

5 Green

A Practitioner of Green Technology

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Nanya Technology Corporation implements the strategy of "creating shared value." We continue to review of the environmental impacts that may occur during our operations, and focus on issues such as nature, climate, energy, resources, pollution emissions, and recycling. We provide consumers with more efficient and lower carbon products through product design from the source to advanced technology development, adopting standards that are better than regulations and follow international sustainability frameworks, so as to avoid or reduce the risk of impacts. We also established sustainability performance indicators to check and ensure that we fulfill the responsibility of cleaner production.

Better than the SBT annual reduction target
Scope 1 & 2 reduction of 8.4%
Scope 3 reduction of 20.4%

Target value: Reduce Scope 1+2 GHG emissions in 2023 by 7.5% compared to 2020, and Scope 3 GHG emissions in 2023 by 7.9% compared to 2020.
 Actual value: In 2023, Scope 1+2 GHG emissions was reduced by 8.4%, and Scope 3 GHG emissions was reduced by 20.4% .

Renewable energy target increased seven fold

Nanya aims to use 25% renewable energy in 2030, a seven-fold increase compared to the 3.2% in 2023, and better than the three-fold goal set in the Global Renewables and Energy Efficiency Pledge of COP 28.

68,565_{MWh}

Cumulative energy saved with energy conservation measures from 2017 to 2023

Strategy and Performance of Material Topics

Issue / Strategy	2023 Goals	Performance and Goal Achievement	2024 Goals
Greenhouse Gas Management SBTs Reduce Scope 1+2 GHG emissions in 2030 by 25% compared to 2020, and Scope 3 GHG emissions in 2030 by 27% compared to 2020. Energy conservation and carbon emissions reduction Set short, medium, and long-term goals and actively implement related management measures. Low-carbon manufacturing Commit to improvement in production technologies and reduce greenhouse gas emissions in the production process.	Scope 1+2 GHG emissions in 2023 was reduced by 7.5% compared to 2020	♦ Decreased 8.4 %	Scope 1+2 GHG emissions in 2024 was reduced by 10.0% compared to 2020
	Scope 3 GHG emissions per unit product in 2023 was reduced by 8.1 % compared to 2020	♦ Decreased 20.4%	Scope 3 GHG emissions per unit product in 2024 was reduced by 10.8% compared to 2020
	Reduction rate of PFCs emissions during process reaches a minimum of 93%	♦ Reduction rate reach 93%	Reduction rate of Fluorinated Greenhouse Gases (F-gases) emissions from processes reaches a minimum of 93%
	Number of days production was suspended due to climate change disasters maintained at 0 days	♦ Maintained at 0 days	Number of days production was suspended due to climate change disasters maintained at 0 days
Energy Management Implementation of energy conservation measures Implement ISO 50001 Energy Management System for systematic management and improve the efficiency of energy usage. Innovative applications Use external exchanges or training to obtain the latest energy conservation technology or energy-saving methodology.	Cumulative energy saved with energy conservation measures from 2017 to 2023 reached 67,500 MWh (2.43x10 ⁸ MJ).	♦ 68,565 MWh (2.47x10 ⁸ MJ)	Cumulative energy saved with energy conservation measures from 2017 to 2024 reached 72,500 MWh (2.61x10 ⁸ MJ)
	Annual renewable energy use reached 25,000 MWh (9x10 ⁷ MJ)	Note1 ♦ 24,490 MWh (8.8x10 ⁷ MJ)	Annual renewable energy use reached 25,000 MWh (9x10 ⁷ MJ)
Water Management Response to risks Establish backup water sources and water storage tanks and use emergency response organization between company plants to coordinate water usage. Wastewater recycling and reuse Establish wastewater collection processing and adopt different multiple recovery and reuse to improve the water recycling rate. Water usage reduction Conserve water through daily management.	Accumulated water consumption per unit production capacity decreased 38.5% compared to 2017	Note2 ♦ 37.5%	Accumulated water consumption per unit production capacity decreased 38.5% compared to 2017
	Production losses caused by restricted water supply: 0 wafer (slice)	♦ 0 wafer (slice)	Production losses caused by restricted water supply: 0 wafer (slice)
	-	-	The average percentage of main indicators of water pollution is more than 50% better than the regulatory standards (new this year)
Waste and Pollution Prevention Circular economy Increase waste recycling and reuse rate to use resources effectively. Source reduction Continue to promote waste reduction and increase waste recycling rate.	0 cases in violation of environmental laws and regulations	♦ 0 cases	0 cases in violation of environmental laws and regulations
	Rate of auditing and coaching waste disposal contractors on-site > 90%	♦ 98%	Rate of auditing and coaching waste disposal contractors on-site > 98%

♦ Exceed ♦ Achieved ♦ Partially Achieved

Note 1:The power generation of the outsourced solar photovoltaic project site was lower than expected during the winter, and renewable energy use fell short of the target by 2%.
 Note 2:Product production capacity in 2023 was approximately 8% lower compared to 2022, resulting in water consumption per unit capacity not reaching the target.

Note 3:The average annual process water recycling rate was deleted because it reached the original target ahead of schedule.
 Note 4:Product production capacity in 2023 was approximately 8% lower compared to 2022, resulting in the reduction of VOC emissions per die not reaching the target.

5.1 Nature and Climate Management

Nanya's production location is in Nanlin Science Park in Taishan District. Nanya has published a TCFD Report according to the Task Force on Climate-related Financial Disclosures Recommendation for 2 consecutive years since 2022. Many scientific studies have pointed out that the Earth's ecosystem has been changed due to human actions, such as climate change and loss of biodiversity caused by global warming. Therefore, we began to face the value chain's nature-related dependencies and the scope of risk impacts. Nanya became an early adopter of the TNFD in 2023, and actively established complete LEAP mechanisms to assess the nature and climate-related dependencies and risks of its own business locations, upstream supply chain, and downstream customers, and formulated corresponding strategies and actions, in hopes of reducing the impact of risks.

Nanya identifies material nature and climate-related issues through interviews with executives and employees responsible for relevant issues, and controls them by improving the corporate governance structure. Nanya implements nature and climate management through two-way interaction between the board of directors and management. This chapter focuses on "Climate Change Issues". For complete nature and climate-related contents, please refer to the first "[Nature and Climate-related Financial-related Disclosures Report](#)" released in 2024.

Adaptation

We developed strategies and actions in response to nature and climate-related issues on the aspects of governance, strategy, risk management, and metrics and targets according to the disclosure recommendations, in hopes of reducing the impact of dependencies and risks. Actions in 2023 are described below:



Governance

- ◆ In terms of governance level, nature and climate is listed as an issue for the board of directors. The Sustainable Development Committee is a functional committee established to implement measures and manage nature and climate-related issues.
- ◆ Management periodically participates in quarterly sustainable development and risk management meetings to examine the Company's implementation results and decide on work items. The Sustainability and Risk Management Division under the President's Office is the dedicated unit for cross-departmental horizontal integration and management.
- ◆ Enhance the climate governance ability of the board of directors and management, and raise the awareness of all employees of climate change.

2023 Operation status

- ◆ A total of 5 board meetings and 2 Sustainable Development Committee meetings were convened in 2023, and topics included sustainability reports, purchase of renewable energy, TCFD reports, greenhouse gases, biodiversity, and sustainability evaluation performance.
- ◆ A total of 8 sustainable development quarterly meetings and risk management quarterly meetings were held in 2023. The topics include responses to nature and climate-related issues, such as evaluating the purchase of an additional 25 million kWh of renewable energy, introducing TNFD methodology, formulating a biodiversity policy, and GHG inventory and tracking. The Risk Management Steering Center assesses material risks related to nature and climate each year; 168 risks were managed and evaluated in 2023.
- ◆ Directors received a total of 82 hours of continuing education in 2023. Courses included economics, corporate governance, risk management, sustainable development, climate change, carbon credit trading and carbon management, and compliance. ESG issues are incorporated into the Company's manager training, and new employees are required to receive training in ESG and climate change.



Strategy

◆ Resilient adaptation

1. Biosensitivity analysis of business locations
2. Identify the dependence and impact of operations on nature and climate
3. Review nature and climate management by the value chain

◆ Transition for mitigation

The impact on nature and climate is effectively reduced through the R&D of low-carbon products, green technology production, sustainable supply chain management, and development in harmony with nature.

◆ Stakeholder engagement

1. Collect and compile opinions of external stakeholders through different platforms.
2. Organize nature and climate-related activities and communicate Nanya's sustainability concepts to relevant stakeholders.

2023 Operation status

◆ Resilient adaptation

1. We analyze whether Nanya's business locations (within two kilometers) touch biosensitive areas through the geographical information system and government open data.
2. Collect nature and climate-related issues of concern to stakeholders, and discuss short-, medium-, and long-term risks and opportunities during cross-departmental workshops. A total of 14 highly dependent factors and 9 major impact factors were identified.
3. Simulate the impact of nature and climate risk scenarios on the Company's operations, strategies, and financial planning, (1) Transition scenario: NDC, pathway to net zero (APS, NZE); (2) Physical scenario: AR5 RCP2.6, 4.5, 6.0, and 8.5.
4. A total of 50 questionnaires were distributed to key suppliers. The analysis results showed that 2 dependencies involved high risk and high exposure, and 5 factors were issues of high concern to suppliers.

◆ Transition for mitigation

1. Considering the risks and opportunities in different climate change and physical scenarios, as well as the operational characteristics of Nanya, we formulated the strategies of developing green products, implementing cleaner production, strengthening adaptation ability, and working with sustainability partners.
2. Nanya periodically engages in ecological monitoring and ecological restoration, and strives to avoid damage to key local areas as it continues to expand its operations. In the future, Nanya will continue to engage in ecological restoration for environmental compensation.

◆ Stakeholder engagement

1. Nanya actively participates in industry associations, co-organizes nature and climate-related initiatives, and shares its practical experience.
2. We cooperate with local organizations to jointly organize community environmental education, environmental welfare, and cultural preservation activities build closer relationships with local communities. Starting in 2023, we actively discuss possible environmental compensation methods, and will protect and restore natural habitats near the fab, jointly creating a better community environment.



Risk Management

- ◆ According to the Company's operational risk management procedures, we assessed the significance of related risks and opportunities brought by different scenarios of nature and climate change, and formulated relevant response measures, which were included in Enterprise Risk Management (ERM) and periodically confirmed by senior managers. Formulated a complete emergency response plan for nature and climate-related risks
- ◆ The scopes 1/2/3 of greenhouse gas inventory and verification are conducted annually to confirm sources of greenhouse gases for key project management.
- ◆ Compile product life cycle inventory and improve hot spots.
- ◆ **Emission risks**
Scope 1: The development of new technologies for control equipment is not verified, which may result in a decrease in the removal rate of fluorine-containing gases in the process. As a result, air pollution control and emission standard controls in the semiconductor manufacturing industry have increased VOCs processing costs.
Scope 2: The increase in electricity demand will increase the proportion of renewable energy use and increase carbon fees, resulting in an increase in operating costs.
Scope 3: The main source of emissions is from products and services purchased upstream in the value chain, which will incur supplier management costs.

2023 Operation status

- ◆ The major risks identified are mainly transition risks, such as changes in the national power structure, customer demand for low-carbon products, and the impact of fulfilling SBT commitments. The three medium-term financial impacts on the Company are estimated to account for approximately 3-4% of annual revenue.
- ◆ The main opportunities identified are product technology and new market development: Due to the trend of net zero emissions, smart clean energy technologies will drive growth in demand on DRAM. According to the scenario analysis by the IEA, the clean energy technology market will triple in size by 2030, and the Company will seize this opportunity to continue investing in innovative R&D (reached 25.4% of revenue in 2023).
- ◆ For water resource risk, short-term water stress was assessed using WRI Aqueduct Tool as medium to low risk (10-20%). Long-term stress to 2050 is also low to medium risk (10-20%), meaning that it is a non-water stress area. According to the climate change water resource hazard map of the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), there is no risk of water shortage in scenario RCP 8.5 in the middle of the century (Y2036-Y2065). Water conservation charge will be levied in 2023. Nanya has worked hard in recent years to implement water conservation and water recycling measures and achieved the government's lowest levy rate. The annual increase in water charges is only about 3%, which has a low impact on operating costs.
- ◆ Verification of GHG emissions in 2023 will be completed in May 2024. Completed the inventory of the carbon footprint of all products and implemented management plans to improve the three hot spots of carbon footprint in the 2023 inventory.



Metrics and Targets

- ◆ **Mitigation goals:** 1. Compile and verify Scope 1/2/3 GHG emissions every year. 2. Set greenhouse gas management goals and energy and resource recycling and reuse goals. 3. SBT reduction target: Reduce Scope 1+2 GHG emissions in 2030 by 25% compared to 2020, and Scope 3 GHG emissions in 2030 by 27% compared to 2020.
- ◆ **Adaptation goals:** 1. Strengthen the Company's drought resistance and increase the water recycling rate. 2. Carry out green factory certification. 3. Participate in the international Carbon Disclosure Project (CDP) and water safety project, disclose related information, and communicate with stakeholders.

Mitigation indicators

1. Completed the inventory and verification of Scope 1/2/3 GHG emissions in 2023.
2. The Company's GHG emissions in 2023 was 430 thousand tons, and emissions per unit product was 430 kg/thousand die, down 29% compared to 2017.
3. Completed 35 raw material consumption improvement proposals in 2023.
4. A total of NT\$14.67 million was invested and 36 energy conservation plans were completed in 2023, saving an estimated 5,337 MWh, reducing carbon emissions by 2,642 tons CO₂e, and saving NT\$16 million in electricity fees.
5. For the renewable energy strategy, 24.49 million kWh of renewable energy was used in 2023, accounting for 3.2% of total electricity consumption. The purchase of an additional 25 million kWh of renewable energy or offshore wind power will be evaluated in 2024, and is expected to reduce carbon emissions by 12,400 tons.
6. Implementation status of SBTs in 2023: Category 1+2 reduced by 8.4%; Scope 3 reduced by 20.4%.

Adaptation indicators

1. The total volume of water recycled and reused in 2023 was 5,832 thousand cubic meters.
2. Passed AWS (International Water Resources Management Standard) verification in 2023.
3. The green factory certificate of Fab 3A was renewed in 2023.
4. Rated in the CDP's A List for climate change and water security in 2023.

Mitigation

The main sources of greenhouse gas emissions from semiconductor fabrication plants are electricity and perfluorocarbons (PFCs). Among them, electricity is essential for operation and production, enabling all machinery and equipment at plants to normally operate. PFCs are perfluorocarbons and other compounds of the same kind used in production process, categorized into the greenhouse gases with high global warming potential.

• Greenhouse Gas Inventory

The Company referenced ISO 14064-1 and requirements set forth by the Ministry of Environment, Executive Yuan in the Climate Change Response Act, Greenhouse Gas Inventory Registration and Management Regulations, Greenhouse Gas Emission Verification Guidelines^{Note1}, and WBCSD/WRI Greenhouse Gas Protocol, and sets the boundaries of the organization at 100% control of operations. At present, verification of Scope 1, Scope 2, and Scope 3 emissions is carried out by a third party verification institution according to international standards.

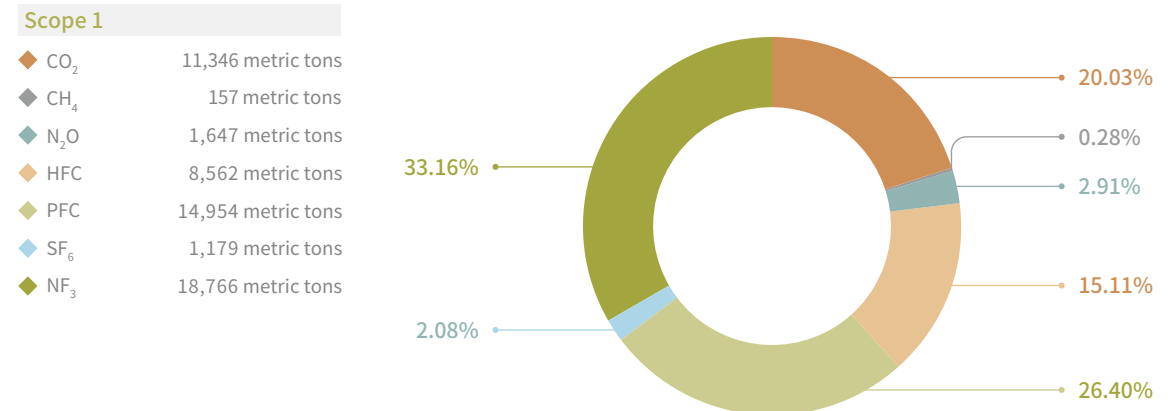
The scope of inventory of Nanya covers all production locations in Taiwan. The main sources of GHG emissions were purchased electricity and steam (accounting for about 86.83%) and process emissions (accounting for about 9.09%). GHG emissions in 2023 totaled 430,324 metric tons CO₂e. Scope 1 emissions totaled 56,654 metric tons CO₂e, and there was no GHG emissions from biomass fuel; Scope 2 emissions totaled 373,670 metric tons CO₂e. The data above does not include emissions of subsidiaries. Subsidiaries have compiling their inventory in 2022, and the inventory will be formally disclosed after verification in 2024.

GHG emission factors were based on the GHG emission factory management table declared on the national registration platform of Taiwan's Ministry of Environment, the IPCC 2006, emission factors released by Taiwan's Energy Administration, Ministry of Economic Affairs, and emission factors made public by the company-owned steam plant of Nan Ya Plastics Corporation's utility plant. The GWP value is cited from the IPCC AR5. Compared with the base year of 2017, the greenhouse gas emissions in 2023 increased by approximately 14%, and the number of chips produced decreased by approximately 5%. In terms of emissions per unit wafer, emission intensity in 2023^{Note2} is 0.9 kg CO₂e/wafer area (cm²), which is slightly higher than the emission intensity in 2021. However, judging from the emission intensity per unit wafer, GHG emissions per unit capacity in 2023 (430 kg CO₂e/thousand die) decreased by 29% compared with the baseline year of 2017.

Percentage accounted for by Scope 1 and Scope 2 emissions in 2023

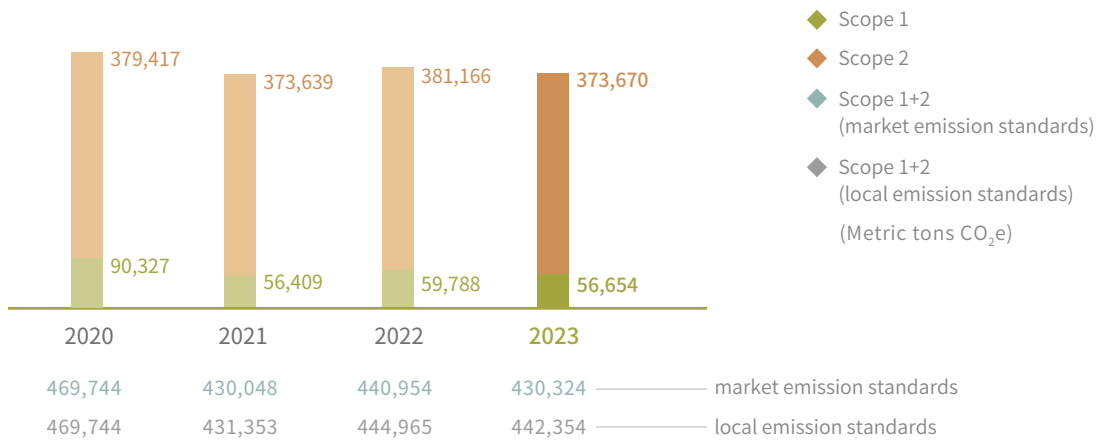


Percentage accounted for by Scope 1 GHG emissions in 2023



Note 1: The Company referenced 2024 version of Greenhouse Gas Emission Verification Guidelines.
Note 2: Emission intensity: the amount of greenhouse gas emitted from per unit wafer area output.

Scope 1+2 emissions



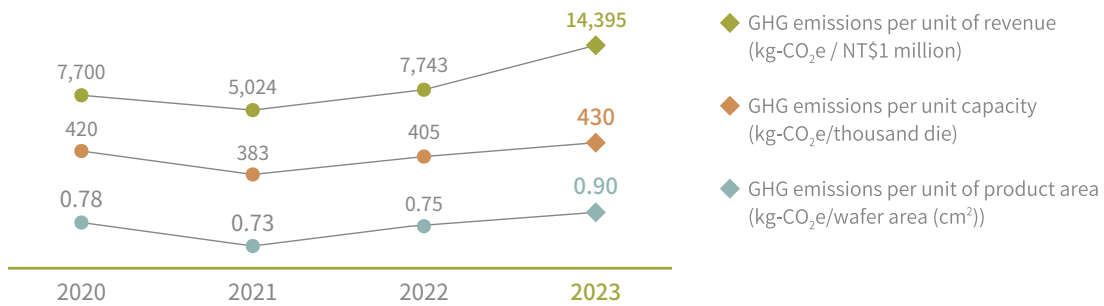
Note 1: PFCs emissions totaled 9 types of process gases, including carbon tetrafluoride (CF₄), perfluoropropane (C₃F₈), hexafluorobutadiene (C₄F₆), tetrafluorocyclobutane (C₄F₈), trifluoromethane (CHF₃), difluoromethane (CH₂F₂), monofluoromethane (CHF), sulphur hexafluoride (SF₆), and nitrogen trifluoride (NF₃).

Note 2: Other direct emissions included CO₂, CH₄, N₂O of process gas, HFCs, and SF₆ of non-process gas, such as fire extinguishing equipment, refrigerators, freezers, and high-voltage power panels.

Note 3: Indirect energy emissions include electricity and steam use, in which the carbon emission factor of electricity is 0.494 kg CO₂e/kWh announced by The Energy Administration, MOEA on April 26, 2024.

Note 4: Starting in 2021, we installed N₂O reduction equipment in the film process, so Scope 1 emissions decreased.

Table heading: GHG emission intensity^{Note 1}



Note 1: GHG emissions in this table includes Scope 1 and Scope 2.

Note 2: The calculation of production capacity was the output of Good Electronic Chip (GEC), and the output of various products was converted into around 4Gb product particle numbers, using per thousand die (k-pcs) as the calculation unit.

To improve the integrity of greenhouse gas (GHG) inventory in our value chain, we have conducted scope 3 inventory in accordance with the Greenhouse Gas Protocol, and have met the ISO 14064-1 standards. The emissions of 7 items in Scope 3 GHG emissions passed verification in 2023. Among all emission categories, the use of sold products generated the most GHG emissions, followed by purchased goods and services, and third is emissions generated by the processing of sold products.

Scope 3 Emissions

Scope 3	Source of calculation	Scope 3 (ton-CO ₂ e)
★ Purchased goods and services	Carbon emissions from the main material purchased and auxiliary materials in the process	100,956
★ Fuel- and energy-related activities	Carbon emissions from the ton-km for transporting fuel used in the factory and energy transported to the factory	82,395
★ Upstream transportation and distribution	Carbon emissions from the ton-km for transporting main materials and auxiliary materials purchased from suppliers to the fab and packaging plant	1,946
Downstream transportation and distribution	Carbon emissions from the ton-km for transporting products from the plant to customers	2,375
Emissions from processing sold products	Carbon emissions according to capacity allocated in the packaging and testing section	107,112
★ Employee commuting	Carbon emissions from company cars and commuting	2,068
★ Business travel	Carbon emissions from employees traveling overseas on business trips	50
★ Waste generated by operations	Carbon emissions from waste generated in the production process, including waste transport and disposal.	1,206
★ Use of sold products	Carbon emissions from electricity consumption of products used by customers	487,767
Assets and equipment	Investments in equipment and property	31,003
Total		816,878

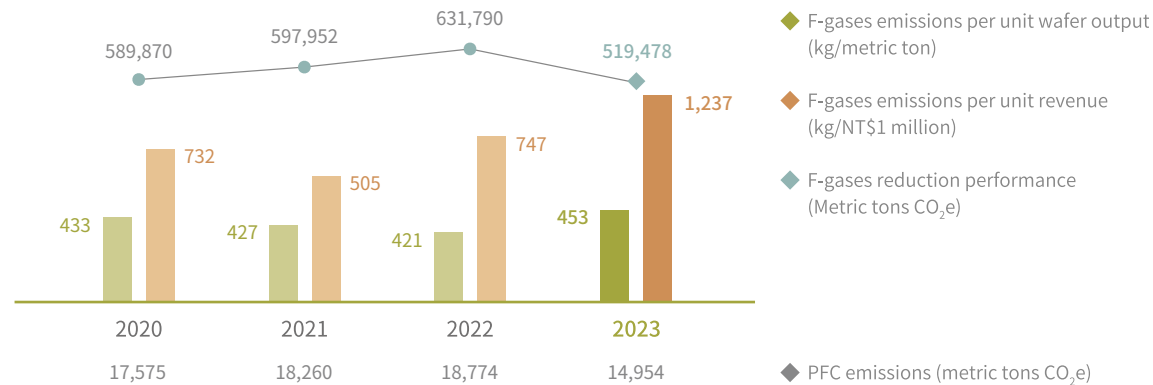
Note 1: ★ The items in Scope 3 GHG emissions passed verification in 2023.

Note 2: Source of main emission factors in Scope 3: The SimaPro9.4.0.2 database is reference for products and services purchased; the carbon footprint platform is referenced for fuel and energy related activities, upstream and downstream transportation and distribution, employee commuting, waste generated by operations, and use of sold products; the ICAO carbon emissions calculator is referenced for business trips; GHG emissions is distributed based on investment percentage in investee companies for investments.

• Greenhouse Gas Reduction

We have actively promoted voluntary reductions and participated in the annual voluntary reduction promotion plan of industrial greenhouse gases implemented by the Industrial Development Administration, MOEA. As Fluorinated Greenhouse Gases (F-gases) have high global warming potential^{Note 1}, Nanya has implemented GHG reduction plans starting in 2006. When planning to build fabrication plants, we have purchased Local Scrubber with high reduction rate. Currently, the PFCs Local Scrubber^{Note 2} used in the thin film and etching processes is Burn Type, destroying PFCs through the high temperature generated by combustion. To reduce PFCs emissions, we established PFCs reduction acceptance standards for local scrubber, in which CF₄ treatment efficiency must reach 90% and above, the reduction rate of C₃F₈, C₄F₆, C₄F₈, CHF₃, CH₂F₂, and SF₆ must reach 95% and above, and the reduction rate of NF₃ must reach 99% and above. After the local scrubber is installed, FTIR^{Note 3} is used to test PFC reduction rate, in order to meet future reduction trends.

PFC emission trends



Through purchasing Local Scrubber with high PFC reduction rate when planning to build fabrication plants, and promoting programs on reducing the use of PFC in process, we aimed to reach a reduction rate of at least 90%. From 2020 to 2023, the reduction rates of PFC gases used in process all reached a minimum of 93%, reducing a total of 2,339,090 metric tons CO₂e emissions in these four years, equivalent to 6,052 times carbon absorption of Daan Forest Park for one year. (Note: According to the Ministry of Economic Affairs Energy Administration's website: Using CO₂ absorption of Daan Forest Park at 386.5 tons per year for calculation)

Note 1: Global Warming Potential (GWP) is the warming intensity of the gases relative to carbon dioxide (set the CO₂'s GWP = 1); The high global warming potential referred in this article are the gases with a GWP value higher than 675. (Based on the GWP values of the IPCC Fourth Assessment Report (FAR))

Note 2: Local Scrubber: local exhaust processor. Note 3: FTIR: Fourier-Transform Infrared Spectrometer

• Carbon Disclosure Project

Upholding the principle of transparent disclosure, we have participated in the evaluation of the Carbon Disclosure Project (CDP), a non-profit organization, since 2009, disclosing related information regarding greenhouse gas emissions and reductions every year. We rated at the leadership level in climate change between 2018 and 2023. In addition to disclosures of information on carbon emissions in the CDP and this report, Nanya also actively discloses information on GHG emissions and reduction in the GHG report system of the Responsible Business Alliance (RBA), or provides information on carbon emissions of products to help customers establish the basis for calculating product footprint.

• Internal carbon pricing

In response to climate change and the global trend of net-zero carbon emissions, Taiwan's government announced in 2022 that it will achieve the goal of net-zero emissions by 2050, and thus implemented the "Climate Change Response Act" in 2023, which is the legal basis for imposing carbon fees on emission sources. To become aligned with international trends and Taiwan's regulations, the Company implemented an internal carbon pricing mechanism in 2022, the carbon emission cost of the Company's internal carbon pricing is calculated at NT\$100 per metric ton of carbon emissions. We include carbon costs in the internal management income statement as the basis for implementing carbon risk management, in hopes of raising awareness of carbon reduction among all employees to achieve energy conservation and carbon reduction.

The Company's carbon emissions in 2023 was 430,324 metric tons, and the carbon emission cost according to internal carbon pricing was NT\$43,032,412.

5.2 Energy and Resource Management

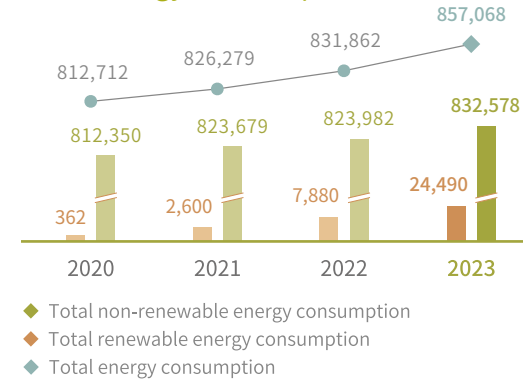
Energy Management

• Energy Structure

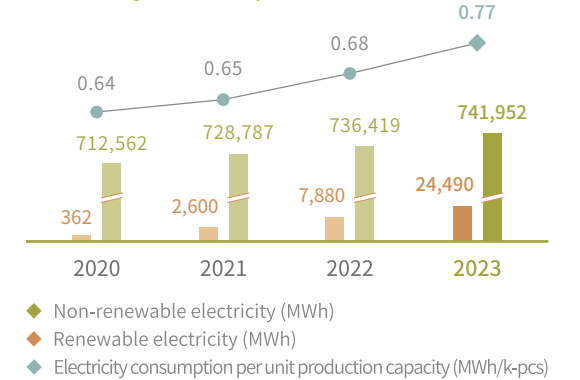
Service life and environmental impacts of fossil energy have been the most important issues so efficient management is urgent. Purchased electricity, steam, and natural gas are the main energy sources that Nanya uses; the Company does not use internal energy. Externally, other indirect energy consumption that generates greenhouse gas emissions includes raw materials transportation, production of raw materials suppliers, waste transportation/disposal, employee travel, and employee commuting. Nanya mainly used purchased electricity (accounted for 89.4% of the Company's energy consumption), natural gas (accounted for 6.4% of the Company's energy consumption), and steam (accounted for 4.2% of the Company's energy consumption) in 2023. The Company also used diesel, but it accounted for less than 0.02%, so it was not included in statistics of energy consumption indicators. The Company began purchasing renewable energy in 2020, and purchased renewable energy (electricity) in 2023 accounted for 2.9% of the Company's energy consumption. Nanya's production capacity^{Note 5} in 2023 decreased 8% compared to 2022. The continued adoption of advanced processes led to an increase in energy consumption. Hence, Nanya's total energy consumption (electricity + natural gas + steam) reached 857,068 MWh (3.09×10^9 MJ) in 2023, an increase of 3% compared to 2022, in which electricity consumption (including renewable and non-renewable) was 766,442 MWh (2.76×10^9 MJ^{Note 2}), natural gas consumption was 54,711 MWh^{Note 3} (1.97×10^8 MJ, 5,228,039 m³), and steam consumption was 35,915 MWh^{Note 4} (1.293×10^8 MJ, 47,482 metric tons). In terms of energy use intensity, the total energy consumption per unit capacity in 2023 was 0.86 MWh/k-pcs, an increase of 12.1% compared to 2022.

Regarding energy consumption management, Nanya has formulated the "Energy Review Management Procedure" to effectively manage the Company's energy use and consumption. Nanya uses the procedure to evaluate the status of various energy use and consumption, and identify its major energy uses, which are controlled with improvement goals set to achieve energy saving benefits. First, an energy use review list is prepared to compile statistics of equipment units and energy consumption, define major energy-consuming equipment, establish energy baseline data, and formulate appropriate performance indicators to achieve specific goals of energy conservation. Furthermore, energy reviews are conducted during regular monthly meetings, and priorities are set after considering improvement cost, energy saving potential, service life, regulatory requirements, and difficulty of improvement. Energy-saving plans are implemented based on the planning results. Implementation results reports and future goal planning are reviewed and approved at the annual senior management review meeting.

Total energy consumption



Electricity consumption from 2020 to 2023



2020 to 2023 natural gas consumed

	2020	2021	2022	2023
Natural gas consumption (Cubic meter)	4,494,478	4,682,857	4,780,740	5,228,039
Natural gas consumption (MWh)	46,743	48,702	50,030	54,711
Natural gas consumption per unit production capacity (cubic meters/k-pcs)	4.0	4.2	4.4	5.2

2020 to 2023 natural gas consumed

	2020	2021	2022	2023
Steam consumption (metric ton)	70,129	61,066	49,620	47,482
Steam consumption (MWh)	53,045	46,190	37,532	35,915
Steam consumption per unit capacity (Metric tons/k-pcs)	0.063	0.054	0.046	0.047

Note 1 : Electricity CO₂e emission is based on the electricity carbon emission factor = 0.495 kgCO₂e/kWh, published in 2022 by the Energy Administration, Ministry of Economic Affairs

Note 2 : Based on the Energy Product Unit Heating Value Table updated in 2020 by the Energy Administration for unit conversion, 1 kWh = 860 kcal = 3.6 megajoules; 1 MWh = 3,600 megajoules.

Note 3 : 1 cubic meter of natural gas = 10.465 kWh (Based on the Energy Product Unit Heating Value Table updated in 2020 by the Energy Administration, Ministry of Economic Affairs for unit conversion, 1 kWh of electricity = 860 kcal; 1 cubic meter of natural gas = 9,000 kcal)

Note 4 : Steam used in plants is steam with a saturation temperature of 132.88°C. According to the table of saturated steam, 1 metric ton of steam = 650,500 kcal/metric ton = 756.4 kWh (1 kWh = 860 kcal).

Note 5 : The calculation of production capacity was the output of Good Electronic Chip (GEC), and the output of various products was converted into around 4Gb product particle numbers, using per thousand die (k-pcs) as the calculation unit.

Note 6 : The calculation of energy consumption reduction is mainly based on the actual measured energy consumption of the equipment before and after the improvement. If it cannot be measured, it is calculated as the difference in rated power of the equipment before and after improvement x number of operating hours.

• Renewable Energy Use and Planning

Nanya carries out planning and implementation of renewable energy use in the following three phases.



1 Self-development evaluation and trial implementation

Nanya purchased 362 T-RECs through the renewable energy trading platform in 2020, and also began evaluating available spaces in existing fabs. We installed 27.36 kW of solar panels on the rooftop of our new building, which was completed and began use in 2022. The solar panels generated 30 MWh of electricity in 2023 (sold to Taiwan Power Company). New fabs in the future will also fully utilize land resources and evaluate the installation of green energy facilities.



2 External cooperation

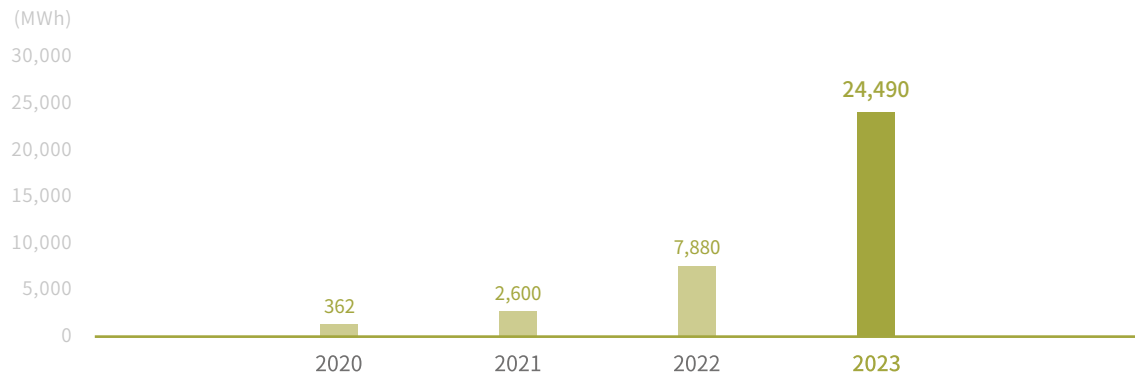
Nanya cooperates with renewable energy based electricity generation and selling companies to obtain more electricity, and is expanding the use of renewable energy based on regulatory requirements. Nanya used 24,490MWh (8.8×10^7 MJ) of solar power in 2023, accounting for 3.2% of the Company's electricity consumption. Nanya plans to sign solar power contracts for another annual 25,000 MWh (9×10^7 MJ) in 2024.



3 Becoming aligned with international standards by achieving net zero emissions

For the percentage of renewable energy to reach 25% by 2030 to achieve the SBT or RE100, Nanya will target the supply contracts of large renewable energy plants to eventually use 100% renewable energy.

Renewable energy use in Y2020-Y2023



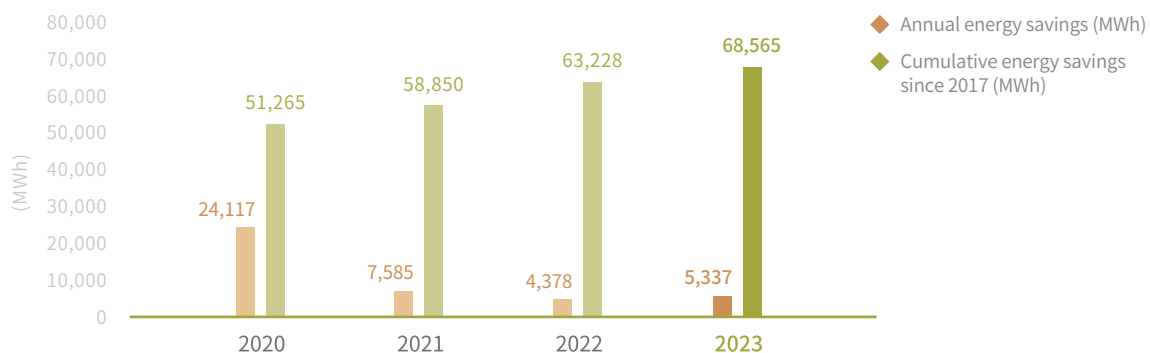
• Enhancing energy usage efficiency

In order to mitigate the environmental impacts of greenhouse effect when building fabrication plants, energy conservation is the base for the plans, such as adopting a dual-temperature chilled water system and waste heat recovery and utilization in freezers. Over the past years, we have constantly implemented various energy-saving technologies, using diverse thinking methods, such as automating equipment control, improving equipment efficiency, reclaiming energy for reuse, and improving production management, to reduce energy consumption. Meanwhile, we prioritize energy conservation equipment during the design of equipment installation and procurement. Nanya introduced the ISO 50001 Energy Management System in 2018 and completed verification. To strengthen the concept of energy conservation among employees, it has trained dedicated energy management personnel in each unit to facilitate energy management and the implementation of energy conservation in each department. Currently, there are 119 qualified energy management personnel, and 228 employees completed training over the years.

Nanya completed the investment of NT\$21.8 million to establish an energy management system platform in 2020, and utilized the energy consumption real-time monitoring platform for statistical analysis of system equipment and smart energy conservation management. The platform helps manage and improve energy consumption of organizations and machinery groups, and promotes best practices of energy management and reinforces good management behavior. We introduced an energy baseline in the energy management system platform in 2023 to continue optimizing system functions. This will also benefit real-time analysis of equipment energy consumption and strengthen management functions, and is expected to be completed in June 2024. Furthermore, by participating in the "Energy and Water Conservation Service Team" organized within the Company, water and energy conservation experts and experts from affiliated enterprises are assigned to visit each factory area (including the Company to provide on-site guidance and audit water and energy conservation. The area covers the Formosa Plastics Group's factories in northern, central and southern Taiwan. We hope that audits and guidance from experts will effectively improve the water and energy conservation results of each factory area.

Energy conservation goals set by Nanya for 2025: The cumulative energy saving from 2017 to 2025 is 75,000 MWh/year. In 2023, a total of NT\$14.67 million was invested to complete 36 energy conservation management plans, with a total energy saving benefit of 5,337 MWh/year^{Note 6} (1.92×10^7 MJ/year). We implemented 29 energy conservation plans (26 new plans, 3 ongoing plans) in 2024, and expect to save 6,804 MWh/year (2.45×10^7 MJ/year).

- Energy consumption real-time monitoring platform



• Highlight energy saving projects

Optimization of the heat dissipation device of HIM machine

saved **1,188 kWh** per machine

The factory-side exhaust system on the upper end of machinery and equipment is integrated for heat dissipation. During exhaust, negative pressure is used to extract air around the clock. The machine's 3 cooling fans (55W each) can be turned off, so each machine can save about 1,188 kWh/month, as the number of machines continues to increase with fab expansion, it will reduce electricity consumption considerably. We continue to review high-energy-consuming equipment in fabs and improve unnecessary electricity consumption, transitioning towards lower carbon emissions.

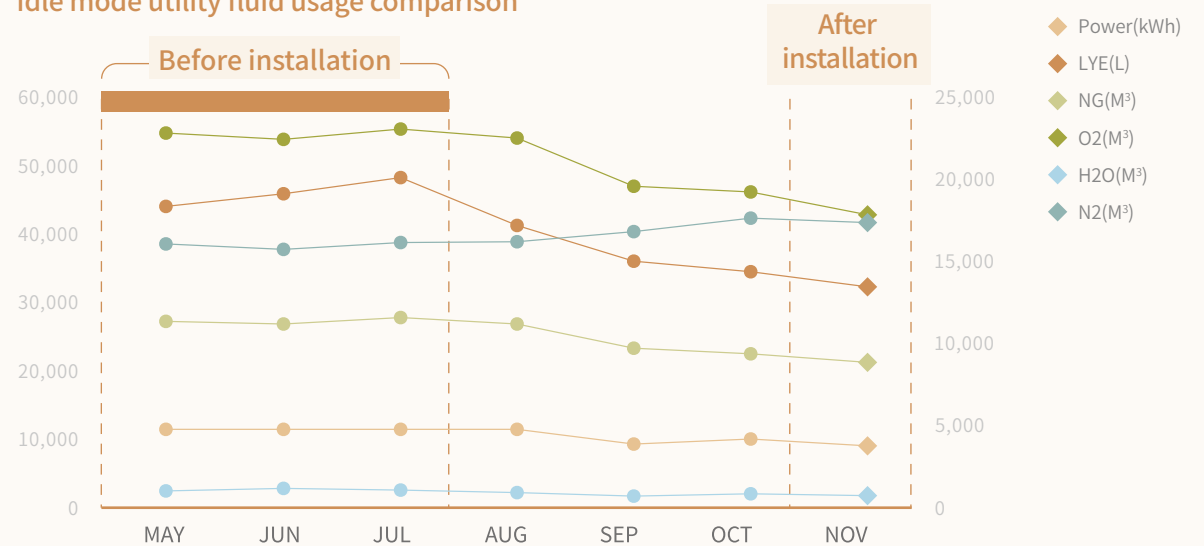


Introduction of the automatic energy-saving function of the exhaust gas treatment device

treatment device saves **920,000 kWh** per year

Most of the process waste gas generated by semiconductor production machines uses a local scrubber to reduce NF₃/PFCs /N₂O and other GHG emissions to reduce the impact on the environment. Most of the local scrubbers used by Nanya uses combustion to treat the GHG emissions from production. However, the process waste gas treatment equipment cannot be changed with machine utilization rate, which not only wastes liquid fuel, but also increases operating costs. Therefore, the automatic energy-saving function of the waste gas treatment device is introduced on the production machine. The ignition timing of the combustion-type waste gas treatment device is controlled by changes in process gas pressure, so that the status of the reaction chamber of the main equipment and the waste gas treatment device operate synchronously. When the process machine's reaction chamber status is low utilization or maintenance, the waste gas treatment device will automatically turn on the idle mode function to reduce the energy consumption of the combustion-type waste gas treatment equipment, thereby achieving the purpose of energy saving and reducing costs. After the automatic energy saving function is installed, an average annual energy saving of 923,146 kWh can be achieved.

Idle mode utility fluid usage comparison



Water Resource Management

Due to the effect of global climate change, rainfall has become polarized in Taiwan, resulting in floods and water shortages occurring at the same time. As an important member of the semiconductor industry, Nanya has monitored the risk of water shortage caused by global climate change, and understands the effect of climate change and water resources on operations. Nanya continues to implement water conservation measures and strives to recycle and reuse water to reduce its impact on the environment and the risk of water shortage. Nanya adopted the Alliance for Water Stewardship Standard (AWS) in 2023, and actively implements the five major results of AWS, continuing to systematically implement sustainable water resources management.

Nanya's efforts in water resource management has gained the recognition of the CDP, which is an international environmental evaluation indicator. Nanya was ranked at the leadership level "A" in Water Security in 2022-2023. Nanya was recognized for its efforts in climate change and water resource management for global sustainability with the "Water Resource Management Leadership Award" in the 15th TCSA in 2022 and 16th TCSA in 2023. Nanya has formulated and disclosed its water resources management policy. Nanya complies with the AWS in actively implementing the sustainability goals of water resources management. Nanya's water resources management policy is as follows :

A Continue to optimize the management of water resources in plants through personnel education and training, organizational planning, water conservation, and the establishment of response systems.

B Disclose quantifiable water operation indicators, with the main goal of continuously improving water efficiency.

C With the goal of improving the water quality of effluent, we continue to improve the water treatment system to reduce the impact of operations on the watershed.

D Maintain the health of important water-related areas through environmental education and continuous monitoring.

E Establish good environmental sanitation and drinking water quality systems in the factory area to reduce the occurrence of infectious diseases.

Water Resource Management Actions

Nanya's water resources management focuses on the following directions. All strategies and requirements cover all operations, R&D, and production locations. Water use, water conservation, and water risk assessment are reported and reviewed by the board of directors every year.



Actively manage indicators, conserve water in operations, and fully utilize water resources.



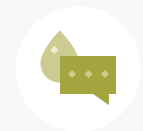
Implement wastewater classification treatment and multiple recycling measures to maximize the efficiency water resources.



Assess the risks and opportunities under climate change, and mitigate the impact of water shortage.



Comply with laws and regulations, continue to strengthen water treatment facilities, and reduce the risk of environmental pollution.

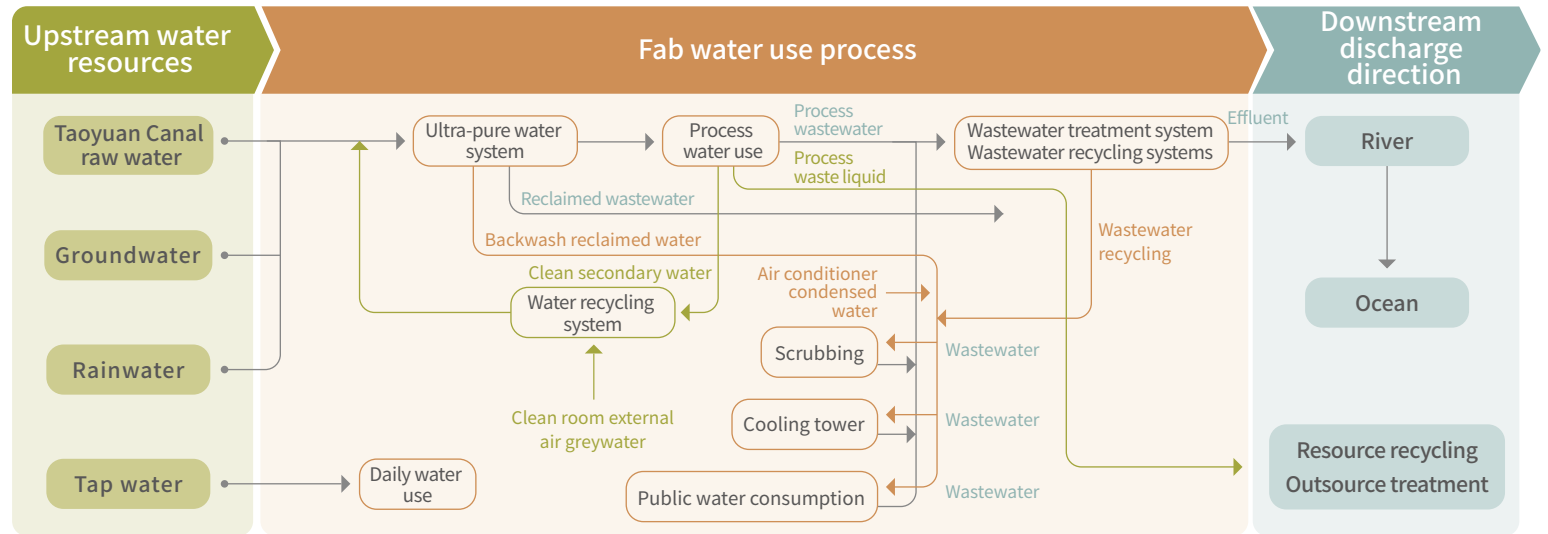


Communicate with stakeholders so that they will take water resources seriously and implement water conservation.

Water Resources Structure

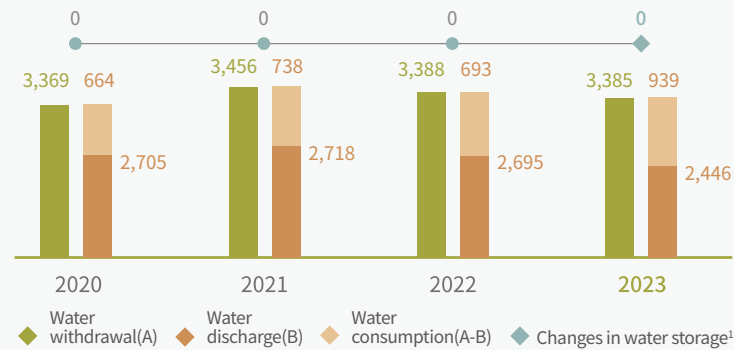
Nanya's total water withdrawal was 3,385 million liters in 2023, in which Taoyuan Canal is the main source of water, accounting for approximately 96.4% (3,265 million liters), followed by well water at approximately 2.8% (94 million liters), and tap water at approximately 0.8% (26 million liters). Rainwater was recycled and reused every year in the past, but was temporarily suspended in 2023 due to equipment changes of new fab expansion. The total water withdrawal in 2023 was 0.1% lower compared to 2022. Nanya's production capacity in 2023 was 8% lower compared to 2022. In terms of water use intensity, the water consumption per unit capacity in 2023 was 3.38 thousand liters/k-pcs, an increase of 8.7% compared to 2022. Ultra-pure water consumption was 3,398 million liters in 2023, down 5% compared to 2022. In terms of water use intensity, ultra-pure water consumption per unit capacity was 3.4 thousand liters/k-pcs, an increase of 3.3% compared to 2022.

Nanya's Water Consumption Structure

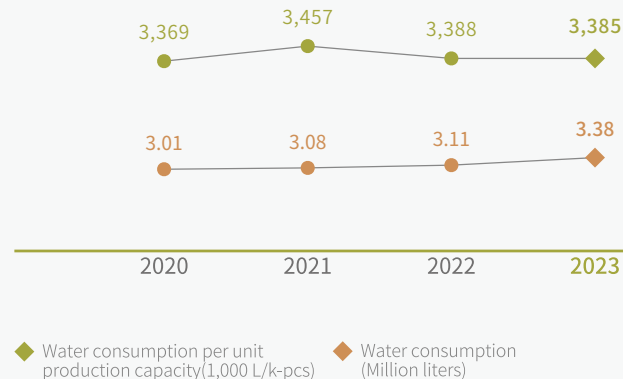


Nanya water consumption

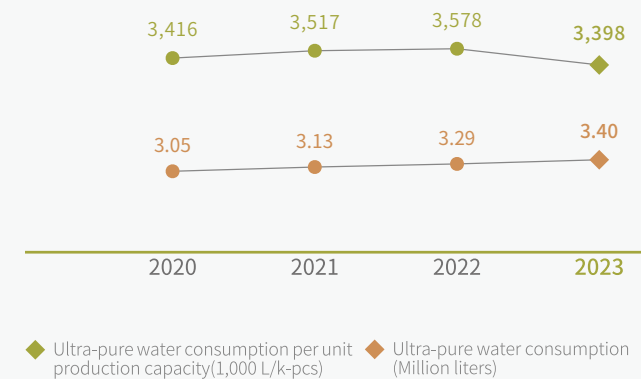
Unit : Million liters








Run chart of water consumption



Run chart of ultra-pure water consumption



• Water Resource Risk Management

Water risk factors	Assessment method	Assessment results and reactions
 <p>Water-related dependencies and shocks</p>	<ul style="list-style-type: none"> ◆ Water Risk Assessment Tool (WRI Aqueduct Tool). ◆ Referring to the economic environment accounting system, including supply services, adjustment and support services, cultural services, etc., dependencies and impacts are identified through cross-departmental workshops. 	<ul style="list-style-type: none"> ◆ Simulation analysis of the risk level of water source. The water source is Taoyuan Canal from Shimen Reservoir. The water supply accounts for 96.4%. The water pressure assessment result is "low". The short-term water pressure assessment result is medium-low risk (10-20%); The long-term 2050 is also a medium-low risk (10-20%), that is, a non-water-stressed area. ◆ Water resources are an ecosystem service that Nanya relies on. At the same time, semiconductors' extensive use of water resources will also cause additional impacts, including not only water grabs from neighboring communities or companies, but also ecosystem damage caused by excessive water use. ◆ Nanya will discharge wastewater during its operations. Although the wastewater complies with regulatory standards, if the total discharge exceeds the environmental load capacity of the area, it will still lead to the loss of biodiversity.
 <p>Future water availability</p>	<ul style="list-style-type: none"> ◆ Climate change water resource hazard map information from the Taiwan Climate Change Estimation Information and Adaptation Knowledge Platform Project (TCCIP), under the RCP 8.5 mid-century (Y2036~Y2065) scenario. 	<ul style="list-style-type: none"> ◆ The average annual rainfall in northern Taiwan increased by 12%, but the spring rainfall decreased by 5%. Nanya's backup water source volume is greater than the decrease in rainfall. It is estimated that the Shimen Reservoir will still be able to meet production requirements due to reduced rainfall in the spring and reduced water supply in the future. demand, no risk of water shortage. ◆ The water supply of Shimen Reservoir is about 800 million liters per day, and Nanya's daily water consumption is about 10 million liters. Therefore, the impact of Nanya's operations on regional water use is 1.25%.
 <p>Future water quality</p>	<ul style="list-style-type: none"> ◆ Introducing Alliance for Water Stewardship Standard, AWS 	<ul style="list-style-type: none"> ◆ All wastewater is collected and discharged to appropriate sewage facilities for treatment. The wastewater is divided into 28 types of pipelines in the diversion and distribution section. In order to ensure that the discharged water quality meets the standards, it has been synchronously connected with the Environmental Protection Bureau to monitor the discharged water quality, and will be commissioned every quarter. Regular external sampling, analysis and testing are carried out to strengthen wastewater quality control. ◆ When the Shimen Reservoir discharged water during the typhoon period, the water supply was affected by high turbidity due to sediment alluvial. Since the layered water intake project of the Shimen Reservoir has been completed in 2021, the high turbidity of the raw water has been greatly alleviated, and the plant has been A rapid settling tank can be set up to treat raw water with high turbidity (<10,000NTU), and the risk of future water quality affected by high turbidity on water supply will be assessed with low risk.
 <p>Local stakeholders</p>	<ul style="list-style-type: none"> ◆ The water supply capacity of Shimen Reservoir owned by Nanya Technology Water Source is approximately 800 million liters per day, and the company's daily water consumption is approximately 10 million liters. Therefore, the impact of Nanya Technology's operations on regional water use is 1.25%. 	<ul style="list-style-type: none"> ◆ Nanya's production water mainly comes from Taoyuan Canal. It has signed a water supply contract with the management unit of Taoyuan Canal. The water supply volume has been agreed to ensure the stability of the water supply. It has also been agreed that the contracted water volume can be exceeded to facilitate emergency replenishment in the event of water shortage and increase water flexibility. ◆ Nanya has united with nearby Formosa Plastics Group factories to establish a water shortage emergency response organization. Through this emergency response organization, emergency water supply support can be allocated to each other. There has never been any production loss due to water shortage. ◆ Communicate with local residents and the public, and disclose information related to Nanya water management to eliminate public doubts about Nanya water management.
 <p>Water related regulations</p>	<ul style="list-style-type: none"> ◆ Regulations on Water Conservation Charge 	<ul style="list-style-type: none"> ◆ The water recovery rate in 2023 has been certified by a third-party impartial unit to reach 95.8%, which is higher than the industry benchmark value announced by the government (50%~85%) and reaches the minimum rate collection calculation standard announced by the government. It is estimated that the annual water fee increase will only be about 3 %, with low impact on operating costs.

• Water Resource Risk Management

Our main water source comes from the Shihmen Reservoir, and is channeled and processed through the Taoyuan Canal before being supplied as production water. The gravity flow is used to independently channel water without affecting the ecology of water resources and any other purposes of usage. In addition, rainwater harvesting can supply production water and tap water for household use. Nanya currently only has one production area located in New Taipei City, Taiwan. Taiwan's rainfall is extremely unevenly distributed between regions and seasons, which often results in regional and seasonal droughts. We used the WRI Aqueduct Tool assessing water risk to simulate and analyze the risk of water sources. For the Taoyuan Canal of Shihmen Reservoir, which supplies 96.4% of water, the water stress assessment result was "low", meaning that it has medium to low risk (10-20%) in the short-term. Long-term stress to 2050 is also low to medium risk (10-20%), meaning that it is a non-water stress area. In addition, according to the climate change water resource hazard map of the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), in scenario RCP 8.5 in the middle of the century (Y2036-Y2065), the average annual rainfall in northern Taiwan increased by 12%, but rainfall in spring decreased by 5%. The Company's backup water supply volume is greater than the decrease in rainfall. Despite the lower rainfall during spring and lower water supply from Shihmen Reservoir, the water supply will still be able to meet production needs without the risk of water shortage.

In addition, when Shihmen Reservoir discharges water during a typhoon, silt washed into the reservoir causes high water turbidity is high and affects the water supply. Since the Shihmen Reservoir layered water withdrawal project was completed in 2021, the high turbidity of raw water has been greatly improved, and the fab has a fast settling tank that can treat raw water with high turbidity (<10,000NTU). Hence, we determined that high turbidity has low risk of affecting water supply in the future. The government began to collect water conservation charge in accordance with the "Regulations on Water Conservation Charge" in 2023. Nanya has dedicated its efforts to water recycling, and Nanya's water recycling rate has been certified by an impartial third party to reach 95.80%^{Note 2}, which is better than the industry standard announced by the government (50%-85%), and qualifies for the minimum charge rate announced by the government. Therefore, the increase in water fee each year is expected to be only about 3%, and only has low impact on operating costs.

Note 2: The recycling rate for water conservation charge is calculated based on the formula set by the Industrial Development Administration of the Ministry of Economic Affairs.

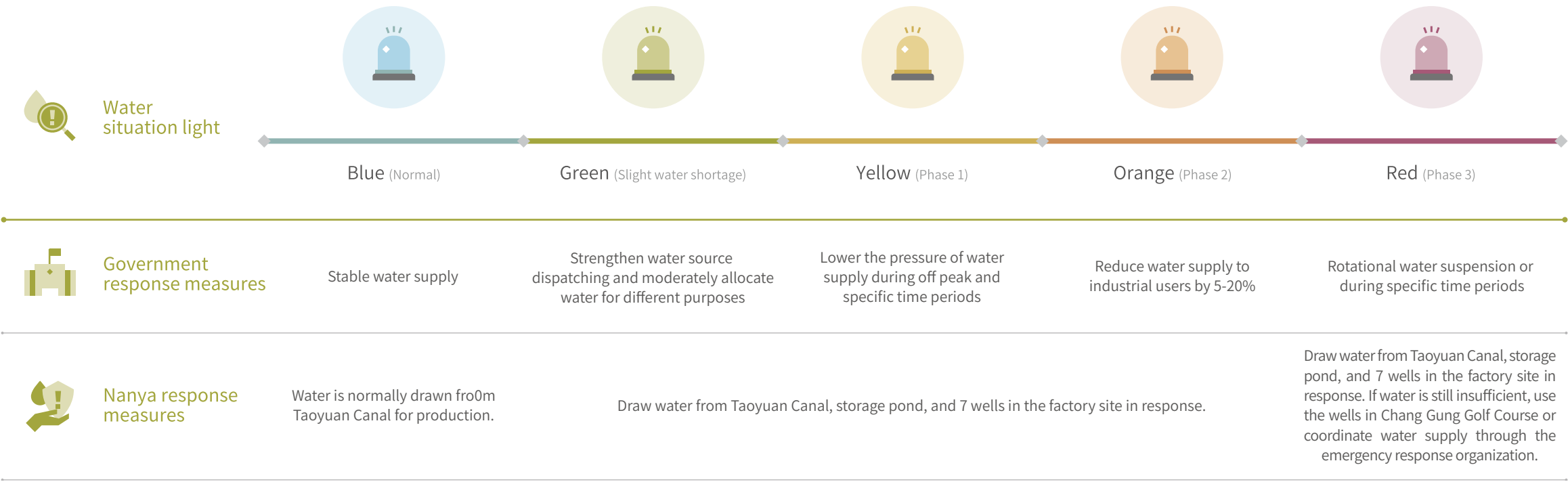
Nanya's water source Shihmen Reservoir supplies approximately 800 million liters/day. The Company's daily water consumption is approximately 10 million liters. Hence, the effect of Nanya's operations on regional water use is 1.25%. Water used by the Company for production is mainly supplied by Taoyuan Canal, and the Company has signed a water supply contract with the management unit of Taoyuan Canal: Irrigation Agency, mainly agreeing on the water volume supplied to ensure the stability of the water supply. The contract also stipulates that the Company may withdraw water exceeding the agreed volume as a temporary water source for emergency replenishment, increasing the flexibility of water use. Nanya participates in the semiconductor industry association, periodically attends meetings of the "water resource diversified management and cooperation platform" of the Water Resources Agency, understands the water supply situation, and engages in exchanges, communication, and cooperation in water resource related policies. Other locations include the design house in Hsinchu, Taiwan, overseas design houses, and sales offices (including San Jose, Houston, and Burlington in the US, Dusseldorf in Germany, Shenzhen in China, and Tokyo in Japan). Since the locations are all offices and do not engage in any production, there is no effect on operational risks. We established a standard process and procedures and examined water resource related risks through the environment management framework and company operational risk management framework, implementing related improvement measures and formulating emergency response plans, which are periodically examined in quarterly meetings of the Sustainability Promotion Center and Risk Management Steering Center.

To reduce the risk of short-term water shortages inherent in the geographical location, we have continuously promoted water-saving measures, and committed ourselves to water recycling to strengthen our adaptability. The amount of water needed by production is huge so water shortage will cause production interruptions, affecting the output and delivery. To mitigate immediate impacts caused by short-term water shortages, a cistern with a capacity of 43 million liters and two detention basins each with a capacity of 4.06 million liters have been built in the plant to effectively harvest rainwater during the rainy season. Moreover, Nanya and the adjacent factories of the Formosa Plastics Group have cooperated to set up an emergency response organization for water shortages. When water shortages occur, the members of the emergency response organization can urgently deploy water resources to support each other. Therefore, no production losses have occurred owing to water shortages.

• Development of multiple water sources to reduce production risks

In coordination with the expansion of the new Fab 5A, we have applied to the water company to supply tap water for processes, with a daily water supply of 11 million liters. We plan to install 8 more groundwater wells outside the factory area, with a daily water supply of 7.2 million liters. The tap water source of the Taishan plant is included and equipment and pipelines were renovated, with a daily water supply of 2 million liters. We will continue to pay attention to the government's reclaimed water development plan. Since the government currently does not have an appropriate reclaimed water utilization plan for the location of the factory area, we will continue to pay attention to the government's plans, and introduce it at an appropriate time.

Nanya drought response mechanism



• Water Conservation

In addition to the design of water-saving processes, the Nanya's water management chiefly emphasizes water reduction and recycling. To manage Nanya's water efficiency, the Company's long-term (2025) water resources management goal is to reduce the cumulative water consumption per unit capacity in 2025 by 39% compared with 2017. We hope to improve water efficiency and recycled water volume through the improvement of production processes and equipment, thereby reducing water consumption. The implementation of water conservation covers all operations, R&D, and production locations. Currently, the main directions of implementation are as follows:

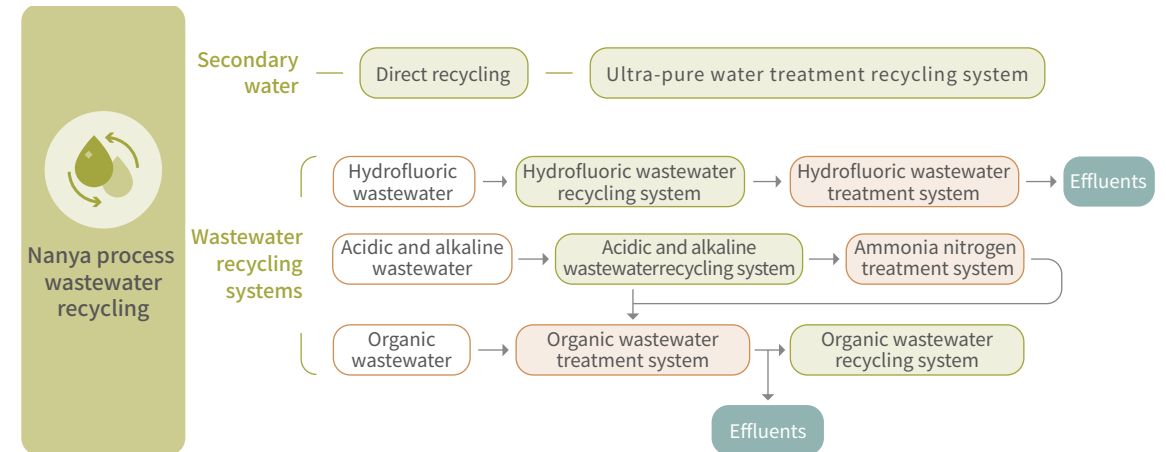
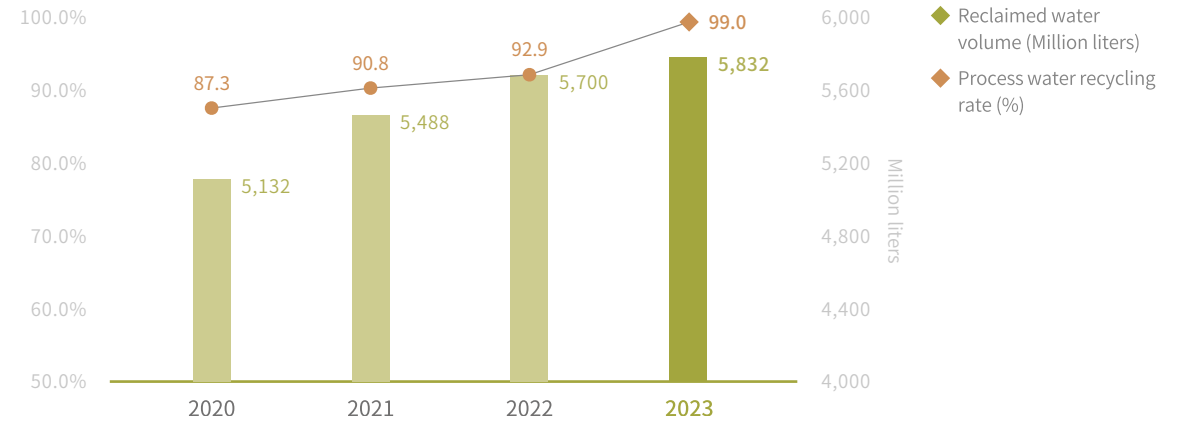
- A** Implement water-saving results through work guidelines.
- B** Reach the reduction effects through methods of conservation such as reduction and recycling.

- C** Promote water conservation through daily management practices.
- D** Build waste water classification treatment and adopt multiple recycling to maximize the use of water resources.

Nanya is actively implementing a number of water-saving measures, and has dedicated even greater effort to water recycling in recent years. The fab currently has acid-alkaline wastewater, hydrofluoric wastewater, and organic wastewater recovery systems. Along with the implementation of various water saving measures, the process water recycling rate has increased each year. The improvement and expansion of the hydrofluoric wastewater recovery system in FAB 3AN and construction of new hydrofluoric wastewater COD and total nitrogen treatment systems (including water recovery system) were completed in 2023, and is expected to further increase the amount of reclaimed water by 522 million liters per year. After years of continuous efforts, process water recycling rate reached 99% in 2023, the wastewater recycling system, process recycling system, and pure water process wastewater recycling and reuse volume totaled 5,832 million liters in 2023, accounting for 172.3% of total water withdrawal.

Nanya's process water recycling rate is calculated using the formula specified by Hsinchu Science Park Bureau, the same as peers in the industry.

Process water recycling rate and volume



2023 Water conservation plans completed

water-saving
benefits
531,425
thousand liters /
year

Completed 6 water conservation plans

- ◆ 2 construction and expansion of water recycling systems
- ◆ 1 reduction in number of equipment operating
- ◆ 3 improvements in equipment water-saving efficiency

Description	Water-saving benefits (Thousand liters/year)	As a percentage of annual Water conservation (%)
◆ FAB 3AN hydrofluoric waste water recycling system equipment improvement and expansion	156,950	29.53%
◆ Newly built hydrofluoric waste water COD and total nitrogen treatment system (includes water recycling system)	365,000	68.68%
◆ Cooling tower sand filter reduces water consumption	8,632	1.62%
◆ Burn Box sprinkler adjustment water saving improvement	205	0.04%
◆ EBARA NST Tool Idle Mode DI parameter adjustment	101	0.02%
◆ AMAT LK NST Tool Idle Mode DI parameter adjustment	537	0.1%

(thousand liters/year)

2024 Water conservation plans to be implemented

water-saving
benefits
50,927
thousand liters /
year

Continue to implement 7 water conservation plans

- ◆ 4 equipment and operation parameter adjustment plans
- ◆ 1 improvement to reduce domestic and cleaning water use
- ◆ 2 plans to increase the use of reclaimed water to further increase the amount of recycled water






Description	Estimated water saving benefit (Thousand liters/year)
◆ OWWR-II reclaimed water is used in the pure water system to increase the use of reclaimed water	45,000
◆ Install water saving valve on sink faucets	2,628
◆ Evaluate reduced use of equipment for water conservation x 2 plans	2,356
◆ Equipment parameter adjustment for water conservation x 2 plans	466
◆ Use reclaimed water for cleaning fab equipment to increase the use of reclaimed water x 1 plan	487

(thousand liters/year)

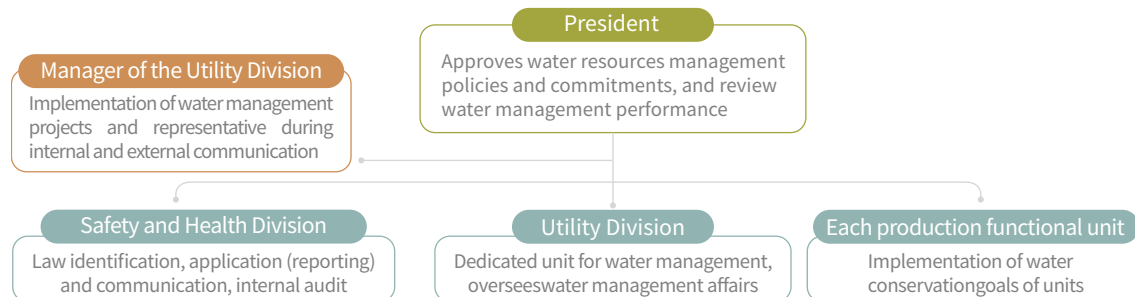
• Promoting AWS certification towards water resource sustainability management

In response to the severe challenge of climate change, Nanya adopted the world's only sustainable water management standard (Alliance for Water Stewardship Standard, AWS) in 2023 to implement water resource sustainability management. We continue to effectively and pragmatically manage every drop of water from the source to water use by processes and finally to discharge. We protect the ecological environment, cherish every drop of water, and continue to improve our water use efficiency. We will also continue to systematically implement water resource sustainability management based on the five major achievements of AWS,

Five Spirits and Requirements of AWS

	Good water management system	A good water management system ensures fair distribution of water resources, and allows different users and nature to share limited water resources.
	Sustainable water balance	The physical, chemical and biological indicators of natural water bodies can meet the needs of human use and the health needs of aquatic animals and plants.
	Excellent water quality	The physical, chemical and biological indicators of natural water bodies can meet the needs of human use and the health needs of aquatic animals and plants.
	Health of important water areas	Water-related areas with natural, social, or cultural value are effectively protected or restored to bring long-term value to people or the environment.
	Safe drinking water and environmental sanitation	All people have access to safe water supply to meet basic dietary and personal hygiene needs

Nanya's Sustainable Water Management Organization and Duties



Nanya's Five Major Achievements in AWS Implementation

Properties	Measures and results
 Good water management system	Nanya formulated the water resources management policies and standard processes and procedures for operations, in order to improve water management efficiency through systematic management. We reviewed water resources-related risks through the Company's risk management framework, implemented improvement measures, and formulated response plans to effectively manage risks. We are transparent and openly share water management-related information with stakeholders, and participate in environmental protection activities to improve the Company's image in society.
 Sustainable water balance	Nanya actively implements various water conservation measures, implements work policies to achieve water conservation results, achieves reduction through reduction and recycling methods, promotes water conservation through daily management methods, establishes wastewater classification treatment, and also adopts four major policies to promote multiple recycling and reuse methods, thereby maximizing the use of water resources. In recent years, Nanya has focused more on the construction of recycling systems, and implemented various water conservation measures. The process water recycling rate reached 99% in 2023, the total amount of wastewater recycled reached 5,832 million liters, accounting for 172.3% of total water consumption.
 Excellent water quality	All wastewater generated by Nanya is collected according to property classification and channeled into proper wastewater equipment for treatment. A total of 28 types of pipelines are distinguished in the wastewater distribution and piping section. To ensure that the quality of discharged wastewater is in line with regulations, we and the Environmental Protection Department have monitored the quality of effluents via synchronous connections. In addition, sampling, analysis, and detection are outsourced every quarter to improve wastewater quality management and control.
 Health of important water areas	Nanya began working with a professional ecology company in 2008 conduct biological resource surveys of animal and plant ecology in water and on land in surrounding areas of its fab. Ecological monitoring is periodically conducted and improvement measures are formulated for abnormalities, in order to lower the impact on biodiversity. Nanya maintains the ecological environment and strengthens environmental education through initiatives, such as removing Mikania micrantha from Wugu Wetland, beach cleaning, and sea cleaning.
 Safe drinking water and environmental sanitation	Nanya formulated operating standards related to drinking water in the fab, conduct regular testing and maintenance, and provide a clean and sanitary environment, so that employees, manufacturers and visitors can enjoy healthy and safe drinking water and a comfortable and adequate sanitary environment. Nanya formed a Pandemic Response Task Force in response to the COVID-19 pandemic in recent years. The task force divides tasks and conducts drills to reduce all epidemic risks in the Company's operations.

• Cooperation and Communication

Nanya continues to manage and evaluate internal water resources, and actively implements water conservation and water recycling and reuse. Nanya also communicates, exchanges, and cooperates with stakeholders through various methods, and communicates with government agencies through various opportunities to understand national water resource policies and developments. Nanya may further cooperate with the government to fulfill its corporate social responsibilities. Nanya shares its experience and provides guidance to suppliers to drive water conservation by the supply chain for the common good of society. Nanya communicates and discloses water management information to local residents and the general public, in order to eliminate any doubts the public may have about Nanya's water management. The Company provides employees with water management-related training to help employees understand the Company's water management-related policies, and facilitate the implementation of water conservation. In 2023, training was provided to all employees through the Company's training management system, with 3,511 people completing the training.



Government

- ◆ Participate in the semiconductor industry association, periodically attend "water resource diversification management and cooperation platform" meetings of the Water Resources Agency, and engage in exchanges, communication, and cooperation in water resource related policies.
- ◆ Attend meetings and coordinate and communicate with the Irrigation Agency and North Region Water Resources Office, and cooperate with the government's emergency response plan when there is a water shortage, in order to most effectively utilize water resources, mitigate the impact of water shortages in water supply areas, and achieve stable and balanced water supply.
- ◆ Participated in the road leveling project and pipeline coordination meeting of the Office of Road and Accessory Maintenance, Taoyuan City Government to understand whether the construction interface will affect the water supply situation through cross-unit meetings.
- ◆ In May 2023, we cooperated with the Irrigation Agency to implement the "Flow Monitoring Implementation Project," and installed an electronic flow meter with an RS-485 transmission interface at the water withdrawal point of Taoyuan Canal. It can link water use information, such as current flow and accumulated flow, to the Irrigation Agency's cloud network, so that the Irrigation Agency can accurately monitor water consumption in real time, and provide the reservoir management authority with accurate allocation of water supply, thereby avoiding waste of water resources.



Suppliers

- ◆ Suppliers are required to sign the Commitment to Corporate Social Responsibility. Water resources management and TCFD physical risk identification are planned in the supplier risk assessment questionnaire (SAQ). We cross referenced maps in scenario RCP8.5 of the IPCC AR5 published by the Climate Change Disaster Risk Adaptation Platform (DR.A) of the National Science and Technology Center for Disaster Reduction (hereinafter referred to as NCDR), and reviewed water resources risks of 31 suppliers of concern, ensuring that they have water resources management measures and emergency response plans for water shortages. We conduct on-site audits of high-risk and key suppliers, and provide guidance to make improvements for deficiencies. Therefore, we have assessed that the physical risks of climate change will have limited impact on Taiwanese suppliers, and will not disrupt production.
- ◆ We share, exchange, and provide guidance to suppliers for water management and conservation measures through supplier meetings, and encourage suppliers to conserve water and improve their water management measures. A total of 2 meetings were held in 2023, and a total of 39 suppliers participated in the meetings. We hope to jointly improve the water management-related actions of the overall supply chain through our experience.
- ◆ Nanya sets goals every year and works with the ESG team to conduct on-site audits and guidance visits to suppliers. In 2023, Nanya conducted on-site audits and made guidance visits to a total of 25 suppliers, in which 9 suppliers completed water conservation plans, with an annual water saving benefit of 1,744 million liters. In 2024, we plan to audit and provide guidance to 30 suppliers, with an estimated annual water saving benefit of 1,000 million liters.



Water resources management experience sharing and guidance during the 2023 Suppliers Meeting



Local residents

- ◆ Nanya formed an Environmental Quality Supervision Committee with the local community when it was first established, and commissions a third party to conduct surveys of surrounding ecology, hydrology, and air quality. Survey results are reported to the Environmental Quality Supervision Committee.
- ◆ Nanya learns about issues that community residents are concerned about through the Environmental Quality Supervision Committee, and includes the issues in its periodic evaluation of ISO 14001 Management Systems.
- ◆ To ensure that the water quality of effluent is normal and eliminate concerns residents may have about effluents from Nanya, we have established an effluent water quality real-time monitoring system that is linked to the Environmental Protection Bureau, jointly monitoring the water quality of effluents in real time.



Companies and the general public

- ◆ Nanya shares its water management experience through participation in various events, such as the green factory visit co-organized with the Industrial Development Bureau in 2021, during which we shared our water management and water conservation results with visiting government officials and companies.
- ◆ By participating in the "Energy and Water Conservation Service Team" organized within the Company, water and energy conservation experts and experts from affiliated enterprises are assigned to visit each factory area (including the Company) to provide on-site guidance and audit water and energy conservation. The area covers the Formosa Plastics Group's factories in northern, central and southern Taiwan. We hope that audits and guidance from experts will effectively improve the water and energy conservation results of each factory area.
- ◆ Nanya began operating a YouTube channel in 2019, and use Vlog, animations, video editing to present topics such as its corporate image, corporate sustainability, process and products, happy enterprise, and social participation, expanding the topics and immediacy of communication. The film "Environmental Sustainability – A Practitioner of Green Technology" shows the importance that Nanya attaches to water resources and its circulation and reuse. The film stood out from nearly 10,000 works from around the world and won the German iF Design award in 2021.
- ◆ Nanya began releasing an [AWS Sustainable Water Management Implementation Report](#) through its official website (Corporate Sustainability ESG) in 2023.

Raw Materials Reduction and Reuse

• Raw Materials Reduction

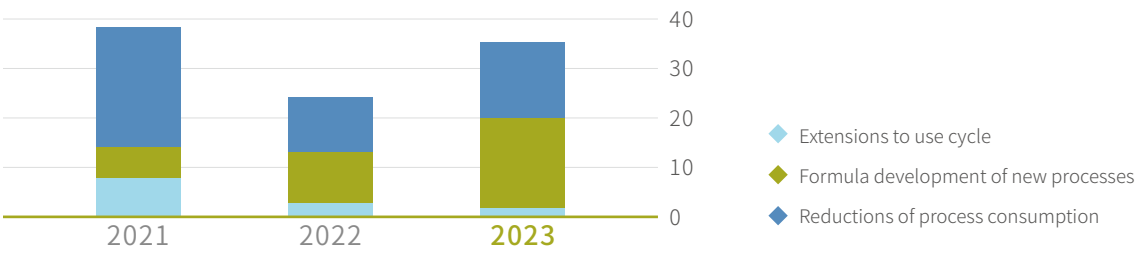
Nanya regularly reviews the rationality and appropriateness of raw material use. Moreover, we reduced the use of raw materials by streamlining the manufacturing process. The responsible organization of the company set implementation goals for raw material reductions every year, and periodically reviewed the performance of reductions in the entire company's raw materials. Accumulative 35 entries in improvement proposals regarding the consumption of raw materials were completed in 2023, including formula development of new processes, reductions of process time, extensions to use cycle, and reductions of process consumption. In the 2023 improvement plan, triethanolamine is recycled and reused at the machine end, and the consumption of a single wafer was reduced from 2.4 liters to 0.13 liters. The greatest benefit is an annual reduction of 296 tons.

Performance of raw material consumption improvement proposals in 2023

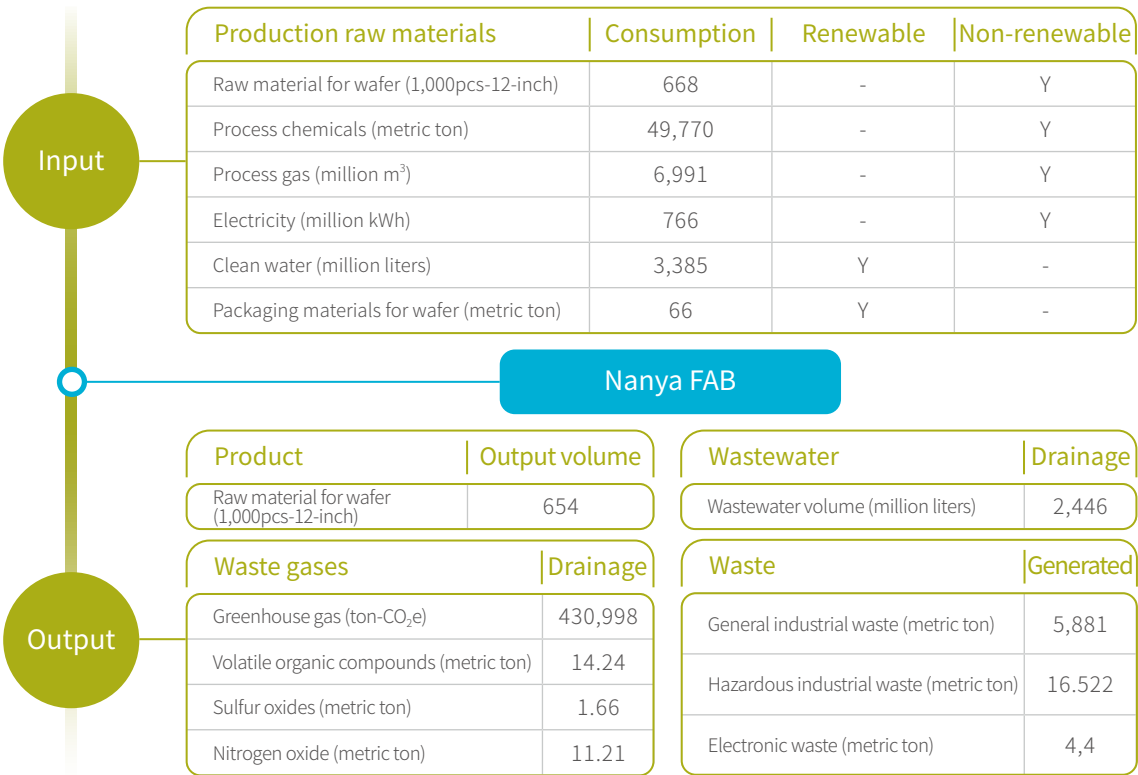
Properties	Number of cases	Proposals	Benefits (NTD/year)
Extensions to use cycle	2	2 items including the extension of the hydrofluoric acid tank acid replacement cycle, and extension of the gas cylinder replacement time	1,283,112
Formula development of new processes	18	Reduced the use of 18 items, including photoresist, chemicals, and grinding fluid, through process optimization and the development of high speed processes and formulas.	52,579,385
Reductions of process consumption	15	Reduced the use of 15 items, including photoresist, special gases, and chemicals, by improving production efficiency and optimizing equipment parameter settings	48,548,192

Plans and measures	Reduction (metric tons/year)
Waste sulfuric acid, hydrogen peroxide, hydrofluoric acid: Process optimization	360
Triethanolamine recycling and reuse	296
Waste grinding fluid: Process optimization	33
Waste photoresist reduction: Process optimization	2
Total reduction	691

Improved performance of raw material consumption



Use and output of raw materials



• Recycling and reuse - Recycling inside plant

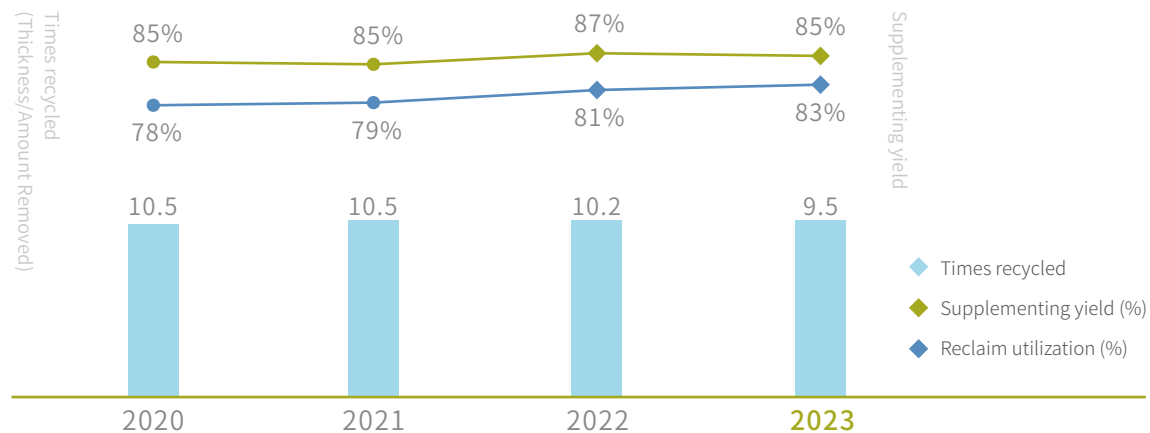
Ratio of using recycled materials as production materials

When using renewable raw materials in the production process, it is necessary to use monitor wafers to monitor process conditions. The used monitor wafers can be reproduced and used repeatedly; each monitor wafer can be repeatedly used 8-11 times (varies with the process used). Therefore, the cost of purchasing brand-new dummy wafers was saved while plenty of waste output was reduced.

Since 2017, we have used suppliers' supplementing yields as major indicators for the allocation percentage of orders of the next year. In addition to considering suppliers' quotations, wafers of high supplementing yields may enhance the quantities of supplementing wafers, and may further improve the percentage of wafer start capacity using reclaim wafer.

We periodically reviewed defective items with suppliers, and asked suppliers improve their process conditions and modify specifications. In 2020, suppliers adjusted process methods so the discard condition that etching numbers of wafers were incorrectly read after step rings were polished was improved. This increased the average supplementing yield from 80% to 85%, and recycling rate increased from 77% in 2019 to 79% in 2021 and further to 83% in 2023 due to the stability of supplementing yield.

Supplementing yield and utilization of reclaim wafers in 2021-2023



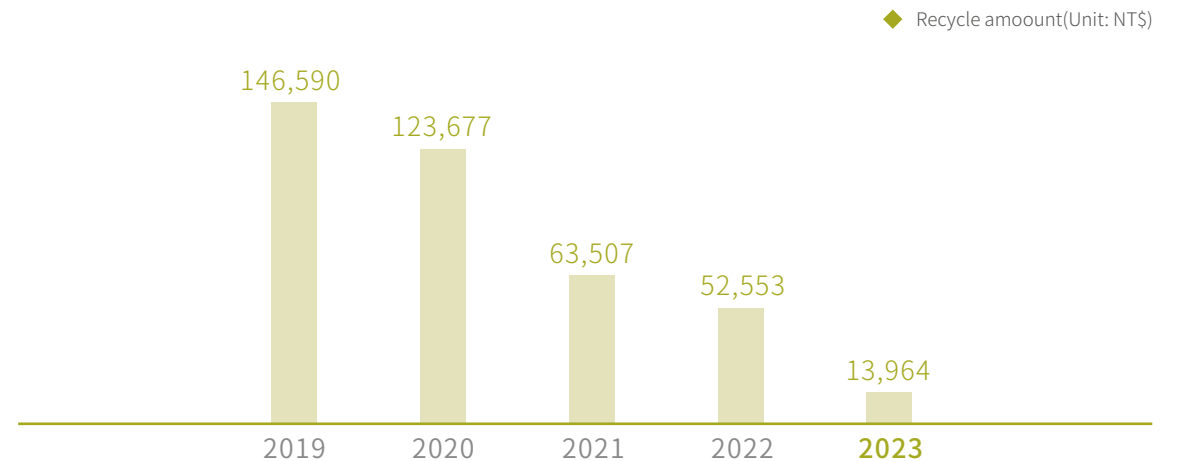
Product testing and reclamation of delivery packaging materials

Packaging materials for product shipments to outsourced testing facilities or packaging facilities, such as cartons, outer cartons, cushioning materials, and wafer cassettes, were all reclaimed as many as possible to be reused within the company. Moreover, wafer cassettes used by raw material for wafer were also recycled and reused in product shipments, and the reuse rate of these cassettes were nearly 100%. The aforementioned practices reduced the consumption of product packaging materials and waste output to minimum levels. This approach could reduce the consumption of approximate 14,000 pieces of brand-new 12-inch wafer cassettes every year, equivalent to reducing the consumption of 66 tons of plastics.

Reduction in product packaging materials

In response to the action of recycling and reductions, the company's own warehouses of finished products started with recyclable packaging materials. Reusable packaging materials used in supplementing finished products were recycled to be used in product exchanges for customer complaints, product storage, and commissioned work to reduce the times of application and purchase, further achieving the action of recycling for reuse and reductions of packaging materials. In addition, the cost of packaging materials used could be reduced. Although the saved amount was small, it made a difference to overall environmental maintenance and resource recycling. The performance is as follows:

Reduction in product packaging materials resulting in cost savings.



◆ Recycle amount (Unit: NT\$)

Recycling and reuse - Recycling outside plant

Nanya outsources the disposal of 100% of the waste it generates. The waste is processed into industrial raw materials, construction materials, or other raw materials, including usage as fuel for incinerators

The percentage of waste that was recycled in 2023 reached **98.8%**, in which 99.8% of hazardous waste was recycled.

Summary of outsourced recycling and reuse of waste generated by Nanya

Year	> 2020	> 2021	> 2022	> 2023
Total amount of outsourced waste disposal (metric ton)	23,413	24,586	23,981	22,403
Waste recycling amount (metric ton)	22,234	23,321	22,089	22,123
Waste recycling percentage (%)	95	94.9	92.1	98.8
Outsourced general waste disposal amount (metric ton)	6,090	7,113	6,383	5,881
Amount of general waste recycling (metric ton)	5,347	6,452	4,951	5,626
Percentage of general waste recycling (%)	87.8	90.7	77.5 ^{Note}	95.7
Outsourced hazardous waste disposal amount (metric ton)	17,323	17,473	17,598	16,522
Hazardous waste recycling amount (metric ton)	16,886	16,870	17,137	16,497
Hazardous waste recycling percentage (%)	97.5	96.5	97.4	99.8

Note: The reason for the decrease in general waste recycling percentage was due to heat recovery from organic sludge, which was listed as recyclable waste in 2021, but it was incinerated and not recycled in 2022.

List of waste generated by Nanya that is recycled externally

- After collecting low concentration waste isopropanol liquid in the factory, it is processed by the concentration system into high concentration waste isopropanol liquid, which is recycled and reused to make industrial grade isopropanol.
- After collecting waste photoresist in the factory, it is recycled and reused to make industrial grade PGMEA and EBR.
- After collecting waste sulfuric acid in the factory, it is recycled and reused to make industrial grade sulfuric acid.
- After collecting waste phosphoric acid, the recycling company increases its purity to make industrial grade phosphoric acid.
- After collecting waste ammonium sulfate, the recycling company uses it to make industrial grade ammonium sulfate.

- After collecting waste ammonium fluoride/hydrofluoric acid, the recycling company uses it to make sodium hexafluoroaluminate.
- After collecting waste hydrofluoric acid, it goes through the chemical treatment system to generate calcium fluoride inorganic sludge, which can be recycled to make the raw material for industrial flux or cement.
- After collecting waste liquid containing copper, it goes through electrolysis in treatment equipment to generate foil, which is recycled and reused to make copper wires.
- After collecting organic wastewater, it goes through the biological treatment system and generates organic sludge, which can be made into raw materials for ready mix concrete and construction materials after thermal treatment.
- After collecting waste SOD, the recycling company uses it to make lacquer thinner.
- The inorganic sludge consisting of river sand generated from filtering water is provided to brick factories to make bricks for construction.

5.3Environmental Pollution Prevention

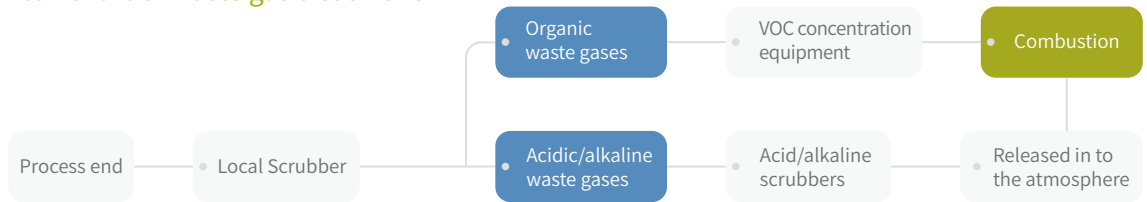
Based on the environmental protection and commitments of environmental impact assessment, the company regularly monitors environmental impact factors, such as air quality, noise and vibration, the quality of surface water and groundwater, traffic flow, and the ecosystem within the scope of development to truly appreciate its impacts on the environment. There has been no violation of environmental regulations since 2014. In addition, Nanya (Nanya) has checked with the competent authorities that Nanya's developing areas are not at an environmentally sensitive location or a location with specific purposes. In the Environment, Safety and Hygiene Policy, Nanya has made every effort to promote various measures to reduce waste and recycle resources to comply with relevant requirements of regulations as well as to respond to the commitments to environmental protection-related requirements signed by the company. Moreover, Nanya annually evaluates waste that can be reduced and recycled, and the types and amount of recovered waste water, drafts annual plans and goals, and includes the plans into the annual budget and work plan.

Air Pollution Control

Since the fab was established, Nanya has put great emphasis on pollution control. Not only have we effectively reduced material consumption and lowered the concentration of waste gas emission, but also have used air pollution control equipment in compliance with statutory standards, including local scrubber, acid/alkaline scrubbers, the VOC (volatile organic compound) zeolite rotor concentration equipment, and post-combustion machinery. local scrubber stands for local waste gas treatment equipment). Detections over the years show that the company has met (exceeded) the pollutant emission standards stipulated in the government's environmental regulations. Furthermore, the Company does not have any ODS emissions. To continue to maintain the best performance of treatment equipment, every equipment is maintained and inspected periodically. The operators receive complete training and education are to maintain the system in good operation and ensure that the waste gases emitted do not endanger the environment.

Nanya's main air pollutants include acid and alkaline waste gas and organic waste gas, and raw materials do not use trichloroethylene, so there are no HAPs emissions. The waste gases are imported into appropriate treatment processes and equipment based on their properties. From the production line, the waste gases are imported into the local waste gas treatment system to have specific substances removed. Acidic or alkaline waste gases are then treated by the acid/alkaline scrubbers. After the treatment, the waste gases can be released into the atmosphere. Organic waste gas is absorbed and concentrated by the zeolite rotor, and then imported into the post-combustion equipment to be directly broken down. The combustion efficiency rate reaches 99%, which substantially exceeds statutory standards. Moreover, the reduction rate of overall volatile organic gas emissions is kept above 90%, meeting the statutory requirements. Organic air pollutants released per unit product (emission intensity) in 2023 was 14.2 g VOCs/kpcs 4Gb eq.

Flowchart of waste gas treatment



VOC emission trends

Year	> 2020	> 2021	> 2022	> 2023
VOC emission trends				
VOC emissions (metric ton)	15.58	15.68	17.31	14.24
Emission per unit wafer area (kg/wafer area m2)	0.26	0.27	0.29	0.30
VOC emissions per unit production capacity (g/thousand die)	14.2	14.0	15.9	14.2
VOC emissions per unit revenue (g/NT\$1 million)	260	183	304	476
Other air pollutant emission trends				
NOx (metric ton)	10.05	10.34	10.50	11.21
SOx (metric ton)	1.92	1.66	1.66	1.66

Air pollution reduction

To reduce the emission of volatile organic compounds (VOCs), besides continuing to adjust the operating parameters of air pollution control equipment to optimize the treatment system each year, Nanya invested NT\$23 million in 2022 to update the 2 VOCs waste gas treatment systems of Fab 3A, and changed the material of the zeolite concentration rotor from ceramic to glass fiber to increase treatment capacity. After completion in 2023, a third party verified that equipment processing efficiency reached 98% and above, and VOCs emission was reduced by 70% compared to 2022.

Air pollutant	> 2022	> 2023
VOCs emission (metric tons) from emission pipe P131 of Fab 3A	8.06	2.36

In 2022, in order to reduce the emission of particulate pollutants in the entire fab, the particulate pollutants generated by process equipment of Fab 3A were collected and processed in the air pollution control equipment, and a dust removal tower was added to reduce the emissions through atomized water washing and collision interception. After completion in 2023, a third party verified that particulate pollutants was reduced by 77%.

Air pollutant	> Before improvement	> After improvement
Total suspended particulate matter from emission pipe P106 of Fab 3A (mg/m3)	79	18

Strengthening VOCs monitoring

To effectively monitor VOCs emission, Nanya not only monitors VOCs emission pipelines, but also installs monitoring equipment in acidic/alkaline exhaust gas emission pipelines, in order to ensure that air pollution control equipment can maintain optimal operation.

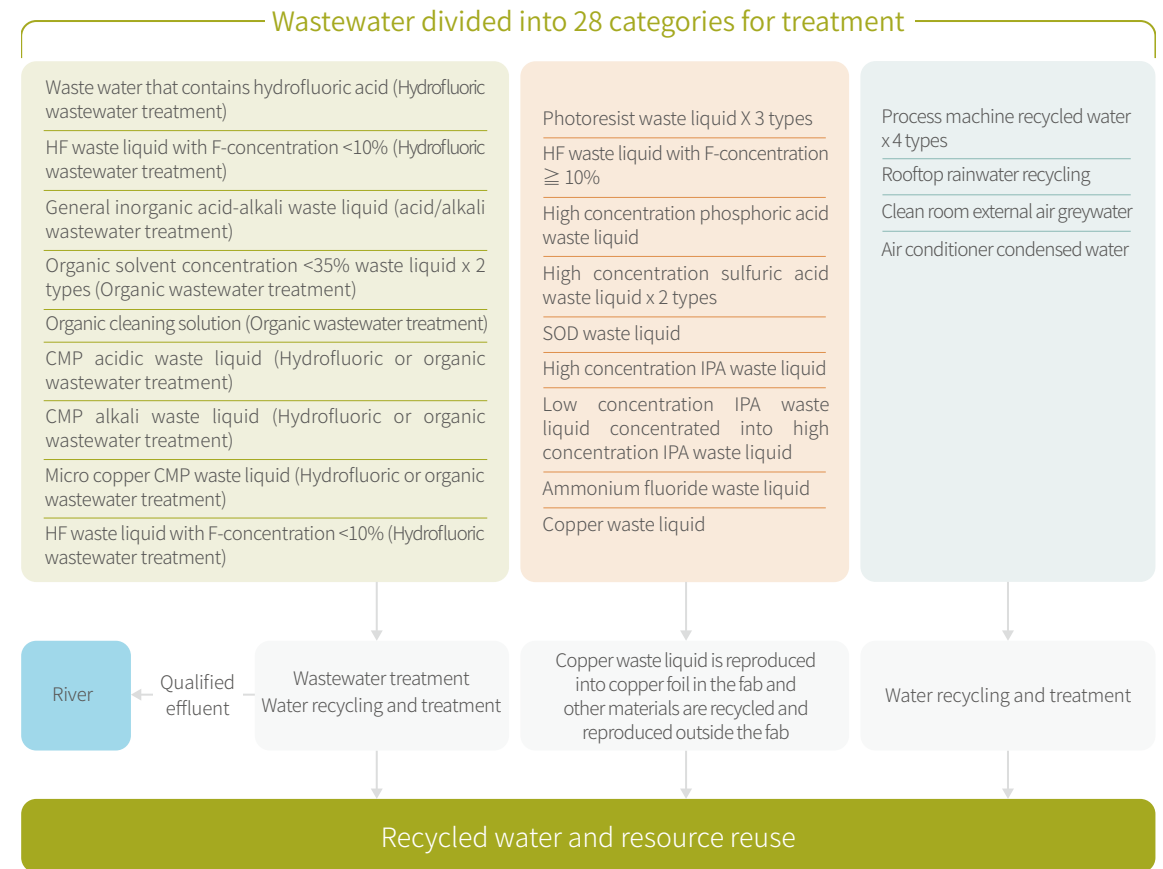
Water Pollution Control

All wastewater generated by Nanya is collected according to property classification and channeled into proper wastewater equipment for treatment. Nanya commissions a third party to monitor and survey surrounding ecology, hydrology, and air quality. Survey results are reported to the Environmental Quality Supervision Committee. Nanya learns about issues that community residents are concerned about through the Environmental Quality Supervision Committee, and includes the issues in its periodic evaluation of ISO 14001 Management Systems. To ensure that the water quality of effluent is normal and eliminate concerns residents may have about effluents from Nanya, we have established an effluent water quality real-time monitoring system that is linked to the Environmental Protection Bureau, jointly monitoring the water quality of effluents in real time.

After water quality meets discharge standards, 100% of wastewater is discharged into Dake River after treatment and meets standards for Category D water bodies, which may be used for irrigation, Class 2 industrial water, and environmental conservation. The water eventually flows into Tamsui River and into the ocean. To avoid environmental pollution and ecological impacts owing to abnormal quality of wastewater, we have spared no effort to prevent and control water pollution, gradually upgrading and investing in wastewater treatment facilities. The in-plant wastewater treatment is carried out in 28 different pipelines. The wastewater is mainly classified into organic wastewater, general acidic and alkaline wastewater, hydrofluoric wastewater, high-concentration liquid waste, and secondary water that can be directly recycled, treated, and reused. In relation to wastewater treatment, wastewater is classified and treated according to different properties. Other than following statutory standards, we also reuse recyclable wastewater that is treated by the recovery system to reduce the discharge amount of wastewater. Furthermore, the plant area is reconstructed on the open space of existing plant so no massive excavation of the peripheral vegetation of the designated land has been made. Wastewater is properly treated before being discharged into the Dake River. Discharged water bodies and relevant habitat are not designated as national or international conservation areas. Investigation shows that the wastewater discharging areas do not involve in affecting the habitat of protected animals or destroying the habitat.

Total waste water discharge volume was 2,446 million liters in 2023, down 9.2% compared to 2022; wastewater discharge volume per unit capacity decreased 1.3%. Due to the phased tightening of controls on ammonia nitrogen concentration in effluent by the Ministry of Environment, a new requirement was added in 2013 that ammonia nitrogen concentration must be lower than 70mg/L; the requirement was tightened to 30mg/L in the second stage in 2015. In light of the rising awareness of regulations and environmental protection, Nanya has completed a number of improvement measures in response, including diversion control from the source of wastewater. Water discharged from machines using ammonium fluoride will be diverted and collected to prevent high-concentration ammonia nitrogen from directly entering the wastewater system. The existing final settling tank will be transformed into an aerobic nitrification tank equipped with a membrane bio-reactor (MBR) as the final treatment unit, which not only lowers the ammonia nitrogen concentration well below the regulatory standard, but also reduces the turbidity and improves the quality of effluent. The COD value of the effluent is also a focus of the competent authority. Therefore, Nanya added an IPA concentration system in 2018. Originally, the low-concentration IPA discharged from machinery would directly enter the wastewater system, resulting in excessive COD load. After adding the IPA concentration system, the low-concentration IPA wastewater is collected and concentrated using high-temperature negative pressure. High-concentration IPA is then cleared by a contractor, in order to reduce the COD concentration of raw water and effectively control the quality of effluent.

Future production capacity expansion plans will be accompanied by an increase in pollutants, and we will consider how to lower the concentration of pollutant emissions. In 2018, Nanya invested NT\$430 million to build a new hydrofluoric wastewater COD and total nitrogen treatment system. The system was completed and began operation in 2023, and stably maintains ammonia nitrogen emissions below 10 mg/L, COD emissions can be further reduced to below 30 mg/L, significantly reducing environmental load. After a number of improvements, in the ammonia nitrogen test results in 2023, the lowest was 0.19 mg/L, the highest was 0.53 mg/L, and the average was 0.4mg/L. In the COD test results, the lowest was 13.2mg/L, the highest was 24.6mg/L, and the average was 18.4mg/L, all far better than the regulatory standards.



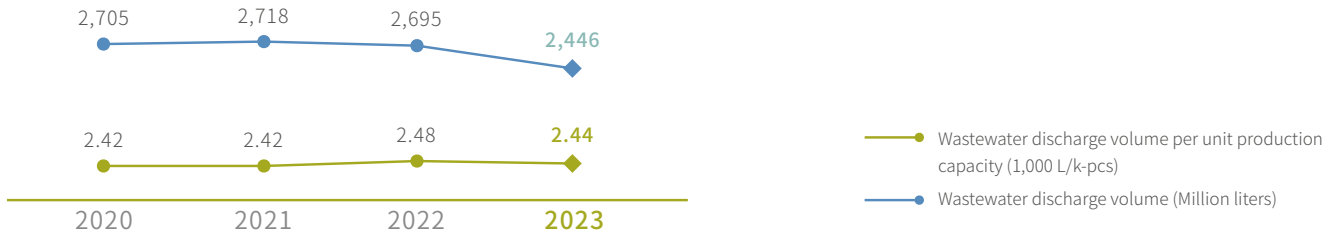


Types and volume of wastewater discharged by Nanya

Total waste water discharge (Million liters)		> 2020	> 2021	> 2022	> 2023
Divided based on Destination ^{Note1}	Fresh surface water	2,705	2,718	2,695	2,446
	Groundwater, seawater, third party water ² , third party water ³ supplied to other organizations ^{Note2}	0	0	0	0
Total water discharge	Freshwater (Total dissolved solids ≤ 1,000 mg/L)	2,705	2,718	2,695	2,446
	Other water (Total dissolved solids > 1,000 mg/L)	0	0	0	0
Divided based on wastewater treatment level	Not treated	0	0	0	0
	Treated inside factory to comply with effluent standards of the Ministry of Environment	2,705	2,718	2,695	2,446

Note 1: The destination of wastewater discharged by Nanya is Dake River (surface water), which is not located in an area with water stress.
Note 2: City government water supplier and sewage treatment plant, public and private utilities companies, and other organizations that participate in the provision, transportation, treatment, disposal, or use of water and sewage

Run chart of wastewater discharge from 2020 to 2023



Testing results of discharged wastewater quality in 2023

Testing items		Unit	Statutory standards	Testing results			Compliant or non-compliant with standards
				Minimum	Mean	Maximum	
FAB 3A	pH	-	6-9	7.4	7.6	8	Compliant
	Chemical oxygen demand (COD)	mg/L	<100	13.2	18.4	24.6	Compliant
	Suspended solids (SS)	mg/L	<30	1.25	2.5	4.2	Compliant
	Fluoride ion	mg/L	<15	10.8	11.4	12.1	Compliant
	Ammonia nitrogen	mg/L	<30	0.19	0.4	0.53	Compliant

Waste Management

• Waste Generate Structure

Nanya's total waste volume in 2023 was 22,403 metric tons, in which 22,123 metric tons was reused, and the overall waste recycling rate reached 98.8%. All waste recycling and reuse is outsourced (no on-site reuse). In 2023, Nanya directly disposed 5,618 metric tons of waste, in which 5,342 metric tons was reused after treatment, accounting for 23.85% of the total waste volume. The amount of waste directly incinerated was 185 metric tons, accounting for 0.8% of the total waste. The amount of waste buried after solidification and directly buried was 91 metric tons, accounting for 0.4% of the total waste. The quantity of other disposals (including physical treatment, recycling, purification, and reuse) is 4 metric tons, accounting for 0.2% of the total waste.

Nanya's waste generated per unit wafer area in 2023 was 22.39 kg/kpcs 4Gb eq, an increase of 1.66% compared with 2022. Outsourced hazardous waste disposal was 16,522 metric tons, and hazardous waste generated per unit wafer area was 16.51 kg/kpcs 4Gb eq, an increase of 2.16% compared to 2022. The Company's main output is hazardous industrial waste (acidic waste liquid, including sulfuric acid, phosphoric acid, and hydrofluoric acid), 100% is processed by the contractor and recycled as other industrial raw materials. The company continues to implement measures such as waste reduction and increased recycling in a circular economy manner to reduce landfill waste.

The general industrial wastes and the hazardous industrial wastes of the Nanya are all managed by the Output Department with respect to storage, clearance, detections, and reduction promotions. Training is organized for operators each year to ensure that personnel are familiar with regulations and to verify their compliance. In addition, the Company periodically audits waste contractors to see whether the contractors follow the regulations of waste disposal to handle the waste clearance, in order to verify the lawfulness of the contractors, ensure that all wastes are properly treated or recycled, and prevent impacting the environment again. Nanya did not ship any hazardous waste to other countries in 2014-2023, and output of all hazardous industrial waste was outsourced to certified domestic waste disposal contractors; a total 48 certified domestic waste disposal contractors was commissioned in 2023.

Waste Generated in 2023

	Generated	Diverted from Disposal	Directed to Disposal
Hazardous waste(Unit: Ton)			
Hazardous waste	14,285	13,477	808
Acidic waste liquid	2,211 ^{Note 2}	1	2,211
Waste solvent	11	0	11
Container	4	0	4
Electronic waste	11	0	11
Other	16,522	13,478	3,045
General waste			
Sludge	5,115	3,187	1,928
Packaging materials	176	5	171
Consumer waste generated by employees	241	0	241
Waste mixed metals	9	1	8
Waste mixed plastics	138	0	138
Other	203	116	87
Subtotal	5,881	3,308	2,573
Total			
	22,403	16,786 ^{Note 2}	5,618

Note 1: In coordination with the update to the GRI content index, we compiled more detailed statistics and recategorized waste, which resulted in different recycling percentages compared with previous years, but the total tons of waste was not changed.

Note 2: "The slight difference between the total output and the sum of the individual outputs is due to rounding."

Waste Directed to Disposal in 2023

	In the plant	Out of plant	Total
Hazardous waste(Unit: Ton)			
Incineration (with energy recovery)	0	3,019	3,019
Incineration (without energy recovery)	0	11	11
Landfilling	0	10	10
Other disposal operations ^{Note 1}	0	5	5
Subtotal	0	3,045 ^{Note 2}	3,045 ^{Note 2}
General waste			
Incineration (with energy recovery)	0	2,318	2,318
Incineration (without energy recovery)	0	175	175
Landfilling	0	80	80
Other disposal operations ^{Note 3}	0	0	0
Subtotal	0	2,573	2,573
Total			
	0	5618	5618

Note 1: Other disposal methods for hazardous waste include physical treatment and chemical treatment.

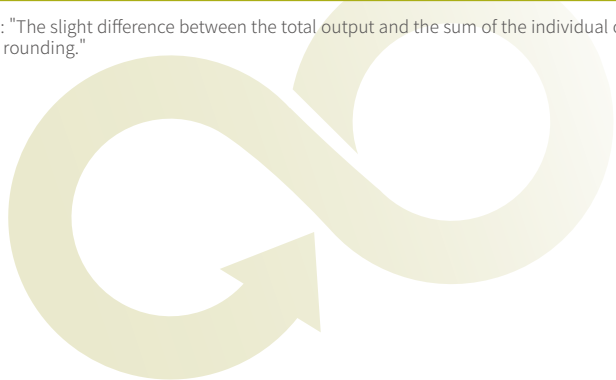
Note 2: "The slight difference between the total output and the sum of the individual outputs is due to rounding."

Note 3: Other disposal methods for general waste refers to physical treatment (broken down and sorted).

Waste Diverted from Disposal in 2023

	In the plant	Out of plant	Total
Hazardous waste(Unit: Ton)			
Preparation for reuse	0	0	0
Recycling	0	13,477	13,477
Other Recovery Operations	0	1	1
Subtotal	0	13,478 ^{Note 1}	13,478 ^{Note 1}
General waste			
Preparation for reuse	0	5	5
Recycling	0	0	0
Other Recovery Operations	0	3,303	3,303
Subtotal	0	3,308	3,308
Total			
	0	16,786 ^{Note 1}	16,786 ^{Note1}

Note 1: "The slight difference between the total output and the sum of the individual outputs is due to rounding."



High-risk items are listed as the direction of management plans each year by assessing the significance of environmental impacts using ISO 14001 Environmental Management System. Items that can be carried out are listed in implementation plans for the current year after comprehensive assessment. Nanya reduces waste from the source and streamlined production processes to reduce the use of raw materials and further achieve waste reduction. Nanya completed 8 improvement proposals regarding the use of raw materials in 2023, including improvements to reduce process time, extend use cycle, and reduce process consumption. The most significant reduction benefit is that the amount of sulfuric acid and hydrogen peroxide used for the wet etching area was effectively reduced by reducing the acid cleaning time, reducing the amount of sulfuric acid used each month by 7,650 liters and hydrogen peroxide by 3,825 liters.

Assessment results of waste impact

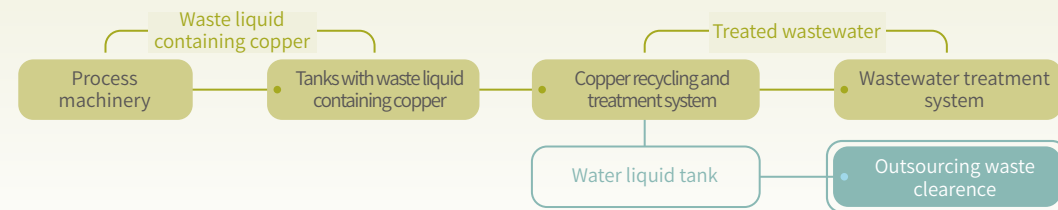
	Upstream	NANYA	Downstream
Impact sources	1.Used large numbers of small gas cylinders, resulting in more residual gases.	1. Sources of raw materials and related materials contained hazardous substances. 2. Used large numbers of acidic and alkaline chemicals. 3. Used monitor wafers in large quantities.	1. Products required many packaging materials. 2. Products contained hazardous substances.
Potential impact	<ul style="list-style-type: none"> Waste of resources: Residual gas volume. Increased carbon emissions: The need for more frequent transportation increases carbon emissions inside and outside the fab. 	<ul style="list-style-type: none"> Violations of international regulations and customer specifications will result in returns and liquidated damages. This might cause hazardous substances to flow along with the waste and cause soil or wastewater pollution. A large amount of waste is generated, there are limited sites and capacity for disposal, and the derived waste needs to be buried after treatment or recycling. 	<ul style="list-style-type: none"> Solid waste pollution: Packaging waste such as EPE cushioning materials and paper boxes may cause solid waste pollution if not properly treated. Waste of resources: The large amount of packaging waste may cause a waste of resources, because some packaging materials can be recycled and reused. It will be a waste of resources if it is discarded as waste.
Mitigation measures	Replaced small gas cylinders with large cylinders to reduce residual gases and numbers of cylinders.	<ul style="list-style-type: none"> Through the establishment of Hazardous Substance Free (HSF) management system of materials, we ensured that the produced wafers, rear-end IC packaging, and DIMM module products would conform to the international regulations and related specifications of clients towards HSF management. a. Completed 24 raw material consumption improvement proposals. b. Recycled wastes in the plant, for example, copper sulfate waste liquid was directly converted to copper foil for recycling. c. Acidic wastes were outsourced for recycling, such as sulfuric acid and phosphoric acid. d. Dummy wafers were recycled for 8-11 times. 	<ul style="list-style-type: none"> Clients were encouraged to recycle packaging materials for Nanya to reuse. Waste electronic equipment had to conform to the EU's environmental protection directives, including WEEE, RoHS, and EuP.

01 Waste Reduction Technology

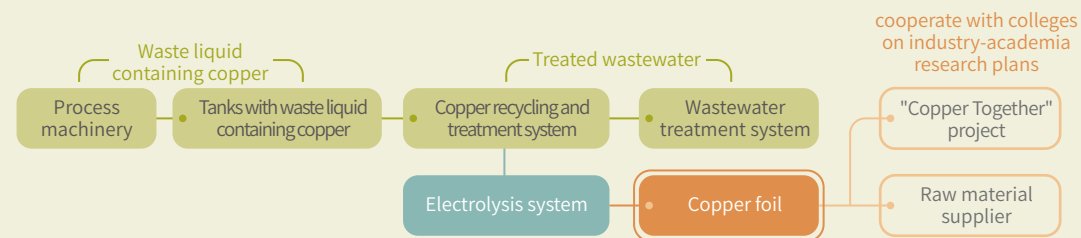
Copper Waste Liquid Electrolysis Regeneration System

Nanya invested NT\$8.19 million to build a copper waste liquid electrolysis regeneration system, which uses resin adsorption and regeneration to produce high-concentration copper sulfate waste liquid, which is electrolyzed to produce copper foil for recycling. Nanya worked with Ming Chi University of Technology and Chuang Ching-Tai, a local artist of New Taipei City, through the "Copper Together" project, and remade waste copper foil into art works, which improved communication with stakeholders. Nanya also produced the waste copper foil into industrial-grade raw materials for reuse, achieving resource circulation. A total of 500 kg of copper foil was produced in 2023.

◆ Original flowchart for treatment of waste liquid containing copper



◆ Utilizing regeneration technology flowchart for treatment of waste liquid containing copper



Nanya's Circular Economy - Copper-Containing Liquid Treatment and Recycling Video

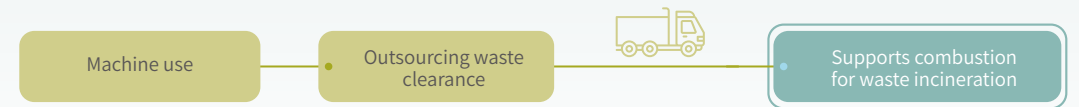
02 Resource Circulation

Isopropanol Recycling System

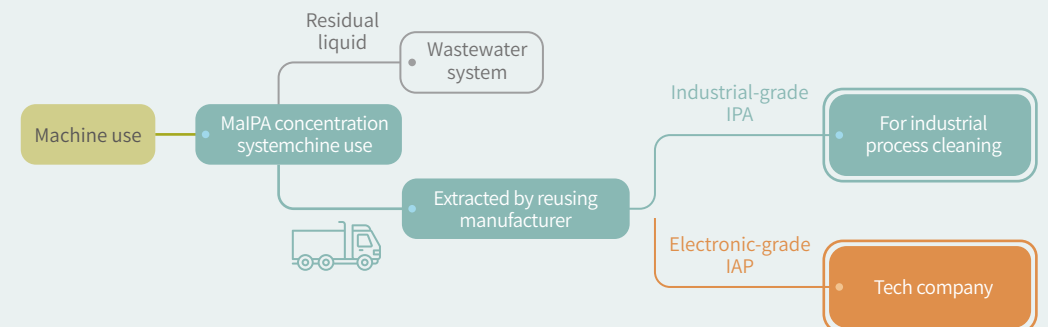
Nanya invested NT\$20 million in 2017 to introduce an isopropanol recycling system, which increases the concentration of isopropanol discharged from the process, effectively reducing the clearance amount (reducing 130 trips/month and saving NT\$21,000 thousand/month in waste clearance costs). Wastewater containing isopropanol that cannot be concentrated is used as the carbon source required for ammonia nitrogen wastewater treatment, replacing purchased methanol.

Nanya adheres to the spirit of corporate sustainability by actively minimizing waste generated and maximizing resource recycling. This project won the Silver Award in the Resource Circulation Division of the 2023 Outstanding Enterprises in Resource Circulation of the Ministry of Environment.

◆ Original flowchart for treatment of waste liquid containing isopropanol



◆ Optimized flowchart for treatment of waste liquid containing isopropanol



Internal management system audit records in the last four years

