已經過審核，並被證明符合下述要求
ISO 14001:2015

For the following activities / 所涵蓋的活動範圍
DESIGN AND MANUFACTURE OF HIGH DENSITY POLYETHYLENE RESINS, LOW DENSITY POLYETHYLENE RESINS, LINEAR LOW DENSITY POLYETHYLENE RESINS, ETHYLENE VINYL ACETATE COPOLYMER RESINS AND CBC (CYCLIC BLOCK COPOLYMER).
高密度聚乙烯樹脂、低密度聚乙烯樹脂、線型低密度聚乙烯樹脂、乙烯醋酸乙烯酯共聚合樹脂、環狀嵌段共聚高分子之設計及生產

This certificate is valid from 02 July 2022 until 02 July 2025 and remains valid subject to satisfactory surveillance audits.
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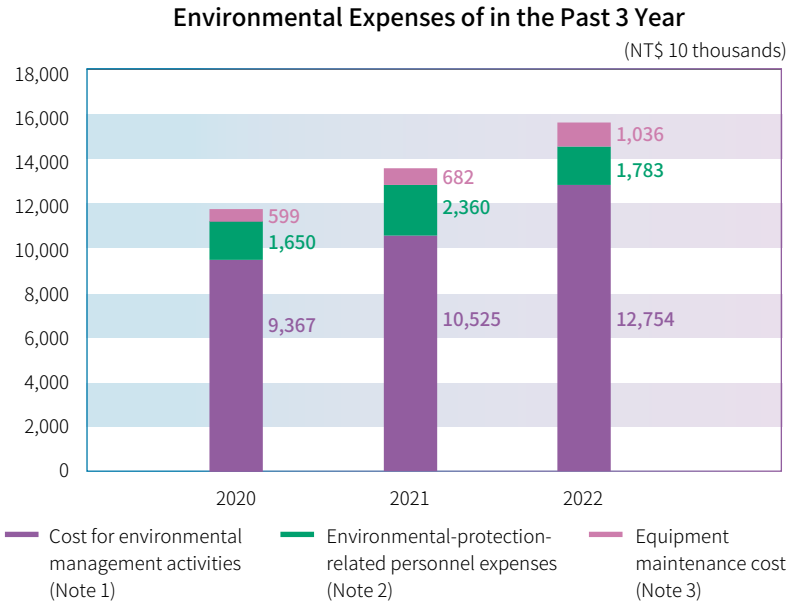
Environmental objectives and management programs

2022 Environmental Protection Targets and Management Programs

Policy	Goals	Program	Effectiveness	2023 Management Program
Zero emission	Reduce the fugitive emissions of VOCs of equipment/component and measured leakage rate <0.5%	1. Reduce equipment/component for emission leakage of VOCs (Plant I) 2. Reduce the annual leakage of VOCs (Plant II) 3. CBC Leaked Emissions of VOCs Reduction Plan (CBC Plant)	Reduced VOCs leakage of plants I/II/CBC to below 0.5% in 2022.	1. Reduce equipment/component leaked emissions of VOCs. 2. Reduce the annual leakage of VOCs. 3. CBC Leaked Emissions of VOCs Reduction Plan (CBC Plant)
	Improve process equipment and pipelines to reduce the fugitive emissions of VOCs.	1. Replace the VA transfer pump in Plant I 2. Replace the ethylene unloading pump in Plant I 3. Replace the EF-line xylene CIP pump 4. Add V-201 to the V-205 emission pipelines 5. TO incinerator emission pipeline tie-in project	1. Reduced VOC leakage, enhanced transmission efficiency, and reduced energy consumption. Equipment delivery was postponed due to the pandemic. Only 25% was delivered in 2022, and completion has been postponed to 2023. 2. Reduced VOC leakage, enhanced transmission efficiency, and reduced energy consumption. Equipment delivery was postponed due to the pandemic. Only 25% was delivered in 2022, and completion has been postponed to 2023. 3. The new pump has arrived at the Kaohsiung Customs. The delivery time is 2023/01/15. The project was postponed due to the pandemic. Only 20% was completed in 2022, and completion has been postponed to 2023. 4. Reduced the leaked emissions of VOCs, completion 100%.	1. Reduce equipment/component leaked emissions of VOCs. 2. Reduce the annual leakage of VOCs. 3. CBC Leaked Emissions of VOCs Reduction Plan (CBC Plant)
	Increase wastewater recycling by 2% (over the 2021 wastewater recycling rate)	N.A.	N.A.	Purchase the new float oil pump
	Reduce GHG emissions by 1,560tCO_2e	The 6 plant electricity conservation projects	In 2022, electricity up to 3,065,102 kWh was accumulatively saved and emissions were reduced up to 1,560tCO_2e.	Four power-saving programs
	Reduce water discharge by 5,280 MT	Continuous monitoring and reclamation of effluents	In 2022, a total of 32,153MT of water was reclaimed through the effluent reclamation system.	The wastewater treatment system, MRT condensate water recycling improvement, and stormwater collection system with detention tanks are expected to result in a water conservation of 48,500 MT/year.
Zero Pollution	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 in the processing area and recovered 11.89MT of plastic resin pellets in 2022.	Continuously implement the prevention and management of plastic resin pellet leakage.

Environmental Expenditures

Our environmental management costs include the cost for environmental management activities, environmental-protection-related personnel expenses, and equipment maintenance costs. In 2022, we actively implemented the reduction of leaked emissions of VOCs, water recycling and reuse, energy conservation and carbon reduction, and emissions reduction. The total amount of environmental expenditures in 2022 increased by **14.8%** over 2021 to about **NT$155.73 million**.



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 Management

GRI 2-25, 3-3 | 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

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. Implement the water efficiency management system and flood prevention measures

Commitment

Annual water conservation >1%

Data scope:
USI coverage 100%

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

- Short-term positive actual impact: Enhance water recycling efficiency and reduce production costs.
- Short-, medium- & long-term negative actual impact: Water shortages, production disruption due to torrential rain
- Short-term negative potential impact: Increase NT$330,000 each year after the collection of the water conservation charge begins.

Impact Boundaries

USI Kaohsiung plant, global customers, government agencies

Process to Remediate and Prevent Negative Impacts

Enhance water recycling and reuse, improve manufacturing processes to reduce steam consumption, and buy water with water trucks.

Achievement and Goal

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. Implemented and passed the certification of the ISO 46001:2019 Water Efficiency Management System.

2022 Achievements

1. Passed the certification of the ISO 46001:2019 Water Efficiency Management System and obtained the certificate on 2022/03/17.
2. Saved water by 3,403MT (target 2,880MT) each year accumulatively through the project at a progress of 105.7%, saving 5.65% of water.
3. The estimated 2022 wastewater reclamation was over 12,000MT/year, the actual volume was 32,153MT. The wastewater treatment system, MRT condensate water recycling improvement, and storm-water collection system with detention tanks are expected to result in a water conservation of 48,500 MT/year.Collected 11.89MT of plastic resin pellets through the Plastic Resin Pellet Collection Program.

2023 Goals

Wastewater treatment system, Estimated water conservation with the MRT condensate recovery improvement and retention basic rainwater harvesting system: 48,500MT/year, saving water by 4.63%.

Medium- & Long-Term 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

Chapter Summary

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

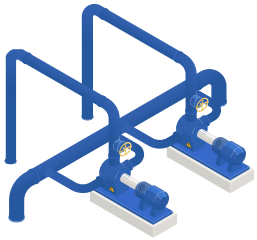
Water resource management

GRI 303-1:2018, 303-3:2018, 303-4:2018, 303-5:2018 | RT-CH-140a.3

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 continuously 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 2022 was 5.65%. The boundary of water resource and effluent management is the Kaohsiung Plant, with data coverage of 100%.

2022 Water Withdrawal, Discharge, and Consumption

GRI 303-3:2018, 303-4:2018, 303-5:2018 | RT-CH-140a.1



Total water withdrawal 925.439 Ml

Low to medium water stress areas , with water stress is less than 10%

- Third-party water-fresh water (≦ 1,000mg/L TDS): 925.439 Ml
- No runoff, groundwater, seawater, output water.

Note: 1: With respect to the test method of NIEA W210.58A, the 2021 TDS was 344mg/L, 2022 TDS was 372mg/L, withdrawal type was fresh water.
Note: 2: Withdrawal is subject to the readings on the water meter (flow meter).

Total water discharge: 268.36 Ml

Ammonia nitrogen total volume control area

- Runoff- fresh water (≦ 1,000mg/L TDS): 268.36 Ml
- Discharge contains no groundwater, seawater, and third-party water.
- NH4 in 2022H1 and 2022H2 was 0.2mg/L and 0.63mg/L, far below the effluent standard (20mg/L).

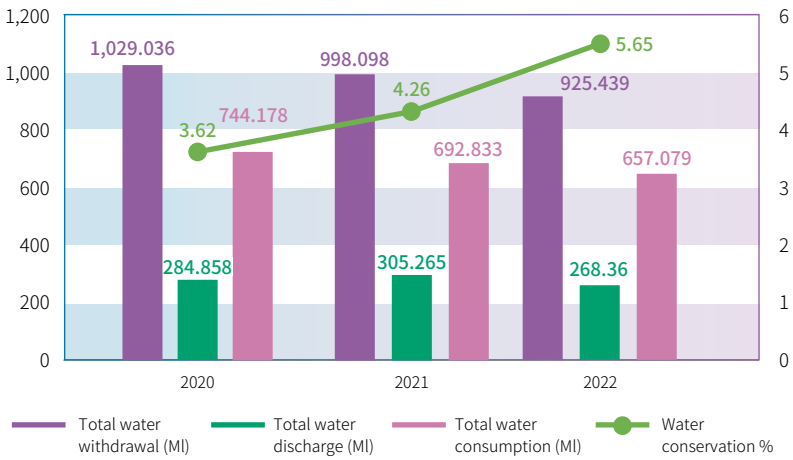
Note: 1: With respect to the test method of NIEA W210.58A, the 2021 TDS was 863mg/L, 2022 TDS was 912mg/L, withdrawal type was fresh water.
Note: 2: Discharge is subject to the readings on the effluent meter (flow meter).

Total Consumption = Total Withdrawal – Total Discharge = 657.079 Ml.

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 is less than 10%.

According to the 2021 water resources statistics published in the Water Resources Agency Register Statistical Report, MOEA, the water consumption of Kaohsiung City was 296,622 Ml, including 85,778 Ml of water for domestic use or public use, 94,526 Ml of water for industrial use, 91,373 Ml of water for agricultural use, and 24,945 Ml of water for other uses. The 2021 total water withdrawal of Kaohsiung Plant was 998.098 Ml, accounting for about 0.34% of Kaohsiung City’s total water consumption. Kaohsiung Plant 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 2021, water withdrawal in 2022 reduced by about 72.7 Ml to 925.439 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.

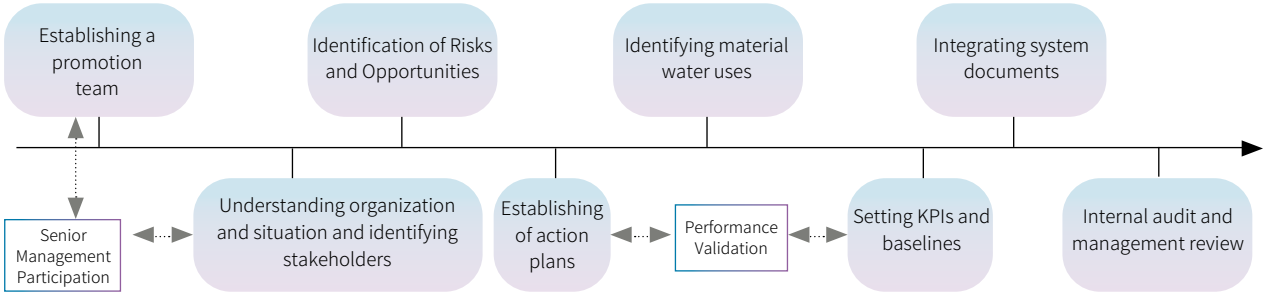
We began to build the water monitoring system in 2020 to keep constant track of the water supply. Based on the drought response measures, apart from cutting unnecessary water consumption, enhancing pipeline and switch tour inspection, and reducing cooling water discharge, we also get support for water in the fire fighting storage tanks, buying water with water trucks, following the government's 3-stage rationing measures, and actively implement various water improvement programs to reduce total water withdrawal each year.

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 will be reused in the new boiler. The water reclaimed is approximately 47,520 MT/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 47,520 MT.
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 27,720 MT.
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 2022 was 32,153MT.
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 estimated water reclamation in 2022 was about 5,786MT. Calculation: The project was completed in 2017 and started operation in 2018. The plant rainwater collection area is 3,500m^2, the tank site dike area is 3,300m^2, Kaohsiung's annual rainfall in 2022 was 946cm. Based on a reclamation rate of 90%, the estimated water reclamation is about 5,786MT/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 2022 was 130,679MT; the total water withdrawal was 925,439MT; the volume of reclaimed and recycled water was 14.1% 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 March 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 enhanced wastewater system management and optimized operation to reduce wastewater discharge and increase wastewater reclamation. The actual reclamation increased to 32,153MT. Additionally, about 5,786MT of water was reclaimed within the retention basin and rainwater harvesting in the tank area.

In 2023, we will enhance wastewater system management and optimize operation to reduce wastewater by about 4.63%.

Water as a shared resource GRI 303-1:2018

In 2022 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 fire fighting storage tank of about 4,500m^3. Currently, the effective capacity of our fire fighting storage tank is 4,297m^3. The connection project was completed at the end of 2022, the total volume of firewater as a shared resource is about 8,797m^3, achieving the estimates in 2021.

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 EPA statistics, the national BOD_5 is 533.63MT/day. Our daily COD is 0.0173MT/day, and the pollution of Kaohsiung Plant is below 0.00324%.

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.

The actual 2022 wastewater reclamation volume was **32,153**MT, with an achievement rate of **268**%.

Water quality monitoring and management

GRI 303-2:2018, 303-4:2018

Every half 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 2022 untreated wastewater and effluent quality tests and analysis, effluents met the effluent emission standard.

Results of Water Quality Examination in Last 3 Years

Water Quality Indicator	2020		2021		2022		Effluent Standard (Petrochemical Industry)
	H1	H2	H1	H2	H1	H2	
SS (mg/L)	3.7	8.5	9.0	5.7	8.0	9.7	30
Grease (mg/L)	6.3	2.6	6.6	4.5	9.5	5.7	10
COD (mg/L)	28.7	52.8	14.4	25.5	26.4	19.7	100
NH4 (mg/L)	1.27	0.28	0.78	0.48	0.2	0.63	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 began implementing the measures for prevention and management of plastic resin pellet leakage and awareness education for in-house plastic resin pellet leakage management. We also arranged education/training for contractors. In 2022, 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 2022, we recovered a total of 11.89MT of plastic resin pellets across the plant.

Year	Recovery Weight (kg)
2021	12,871.1
2022	11,889.4

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

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

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

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

4.3 Air Pollution Control

GRI 2-25, 3-3 | SDG 11

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

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

Strategy

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

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

Short-, medium- & long-term negative actual impact: Air pollution

Impact Boundaries

Community residents, environment and ecology affected by pollution

Process to Remediate and Prevent Negative Impacts

Negative impact remediation:
Sponsor plantation and forestation for 5 hectares and began sponsoring air quality purification area on an annual bases in 2018
Preventive measures:
Improve air pollution and environmental protection equipment and increase materials recycling to reduce air pollution.

Achievement and Goal

2022 Goals

1. Zero air pollution: Equipment/component VOC leakage <0.5%
2. Zero air pollution: Reduce the leaked emissions of VOCs

2022 Achievements

1. VOCs equipment component leakage: 0.036%
2. Pump replacement project progress at 25% due to the pandemic.
3. 3. Completed the reduction of pipelines leaked emissions of VOCs.

2023 Goals

1. Equipment/component VOC leakage <0.5%.
2. Process pump replacement
3. Add VA storage tank condensers to increase VA recovery by 40MT/year

Medium- & Long-Term Goals

1. Implement VOCs reduction programs
2. Reduction of equipment/component leakage.
3. 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

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. As heavy VOC leakage was detected at the existing in-house VA transfer pump, ethylene unloading pump, and the EF-line xylene CIP pump in 2021, we scheduled the replacement of four pumps in 2022 to reduce VOC leakage, enhance transmission efficiency, and reduce energy consumption. However, as delivery was delayed in 2022 by the port congestion, pump replacement is expected to be completed in 2023.

Management Approach

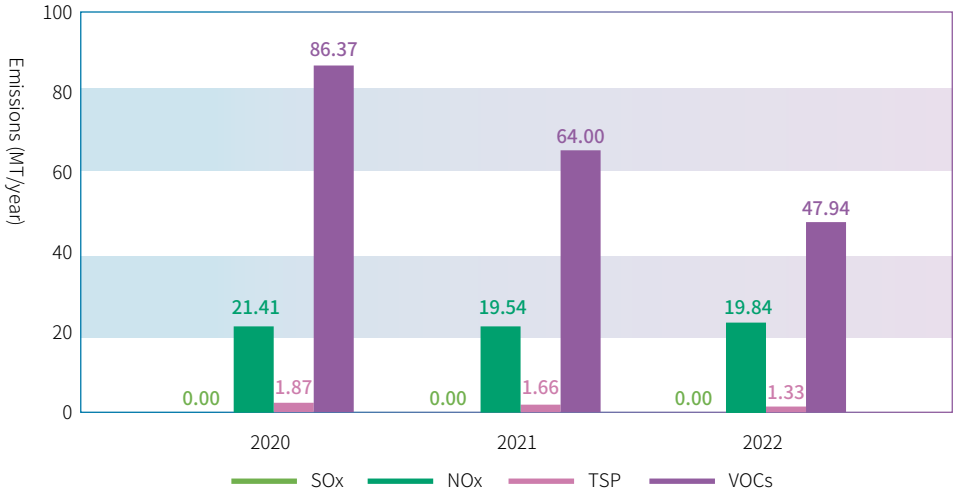
In addition to regularly testing and reporting air pollutants, we have planned the following reduction programs to effectively reduce air pollutants:

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 2022, we continued to implement the management of the leaked emissions of VOCs for equipment/components. The in-house environmental protection section performed self-imposed equipment/component spot checks on 2,296 points and found leakage at one point. Improvement was completed immediately. 2. Programs in 2022: a. Replacement of the VAM transmission pump in Plant 1. b. Replace the ethylene unloading pump in Plant I c. To replace the EF-line xylene CIP pump, the progress is currently at 25%, and it is expected to be completed by 2023.
Effective VOCs Treatment	The RTO treats high-intensity VOCs in-house. In 2022 we commissioned an outsourced inspection. The results showed that the content of non-methane hydrocarbons (NMHC) before and after treatment was 2,210 ppm and 56 ppm respectively, with a removal rate of 97.3%, better than the regulatory requirement of 95% or 150ppm. In 2022 we continued the equipment operation and maintenance training, management system establishment, and 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 2022 we purchased the new VA storage freezer to reduce the condenser temperature from -5°C to -18° C to increase VA recovery and reduce pollution.
Emergency Response to Air Quality Deterioration	In 2020-2022, we implemented the air quality deterioration response drill to enhance the response ability of employees and review the opportunity for improvement after the drill. We also joined the LINE group of the Environmental Protection Bureau to keep updated with the air quality condition in Kaohsiung City at any time and take counteractions immediately.
Managing hazardous air pollutants (HAPs)	In 2022 test of hazardous air pollutants (HAPs), the intensity of all other tested items was below 200ppb, except for xylene at 400ppb.

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 RT-CH-120a.1



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	2020	2021	2022	Emission Standard (announced 2020)
SOx(ppm)	ND	ND	ND	50
NOx(ppm)	90	54	88.9	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	2020	2021	2022	Emission Standard
SOx(ppm)	ND	ND	ND	100
NOx(ppm)	2	2	2	150
TSP (mg/NM^3)	<1	-	2	100
VOCs (ppm)	52	52	56	Reduction rate>95% or <150ppm

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

4.4 Waste Management

GRI 2-25, 3-3 | SDG 11, 12

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

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

Strategy

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

Commitment

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

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

- Medium-term positive actual impact: Resource recycling, waste reduction
- Long-term negative actual impact: Improper waste treatment.

Impact Boundaries

Community residents, environment and ecology affected by pollution, waste disposal contractors

Process to Remediate and Prevent Negative Impacts

1. Reduce at the source and source qualified waste disposal contractors
2. Implement the waste audit and management systems

Achievement and Goal

2022 Goals

Establishing the waste audit and management systems.

2022 Achievements

Spot checks on 9 waste cleanup contractors and 7 waste disposal contractors, and no nonconformity was found

2023 Goals

1. Continue to implement the waste audit and management systems
2. Implement waste recycling and reuse

Medium- & Long-Term Goals

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

Management

Effectiveness Assessment

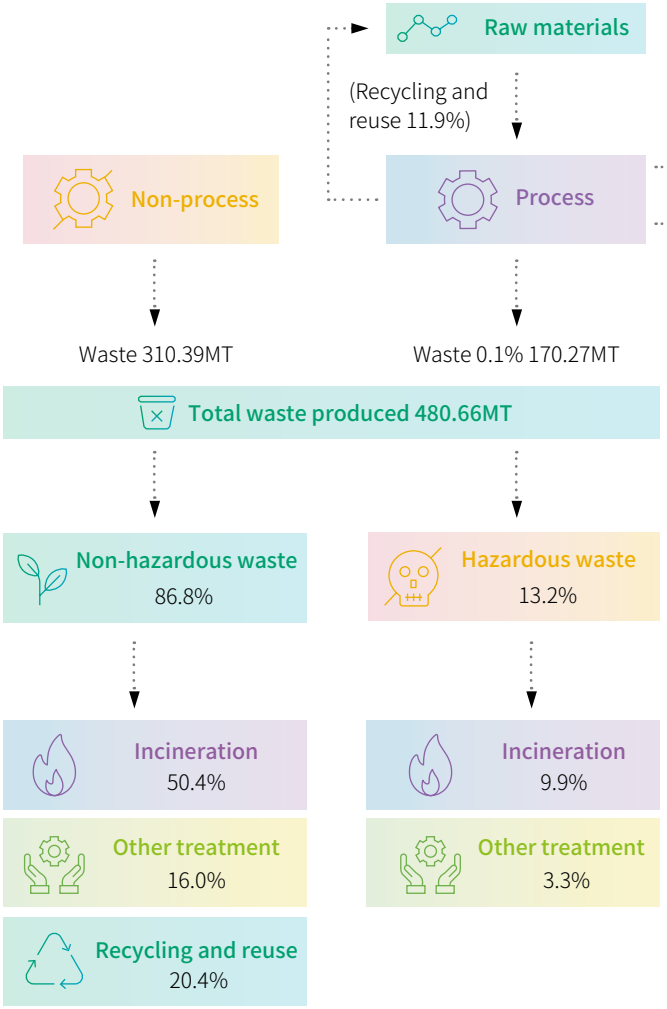
1. Waste reporting data.
2. Targeted research reports.

Grievance Mechanism

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

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

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 and 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 2022, we continued with the comprehensive review of waste legitimacy, compared and proofread the monthly report data to facilitate the 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 2022, we audited waste storage sites every month, and all sites complied with the related regulations.

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 9 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 | RT-CH-150a.1

We are also committed to waste sorting to categorize, collect, and manage recyclable resources. Apart from weighing and recording waste before shipping out of the plant, we hire licensed contractors to recycle waste metal. In 2022 we recovered 93.5MT of waste metal and hired nearby resource recycling contractors to dispose of the 4.7MT of paper waste. The total volume of waste recycling reduced by 26.8% over 2021 to 20.40% of all waste. The recycling rate in 2021 was higher mainly because of the increased metal recycling due to equipment replacement and the expansion of the R&D building. In 2022 the total waste production was 480.66MT. Additionally, no spill of oils, fuels, waste, or chemical substances was reported in 2022.

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

Waste		Disposal/Recycling	2020	2021	2022
Hazardous waste	Toxic Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	1.05	3.46	47.5
		Other treatment	15.67	18.77	15.85
Total weight of hazardous waste			16.72	22.23	63.35
Non-hazardous waste	General Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	201.22	269.40	248.95
		Other treatment	171.14	178.32	70.16
	Total weight of non-hazardous waste		372.36	447.72	319.11
	Recycling	Recycling for reuse	84.92	420.87	98.20
		Resource recycling rate (%)	17.9	47.2	20.40
Total weight of non-hazardous waste			457.28	868.59	389.27
Total weight of waste (MT)			474.00	890.82	480.66

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 awareness 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.

4.5 Climate Change and Energy Management

GRI 2-25, 3-3 | 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

Establish the energy management system, lower unit product energy consumption, reduce GHG emissions, and develop green power.

Commitment

Annual electricity conservation >1%

Data scope:
Kaohsiung Plant, Guishan R&D Division, Taipei HQ, coverage 100%

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

- Short-term positive actual impact:
  Invest in green power with profit gained from EVA solar energy products.
- Short-term positive potential impact:
  Develop AI systems to lower energy consumption
- Short-& medium-term negative actual impact:
  1. Increased electricity prices estimated at NT$100 million/year
  2. Disrupted production by power curtailment
- Short-term negative potential impact:
  Increased costs due to carbon tax collection of about NT$45 million at NT$300/MT.

Impact Boundaries

USI, global customers, green power suppliers

Process to Remediate and Prevent Negative Impacts

1. Sponsor forestation of 5 hectares
2. Implement various energy conservation and carbon reduction programs.
3. Develop green power

Achievement and Goal

2022 Goals

Implement 10 energy conservation projects to reduce electricity by about 1.71%

2022 Achievements

Due to the pandemic and project delays, implemented 6 energy improvement projects to reduce power consumption by 1.31%/year (average of 2015-2022 was 1.37%).

2023 Goals

1. Saved electricity: 1.27%
2. Reduce GHG emissions by 145,000tCO_2e
3. Implement three energy conservation and carbon reduction projects in 2023 to reduce emissions by about 838tCO_2e.
4. Implement ISO 14064-1 GHG emissions inventory and verification.

Medium- & Long-Term Goals

1. Build the AI intelligent management platform to advise energy conservation operations.
2. Continue to plan energy conservation to enhance energy efficiency, saving electricity by 1% /year.
3. Plan and implement green power strategies within the group: Kaohsiung Plant will use green power (solar PV) of about 3.698GWh in 2025 by law.
4. Fulfill the commitment of carbon reduction by 27% in 2030 over 2017 (base year).
5. Continue to increase the use of renewables.

Management

Effectiveness Assessment

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

Grievance Mechanism

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

* Determined and target 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

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

TCFD climate change risk management

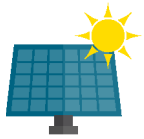
Climate change is a common challenge around the world. To keep up with the world and match the demand for sustainable development, Taiwan's legislature passed the Climate Change Response Act in October 10, 2023. Facing the impact of climate change, carbon reduction has become a global goal. To enhance carbon reduction, we set the 2030 carbon reduction target at "**27% less than 2017 by 2030**" in early 2022 to actively implement countermeasures and management mechanisms. Nine core businesses of the group will continue to implement ISO 14064-1 GHG inventory and verification and plan and implement carbon reduction programs. The group will also actively develop external renewables sites. By the end of 2022, the accumulative on-grid capacity of solar PV sites has reached 5.9MW.

Carbon reduction pathway

We plan our carbon reduction pathway according to the group's 2030 carbon reduction target. Our 2022 GHG reduction already reached 16.4% over the base year (2017). The target is "27% less than base year by 2030". In the future, we will implement energy conservation and carbon reduction programs more actively, enhance energy efficiency, increase renewables use, and use low-carbon fuels to achieve the carbon reduction target and implement sustainable development.

USI 2030 Carbon Reduction Pathway Planning

As indirect GHG emissions from purchased electricity accounts for over 80% at USI, green power deployment is an important strategy:

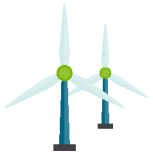


Solar PV

Installed capacity reached 5.9MW in 2022 and will increase to 20MW in 2027.

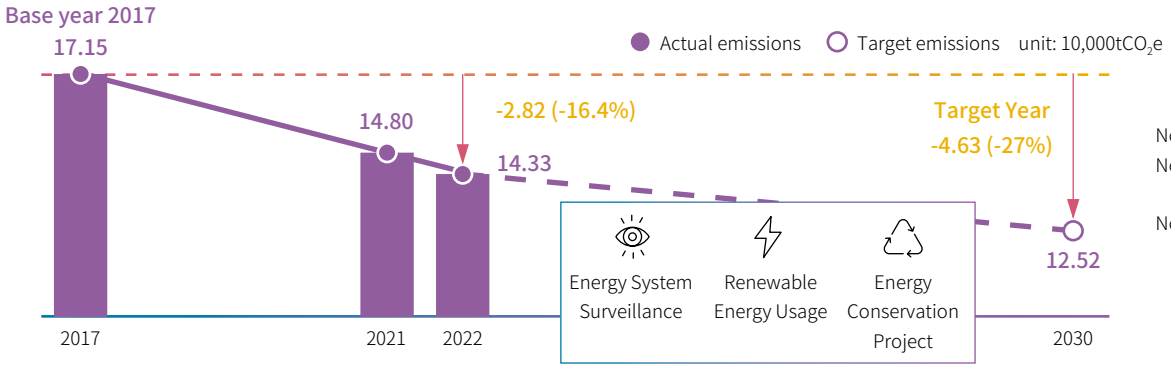
Geothermal

We have selected sites in Taitung, and terminal survey is in progress.



Offshore wind power

We have formed an alliance with other petrochemical companies to discuss electricity purchase with wind power developers.



Note 1: Achieved rate = 2022 target emissions/2022 actual emissions
Note 2: The carbon reduction contribution from purchased electricity (TPC) was not included in the carbon reduction pathway planning.
Note 3: As full plant operation started in 2017 after the completion of new production lines, we set 2017 the base year for energy consumption and total GHG emissions.

At USI, the ESG Committee is the highest governance body of climate change management. Chaired by independent director, the committee reviews the Company's climate change strategies and targets every year, manages the actions and reviews the performance in climate change risks and opportunities, and reports to the Board. Based on the framework recommended by the Task Force on Climate-related Financial Disclosures (TCFD), we identify climate-related risks and opportunities, assess risks and opportunities from different departments, assess financial impacts and set responsive plans, plan overall assessment every three years, and review updates every year. The last assessment was completed in 2021.

Climate change management framework

Type		Management strategy and action
Governance	ESG Committee	As the highest governance body of climate change management chaired by an independent director, it reports climate change planning, implementation and performance to the Board every year.
	Operations Management Meeting	Chaired by the Board chairman, it plans and implements material policies for energy conservation and carbon reduction and reports the results from time to time.
	Division of Equipment Preventive Maintenance and Environmental Risk Control Quarterly Meeting	As the highest governance body of the Group's energy management, it reports the planning and progress to the Group's chairman each quarter and makes decisions on energy management.
	Group Green Power Team	As the Group's responsible unit for green power promotion, it reports the status of and future plans for green power development to the chairman.
Strategy	Identification of risks and opportunities	Identify material risks and opportunities based on their likelihood and impact.
	Assessment of risks and opportunities	Assess the potential financial impacts of identified material risks and opportunities.
	Scenario analysis	Set plans to achieve net zero emissions in different scenarios.
Risk Management	Implementation of TCFD-recommended framework	Identify risks and opportunities based on the TCFD-recommended framework, communicate with all responsible units, and confirm by senior supervisor.
	Report of identification results	Include them in the annual risk assessment. The president reports the control measures and management performance to the Audit Committee and Board every year.
Indicators and Targets	Group carbon reduction target	27% less than 2017 (base year) by 2030.
	Climate change countermeasures	Equipment replacement, construction of renewables facilities, optimization of production scheduling, planning building aircon, energy management system, extreme weather events contingency plans
	GHG emissions disclosures	Disclose the data of Scopes 1 and 2 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 Risks and Opportunities

The impact of climate change on USI's operations has been increasing. To carefully tackle potential risks and capture 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. During operations, we have identified 8 major risks and 10 major opportunities with the TCFD-recommended methods and assessed and differentiated the duration of impacts. In the future, we will review the counteractions every year and develop a resilient climate change culture.

The climate change risks and opportunities by the identified duration are tabulated below:

Type	Short-term (<3 years)	Medium-term (3-5 years)	Long-term (>5 years)
Physical risk	· Increased severity of extreme weather events · Changes in precipitation patterns and extreme variability in weather patterns	—	· Sea level rises · Average temperature rises
Transition risk	· Enhance GHG Emission Pricing · Raw material cost rises · Product Stigmatization · Enhance emission report obligation	—	—
Opportunity	· Reduce water use and water consumption · Participation in renewables projects and adoption of energy conservation measures · Alternative energy and energy diversification · Recycling and reuse · Use low-carbon energy · Use of incentivizing policies	· R&D and innovation of new products and services. · Participation in carbon trade	· Consumer preference changes · Use of new technology

Financial implications and other risks and opportunities due to climate change and countermeasures GRI 201-2

Type	Climate Related Risks	Time Range	Degree of Risk	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 (OBM) is our core business. The electricity cost accounts for 7.9% of the total production cost. **Apart from the annual electricity conservation target at 1%, we have also set the 2030 carbon reduction target to reduce GHG emissions.** The result of financial quantification in carbon control risk assessment shows that the carbon tax mechanism will be implemented in 2024 the earliest. If the amount of carbon tax is NT$300/MT for direct (Scope 1) GHG emissions from operations and indirect (Scope) GHG emissions from purchased electricity, we will need to pay a carbon tax of nearly NT$45 million by then. Electricity prices increase at about 17% a year on average to increase electricity bills by about NT$100 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). 2022 materials recycling rate at 13.1%, about NT$1.45 billion.
	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.	The High-Value R&D Center with an investment of NT$170 million started operations in 2022 to accelerate R&D.
	Enhance emission report obligation	Short-Medium Term	Medium-High	↑ operating costs	1. ISO 14064-1 and promote Scope 3 (completed Cat. 4 and continue to increase others), ISO 14067 production carbon footprint verification. 2. Enhance website and media disclosures.	1. The expenses on the guidance and verification of ISO 14064-1 for Kaohsiung Plant completed in 2022. 2. As the ISO 14067 certificate is valid until 2024/03/02, Kaohsiung Plant did not need CFV in 2022.
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. Passed the certification of the ISO 46001 Water Efficiency Management System in 2022. 3. The 2022 water recycling volume was 32,153MT. The volume is estimated to increase by 2% in 2023. Based on the price of NT$12/$m^3$ of tap water, this will save up to NT$385,836.
	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 Opportunities	Time Range	Degree of Opportunity	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, process operation improvement reduced steam use to save water by 3,403MT/year. 2. Constantly develop water conservation programs. 3. If the water conservation fee is NT$3/㎥, water bills will increase by NT$330,000/year.
	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. The 2022 wax recycling volume was 17,650kg, with a profit of NT$35,300, saving wax disposal fee by about NT$1 million. 2. Materials recycling: 13.1%.
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.	Cultivate new markets and engage in industrial transformation, and the R&D center started operations in 2022.
	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 power development. INOMA Corporation with an authorized capital of NT$72.59 million is our wholly-owned investee. In 2022, we invested in solar generation of about 5.9MW.

We continue to invest in innovative materials and products to lower the impact of climate change. Please refer to 3.1 Technology R&D for details.

2 Energy management

Group Energy Management Targets

USI Group (USIG) voluntarily set energy management targets in 2016 and began to make dynamic target reviews in accordance with the country's energy development policies and by keeping track on the internal trends and domestic laws and regulations. After measuring the internal and external factors, we set the 2030 carbon reduction target in early 2022. The 9 USIG core businesses began to implement the ISO 50001 energy management system and obtained the certificate on after another in 2018 to effectively manage energy performance and continuously improve energy conservation and carbon reduction, hoping to demonstrate USIG's influence and so to lower environmental impact.

Every year USIG holds the"plant technology exchange meeting"and several"northern/ Kaohsiung plants resource integration meetings" for plants to share resources and exchange technologies to improve performance in energy conservation and carbon reduction. In 2022 the "plant technology exchange meeting" was held in October. Case presentation with themes including "industrial safety and environmental protection", "equipment preventive maintenance", and "energy conservation and carbon reduction" were conducted through competitions. Through plan technology case submission and documentary review, a total of 7 cases entered the final. Senior USIG officers and plant representatives elected the three best cases. The USIG chairman presented the certificates and bonuses to winners. Through ratings and encouragement, sharing, and mutual learning, we aim to advance technology in the group.


USIG Plant Technology Exchange Meeting

USIG Carbon Reduction Targets 2030

27% less than 2017 by 2030

Carbon Inventory/ Carbon Footprint

- TVCM, CGPC, and USI have been implementing carbon inventory and verification for years. In 2022 APC, TTC, CGPCP, and ACME will complete Carbon Inventory and Verification.
- Carbon Footprint (CFP) in 2021 USI implemented EVA CFP inventory. In 2022 CGPC and CGPCP implemented CFP on PVC resin powder, PVC films, PVC leather, and TPE. In 2023 TTC implemented VCM CFP.

Plant Energy Conservation and Carbon Reduction

- All USIG publicly offered companies in Taiwan already passed ISO 50001 EnMS certification.
- USIG plants in Taiwan continue to implement energy conservation and carbon reduction, and the 2020-2021 performance was 12,000tCO_2e.
- Hold the USIG Plants Technology Exchange Meeting every year for mutual learning and resource sharing.

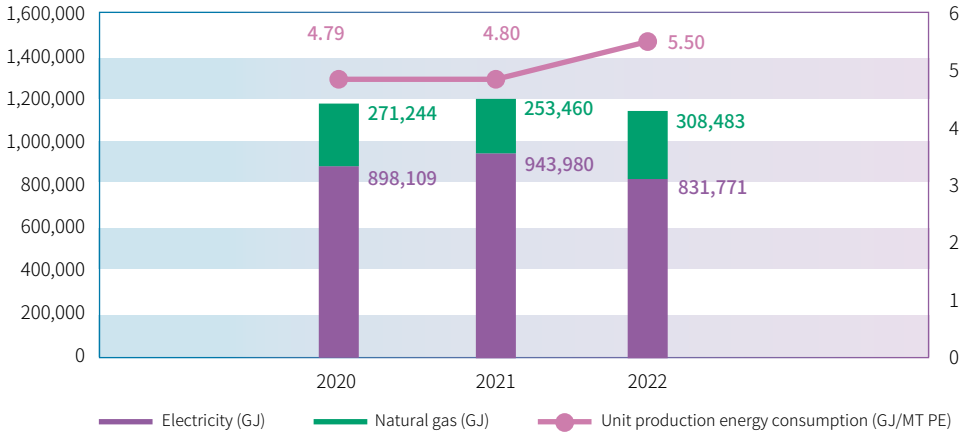
Creating Renewables

- Established the USIG Green Power Team to plan and implement green power strategies.
- By the end of 2022, USIG has invested in solar PV facilities up to 5.9MW. In 2022 CGPC bought back its' 1.4MW PV plant.
- Continue to actively implement other renewables

Energy consumption GRI 302-3 RT-CH-130a.1

The production line shutdown due to the equipment failure in 2022 increased the unit energy consumption when there was no output.

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.

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

Energy Type	Unit	2020	2021	2022
Electricity	GJ	898,109	943,980	831,771
Natural gas	GJ	271,244	253,460	308,483
Diesel	GJ	527	581	415
Total consumption	GJ	1,169,881	1,198,022	1,140,670
Production	MT	244,162	249,402	207,413
Unit product energy consumption	GJ/MT	4.79	4.80	5.50

Note1: 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/m3, and 8,400 kcal/L; where 1 cal = 4.187 kJ.
Note2: Sources of natural gas and electricity consumption: fuel bill statistics.
Note3: Source of diesel consumption: Material collection forms.
Note4: Only non-renewables is used.
Note5: Energy data coverage rate = 100%.
Note6: Natural gas calculation: Changed from the boiler consumption into the total of boiler consumption and prevention equipment consumption.
Note7: Kaohsiung Plant followed the carbon reduction pathway to achieve USIG's 2030 carbon reduction commitment. The 2020 and 2021 energy consumption data was corrected to the energy consumption data of all plants (Plants I, II, and CBC).

Electricity Conservation Rate in the Past 3 Years

Item	2020	2021	2022
Electricity Saved (kWh)	4,230,976	1,972,419	3,065,102
Electricity Conservation (%)	1.67	0.75	1.31

Note 1: Based on the 2022 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.

The 2022 target and performance of electricity conservation and the planned 2023 target are tabulated below:

Year	2022		2023
Item	Targets	Performance	Targets
Electricity Conservation (%)	1.71	1.31	1.27

Factory smart energy management system

After applying to the 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.

- Establish energy performance indicators and baseline requirements.
- Develop the data collection and analysis and control and management capabilities of plant personnel.
- Practice the application of smart production and management.
- Provision of decision-making references of corrective action for management.
- Reduction of management workforces and costs.
- Discovery of room for improvement of energy conservation and references for improvement of energy performance supervision.

In March 2021, we were selected as a demonstration plant for the smart energy management system. In 2022, we were published by the IDB in the media for implementing the ISO 50001-transformed low-carbon smart factory. We follow up 93 KPIs and progressively propose improvement programs.

GHG management GRI 302-2, 303-2, 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 2022, Kaohsiung Plant's direct (Scope 1) GHG emissions were 25,480tCO_2e/year, the energy indirect (Scope 2) GHG emissions were 117,580tCO_2e/year, other indirect (Scopes 3-Cat 4) GHG emissions were 130tCO_2e, and the combined direct and indirect GHG emissions were 143,180tCO_2e/year (rounding error).

Guishan R&D Division’s direct (Scope 1) GHG emissions and energy indirect (Scope 2) GHG emissions were 10tCO_2e and 90tCO_2e respectively. The combined direct and indirect GHG emissions were 100tCO_2e.

Taipei HQ’s direct (Scope 1) GHG emissions and energy indirect (Scope 2) GHG emissions were 0tCO_2e and 120tCO_2e respectively. The combined direct and indirect GHG emissions were 120tCO_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 so as to achieve the win-win scenario of environmental protection and profit together. Currently, we have added to the 2023 inventory the carbon emissions from the commuting and business travel by employees (Cat. 3 as referred to in ISO 14064) in Scope 3.

GHG Emissions in the Past 3 Years GRI 305-4 RT-CH-110a.1

Note 1: Scope 1 refers to the direct emissions from stationary combustion sources, direction emissions from mobile combustion sources, direct process emissions from industrial manufacturing processes, and direct leaked emissions from GHGs generated by artificial systems.
Note 2: Scope 2 refers to the indirect emissions of purchased electricity.
Note 3: Scope 3 refers to other indirect emissions. During 2021-2022, we inventoried category 4: indirect emissions from the disposal of solid and liquid waste.
Note 4: The latest carbon emission factor of electricity announced by Bureau of Energy was apply: 2020 at 0.502kgCO_2e//kWh, 2021-2022 at 0.509kgCO_2e/kWh.
Note 5: Diesel containing no biofuel was used in 2021. The combustion emission of biofuel was 0 kgCO_2e/kWh.
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 energy conservation and carbon reduction programs in 2022 and their performance are tabulated below. **A total of 6 programs with a total investment of NT$25.176 million were implemented to reduce carbon by 2,138tCO_2e.** GRI 305-5

Item	Type	Program	Energy Saved kWh/Year	Carbon Reduced tCO_2e/year
1	Electricity Saving	W-238 refrigerator replacement	1,152,620	586.7
2	Electricity Saving	J-290A/C cooling water pump replacement	1,576,913	802.6
3	Electricity Saving	Inlet pressure reduction of primary compressors in Plant I	385,393	196.2
4	Electricity Saving	Suspension of the MULTI CYCLONE FEEDER	11,412	5.8
5	Electricity Saving	Reactor pressure reduction of Plant I	178,503	90.9
6	Natural gas	Reduction of MRT steam consumption	219,110 m^3	455.3
			Total	2,138

Note 1: Carbon emission factor of electricity as 0.509kgCO_2e/kWh.
Note 2: Based on the 2022 Report on the Annual Energy Saving Audit System of Energy Users of the Bureau of Energy.
Note 3: Electricity conservation of items 1 and 2 was calculated based on the design value/measured value and operating duration of equipment before and after replacement.
Note 4: Electricity conservation of item 3 was calculated based on the operating current and operating duration of the inlet pressure of primary compressors before and after adjustment.
Note 5: Electricity conservation of item 4 was calculated based on the equipment specifications.
Note 6: Electricity conservation of item 5 was calculated based on the electricity consumption and operating duration of the reactor pressure before and after adjustment.
Note 7: Energy conservation of item 6 was calculated based on the actual steam consumption.

The energy conservation programs we have declared to the Bureau of Energy in 2023 include freezer and cooling water pump replacement, inlet pressure reduction of compressors, and operating pressure reduction of compressors. A total of 3,362,422kWh of electricity is projected to conserve in 2023, with a conservation rate of 1.27%.

2023 Principal Energy Conservation and Carbon Reduction Program	2023 Target Reduction
Reduction of reactor pressure and secondary compressor load (B line UE2828)	838 tCO_2e/year
Optimization of operation for J-214B-1/2/3	
Plant II nitrogen compressor replacement	

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 an 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 387tCO_2e.)

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

We began supporting this event in 2018. During 20:30-21:30 on March 26, 2022, we joined the "Earth Hour" activity with the world by turning off the landscaping lights of the plant's exterior walls and unnecessary lighting fixtures so as 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 and reduce carbon of about 0.6kg CO_2e.

Product carbon footprint

We promoted product carbon footprint verification (CFV) in 2021 and obtained the assurance certificate in March 2022. Based on the data of lifecycle assessment, the GHG emissions from direct and indirect activities or accumulated in the product is 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

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 enhance 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 in 2022 was 13.1%.