wiwynn®
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2023
Sustainable Impact Valuation Report

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Executive summary

“Unleash the Power of Digitalization, Ignite the Innovation of Sustainability” is the vision set by Wiwynn. We expect to implement corporate sustainability through innovative approaches and, at the same time, consider the balance between the environment and the ecology to bring the well-being of common good to the society, and further create long-term positive value for stakeholders. To grasp risks and opportunities generated by ESG (environmental, social, and governance) to the operations, Wiwynn started to introduce the methodology of “Impact Measurement and Valuation (IMV)” from 2023 to comprehensively review the impacts to human well-being by the value chain from outside in. From upstream supply chain, production and operations, to downstream stage of product sales, we analyze cross-area intersection that covers economic, environmental, and social topics and adopt the management thoughts of Profit and Loss (P&L) to incorporate cost (negative) or benefit (positive) externality[1]. Besides, we convert it to a consistent language of currency and establish a sustainable impact management framework based on Triple Bottom Line (TBL) to measure the substantial contribution to the society generated by the value chain.

Through the approach of Gross Value Added (GVA), Wiwynn measures economic values created for stakeholders during the process of production and operations, including net operating income, employee compensation, cash dividends, R&D investment, taxation, depreciation, and amortization. Based on Natural Capital Protocol, Social & Human Capital Protocol, ISO 14008:2019 Monetary valuation of environmental impacts and related environmental aspects, Value Balancing Alliance (VBA), and Impact-Weighted Accounts (IWA), we assess environmental and social externality generated in operating activities through causality-oriented impact pathway. In terms of supply chain, Wiwynn adopts the Input-output Model to analyze procurement demands and output value enhancement created by the overall industry chain supply-demand effect driven by product sales as well as the employment opportunity and workers’ compensation income brought to the supply chain. Facing the consequent environmental issues, we use the Environmentally Extended Input Output Analysis (EEIO) for industrial hotspot analysis and incorporate and weigh the results in the procurement strategy. As for products and services, Wiwynn provides high-efficiency and high-quality computing and storage cloud servers and integrated rack solutions. We not only bring success to customers but also indirectly push up the industry chain output value as well as analyze the environmental impact from the use of product to product disposal through Life Cycle Assessment (LCA) and the environmental benefits generated from energy-saving and eco-friendly design on products.

[1] Externality refers to the positive and negative impacts caused to the society and the environment by the operating activities but not being reflected in the relative value in free market price.

n 2023, Wiwynn created a net operating income of NT$12 billion in economic aspects and spent NT$15.7 billion in paying tax, interest, lease, new technology development, employee compensation, depreciation and amortization. We not only assisted customers and suppliers, promoted the welfare policy launched by the government successfully and supportively, provided investors quality return on investment, satisfied employees' life quality and purchasing power but also boosted the growth of socioeconomic capacity. In the aspect of society, we completed training programs drove the development of employees' skills and employability and created future income of NT$890 million. Besides, employee occupational accidents generated a social cost of NT$2.05 million and a potential medical cost of NT$5.06 million for the risk of cardiovascular diseases that employees may encounter while the diverse activities of health education brought health improvement effect for around NT$430 thousand. In terms of environment, environmental footprint generated by energy and resource consumption and the pollutants during the production process created a social cost of NT$54.70 million. On the other hand, the promotion of energy-saving programs and arrangement of renewable energy application created environmental benefits of NT$29.45 million. In terms of supply chain, Wiwynn's procurement demands raised supply chain output value in a total of NT$536.6 billion, created 40,000 employment opportunities, and compensation income of NT$14.8 billion while the environmental footprint generated in the process of industrial supply and demand brought a social cost of NT$6 billion. As for products and services, the sales of Wiwynn products created an output value of NT$397.6 billion for customers' industries, and greenhouse gas emissions during the use of products and the waste disposal stage generated a social cost of NT$290 million. Through product design, verification, and life cycle management, optimization of energy and power saving efficiency, selection of hazard-free and renewable materials, and development of product characteristics of easy to be dismantled and recyclable, it brought environmental benefits of NT$10.55 million. We not only assisted customers to achieve the goals of net zero but also promoted industrial low-carbon transition. To respond to the rapid change of technology and the trend of global sustainability transition, Wiwynn will continue enhancing operating efficiency, optimizing product and service models, adopting design, R&D, and integration capabilities to create higher technical threshold required for new products as well as actively engage with green product innovation and low-carbon manufacturing transition in order to continue deepening Wiwynn's sustainability resilience.

In implementing sustainable development, Wiwynn continues pushing the boundaries and innovating as well as works hard to decrease negative impacts caused by operations and create positive value for stakeholders. Through impact thinking, it helps us considering wider and deeper impact aspects when making decisions and further digging out risks and opportunities that come along with the management of sustainable topics for the long-term development of the Company.

Value chain	ESG topic management	Input and output during the process of operations	Welfare changes caused and promoted	Potential impact	Impact indicator		Type of impact			Monetary value (NT$ thousand) 2022	Monetary value (NT$ thousand) 2023		Impact object
Supply chain	Sustainable supply chain management	Procurement payment to suppliers	Promoted industry chain supply-demand relationship and raised output value	Social and economic development	Social externality: Enhancement of supply chain output value	(+)	Indirect	Short term	Regional	722,876,965	536,620,631	↘	Supply chain
			Created employment opportunities in the supply chain and compensation income	Employment opportunities and skills	Social externality: Supply chain employee compensation income	(+)	Indirect	Short term	Regional	19,976,545	14,762,985	↘	External employees
			Changes of greenhouse gas concentration caused global warming.	Social cost of carbon	Environmental externality: Supply chain greenhouse gas emissions	(-)	Indirect	Long term	Global	5,077,726	3,827,418	↘	Environment
			Changes of air pollutant concentration in the atmosphere	Human health, ecological system	Environmental externality: Supply chain air pollution emissions	(-)	Indirect	Short term	Regional	2,949,862	2,142,262	↘	Environment
Business operations	Economic performance	Net profit after tax	Assisted customers to achieve success on products and created return on investment for investors	Life quality and purchasing power	Gross value added (GVA): Net profit after tax	(+)	Direct	Short term	Regional	14,174,709	12,043,655	↘	Customers/ shareholders/ investors
		Depreciation and amortization	Promoted technology development for the industry	Industrial technology capability	Gross value added (GVA): Depreciation and amortization	(+)	Direct	Short term	Regional	761,585	1,002,139	↗	Supply chain
		Interest and lease	Enhanced momentum of economic growth	Life quality and purchasing power	Gross value added (GVA): Interest and lease	(+)	Direct	Short term	Regional	1,277,067	1,444,703	↗	Supply chain
	Talent attraction and retention	Compensation and welfare	Provided compensation that is higher than living wage to enhance the feeling of well-being	Employment opportunity and purchasing power	Gross value added (GVA): Compensation and welfare	(+)	Direct	Short term	Regional	4,878,012	5,850,509	↗	Internal employees
	Product/ service R&D and innovation	New technology development	Facilitated the development and application of industrial technology	Life quality and industrial technology capability	Gross value added (GVA): New technology R&D	(+)	Direct	Short term	Regional	3,528,532	4,018,816	↗	Customers/ end users
	Tax management	Tax payment	Supported the government to expand infrastructure and social welfare	Social and economic development	Gross value added (GVA): Tax payment	(+)	Direct	Short term	Regional	3,722,574	3,400,024	↘	Society
	Climate strategy and energy management	Direct greenhouse gas emissions during the manufacturing process	Changes of greenhouse gas concentration caused global warming	Social cost of carbon	Environmental externality: Operational greenhouse gas emissions	(-)	Direct	Long term	Global	43,372	52,530	↗	Environment
		Energy indirect greenhouse gas emissions	Changes of greenhouse gas concentration caused global warming	Social cost of carbon									
		Utilization of renewable energy	Avoided greenhouse gas emissions causing global warming	Social cost of carbon	Environmental externality: Utilization of renewable energy efficiency	(+)	Direct	Long term	Global	12,393	29,155	↗	Environment
		Energy-saving measures during the manufacturing process	Avoided greenhouse gas emissions causing global warming	Social cost of carbon	Environmental externality: Manufacturing process energy-saving measure efficiency	(+)	Direct	Long term	Global	429	294	↘	Environment
	Water resource management	Water resource withdrawal	Changes of water resource stock	Human health and natural resource stock	Environmental externality: Operational water resource consumption	(-)	Direct	Short term	Regional	586	727	↗	Environment
		Manufacturing wastewater disposal	Changes of pollutant concentration in the water	Human health and ecological system	Environmental externality: Operational wastewater disposal	(-)	Direct	Short term	Regional	585	434	↘	Environment
	Waste management	Waste generated in the manufacturing process	Air pollution and greenhouse gases generated by waste incineration	Social cost of carbon, human health, and ecological system	Environmental externality: Operational waste disposal	(-)	Direct	Long term	Global	627	999	↗	Environment
	Human capital development	Training hours and budget	Professional skills and employability were enhanced through training	Professional knowledge and skills	Social externality: Employee future income	(+)	Direct	Long term	Regional	1,264,744	891,139	↗	Internal employees and society
	Occupational safety and health	Incidents of occupational accidents and occupational diseases	Impacts on workers' body, mind, and spirit and expenditure of medical resources	Life quality and social resource consumption	Social externality: Employee occupational accidents	(-)	Direct	Short term	Regional	1,765	2,054	↗	Internal employees and society
		Number of people with health risks	Health risks caused by the workload	Work and life balance	Social externality: Employee health risks	(-)	Direct	Short term	Regional	4,105	5,061	↗	Internal employees and society
		Number of people improved health through health management	Employees' life style was improved through health education	Work and life balance	Social externality: Employee health management	(+)	Direct	Short term	Regional	313	429	↗	Internal employees and society
Products and services	Customer relationship management	Product sales figures	Promoted industry chain supply-demand relationship and further pushed up output value	Social and economic development	Social externality: Enhancement of industry chain output value	(+)	Indirect	Short term	Regional	456,876,466	397,557,337	↘	Customers/ end users
	Sustainable products	Quantity of product sales	Greenhouse gas emissions generated by products from the process of selling to disposal	Social cost of carbon	Environmental externality: Cabon footprint generated during the use of products	(-)	Direct	Long term	Global	229,260	285,896	↗	Environment
		Product energy-saving design	Conducted power-saving on products to avoid greenhouse gas emissions	Social cost of carbon	Environmental externality: Product energy-saving efficiency	(+)	Indirect	Long term	Global	867	6,571	↗	Environment
		Adoption of recycled materials on products	Avoided greenhouse gas emissions generated during the exploitation of raw materials	Social cost of carbon	Environmental externality: Adoption of recycled materials	(+)	Indirect	Long term	Global	782	3,824	↗	Environment
		Removal of plastics in product packaging	Reduced greenhouse gas emissions generated from the packaging materials	Social cost of carbon	Environmental externality: Removal of plastics from packaging	(+)	Indirect	Long term	Global	0	154	↗	Environment

Method of analysis

Evaluation of the sustainable impact contains four major steps, including defining boundary and category, drawing the impact pathway, confirming source and quality of data, and establishing value approach. These steps are all linked with one another, and decisions made when executing any step may affect the completeness and correctness of the results of final analysis.

Boundary and category

Activities in Wiwynn's value chain include the supply chain (upstream), production and operations, and products and services (downstream). The process of activities may generate positive impacts or negative impacts to stakeholders. Some are direct impacts generated during the process of operations while some are impacts generated indirectly from upstream or downstream of the value chain.

- Upstream: It refers to all the economic activities engaged by raw material suppliers or service providers to satisfy Wiwynn's procurement demands, including categories of mechanics and electronic raw material, equipment, software, engineering, electronic components, consumables, general affairs, and transportation services.
- Production and operations: It refers to all the activities in Wiwynn's global production and operations locations, including product design, manufacturing, and assembly. Boundaries reported are consistent with those specified in the corporate sustainability report prepared by Wiwynn. If the boundaries evaluated are different from the description above, it shall be explained in the paragraph of the results of analysis.
- Downstream: It refers to the customers that Wiwynn provides products and services to.

Drawing the impact pathway

To clarify the direct and indirect, positive and negative, long-term and short-term as well as global and regional impacts to stakeholders generated from various activities in the value chain, Wiwynn adopts the approach of impact pathway and considers the input and output during the activities, changes and impacts to stakeholders' living welfare, and social value or cost generated as well as considers the connection between ESG topics to systematically identify complicated causation in logic thinking. Please refer to the explanation in paragraphs in the result of analysis.

Value chain	ESG topic management	Input and output during the process of operations	Welfare changes caused and promoted	Potential impact	Impact object
Supply chain	Sustainable supply chain management	Procurement payment to suppliers	Promoted industry chain supply-demand relationship and raised output value	Social and economic development	Supply chain
			Created employment opportunities in the supply chain and compensation income	Employment opportunities and skills	External employees
			Changes of greenhouse gas concentration caused global warming.	Social cost of carbon	Environment
			Changes of air pollutant concentration in the atmosphere	Human health, ecological system	Environment
Business operations	Economic performance	Net profit after tax	Assisted customers to achieve success on products and created return on investment for investors	Life quality and purchasing power	Customers/ shareholders/ investors
		Depreciation and amortization	Promoted technology development for the industry	Industrial technology capability	Supply chain
		Interest and lease	Enhanced momentum of economic growth	Life quality and purchasing power	Supply chain
	Talent attraction and retention	Compensation and welfare	Provided compensation that is higher than living wage to enhance the feeling of well-being	Employment opportunity and purchasing power	Internal employees
	Product/ service R&D and innovation	New technology development	Facilitated the development and application of industrial technology	Life quality and industrial technology capability	Customers/ end users
	Tax management	Tax payment	Supported the government to expand infrastructure and social welfare	Social and economic development	Society
	Climate strategy and energy management	Direct greenhouse gas emissions during the manufacturing process	Changes of greenhouse gas concentration caused global warming	Social cost of carbon	Environment
		Energy indirect greenhouse gas emissions	Changes of greenhouse gas concentration caused global warming	Social cost of carbon	
		Utilization of renewable energy	Avoided greenhouse gas emissions causing global warming	Social cost of carbon	Environment
		Energy-saving measures during the manufacturing process	Avoided greenhouse gas emissions causing global warming	Social cost of carbon	Environment
	Water resource management	Water resource withdrawal	Changes of water resource stock	Human health and natural resource stock	Environment
		Manufacturing wastewater disposal	Changes of pollutant concentration in the water	Human health and ecological system	Environment
	Waste management	Waste generated in the manufacturing process	Air pollution and greenhouse gases generated by waste incineration	Social cost of carbon, human health, and ecological system	Environment
	Human capital development	Training hours and budget	Professional skills and employability were enhanced through training	Professional knowledge and skills	Internal employees and society
	Occupational safety and health	Incidents of occupational accidents and occupational diseases	Impacts on workers' body, mind, and spirit and expenditure of medical resources	Life quality and social resource consumption	Internal employees and society
		Number of people with health risks	Health risks caused by the workload	Work and life balance	Internal employees and society
		Number of people improved health through health management	Employees' life style was improved through health education	Work and life balance	Internal employees and society
Products and services	Customer relationship management	Product sales figures	Promoted industry chain supply-demand relationship and further pushed up output value	Social and economic development	Customers/ end users
	Sustainable products	Quantity of product sales	Greenhouse gas emissions generated by products from the process of selling to disposal	Social cost of carbon	Environment
		Product energy-saving design	Conducted power-saving on products to avoid greenhouse gas emissions	Social cost of carbon	Environment
		Adoption of recycled materials on products	Avoided greenhouse gas emissions generated during the exploitation of raw materials	Social cost of carbon	Environment
		Removal of plastics in product packaging	Reduced greenhouse gas emissions generated from the packaging materials	Social cost of carbon	Environment

Confirming the source of data

The source of activity data can be divided into primary data (the original data obtained from actual verification) and secondary data (obtained from relevant literatures, databases or estimation). When conducting sustainable impact evaluation, it shall first consider using the primary data that is with better data quality. However, when the primary data is not available in real practice, secondary data can be adopted. For example, the supply-demand relationship between each industry in the supply chain and pollutant emission figure caused by each unit of output value can only be estimated with the industrial average coefficient through the reference to the national investigation report.

		Upstream supply chain	Production and operations	Downstream product sales
Economic aspect	Activity data	Procurement amount/ industrial supply-demand relationship	Internal financial profit-and-loss indicator	Product sales amount/ industrial supply-demand relationship
	Data quality	Primary data/ secondary data	Primary data	Primary data/ secondary data
	Category of the impact	Enhancement of supply chain output value	Economic value created directly	Enhancement of supply chain output value
Environmental aspect	Activity data	Industrial average coefficient database	Energy resources and pollutant emissions	Product environmental efficiency and greenhouse gas emissions
	Data quality	Secondary data	Primary data	Primary data/ secondary data
	Category of the impact	Human health, ecological system loss, and social cost of carbon		
Social aspect	Activity data	Industrial average coefficient database	Employee occupational accidents, health examination, compensation, etc.	Methodology is under development.
	Data quality	Secondary data	Primary data	
	Category of the impact	Creation of employment opportunity and compensation	Changes of personal or social welfare	

Establishing value approach

The management framework of sustainable impact adopted by Wiwynn covers three major value chain stages (supply chain/ production and operations/ products and services), three key sustainable management dimensions (economy/ environment/ society), and 14 impact indicators. The methodology used are referenced from domestic and overseas benchmark enterprises and relevant research reports.

Boundary	Impact indicator	Method of calculation
Supply chain	Social externality: Enhancement of supply chain output value	We adopted the input-output analysis (IOA) model to evaluate the economic benefits generated from the industry chain supply-demand effect driven by the procurement activities. Besides, emissions generated per unit output value in each industry were used to assess the environmental externality cost caused by greenhouse gases and air pollution as well as the positive impacts on the employment opportunities and compensation income brought to the supply chain.
	Social externality: Supply chain employee compensation income	
	Environmental externality: Supply chain greenhouse gas emissions	
	Environmental externality: Supply chain air pollution emissions	
Production and operations	Gross value added (GVA)	Through the approach of gross value added (GVA), we inspected the value flow created for stakeholders during the process of operations, including net operating income (shareholders/ investors), compensation and welfare (employees), tax payment (government), R&D investment (customers/ end users), interest and lease (suppliers), and depreciation and amortization (suppliers).
	Environmental externality: Greenhouse gas emissions/ renewable energy/ energy-saving efficiency	We adopted the thinking style of environmental profit and loss (EP&L) to evaluate the external environmental costs generated by energy resource consumption and pollutant emission or disposal during the process of operation to take actions for the reduction of negative impacts brought to the society.
	Environmental externality: Water resource consumption during the operation	
	Environmental externality: Operational wastewater disposal	
	Environmental externality: Operational waste disposal	
	Social externality: Employee future income	We took reference to the methodology of VBA (2021) to assess the professional skills and knowledge employees obtained by receiving training, which not only enhance productivity for the Company but also bring better employability and compensation income for employees' future career development.
	Social externality: Employee occupational accidents	Research report published by Health and Safety Executive (HSE, 2017) in the UK was used to evaluate the factors of productivity loss caused by occupational accidents, workers' compensation, and willingness to pay for avoiding occupational accidents.
	Social externality: Employee health risks/ employee health management	Through regular health examination, the employees with high blood pressure, high cholesterol, high blood sugar, and obesity were found at early stage to formulate various health promotion programs to reduce or avoid the risks of cardiovascular diseases and relevant medical costs.
Products and services	Social externality: Enhancement of industry chain output value	We focused on cloud servers and integrated rack solutions and the supply-demand relationship between sales amount and industry output value for brand customers to evaluate the indirect economic value created by product sales.
	Environmental externality: Product environmental footprint and benefits	Through the perspective of life cycle assessment (LCA), environmental impacts from the use of products to the disposal of products were analyzed as well as the environmental benefits generated by energy-saving products and eco-friendly design.

Because the monetary value conversion coefficient comes from different research, Wiwynn followed ISO 14008:2019 Monetary valuation of environmental impacts and related environmental aspects framework to set 2018 as the base year and adjusted differences caused by different background of geography and time.

1. Adjustment of geographical differences: based on the following formula, weighted equity was calculated with the gross national income (GNI) adjusted by the purchasing power parity (PPP) in different areas (OECD, 2012).

$$E_i=(Y_i / Y_{ref})^{\epsilon}$$

Where

- Ei refers to the equity weighted coefficient after income adjustment
- Yi refers to the gross national income (GNI) after the adjustment of purchasing power parity (PPP) in the expected value transfer area
- $Yref$ refers to the gross national income (GNI) after the adjustment of purchasing power parity (PPP) in the original value coefficient research area
- ϵ refers to income coefficient of elasticity. It is the correlation between WTP and income and is represented by 0~1.
  1 means direct proportion between WTP and income while 0 represents irrelevance between WTP and income. The report adopts the value of 0.6 suggested in PwC UK (2015).

2. Adjustment of differences in different background of time: In consideration of inflation rates and currency exchange rates, value coefficients in different background of time were adjusted to the monetary value of the base year.

Result of analysis

- Supply chain output value enhanced by procurement
- Procurement created compensation income for supply chain employees
- Greenhouse gases and air pollution emissions generated by the supply chain

- Value-added income
- Greenhouse gas emission, energy saving, and renewable energy
- Water resource consumption
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- Waste disposal
- Employee future income
- Employee occupational accidents
- Employee health risk and management

- Industry chain output value raised by product sales
- Product environmental footprint
- Product environmental benefits

Upstream supply chain

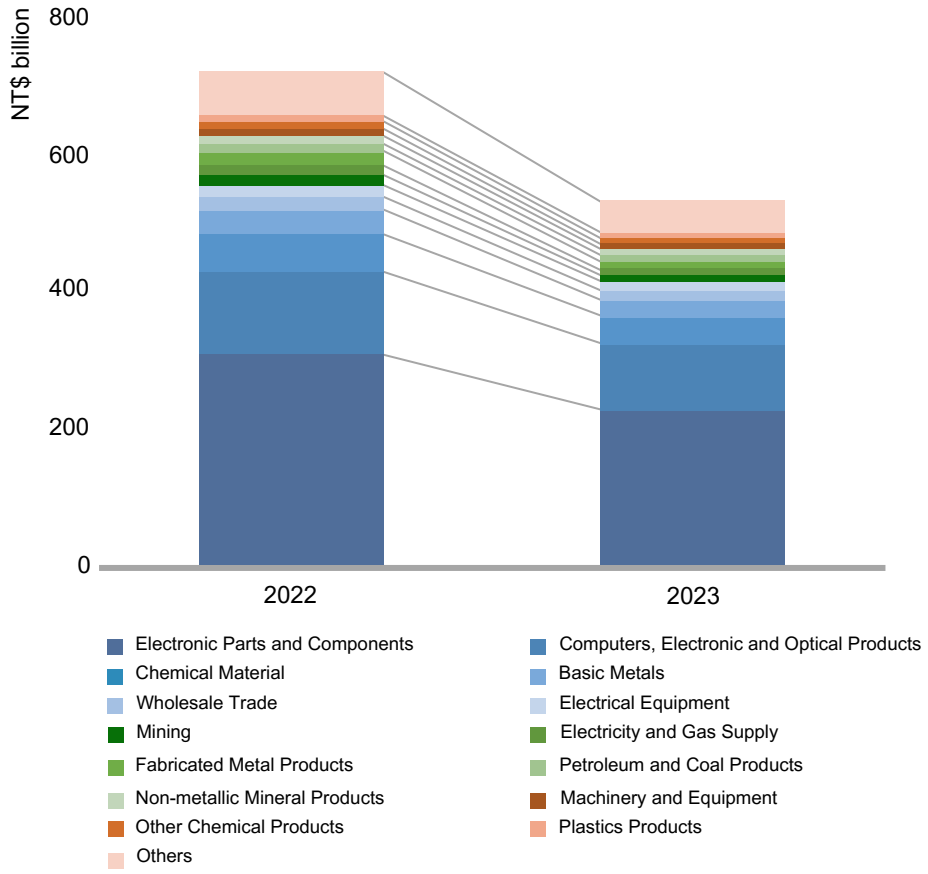
Supply chain output value enhanced by procurement

Economic activities conducted among industries involve complicated interdependence. Through the input-output model developed by Nobel Memorial Laureates, Wassily Leontief, between 1930 and 1940, the input factors of production in industries can be allocated to the final product demands; the activities conducted by the company will lead to the changes of final demands (VBA, 2021). The statistics of the model are usually implemented by governments or scientific research institutions according to the actual financial data and presented in input-output tables. In the report, the impact of expenditure in procurement to the supply-demand structure in the industry chain is identified through the input-output model, including output value, employment, and compensation, and can be even extended to the calculation of various emissions.

Analytical results

In 2023, due to procurement demands, Wiwynn indirectly created a supply chain output value of NT$536.6 billion (positive). Among them, “electronic components” and “computer, electronic, and optical products” accounted for the most, 42% and 18% respectively. From the trend over the years, the impact of procurement demands enhanced supply chain output value decreased by 26%. It was mainly because the global server shipment in 2023 declined from the previous year, and it caused the overall procurement demand in 2023 slowed down.

Boundary	Wiwynn’s global production and operating sites
Activity data	Procurement amount
Calculation instruction	In the report, Input-Output Table published by the Directorate General of Budget, Accounting and Statistics in 2016 was used for the calculation of supply-demand relationship among industries.
Reference	Directorate General of Budget, Accounting and Statistics (2020)



Upstream supply chain

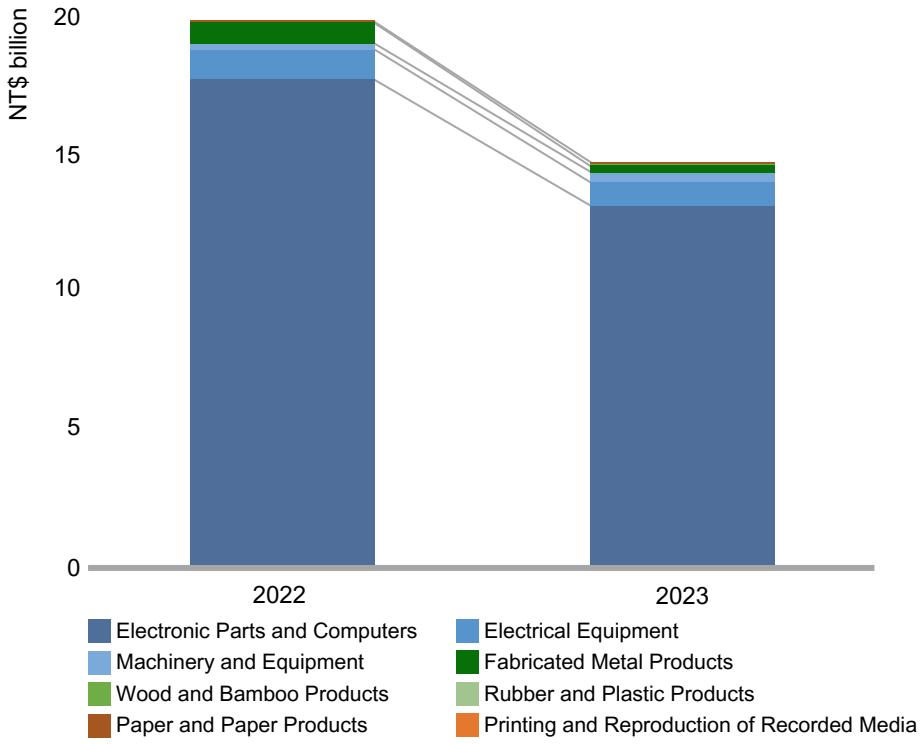
Procurement created compensation income for supply chain employees

The model of the input-output analysis incorporates all the input elements during the process of production and service provided by suppliers (direct) and at the stage of upstream (indirect) into the calculation as well as allocates according to the changes of final demands caused by the company activities (VBA, 2021). Through the model, it analyzes the direct and indirect resources required to satisfy the changes of final demands for the procurement demand in the overall industry chain, such as employee recruitment and compensation expense.

Analytical results

In 2023, Wiwynn's procurement demands created 40,000 employment opportunities in the supply chain and brought the benefit of social externality (positive) of NT$14.8 billion compensation income to workers. Among them, "electronic components" and "computer, electrical and optical products" contributed the most to the industry in 89%.

Boundary	Wiwynn's global production and operating sites
Activity data	Procurement amount
Calculation instruction	The report referred to Exiobase 2 Input-Out Database[2] and adopted Taiwan Industry Coefficient for calculation.
Reference	EXIOBASE 2 Database



[2] EXIOBASE Database a global cross-border industrial supply-use and input-output database jointly developed by research institutions, including Norwegian University of Science and Technology (NTNU), Netherlands Organization for Applied Scientific Research (TNO), Sustainable Europe Research Institute (SERI), Institute of Environmental Sciences (CML), Institute for Ecological Economics (WU), and 2.-0 LCA Consultancy Company. EXIOBASE 2 is based on Year 2007 and covers economic, environmental, and social information in five major continents, 43 countries/ regions, and 163 industries.

Upstream supply chain

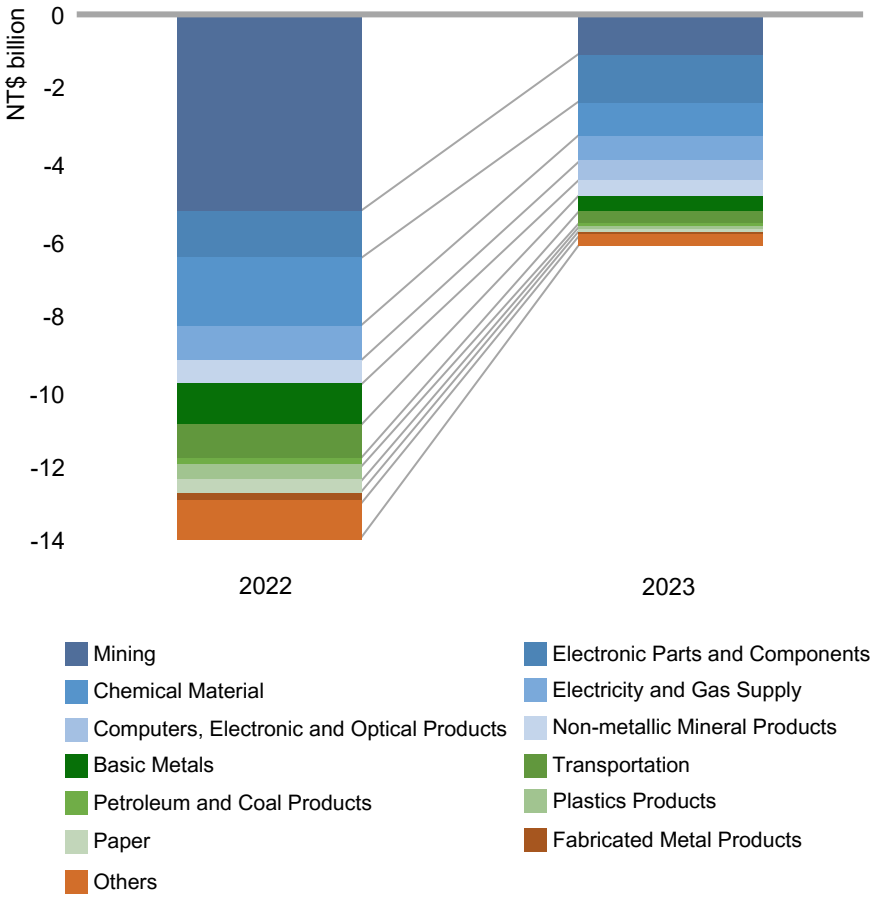
Greenhouse gases and air pollution emissions generated by the supply chain

The model of input-output analysis is widely used for economic impact analysis (EIA) and environmentally extended input output analysis (EEIO) (VBA, 2021). Traditional input-output table is used to clarify exchanges among industries (Miller & Blair, 2009) while EEIO integrates information of environmental impacts in each industry and provides a simple and sound method for the evaluation of connection between economic consumption activities and environmental impacts (Kitzes, 2013).

Analytical results

In 2023, due to the procurement demands, Wiwynn indirectly generated 2.34 million metric tons of greenhouse gas emissions in the supply chain and 5,070 metric tons of air pollutants. The environmental externality generated was estimated around NT$6 billion (negative) in monetary value. It was mainly caused by electronic components and the upstream mineral mining, which accounted for 38%. It was followed by the environmental footprint generated during the production of chemicals and the electricity and gas supply process, accounting for 14% and 11% respectively.

Boundary	Wiwynn's global production and operating sites
Activity data	Procurement amount
Calculation instruction	To identify the correlation between the procurement amount invested in each industry and environmental impacts. The report followed the methodology of EEIO and analyzed with the statistical information published by Directorate General of Budget, Accounting and Statistics and Energy Administration and calculated pollutant emissions per unit output value in each industry, including greenhouse gases and air pollution (PM2.5, NOx, Sox, NMHC, and Pb, etc.) before evaluating social costs generated with value coefficients.
Reference	Directorate General of Budget, Accounting and Statistics (2021), Energy Administration (2021), US EPA (2016), OECD (2012), PwC UK(2015), and CE Delft (2018)



Production and operations

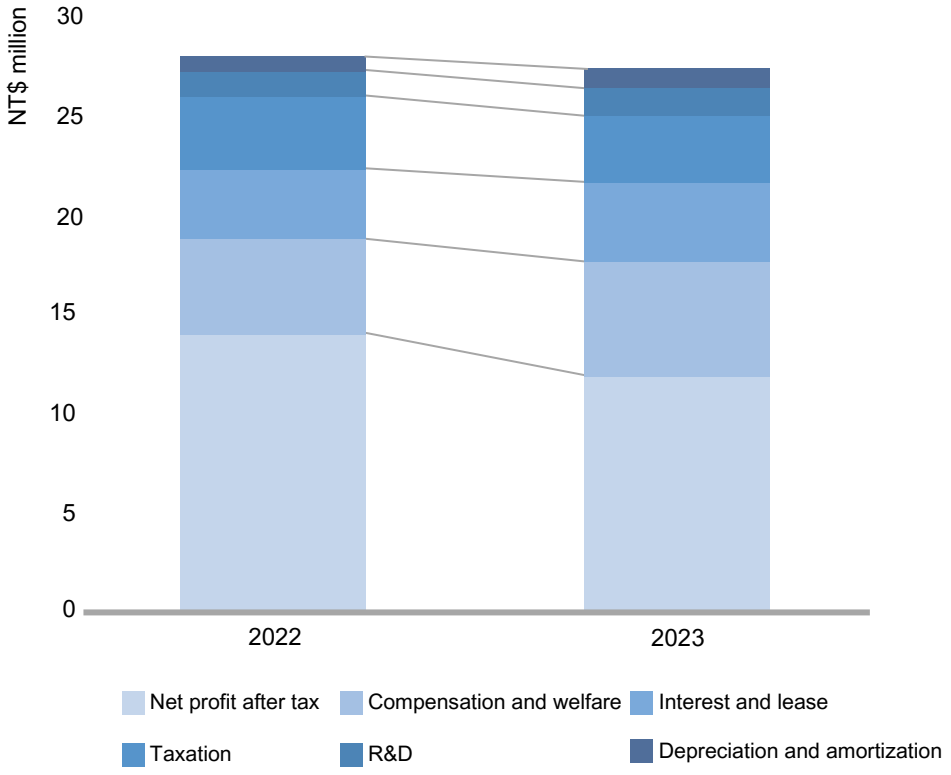
Value-added income

The approach of gross value added (GVA) is to evaluate the difference between the intermediate input and final output in the business operations. At the same time, it considers original investment and public expenditure to evaluate the benefits of these economic activities generated to different stakeholders, including net operating income, employment cost, and tax payment. Therefore, GVA can be used as a basis to understand the contribution made by the enterprise to the welfare of stakeholders (VBA, 2021). The report re-evaluates the value flow created for the stakeholders during the process of operation through GVA approach, including net operating income (shareholders/ investors), compensation and welfare (employees), taxation (government), and depreciation & amortization (suppliers).

Analytical results

In 2023, Wiwynn created an operating income of NT$241.9 billion. Among them, NT$1 billion was listed for depreciation and amortization, NT$3.4 billion for tax payment, NT$4 billion for technology R&D, and NT$5.9 billion was used to pay for employee compensation. We not only assisted customers to achieve success in products, promoted industrial technology development, enhanced employees' feeling of well-being and purchasing power but also supported governments in expanding infrastructure and social welfare (positive). At the same time, we created a net operating income of NT$12 billion and distributed NT$8.7 billion cash dividends to create quality return on investment for investors (positive).

Boundary	Wiwynn's global production and operating sites
Activity data	Relevant data disclosed in Wiwynn's financial statements
Calculation instruction	Approach of gross value added (GVA) was adopted to evaluate the difference between intermediate input and final output of the business operation in Taiwan Semiconductor Manufacturing Company Limited. At the same time, it considered the benefits of economic activities of original investment and public expenditure generated to different stakeholders.
Reference	VBA (2021)



Production and operations

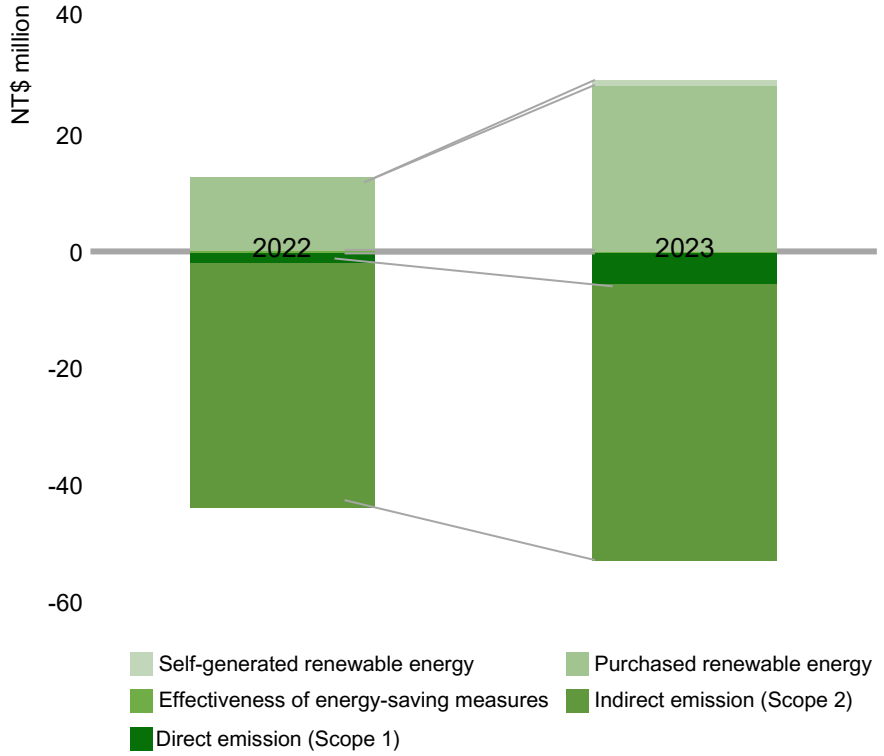
Greenhouse gas emission, energy saving, and renewable energy

Greenhouse gas (GHG) refers to the gases that absorb or release infrared radiation and exist in the atmosphere. The heat is then trapped between the surface of the earth and the troposphere and causes greenhouse effect. United Nations Framework Convention on Climate Change classifies greenhouse gases into seven categories, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF_6), and Nitrogen trifluoride (NF_3). In the report, environmental externality generated during the production and operations is calculated according to the social cost of carbon (SCC) caused by greenhouse gases.

Analytical results

In 2023, greenhouse gas emitted during Wiwynn's production and operations was 32,133 metric tons CO_2 e. It generated around NT$52.53 million of environmental externality cost (negative), and 90% of them were the indirect emissions (Scope 2)[3] caused by the use of energy while 10% was the direct emission (Scope 1) from the process of production and operations. To reduce the external costs caused by the consumption of energy resources, Wiwynn was active in arranging the application of renewable energy in global operating sites as well as launched various energy-saving programs. In 2023, we avoided greenhouse gas emissions in a total of 18,015 metric tons CO_2 e, and it generated environmental external benefits (positive) of NT$29.45 million.

Boundary	Wiwynn's global production and operating sites
Activity data	Greenhouse gas emissions, self-generated and outsourced renewable energy, and effectiveness of energy-saving measures
Calculation instruction	Through the perspective of the environmental profit and loss (EP&L), social cost of carbon was adopted as the external cost value coefficient for each unit of greenhouse gas emission. It means the social cost for long-term damage on global physical and economic systems caused by climate change, including property & economic loss and physical health damage caused by physical disasters or the economic cost generated for energy transformation to avoid the rise of temperature.
Reference	US EPA（2016）



[3] Scope 2 adopted the approach of regional standards for calculation.

Production and operations

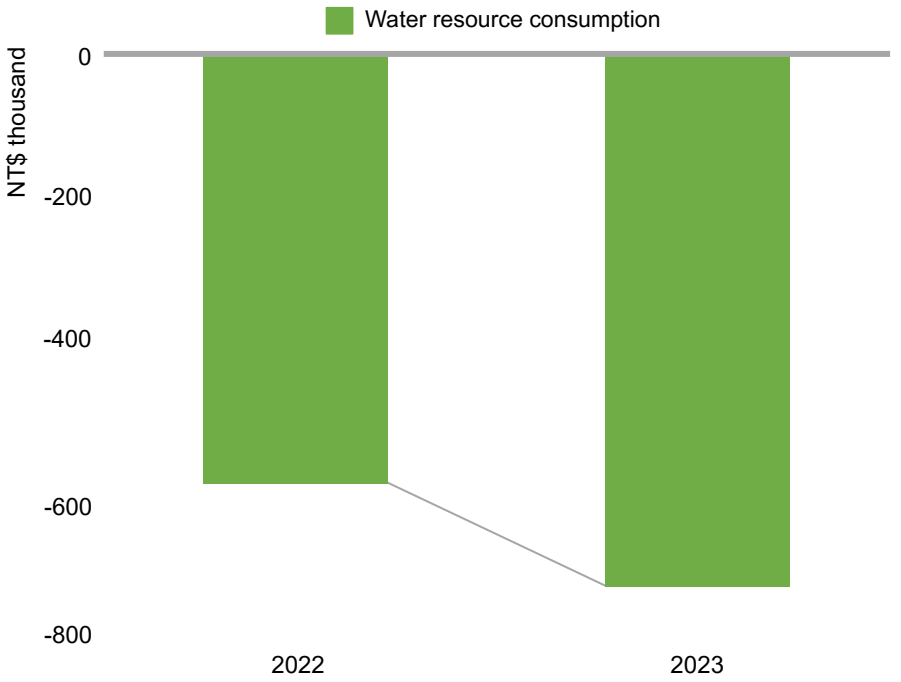
Water resource consumption

Water resource consumption may cause various potential impacts to human health through different approaches. Excessive freshwater consumption will cause the shortage of irrigation water and reduce the harvest of crops and further lead to malnutrition (Bayart et al., 2010; Kounina et al., 2013). On the other hand, the lack of clean household water may cause waterborne diseases (WWAP, 2009; Boulay et al., 2011). In the report, we assumed the water resource consumption during the process of business operations will directly affect the amount of water available for household and agriculture purpose to estimate the environmental externality generated due to the human health loss caused by water resource shortage.

Analytical results

The manufacturing process of Wiwynn's products is mostly assembly without water consumption demands. It is mainly household water consumption and for some factory equipment, including kitchen and cooling water tower. In 2023, water resource withdrawal during the process of production and operations was 159,410 cubic meters. It generated around NT$730 thousand of environmental externality cost (negative) and was increased by 24% compared to the previous year. It was mainly because the new factory in Malaysia started operations in 2023, and it expanded the operating boundary.

Boundary	Wiwynn's global production and operating sites
Activity data	Volume of water withdrawal
Calculation instruction	Through the perspective of environmental profit and loss (EP&L) as well as the consideration of factors of water poverty index (WSI) and human development index (HDI), we evaluated the risks of agricultural and household water shortage caused by the water consumption demand by Taiwan Semiconductor Manufacturing Company Limited and potential impacts to human health generated. Besides, the approach of value of a statistical life (VSL) was used to estimate social cost generated by the loss of human health.
Reference	Pfister et al. (2009) 、 LC-Impact (2016) 、 Motoshita et al. (2011) 、 OECD (2012) 、 PwC UK (2015)



Production and operations

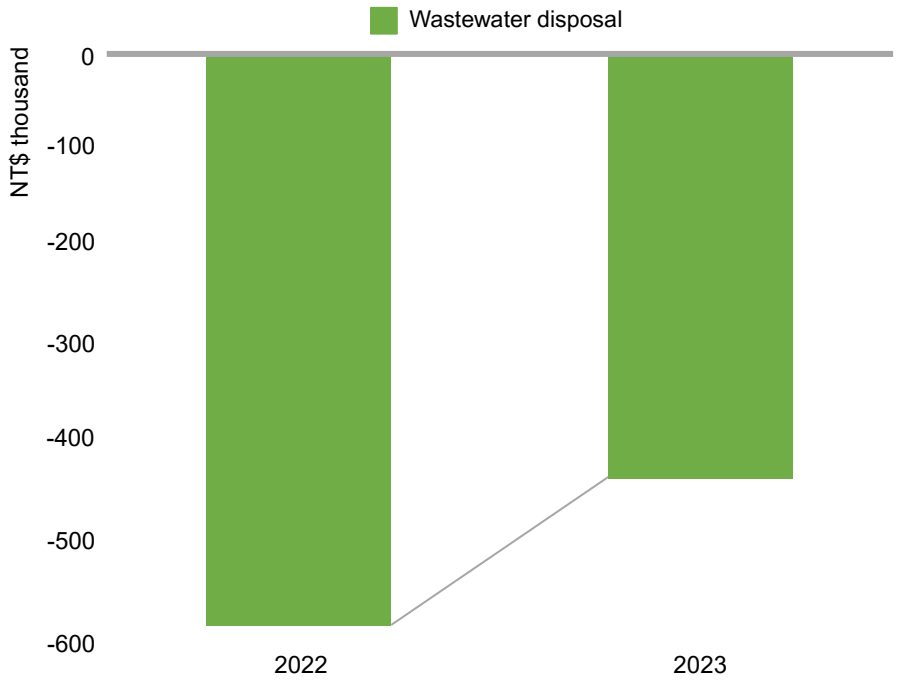
Wastewater disposal

Pollutants in water may enter human body through various approaches, including direct ingestion (such as drinking), indirect ingestion (such as bioaccumulation), and direct inhalation (such as evaporation). Among them, heavy mental and chemicals are the main source of toxicity to human body. These pollutants are usually discharged to waterbody in a low concentration, and it will affect chronic health for long-term exposure, such as cancer and unhealthy pregnancy. Also, it will reduce mental and central nervous functions (PwC UK, 2015; CE Delft, 2018). In the report, it mainly evaluates the environmental footprint generated during the process of wastewater disposal and discharge that may cause the loss of human health and further generate environmental externality.

Analytical results

The wastewater discharged by Wiwynn during the process of production and operations is mainly the domestic water used by employees. In 2023, the amount of wastewater discharge was 95,353 cubic meters, and it generated around NT$430 thousand of environmental externality cost (negative); reduced 26% compared to the previous year. In 2023, Wiwynn enhanced the recycling rate of water resources through air conditioning condensed water, rainwater, and water used after washing hands and reuse them in watering landscape. In 2023, water resource recycling rate was 9%.

Boundary	Wiwynn's global production and operating sites
Activity data	Volume of wastewater discharge
Calculation instruction	Through the perspective of environmental profit and loss (EP&L), potential impacts to human health caused during the process of business wastewater disposal is evaluated. Supported with the approach of value of a statistical life (VSL), it estimates the social cost generated due to the loss of human health.
Reference	ReCiPe 2016 Database、OECD（2012）、PwC UK（2015）



Production and operations

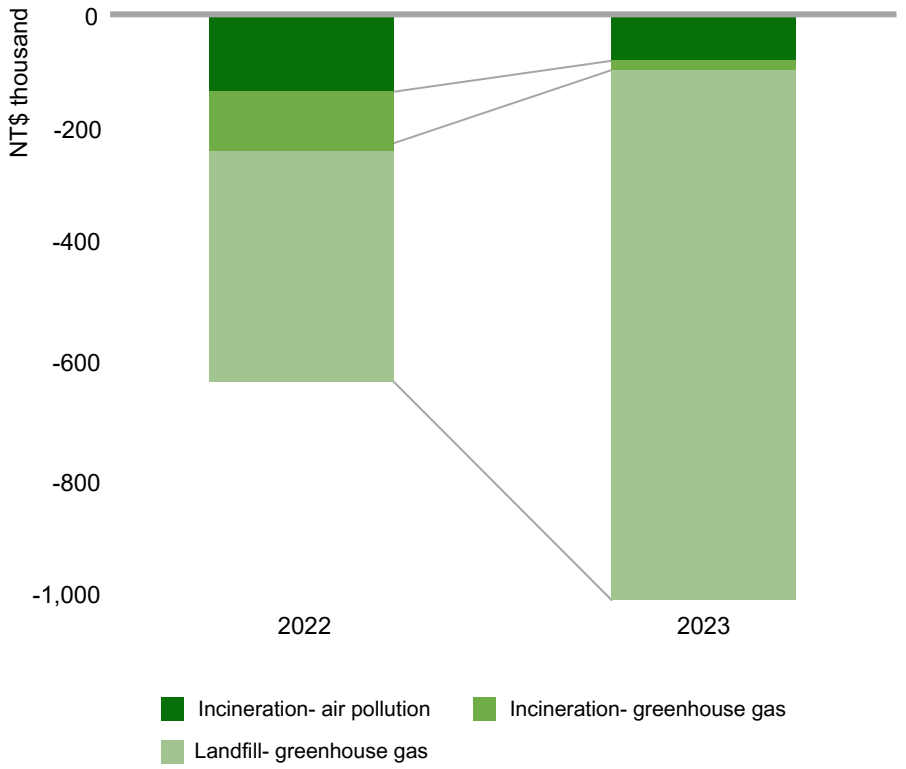
Waste disposal

Various air pollutants may be generated during the process of waste incineration, such as particulate matters (PM), nitrogen oxide (NOx), sulfur oxide (SOx), dioxin, and heavy metal. They may cause critical impacts to human health, such as cancer or loss of mentality (EXIOPOL, 2009; PwC UK, 2015). Atmospheric deposition of inorganic matters (such as sulfate, nitrate, and phosphate) will cause soil acidification and affect the terrestrial ecosystem (Goedkoop et al., 1999; Hayashi et al., 2004). In the report, the environmental externality was evaluated in consideration of the potential impacts to human health and ecosystems by air pollutants emitted during the process of waste incineration as well as the greenhouse gases generated during the process of waste being burned in the incinerator or landfill and decomposition.

Analytical results

In 2023, the general and hazardous business waste generated during the process of Wiwynn's production and operations was 742 metric tons in total. It generated around NT$1 million of environmental externality cost (negative), which increased by 59% compared to the previous year. Limited by the different waste disposal approaches and skills in regions where operating sites are located, Wiwynn was devoted to reduce waste. The waste output per unit revenue in 2023 reduced 24.74% compared to the previous year. In addition, we increased the channels for waste reutilization, strengthened the recycling system, effectively enhanced resource recycled and reutilization rate, and planned reduction or sought the possibility of reused in the factory according to the source of waste. In 2023, the operating site in Mexico continued recycling wooden boxes and wooden pallets used for product transportation. In average, the number of recycling was five times. It was estimated that 3,004,500 kilograms of waste output were reduced in 2023, and it achieved NT$460 million in terms of economic benefits.

Boundary	Wiwynn's global production and operating sites
Activity data	Output of general and hazardous waste
Calculation instruction	Through the perspective of environmental profit and loss (EP&L), the potential impacts to human health caused by air pollutants generated during the process of waste incineration is evaluated. Furthermore, the approach of value of statistical life (VSL) is used to estimate the social cost generated by the loss of human health. Meanwhile, through the model of first order decay (FOD), the volume of methane (CH4) emissions after anaerobic digestion during the waste landfill process is calculated to estimate the social cost of carbon generated by incineration and landfill.。
Reference	LC-Impact（2016）、USEtox（2017）、IPCC（2006）、US EPA（2016）、OECD（2012）、PwC UK（2015）



Production and operations

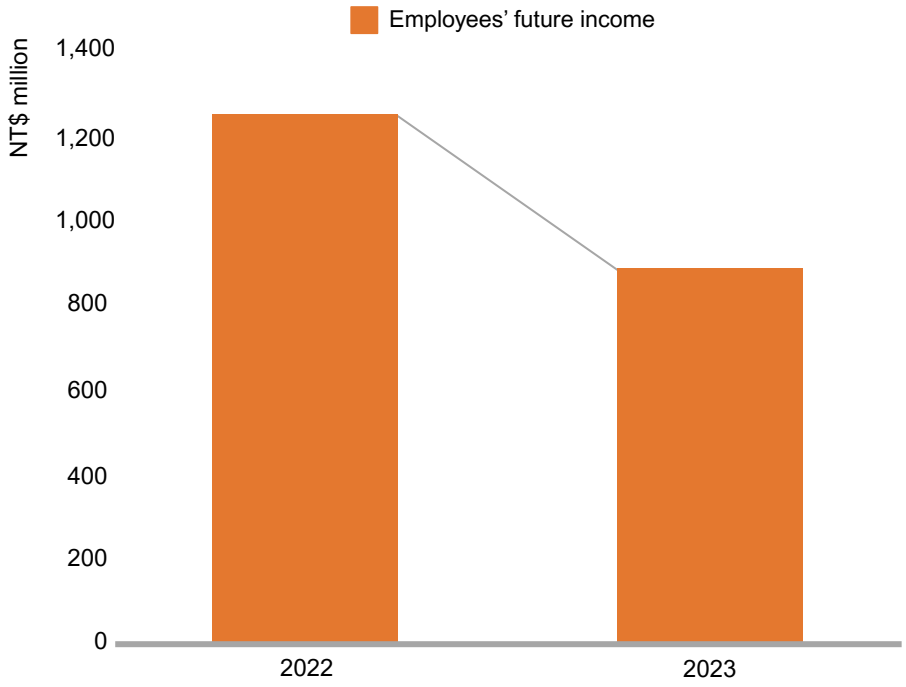
Employee future income

Employees' experience and skills are essential for the long-term development of enterprises. They not only enhance productivity to bring revenue to the company but also strengthen employees' personal employability to bring better compensation income in their future career development and improve their life quality and purchasing power. In the report, it is mainly to evaluate the social externality generated because employees obtain professional skills and knowledge from the training received to not only enhance productivity, bring better employability to their future career development, and further affect the average annual expected value for the compensation development in their career.

Analytical results

Human capital development strategy adopted by Wiwynn focuses on "enhancing quality of manpower, strengthening core competency, and increasing work performance". In 2023, trainings provided to employees in global operating sites achieved a total of 173,417.75 hours. By providing employee training resources, enhancing employee management and professional capabilities, and strengthening personal and organizational effectiveness and competitiveness through diverse channels, we created a benefit of expected compensation growth (positive) for employees' future career development in NT$890 million.

Boundary	Wiwynn's global production and operating sites
Activity data	Employees' training hours, average salary, salary adjustment rate, turnover rate
Calculation instruction	Refer to VBA (2021), impact factors of employee salary, training hours, salary adjustment rate, turnover rate, retirement age, and discount rate are used to estimate the social contribution to the average annual salary benefit expected to be obtained in the future career development because the experience accumulation and skill improvement caused by the training resources provided by the company.
Reference	VBA（2021）



Production and operations

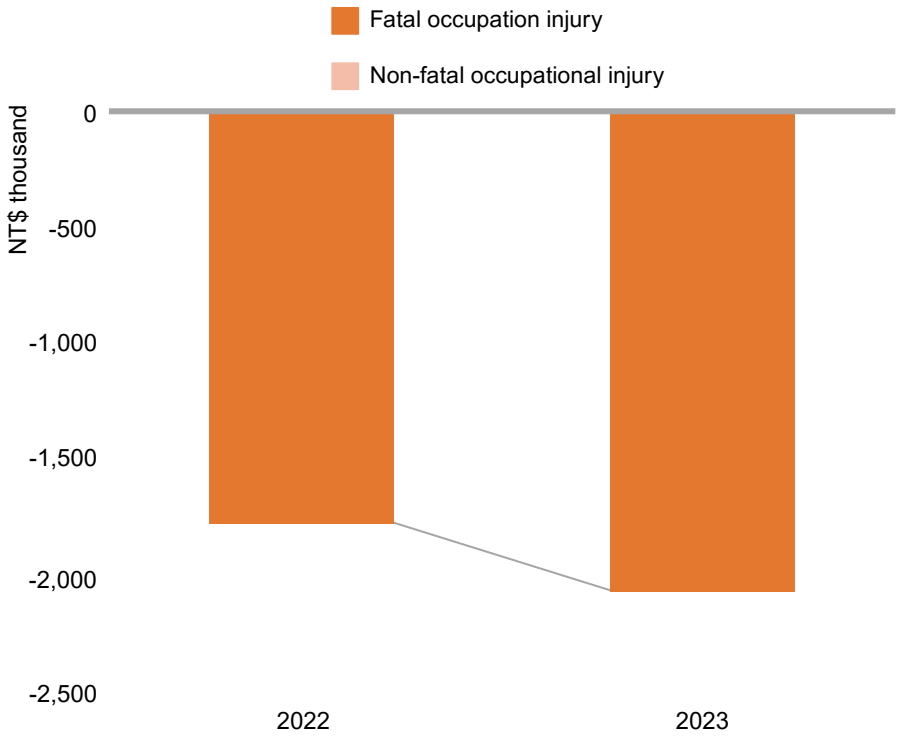
Employee occupational accidents

When employee performing duties, employees may encounter occupational accidents, including disease, injury, disability, or death, caused by the buildings, machines, equipment, raw materials, materials, chemicals, gases, steam, and dust in the workplace or operating activities and other causes due to the profession. According to the research by UK Health and Safety Executive (HSE, 2020), social costs generated by the occupational incidents on employees include financial cost and human resource cost (HSE, 2020). In the report, the disabling injury and death by occupational accidents are included for evaluation. Financial cost includes the loss of productivity and relevant compensation for occupational accidents while human resource cost refers to the willingness to pay to avoid occupational accidents and the economic loss caused by occupational death. These are used to evaluate of social externality caused by occupational accidents.

Analytical results

In 2023, there were 33 employees encountering occupational accidents in Wiwynn's global operating sites. It caused 390 working days lost due to disabling injuries and no fatal occupational injury. It generated a social cost of NT$2.05 million (negative). Most of the injuries were caused by contacting high-temperature equipment, pinch injury, fall, contusion, and sprain. Immediate medical care was provided immediately after the accident happened, and investigation and corrective measures were conducted through the interview with relevant personnel. To effectively reduce occupational accidents, relevant implementation and management measures were enhanced, including (1) incorporating cases of occupational injuries and accidents into training materials to increase safety awareness, (2) promoting safety slogan, (3) inspecting the critical control points on the machine, adopting preventive corrections and conducting engineering improvement, and (4) strengthening inspection on environment, safety, and health, to implement safety commitment for the workplace.

Boundary	Wiwynn's global production and operating sites
Activity data	Number of employees encountered occupational accidents, working days lost, compensation for occupational accidents
Calculation instruction	The methodology of HSE (2020) is used to calculate the social cost generated by occupational accidents. Financial cost includes loss of productivity, medical and rehabilitation expenses, administrative and legal fees, and salary and insurance compensation. Human resource cost refers to the value of willingness to pay personally to reduce risks of occupational injury or death. Because the loss of productivity, salary compensation, and administrative and legal expenses have been reflected in the financial statements while workers' medical and rehabilitation expenses involve with personal privacy, these are excluded from calculation.
Reference	HSE (2020), VBA (2020), Ho Chun-Chieh (2005), and Tsao Chang-Ching at al. (2013)



Production and operations

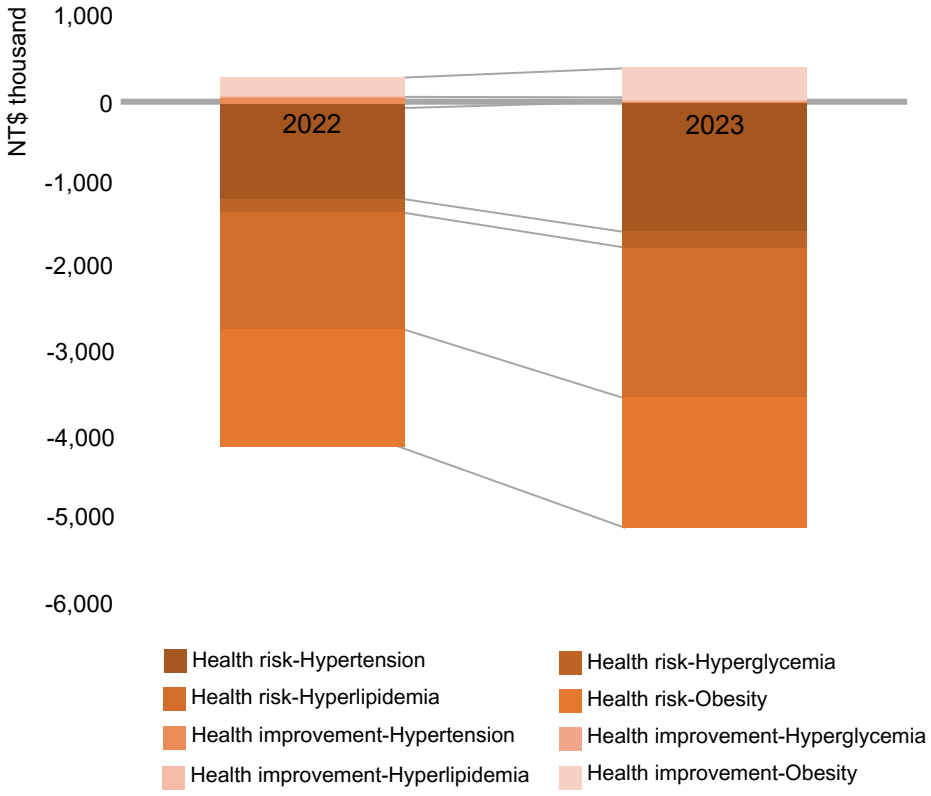
Employee health risk and management

According to the statistics published by Ministry of Health and Welfare, cardiovascular diseases have always been ranked as top three in the national top ten causes of death. Epidemiological study revealed factors of hypertension, hyperlipidemia, diabetes, and obesity may cause onset of cardiovascular diseases (Anderson et al., 1991). The report adopts the concept of attributable risks to evaluate avoidable medical costs by eliminating or reducing the risks of employee contracting cardiovascular diseases through regular health examination, personalized health management, and various activities of health promotion.

Analytical results

Comprehensive health examination helps the early detection of possible diseases. Wiwynn implements employee health examination every year. In 2023, a total of 2,786 employees in the operating sites in Taiwan participated in health examination. The examination showed the employees with risk factors of cardiovascular diseases, including hypertension, hyperglycemia, hyperlipidemia, and overweight, may generate a potential medical cost (negative) of NT$5.06 million. Wiwynn conducted control banding according to the results of the health examination. Through doctor consultation services and health education and instruction by the factory nurse as well as health management follow-up, employees' health was improved and under the control to avoid a medical cost of NT$430 thousand in total (positive).

Boundary	Wiwynn's operating sites in Taiwan
Activity data	Employee health examination and health management information
Calculation instruction	With reference to the methodology of impact weighted accounting (IWA) published by Harvard Business School, we consider employees with the potential risks of cardiovascular diseases, including hypertension, hyperglycemia, hyperlipidemia, and overweight, causation with work load, and possible medical resource investment required as well as property control employees' risks in contracting cardiovascular diseases through personal health management to evaluate avoidable medical costs.
Reference	WHO (2008) and Lee Chieh-Hsien (2010)



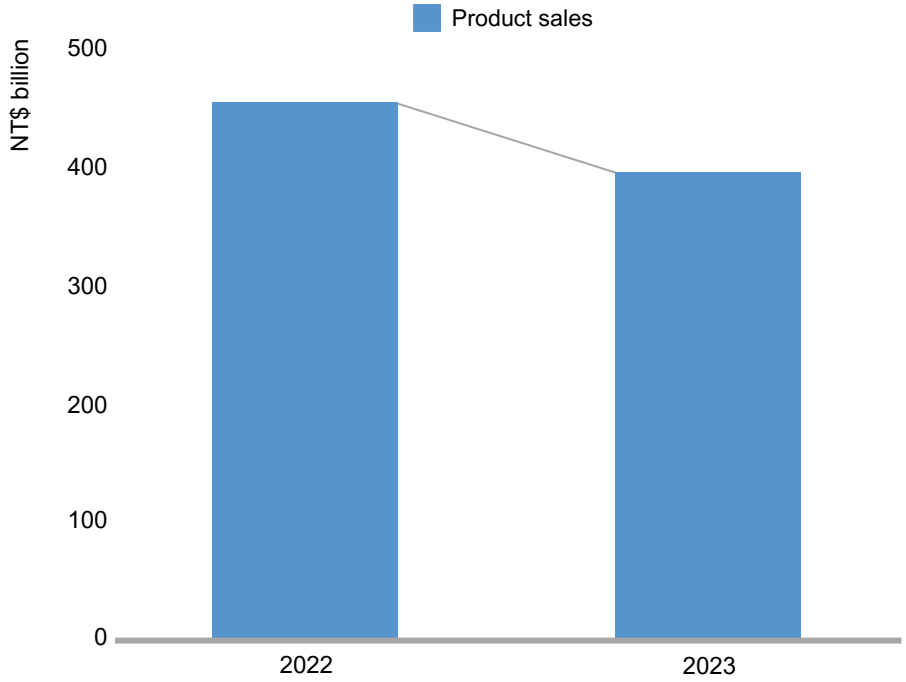
Downstream products and services

Industry chain output value raised up by product sales

Products offered by Wiwynn are mainly cloud servers with high efficiency, high-quality computing, and storage as well as integrated rack solutions. We provide customized products and services of system integration to cloud service providers. With optimized solutions, we provide data centers the best workload and total cost of ownership (in short, TCO) to assist customers adopting IT resources more efficiently and more flexibly. At the same time, we create the growth of revenue for customers. In the report, factors of product sales, industrial supply-demand relationship, customer's industrial type, and production output value are evaluated for the efficiency of social externality created during the process of product sales.

Analytical results

In 2023, Wiwynn created benefits of social externality (positive) in NT$397.6 billion because of customers' output value pushed up by product sales. It reduced 13% from the previous year because the global economic growth in 2023 slowed down, industrial management environment was getting weaker, and the demands for cloud services from consumers and enterprises dropped since the pandemic, causing the global server shipment declined compared to the previous year. In facing the expansion of AI application demands and environmental sustainability driven by technology and energy transformation, Wiwynn will treat global trends and market changes in a more macroscopic view, continue maintaining competitive advantage and resilience, and step forward steadily to develop unlimited possibility for the future.



Boundary	Wiwynn's global production and operating sites
Activity data	Amount of product sales (production output value)
Calculation instruction	With reference to the evaluation method of BASF (2017), reasonable distribution is conducted in the consideration of the supply-demand relationship between the amount of product sales and customers' industry output value to calculate the indirect economic value created to customers' industry during the process of sales.
Reference	BASF (2017)

Downstream products and services

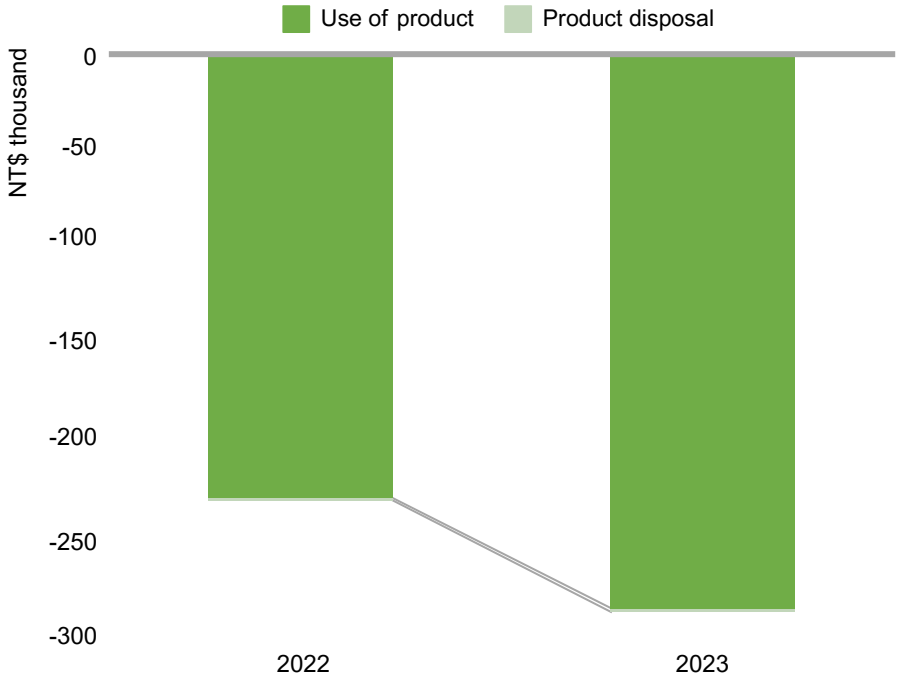
Product environmental footprint

According to the purpose of different terminal applications, the energy consumption of Wiwynn's products during the use of products and the stage of disposal will generate indirect greenhouse emission during the process of power generation and further cause social cost of carbon. In the report, the perspective of life cycle assessment (LCA) is used to analyze the indirect greenhouse gas emission generated from the use of the product to the disposal of the product and evaluate environmental externality caused by the production and operations with social cost of carbon (SCC).

Analytical results

In 2023, due to the purpose of terminal utilization, Wiwynn's products generated a total of 5.37 million metric tons of greenhouse gas emission and around NT$290 million of environmental externality cost (negative); it grew 24.7% compared to the previous year. It was mainly because product energy consumption increased hugely along with the computation demand. To respond to the continuous increasing demand on computing acceleration and power density by AI, Wiwynn kept investing in cooling systems. In 2023, based on traditional air cooling and compared to our products with liquid cooling technology, the liquid-cooling products are 1.15 times better than traditional air-cooling products in efficiency, calculated by floating-point operations per second divided by thermal design power.

Boundary	Wiwynn's global production and operating sites
Activity data	Greenhouse gas emissions during the use of the product and product disposal.
Calculation instruction	According to GHG Protocol, energy consumption is calculated by the scenario of terminal product utilization and life cycle as well as unrecyclable weight in the terminal products to further estimate greenhouse gas emission and social cost of carbon in the stage of disposal.
Reference	WRI & WBCSD（2013）、US EPA（2016）



Downstream products and services

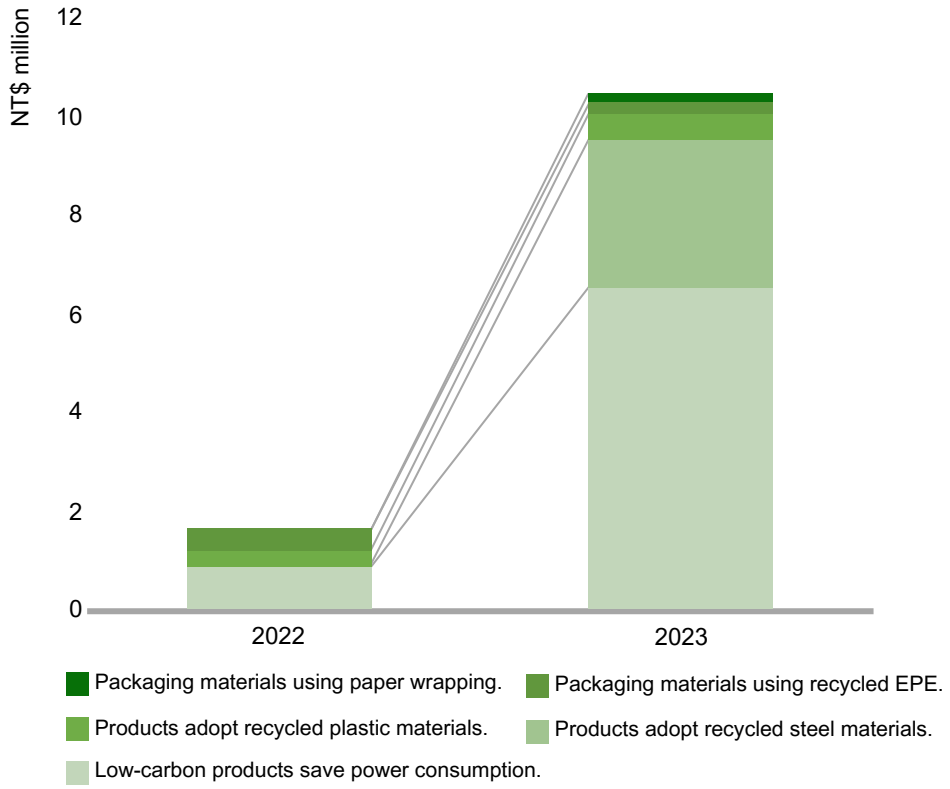
Product environmental benefits

Wiwynn incorporates the spirits of sustainability and innovation into each detail and considers the whole product life cycle from design, raw material, production, delivery, to recycling the product. We not only create the value of product itself but also focus more on reducing environmental carbon footprint, lowering energy consumption, and seek a virtuous cycle of ecological balance. In the report, efficiency of environmental externality along with the avoided greenhouse gas emission by eco-friendly design from product energy saving and product adoption of recycled steel materials, recycled plastic materials, recycled expandable polyethylene (EPE), and plastics removal from packaging are estimated through the perspective of life cycle assessment (LCA).

Analytical results

In 2023, Wiwynn avoided greenhouse gas emissions in a total of 6,603 metric tons by product energy-saving design and introduction of recycled materials and plastics removal from packing materials. It created a benefit of environmental externality (positive) around NT$10.55 million and increased by 540% compared to the previous year. It was mainly because the expansion of product energy-saving efficiency and the eco-friendly design of adopting recycled steel materials.

Boundary	Wiwynn's global production and operating sites
Activity data	Product energy-saving efficiency, use of recycled materials, plastics removal from packaging materials.
Calculation instruction	In consideration of the energy consumption saved on products with energy-saving design in the stage of utilization compared to that on old-generation products, the use of recycled materials on products to avoid virgin material exploitation, and the greenhouse gas emissions reduced by replacing plastic packaging materials with paper packaging materials, the avoidable social cost of carbon can be estimated.
Reference	US EPA (2016)



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