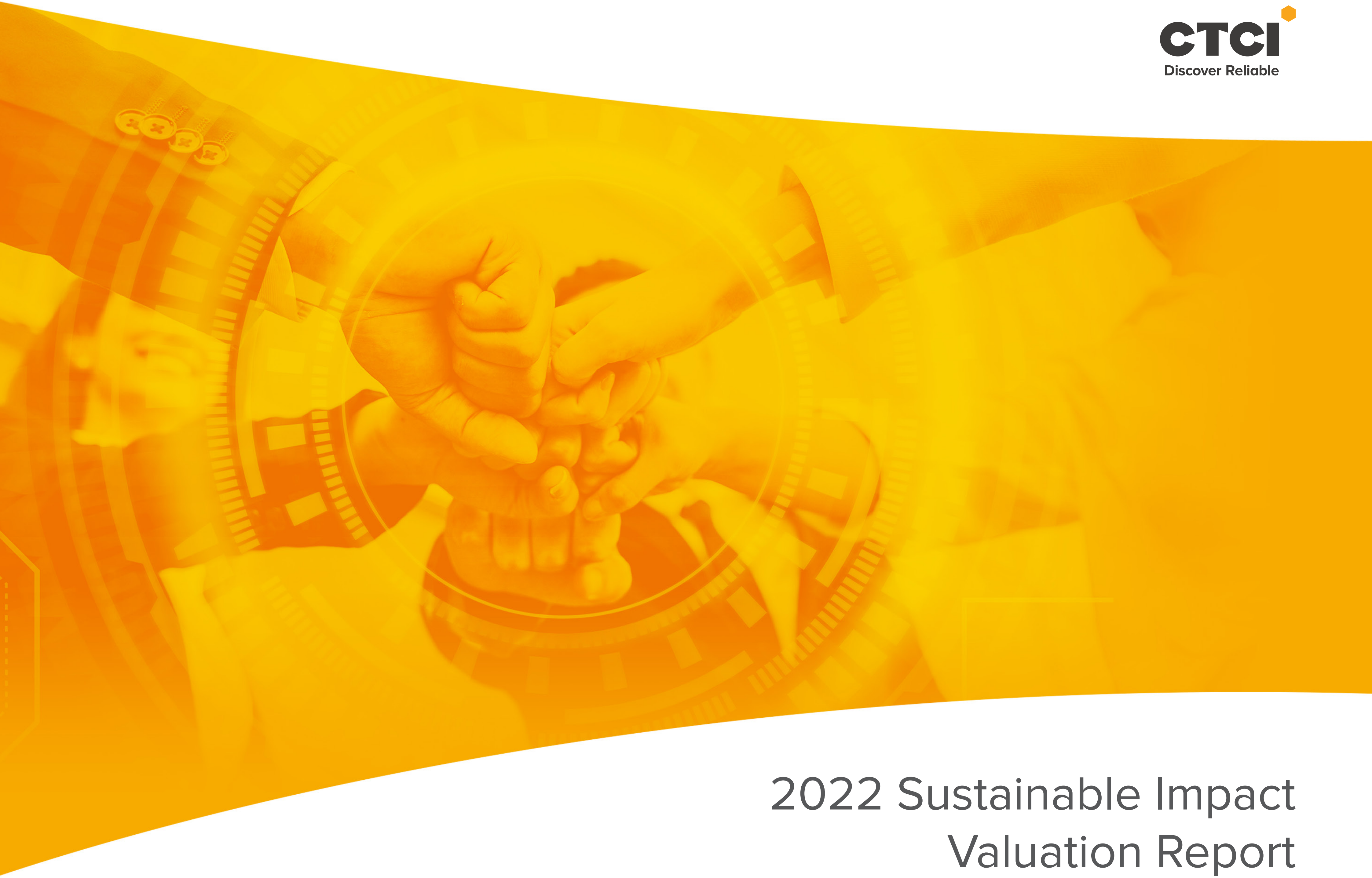


CTCI
Discover Reliable

2022 Sustainable Impact Valuation Report

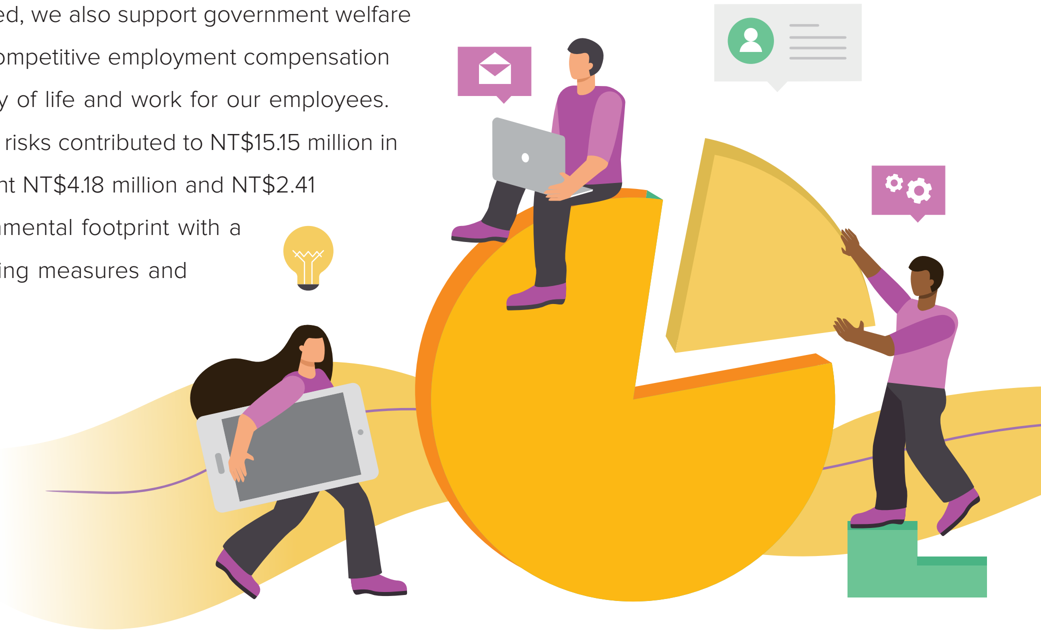
TABLE OF CONTENTS

Mission Summary

Creating long-term value at the core of implementing sustainable operations for CTCI Corporation. We examine the social impacts of all activities within our operations and along our entire value chain from an external standpoint to facilitate change. To better grasp ESG (environment, social, and governance) opportunities and risks in our operations, CTCI has been partnering with the Corporate Sustainability Impact Center of Tunghai University (THU) since 2022. By adopting a profit & loss mindset and combining it with the Triple Bottom Line (TBL) framework (economic, environmental, and social), we evaluate the direct/indirect negative and positive impacts created by the company, then translate it into a uniform currency. This allows stakeholders to better understand the substantive value that CTCI creates, and helps drive effective decision making within the company.

CTCI employs the Gross Value Added (GVA) method to assess the direct economic value that company operations create for stakeholders. In accordance with the Natural Capital Protocol, Social, Human Capital Protocol, ISO 14008:2019, Value Balancing Alliance (VBA) and Impact-Weighted Accounts (IWA) frameworks, CTCI evaluates the environmental and social externalities arising from company operations with the causality oriented Impact Pathway method. CTCI utilizes the Input-Output Model to analyze the impact of procurement demand and engineering services on the entire industry supply chain, leading to increased output, employment opportunities, and income for workers. We also address environmental issues through the Environmentally Extended Input-Output Analysis (EEIO) for industry hotspot analysis and trade-offs.

In 2022, CTCI created NT$3.7 billion in economic value for external stakeholders through operations such as operating profit, tax payments, R&D investments, depreciation, and amortization, etc. Not only do we help customers and suppliers succeed, we also support government welfare policies, provide excellent returns to investors, and also contribute to social and economic growth. Competitive employment compensation and training opportunities at CTCI created NT$4.4 billion in positive impacts, furnishing better quality of life and work for our employees. Through volunteering, CTCI employees also created NT$690,000 in social value. Work-related health risks contributed to NT$15.15 million in social costs, but diverse health promotion activities and employee health promotion measures brought NT$4.18 million and NT$2.41 million in social value respectively. While contributing to the industry, CTCI also created an environmental footprint with a social cost of NT$140 million through resource consumption and waste production. But energy saving measures and renewable energy use created NT$420,000 in positive impact.



CTCI procurement created NT$64.2 billion in value for the supply chain, furnishing 13,000 jobs for suppliers and NT$4 billion in employee compensation. However, occupational accidents occurring at partnering businesses cost society NT$26.87 million. Partnering businesses created an environmental footprint that cost society NT$990 million through providing raw materials and services. CTCI shall therefore continue to promote responsibility along the supply chain and work with suppliers to discover opportunities for improvement and facilitate sustainable transition for industries. CTCI's EPC projects generated a value of NT$46.1 billion for client industries through constructing and maintaining plants. Through the three dimensions of "Green Engineering" (green technology, green contracting, and green investment), innovative technologies are employed to assist clients in energy conservation, water conservation, and reducing resource consumption, resulting in environmental benefits valued at NT$19.7 billion.

In the future, we will expand the application of innovative technologies in green engineering. Simultaneously, we will strengthen sustainable supply chain management and adopt more efficient engineering service models to reduce environmental impacts along the value chain and enhance societal well-being. Our aim is to create even more significant positive value for stakeholders.

Sustainable Impact of CTCI		Output Metric	Impact Metric	Monentory	Rating	Stakeholders	Cause of the Impact	ESG Issue
Supply chain output value elevated	➡ +	Procurement demand drives industry supply and demand	Promote social and economic development	64,163,220,185	●●●●●●	Society	Supply chain (Indirect)	Supply Chain Sustainability Management
Supply chain employee salary income	➡ +	Procurement demand creates job opportunities	Enhance quality of life and purchasing power	4,037,996,682	●●●●●○	External employees	Supply chain (Indirect)	
Social cost of GHG emissions derived from the supply chain	➡ —	Procurement demand contributes to GHG emissions along the supply chain	Elevates climate risks caused by global warming	446,753,690	●●●●○○	Environment	Supply chain (Indirect)	
Social cost of air pollution derived from the supply chain	➡ —	Procurement demand contributes to air pollution along the supply chain	Negative impacts on human health and ecosystems	529,999,006	●●●●○○	Environment	Supply chain (Indirect)	
Social cost of wastewater derived from supply chain	➡ —	Procurement demand contributes to wastewater along the supply chain	Emit methane that exacerbates global warming	2,153,545	●●○○○○	Environment	Supply chain (Indirect)	
Social cost of waste disposal derived from supply chain	➡ —	Procurement demand contributes to waste production along the supply chain	Negative impacts on global warming, human health, and ecosystems	8,611,904	●●○○○○	Environment	Supply chain (Indirect)	
Social cost of accidents' occupational accidents	➡ —	Subcontractors' occupational accidents	Impact and medical costs of employee well-being	26,867,090	●●●○○○	External employees	Company operations (Direct)	Safe and Healthy Work Environment
Economic value-added income	➡ +	Create direct economic value for stakeholders	Enhance quality of life and purchasing power	3,679,538,000	●●●●●○	Society	Company operations (Direct)	Economic performance
Avoid social costs of GHG emissions	➡ +	Use renewable energy to prevent GHG emissions	Mitigate climate risks caused by global warming	77,676	●○○○○○	Environment	Company operations (Direct)	Climate Change and Net Zero Outcomes
Avoid social costs of GHG emissions	➡ +	Promote energy saving measures to prevent GHG emissions	Mitigate climate risks caused by global warming	337,577	●○○○○○	Environment	Company operations (Direct)	
Social cost of GHG emissions	➡ —	GHG emissions from energy consumption	Elevates climate risks caused by global warming	16,766,718	●●●○○○	Environment	Company operations (Direct)	
Social cost of air pollution	➡ —	Gasoline and diesel use causes air pollution	Negative impacts on human health and ecosystems	123,151,956	●●●●○○	Environment	Company operations (Direct)	
Social cost of water consumption	➡ —	Water use depletes water resources	Causes water shortages or facilitates waterborne diseases, further impacting human health	870,398	●○○○○○	Environment	Company operations (Direct)	Water resource management
Social cost of waste disposal	➡ —	Waste incineration and landfills causes air pollution and GHG emissions	Negative impacts on global warming, human health, and ecosystems	2,787,042	●●●○○○	Environment	Company operations (Direct)	Resource waste management
Employee training creates future income	➡ +	Employee training hours	Training to improve professional skills and employability	234,795,487	●●●●○○	CTCI employees	Company operations (Direct)	Career Development and Training
Employee purchasing power and quality of life	➡ +	Employee salary and benefits	Enhance quality of life and purchasing power	4,131,274,000	●●●●●○	CTCI employees	Company operations (Direct)	Talent recruitment and retention
Social value of health promotion	➡ —	People discovered to be obese or have high blood pressure, high cholesterol, or high blood sugar (2017-2021)	Risk of work-related cardiovascular diseases	15,146,239	●●●○○○	CTCI employees	Company operations (Direct)	Safe and Healthy Work Environment
Social value of health promotion	➡ +	Health promotion reduces the risk of diseases (2017-2021)	Maintain work-life balance	2,411,358	●●●○○○	CTCI employees	Company operations (Direct)	
Social value of health promotion	➡ +	Investing in health promotion activities	Maintain work-life balance	4,181,364	●●○○○○	CTCI employees	Company operations (Direct)	
Social costs of occupational accidents	➡ —	Occupational accidents among employees	Impact and medical costs of employee well-being	0	○○○○○○	CTCI employees	Company operations (Direct)	
Social value of volunteering	➡ +	Employee volunteering hours	Promote local and community connections	692,880	●○○○○○	Society	Company operations (Direct)	Social influence
EPC projects create output value for our clients	➡ +	EPC Projects facilitate industry supply and demand	Promote local and community connections	46,081,053,156	●●●●●●	Society	Product and services (Indirect)	Economic performance
Environmental benefits of green engineering	➡ +	Help clients save energy and water and reduce emission of air pollution and carbon	Reduce clients' environmental impact when maintaining their facilities	19,659,841,020	●●●●●●	Environment	Product and services (Indirect)	Net zero turnkey projects and green engineerings

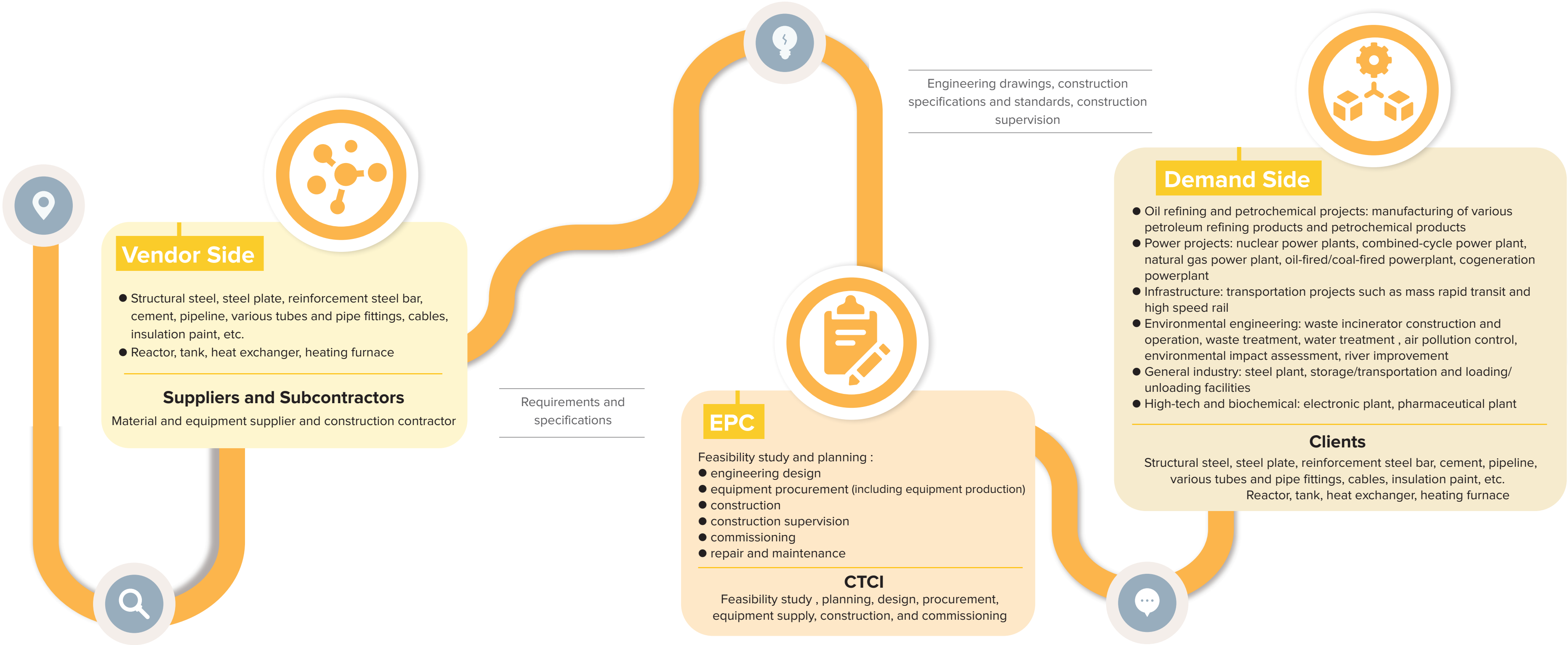
Methodology

There are four steps in assessing CTCI's sustainability impact: defining boundary and scope, mapping impact pathways, confirming data sources and quality, and establishing a valuation method. Each step is interconnected, and decisions made during each step may affect the integrity and accuracy of the final result.

Defining Boundary and Scope

CTCI provides services to the oil refinery, petroleum, chemical, natural gas, power generation, transportation, steel, and environmental engineering industries. CTCI, as an EPC (Engineering, Procurement, and Construction) turnkey company, provides comprehensive professional services by integrating demand Side (Clients) and collaboration with vendor Side (Suppliers and Subcontractors), forming a complete industrial value chain.

- Vendor Side (Suppliers and Subcontractors): includes materials, equipment suppliers, and building contractors, etc.
- EPC (CTCI): includes CTCI HQ and construction sites all across the world.
- Demand Side (Clients): includes feasibility analysis, planning, design, procurement services, equipment supply, construction, and testing services for EPC projects.



Mapping Impact Pathway

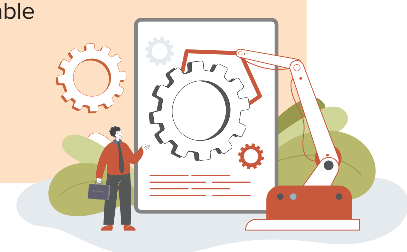
To assess the direct/indirect, positive/negative, long-/short-term, and global/local impacts of value chain activities on stakeholders, CTCI uses the Impact Pathway to track the input and output of operations, the changes to stakeholders' quality of life, and the subsequent social value or cost. We also connect them with ESG issues to elucidate complex causal relationships and identify impacts through systematic reasoning.

Sustainable Impact of CTCI		Output Metric	Impact Metric	Stakeholders	Cause of the Impact	ESG Issue
Supply chain output value elevated	+	Procurement demand drives industry supply and demand	Promote social and economic development	Society	Supply chain (Indirect)	
Supply chain employee salary income	+	Procurement demand creates job opportunities	Enhance quality of life and purchasing power	External employees	Supply chain (Indirect)	
Social cost of GHG emissions derived from the supply chain	−	Procurement demand contributes to GHG emissions along the supply chain	Elevates climate risks caused by global warming	Environment	Supply chain (Indirect)	
Social cost of air pollution derived from the supply chain	−	Procurement demand contributes to air pollution along the supply chain	Negative impacts on human health and ecosystems	Environment	Supply chain (Indirect)	Supply Chain Sustainability Management
Social cost of wastewater derived from supply chain	−	Procurement demand contributes to wastewater along the supply chain	Emit methane that exacerbates global warming	Environment	Supply chain (Indirect)	
Social cost of waste disposal derived from supply chain	−	Procurement demand contributes to waste production along the supply chain	Negative impacts on global warming, human health, and ecosystems	Environment	Supply chain (Indirect)	
Social cost of accidents' occupational accidents	−	Subcontractors' occupational accidents	Impact and medical costs of employee well-being	External employees	Company operations (Direct)	Safe and Healthy Work Environment
Economic value-added income	+	Create direct economic value for stakeholders	Enhance quality of life and purchasing power	Society	Company operations (Direct)	Economic performance
Avoid social costs of GHG emissions	+	Use renewable energy to prevent GHG emissions	Mitigate climate risks caused by global warming	Environment	Company operations (Direct)	
Avoid social costs of GHG emissions	+	Promote energy saving measures to prevent GHG emissions	Mitigate climate risks caused by global warming	Environment	Company operations (Direct)	Climate Change and Net Zero Outcomes
Social cost of GHG emissions	−	GHG emissions from energy consumption	Elevates climate risks caused by global warming	Environment	Company operations (Direct)	
Social cost of air pollution	−	Gasoline and diesel use causes air pollution	Negative impacts on human health and ecosystems	Environment	Company operations (Direct)	
Social cost of water consumption	−	Water use depletes water resources	Causes water shortages or facilitates waterborne diseases, further impacting human health	Environment	Company operations (Direct)	Water resource management
Social cost of waste disposal	−	Waste incineration and landfills causes air pollution and GHG emissions	Negative impacts on global warming, human health, and ecosystems	Environment	Company operations (Direct)	Resource waste management
Employee training creates future income	+	Employee training hours	Training to improve professional skills and employability	CTCI employees	Company operations (Direct)	Career Development and Training
Employee purchasing power and quality of life	+	Employee salary and benefits	Enhance quality of life and purchasing power	CTCI employees	Company operations (Direct)	Talent recruitment and retention
Social value of health promotion	−	People discovered to be obese or have high blood pressure, high cholesterol, or high blood sugar (2017-2021)	Risk of work-related cardiovascular diseases	CTCI employees	Company operations (Direct)	
Social value of health promotion	+	Health promotion reduces the risk of diseases (2017-2021)	Maintain work-life balance	CTCI employees	Company operations (Direct)	
Social value of health promotion	+	Investing in health promotion activities	Maintain work-life balance	CTCI employees	Company operations (Direct)	Safe and Healthy Work Environment
Social costs of occupational accidents	−	Occupational accidents among employees	Impact and medical costs of employee well-being	CTCI employees	Company operations (Direct)	
Social value of volunteering	+	Employee volunteering hours	Promote local and community connections	Society	Company operations (Direct)	Social influence
EPC projects create output value for our clients	+	EPC Projects facilitate industry supply and demand	Promote local and community connections	Society	Product and services (Indirect)	Economic performance
Environmental benefits of green engineering	+	Help clients save energy and water and reduce emission of air pollution and carbon	Reduce clients' environmental impact when maintaining their facilities	Environment	Product and services (Indirect)	Net zero turnkey projects and green engineerings

Confirming Data Sources

The activity data sources include primary data (original data collected from actual inventory) and secondary data (collected from relevant literature, databases, or estimation. When assessing Wistron's sustainability impact, primary data, whose quality is higher, takes precedence over secondary data. However, secondary data will be used when primary data is unavailable. For example, the relationships between supply and demand of each industry within the supply chain, and the volume of pollution generated per unit of output value, could only be obtained from country-level investigation reports and estimated by industry average.

Dimension		Supply Chain	CTCI Operation	Product & Service
Economic	Activity data	Amount of procurement/ Relationship between industry supply and demand	Internal financial profit and loss indicators	Construction revenue / Relationship between industry supply and demand
	Data quality	**Primary and Secondary data**	**Primary data**	**Primary and Secondary data**
	Impact Categories	Supply chain output value generated	Direct economic value generated	Industry chain output value generated
Environmental	Activity data	Industry average databases	Energy resources and pollution generation	Energy resources and pollution generation
	Data qual	**Secondary data**	**Primary data**	**Secondary data**
	Impact Categories	Social cost of carbon, Human health and Ecosystem loss		Social cost of carbon, Human heath and Ecosystem loss
Social	Activity data	Industry average databases	Employee occupational accidents, health examinations, remuneration, etc.	Not applicable
	Data qual	**Secondary data**	**Primary data**	
	Impact Categories	Creating job opportunities and salary income	Change to personal or social welfare	



Establishing a Valuation Method

CTCI's sustainability impact management framework covers the three major stages of the value chain (upstream/midstream/downstream), the three significant sustainability management aspects (economic/environmental/social), and 14 impact indicators. The methodology refers to the practices of benchmark companies in Taiwan and abroad and relevant research.

Boundary	Scope	Impact indicators	Calculation methodology
Supply Chain	Economic	Supply chain output value gained from procurement	The report uses Input-Output Analysis (IOA) model to assess the economic benefit derived from gains in industry chain supply and demand generated by procurement activities; the report also uses the volume of pollution caused per unit of output value to assess the external environmental costs created caused from greenhouse gasses, wastewater disposal, waste disposal (incineration) and air pollution. The report also assesses the positive impact, namely job opportunities and salary income gained in the supply chain.
	Environmental	Social cost generated by the environmental footprint of the supply chain	
	Social	Supply chain employee salary income generated from procurement	
CTCI Operation	Economic	Direct economic contribution	The report uses Gross Value added (GVA) method to examine the stakeholder value flows in operations, including business revenue (customers), R&D investment (customers), dividends (shareholders/investors), remuneration and benefits (employee), taxes (government), depreciation and amortization (suppliers).
	Environmental	Social cost generated by greenhouse gas emissions, water consumption, air pollution and waste disposal	The report applies the Environmental Profit and Loss (EP&L) mindset to assess the external environmental cost generated by energy and resource depletion, emissions, and pollution during the company's operations and the company's input to mitigate the negative impact on the society.
	Social	Future income generated from employee training	The report refers to VBA (2021) methodology to assess the professional skills and knowledge that employees gained from the company's training programs, which improves their productivity, competitiveness, and salary income further down their careers.
		Social cost generated by occupational accidents	The report refers to the research report by the UK's Health and Safety Executive (HSE, 2017), which considers the loss of productivity due to work injury, compensation for occupational accidents, and willingness to pay to avoid occupational accidents in calculating the social cost.
		Economic benefit gained from the health promotion	The aims are early detection of hypertension, hyperlipidemia, high blood sugar, and obesity through regular health examinations and formulating health promotion programs to reduce or avoid cardiovascular diseases and the medical costs derived from such diseases.
Product & Service	Economic	EPC projects create output value for our clients	The report considering the supply and demand relationship between construction service and the output value of customer industrial chain to assess the indirect economic value generated by construction service.
	Environmental	Environmental benefits of green engineering	Through green technology, green contracting, and green investments, CTCI helps clients save on energy, carbon emissions, as well as costs. It also prevents or reduces external costs to the environment derived from plant maintenance.

Since the currency value conversion factors come from several different studies, CTCI follows the ISO 14008:2019 definitions of environmental impact and relevant currency valuation frameworks. The base year is 2018, and the conversions are adjusted according to geography and time.

❶ Geographic adjustment：

the report uses the Purchasing Power Parity (PPP) of each region to adjust the weighting (OECD, 2012) of Gross National Income (GNI). The equation is listed below.

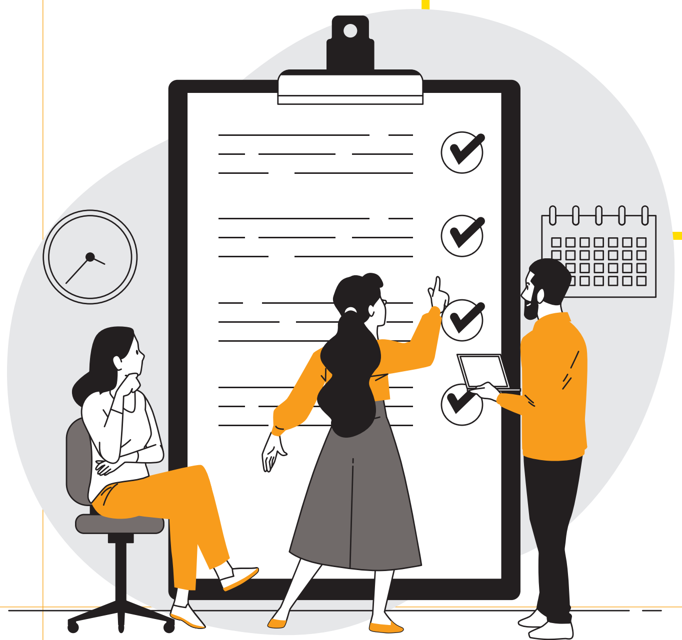
$$Ei=(Yi/Yref)^{\epsilon}$$

Ei is the income adjustment weighting

Yi is the adjusted GNI of the region of the value conversion using the region's PPP

Yref is the adjusted GNI of the region of the original studies using the region's PPP

ϵ Income elasticity factor refers to the relationship between WTP and income. The value is between 0 and 1. indicates a positive correlation between WTP and income, while 0 shows that the WTP is not correlated with income. The report adopts the recommended value of 0.6 by PwC UK (2015).



❷ Temporal adjustment：

the report considers inflation and exchange rates when adjusting the currency values of different periods to the currency value of the base year.

Results

Supply Chain Output Value Elevated

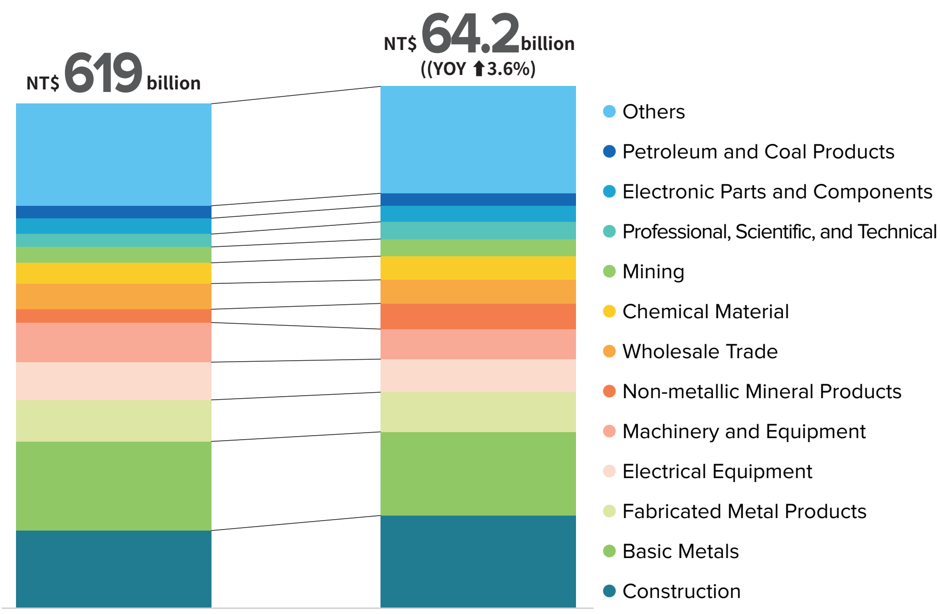
Since economic activities of various industries cannot be separated from one another, the report adopts the Input-Output model developed by Nobel Prize laureate in Economic Science Wassily Leontief in the 1930s and 1940s, which distributes the production input elements to the final demand of the products. In other words, company activities would ultimately affect the final demand (VBA, 2021). The model is often constructed by governments or research institutions based on actual financial data and presented as an Input-Output table. The report adopts the Input-Output model to examine CTCI procurement's impact on the supply-and-demand structure of the industry chains, including output value, employment, and salary income. The model can also apply to calculate the disposal of pollutants.

Calculation

- In the report, the supply-and-demand relationships among each industry are based on the DGBAS 2016 Input-Output table (2020).

Result

CTCI generated approximately NT$64.2 billion in supply chain output value in 2022 through procurement demands. The construction industry accounted for 17.5%, and the basic metal industry contributed to 16.4%. Based on recent trends, CTCI facilitated 3.6% growth in industry chain output in 2022 compared to the previous year. Procurement demands in the non-metallic mineral products industry had the most significant impact in driving overall growth, with a 7.5-fold increase. This can mainly be attributed to a significant increase in procurement for concrete and concrete piles to execute two large-scale power plant projects.



Supply Chain Employee Salary Income

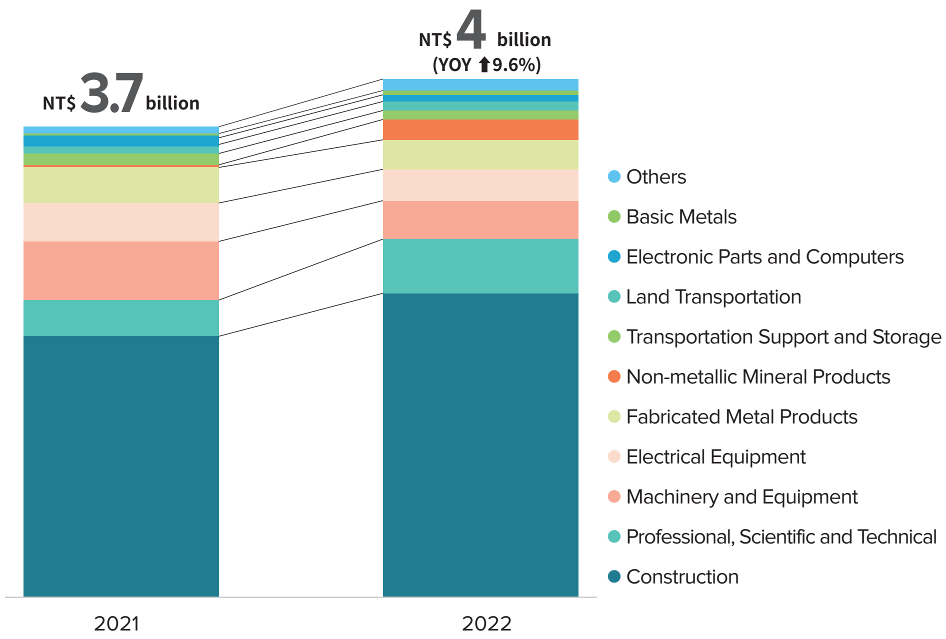
The Input-Output model considers all input elements, from the elements during the suppliers' products and services (direct) to upstream (indirect) elements, and distributes these elements to the final demand according to company activities (VBA, 2021). The model offers an analysis of direct and indirect input resources required in the overall industry chain to meet the procurement demand, such as employee recruitment and salary expenses, which affect the final demand.

Calculation

- The report refers to the Exiobase 2 Input-Output database[1] , and the calculation is based on Taiwan's industry coefficients.

Result

CTCI procurement demands in 2022 created 14,000 employment opportunities in the supply chain and NT$4 billion in external social benefits for employee wages. The construction industry contributed the most at 59%.



Note 1: EXIOBASE is a global, detailed Multi-regional Supply-Use and Input-Output database jointly developed by the 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 consultants. EXIOBASE 2 uses 2007 as the base year and covers economic, environmental, and social data for 5 continents, 43 countries/regions, and 163 industries.

Environmental Footprint from Supply Chain

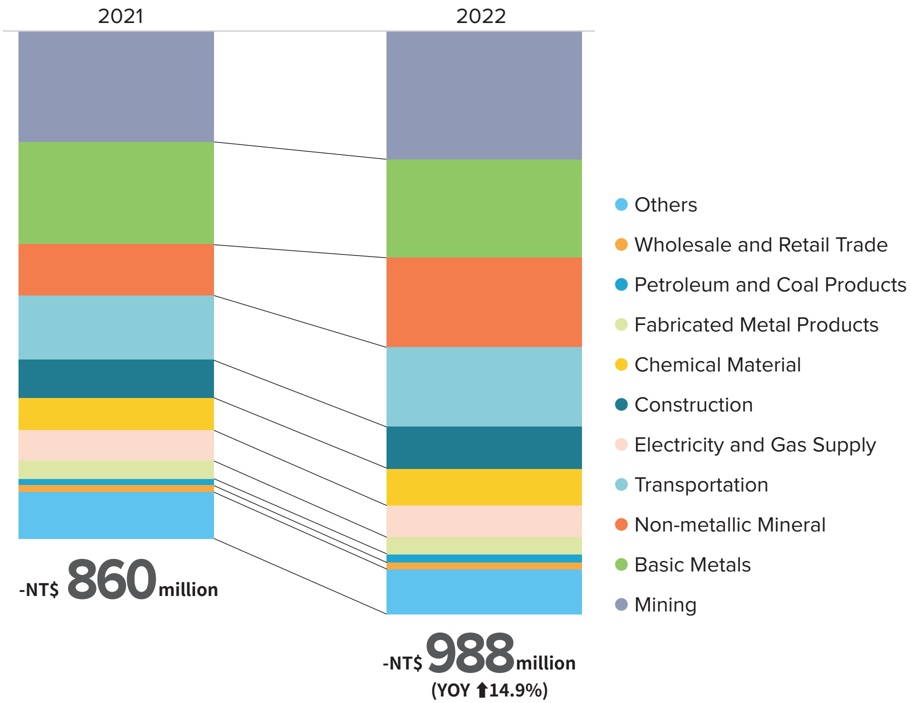
The Input-Output model is widely applied to economic impact analysis (EIA) and Environmentally Extended Input-Output Analysis (EEIO) (VBA, 2021). Traditional input-output tables offer a clear overview of the interactions among each industry (Miller & Blair, 2009), while the EEIO integrates the information on the environmental impact of each industry, allowing a simple and comprehensive assessment of the connection between economic activities and environmental impact (Kitzes, 2013).

Calculation

- The report follows the EEIO methodology when analyzing statistical data from the DGBAS and Bureau of Energy to examine the relationship between each industry's procurement input and environmental impact. The report calculated the volume of pollution generated per unit of output value, including greenhouse gasses, water pollution (COD), waste (incineration), and air pollution ($PM_{2.5}$, NOx, SOx, NMHC, Pb). It used the valuation factor to assess the social cost created.

Result

In 2022, CTCI's procurement demands resulted in approximately NT$988 million in environmental externalities within the supply chain. The majority of these costs, accounting for 54.3%, were attributed to the extraction of non-metallic minerals, basic metal products and upstream mineral resources. The transportation sector, which contributes to the environmental footprint during the service provision, accounted for 13.6% of the total environmental externalities. Based on recent trends, environmental externalities derived from the supply chain increased by 14.9% compared to the previous year. Main factors include high procurement amounts in the non-metallic mineral products and water transport industries.



Direct Economic Contribution

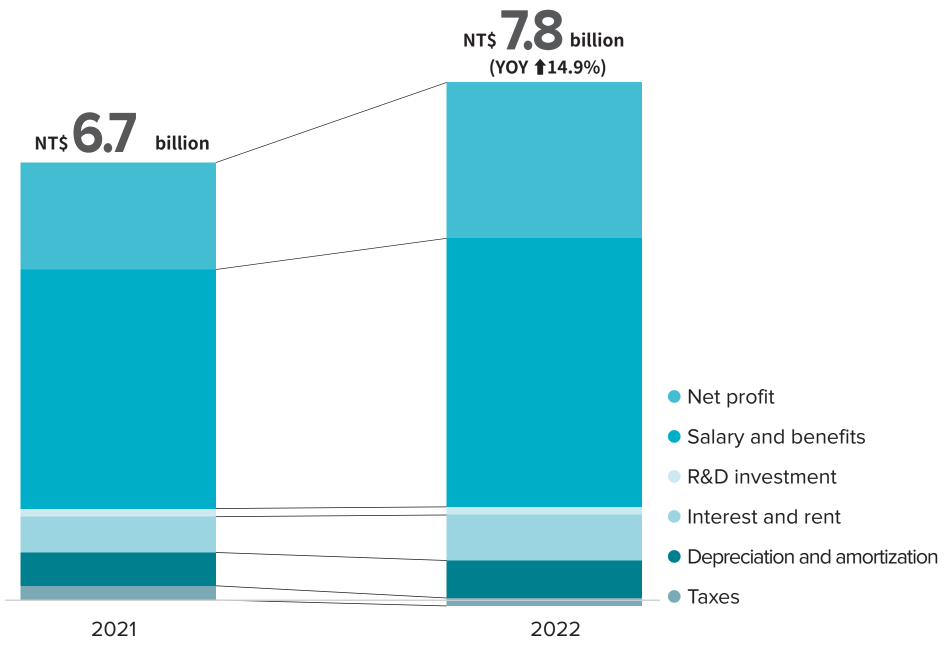
Gross Value added (GVA) assesses the difference between intermediary input and final input in business operations. It also considers the original input, public expenses, and the benefits of economic activities for various stakeholders, such as net business profit, employment cost, and taxes. Therefore, GVA allows the researchers to understand each company's contribution to stakeholder benefits (VBA, 2021). The report uses the GVA method to reexamine the value flows for stakeholders, including net business profit (customers/shareholders/investors), remuneration and benefits (employee), taxes (government), depreciation, and amortization (suppliers).

Calculation

- Relevant information comes from the financial profit and loss data in CTCI's annual financial statement.

Result

In 2022, CTCI operations created an economic value of NT$3.7 billion for external stakeholders, including operating profits, investments in new technology research and development, interest and lease payments, tax contributions[2] , depreciation, and amortization. These activities not only contribute to the success of customers and suppliers, support government welfare policies, and provide investors with quality returns, but also promote socioeconomic growth. Salary and welfare expenses also provided CTCI employees with a total of NT$4.1 billion in improved quality of life and increased purchasing power.



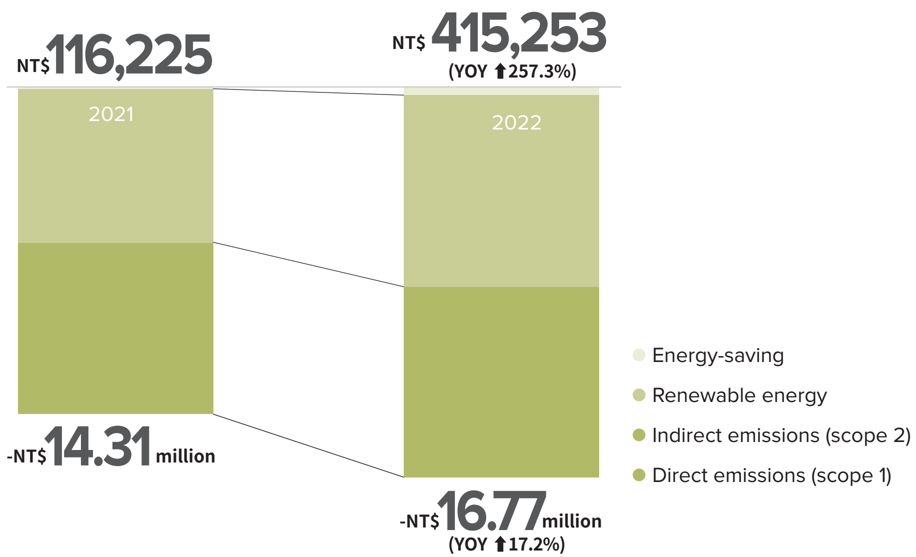
Note 2: In 2022, capital injection into subsidiary companies resulted in an income tax benefit of NT$268 million. Therefore, the impact of tax payments on external stakeholders is represented by a negative value.

Social Cost of Greenhouse Gas Emissions

Greenhouse gas is a gas that absorbs and emits radiant energy, causing heat to be trapped in the Earth's surface and troposphere, thereby resulting in greenhouse effects. The Intergovernmental Panel on Climate Change (IPCC) lists seven principal classes of GHGs, namely, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_{20}), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3), various hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). The report calculated the environmental externalities of the Company operations based on the carbon social costs generated by greenhouse gas emissions.

Calculation

- The Social Cost of Carbon (SCC) developed by the US Environmental Protection Agency (US EPA, 2016) as the valuation factor of external costs per unit of greenhouse gas emissions. The external costs refer to the social costs of long-term physical and economic damage worldwide resulting from climate change, including loss of money, property, or bodily health from natural disasters, and the economic tradeoff for energy transformation to avoid further warming. The US EPA converts the costs of future damages at discount rates of 2.5%, 3%, and 5% to current values[3] . The report opted for the median value of 3%.
- Social cost for carbon adopts a comprehensive assessment model that evaluates the global impact of carbon emissions, increasing the concentration of greenhouse gasses. There is no bias in geography. However, there are still various factors of uncertainty, such as the catastrophic and non-catastrophic impact, mitigation of climate change and changes in technology, estimation of damages from rising temperatures, and the assumptions of risk aversion.
- Since Scope 3 emissions (other indirect greenhouse gas emissions) cover too wide a range for the report and there are limited cases of application, Scope 3 emissions are excluded from the report.



Result

CTCI HQ and global construction sites generated a total of 10,987 metric tons of CO_2e emissions through direct (Scope 1) or indirect (Scope 2) sources. The associated environmental externalities cost approximately NT$16.77 million, 49.9% of which were direct emissions from production and operational processes, including combustion, mobile sources, process emissions, and fugitive emissions. The remaining 50.1% were indirect emissions from energy consumption[4] . Additionally, CTCI subscribed to and self-generated a total of 100 MWh of renewable energy. By implementing various energy-saving measures, CTCI saved a total of 435 MWh of energy and prevented 272 metric tons of CO_2e emissions - equivalent to approximately NT$415,253 in carbon reduction benefits.

Since 2023, CTCI has adopted SBTi's 1.5°C scenario to establish carbon reduction goals and plan a decarbonization pathway. With 2022 as the base year, the short-term target is to achieve a 21% absolute reduction in greenhouse gas emissions (Scope 1 and Scope 2) by 2025. The mid-term target is to achieve a 45% absolute reduction in greenhouse gas emissions (Scope 1 and Scope 2) by 2030. The long-term goal is to reach net-zero emissions by 2050.

Note 3: A high discount rate means that people are willing to pay more attention to short-term rather than long-term benefits (Yan, 2014).

Note 4: Scope 2 Calculations with Market-Based Approach

Social Cost of Water Consumption

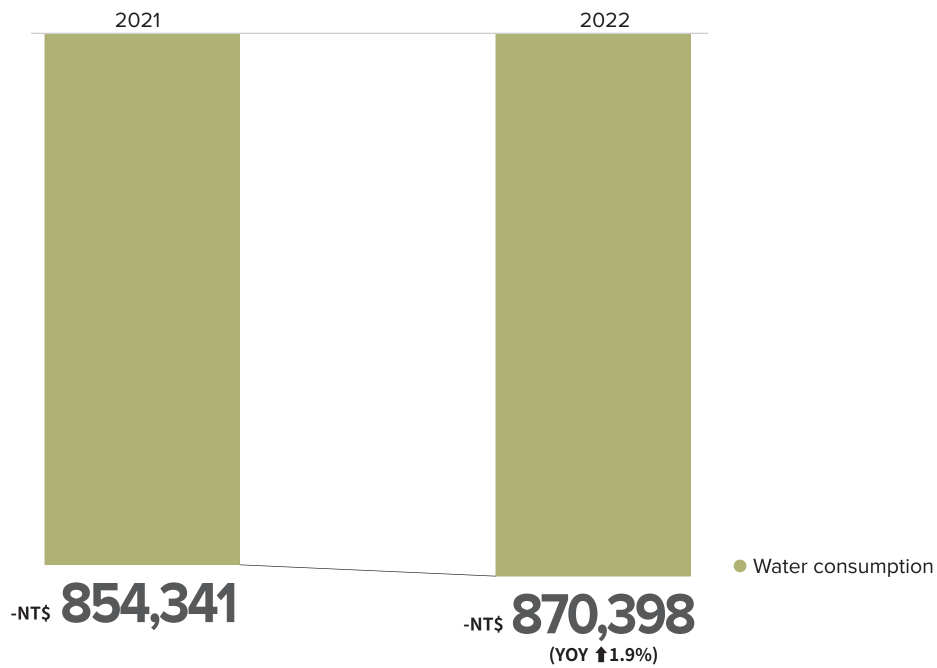
Generally, three main types of water use exist for human needs, namely, domestic, agricultural, and industrial (UNEP, 2016). According to Bayart et al. (2010) and Kounina et al. (2013), excessive freshwater consumption will lead to irrigation water scarcity and will subsequently result in health degradation from malnutrition. Malnutrition may result from waterborne diseases that reduce nutrient absorption (WWAP, 2009; Boulay et al., 2011). The report assumes that the water consumed by business operations would directly impact the water available for domestic and agricultural uses. Thus, we estimate the environmental externality derived from damage to human health using the characterization factors (CFs)[5] , which determine the impact of water scarcity on human health, and convert into monetary value based on statistical life (VSL).

Calculation

- Agricultural water shortage: Refers to characteristic factors of malnutrition caused by agricultural water shortage LC-Impact(2016). The regional differences factors are the agricultural water percentage, Water Stress Index (WSI), and human development index (HDI).
- Domestic water shortage: Refers to characteristic factors of waterborne diseases caused by domestic water shortage Motoshita et al. (2011). The diseases include roundworm, whipworm, hookworm, and diarrhea.
- The valuation methodology of damage to the ecosystem from water depletion is still under development; therefore, this item is excluded from the assessment.
- The environmental impact of water supply facilities is excluded due to low data availability.

Result

In 2022, CTCI HQ and global construction sites consumed a total of 183,698 m^3 of water - resulting in NT$870,398 in environmental externalities. This is a slight increase to 1.9% from the previous year, and the main contributor was HQ building water consumption. In addition to installing automatic sensor faucets to regulate water flow, CTCI has also created campaigns to remind employees to conserve water. Moreover, rainwater harvesting systems have been installed on the rooftops of the headquarters building and construction sites, collecting rainwater for watering plants or construction. CTCI has also made water conservation at HQ one of its targets. Measures have been implemented to reduce water usage during construction. Water recycling and conservation measures have been quantified, including the use of sedimentation tanks to collect rainwater and surface runoff, the reuse of water from bucket and trough leak tests, and the recovery and reuse of water from pressure testing.



Note 5: Refers to changes caused by resource depletion and pollution, such as increased concentration of particulates in the air, that affect human health or the ecosystem.

Social Cost of Air Pollution

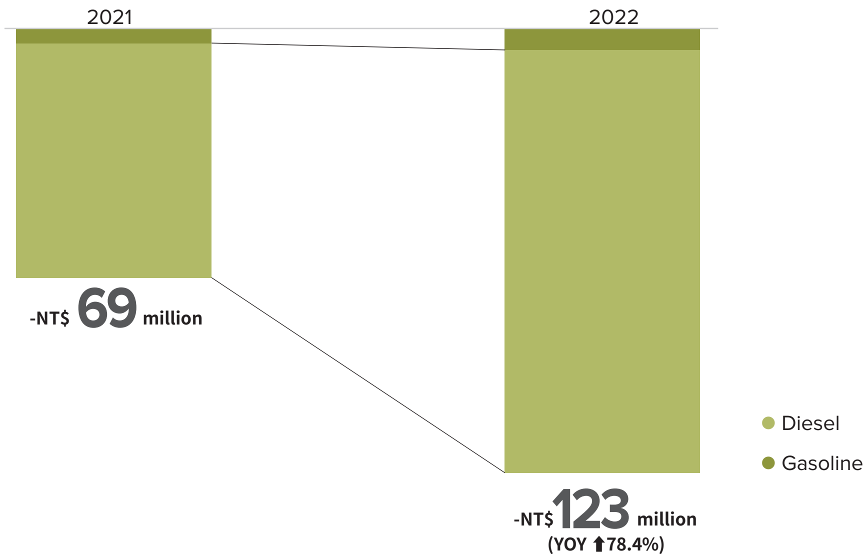
Air pollution that produces primary and secondary aerosols in the atmosphere can have a substantial negative impact on human health (WHO, 2006; HEIMTSA, 2011; Burnett et al., 2014; Lelieveld et al., 2015). After engine combustion, gasoline and diesel produce air pollutants including nitrogen oxides (NOx), sulfur oxides (SOx), total organic compounds (TOC), carbon monoxide (CO), and particulate matter (PM). The formation of NOx is directly related to the high temperature, high pressure, and nitrogen content in the fuel during combustion. SOx is mainly composed of sulfur dioxide (SO_2) and its formation is directly related to the nitrogen content in the fuel. Other pollutants result from incomplete combustion. Additionally, the ash content and metal additives in the fuel can increase the particulate matter content in the exhaust gases (US EPA, 1996). The report estimates the environmental externality using the characterization factors (CFs), which determine the impact of air pollutants on human health and the ecosystems, and convert into monetary value based on statistical life (VSL) and willingness to pay (WTP).

Calculation

- This report references the US EPA (1996) and the Eco-indicator 99 database to calculate the characterization factors for human health and ecosystem losses caused by air pollution.

Result

In 2022, the gasoline and diesel consumption at CTCI HQ and global construction sites amounted to 222,559 liters and 1,829,948 liters, respectively. The environmental externalities resulting from air pollution emissions amounted to approximately NT$123 million, representing a significant increase of 78.4% compared to the previous year. The main reason for this increase was the easing of the pandemic in 2022, leading to an acceleration of construction work at global sites, resulting in a significant rise in fuel consumption for construction machinery and transportation vehicles. CTCI continuous to monitor energy consumption levels and performance indicators. Regular statistical analysis of performance is conducted each year, and the results are reported to the President. The purpose of analyzing historical trends in energy usage is to assess the operational energy efficiency of the company, which helps in formulating and implementing relevant policies, serving as a reference for setting future reduction and energy-saving goals. This is a step towards realizing CTCI's vision for low-carbon development.

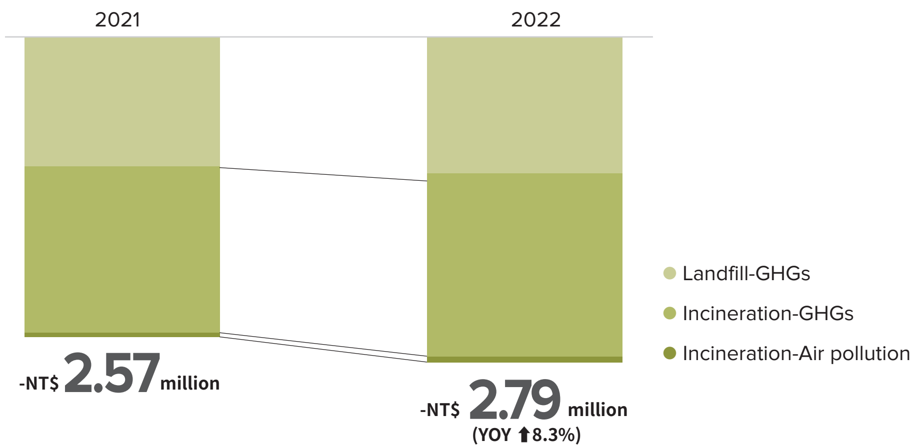


Social Cost of Waste Disposal

Waste incineration produces a wide variety of air pollutants. PM, NOx, SOx, dioxins, and heavy metals are particularly important, as they can have considerable societal consequences (e.g., causing cancer or loss of intelligence via developmental harm) (EXIOPOL, 2009; PwC UK, 2015). The atmospheric sedimentation of inorganic materials (such as sulfates, nitrates, and phosphates) would cause soil acidification, affecting terrestrial ecosystems (Goedkoop et al., 1999; Hayashi et al., 2004). The report estimates the environmental externality using the characterization factors (CFs), which determine the impact of air pollutants generated during waste incineration on human health and the ecosystems, and convert into monetary value based on statistical life (VSL) and willingness to pay (WTP). The report also considers the environmental externality derived from greenhouse gas emissions caused by waste incineration or landfill degradation.

Calculation

- The volumes of waste air pollutants generated during waste incineration, based on the air pollution factor, are calculated using the actual monitoring data of 24 incineration plants in Taiwan. The study also refers to relevant characteristic factors in the USEtox and Eco-indicator 99 databases to estimate the impact of air pollutants on human health and biodiversity.
- The greenhouse gas emissions from waste incineration and landfill disposal are calculated using the IPCC (2006) methodology and EPA statistic data. The study also refers to US EPA's (2016) research to estimate the social cost of carbon.
- Other sources of externality are irrelevant to the main impact issues and thus are excluded.
- The waste recycling technologies are complex and thus are excluded due to low data availability.



Result

In 2022, the total waste treated through incineration and landfill at CTCI HQ and global construction sites amounted to 1,856.9 metric tons and 41.6 metric tons, respectively. The environmental externalities resulting from this waste treatment amounted to approximately NT$2.79 million. The primary sources of these costs were the GHG and air pollutant emissions generated during the incineration process. Based on recent trends, the social costs of treating waste increased 8.3% from the previous year. CTCI has implemented surplus management for all projects. During the design, procurement, and construction processes, we ensure that any surplus materials generated are promptly disclosed and controlled through a platform.

CTCI has also established a repurchase mechanism for purchased materials, providing incentives to encourage active reporting, substitution, and utilization, with the goal of minimizing surplus materials and maximizing their activation and utilization. These measures are aimed at minimizing waste generation and reducing environmental externalities associated with waste disposal. In addition, CTCI encourages the use of reusable construction materials and promotes renting or purchasing second-hand goods as alternatives to buying new products. CTCI is committed to comprehensive construction site waste management and classification, and actively rewards and recognizes cooperative partnering businesses for their outstanding environmental practices. They organize competitions related to site safety, health, and environmental performance. In addition, CTCI also establishes relevant regulations, penalties, and incentives in contracts with partnering businesses, mandating their adherence to proper site and environment cleanup, waste recycling, and reuse practices.

Employee Training Creates Future Income

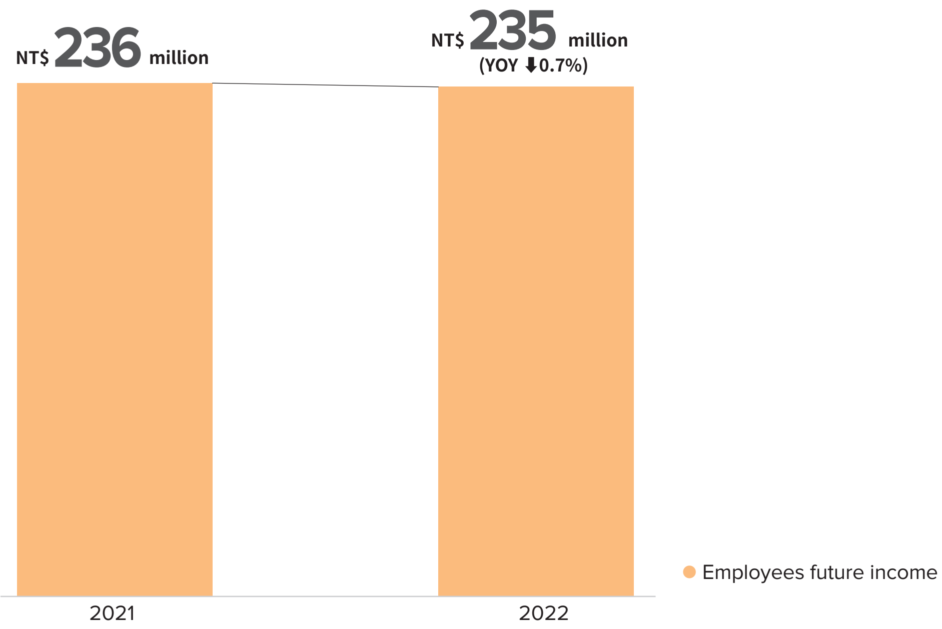
Employee experience and skills are crucial to a company's long-term development. Training increases productivity, increasing business revenue and employment competitiveness for individual employees. This benefits the employees' future career development, boosting salary income and improving their quality of life and purchasing power. This study refers to the VBA (2021) methodology and targets indirect employees. The aim is to estimate the positive social externality, i.e., the expected increase in salary income in the future career development of the employees, generated by training resources a company provides that improve employee professional know-how and skills. The report considers impact factors such as employee salary, hours of training, salary adjustment rate, employee turnover, retirement age, and conversion rates to the current value.

Calculation

- Employee salary used to calculate the social externality from employee training is based on CTCI's internal statistic data. The retirement age used was 65, and the discount rate was 3%.
- Since the increase in revenue and decrease in operational costs resulting from improved productivity due to training is already reflected in the company's financial statement, such a positive impact was excluded.

Result

In 2022, the average training hours per employee at CTCI was 61 hours. The training programs designed for employee career development resulted in a social externality benefit of approximately NT$235 million. CTCI invests significant resources in talent development, aiming to attract like-minded professionals. The company has a comprehensive plan for education and training, which includes programs for new employees as well as specialized training tailored to different job roles. In addition to individual development plans for each employee, CTCI consistently allocates resources for building management capabilities, implementing mentorship programs, and providing online learning courses. These initiatives encourage continuous learning and growth among employees, fostering a stronger identification with CTCI corporate culture and values. This ensures that talent development aligns with our strategic objectives, drives diversified business and global expansion, and creates a long-term positive impact on employees' future careers.



Social Cost of Occupational Accidents

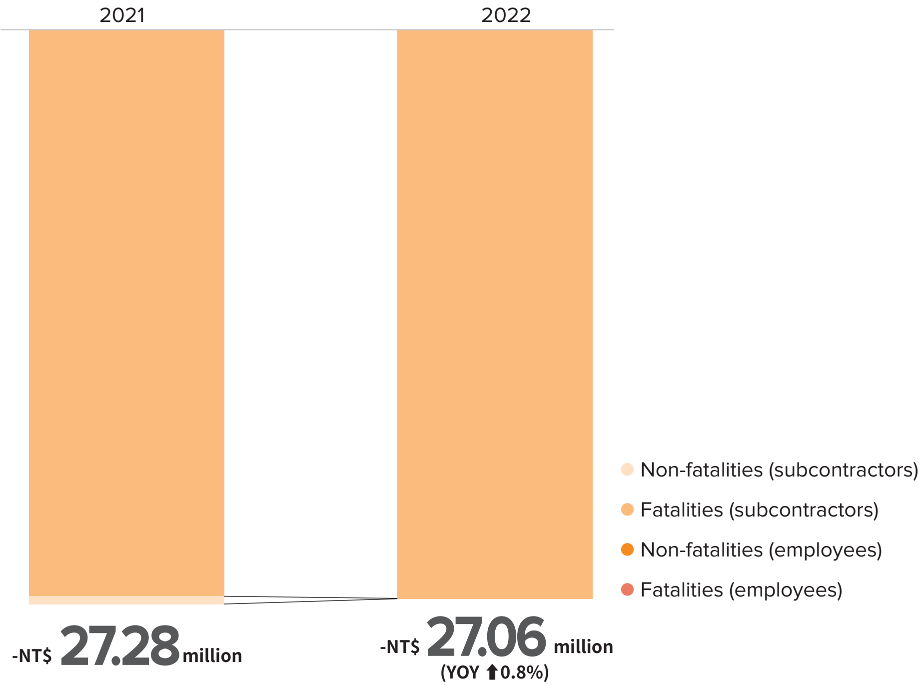
A UK Health and Safety Executive (HSE, 2020) study states that the social costs derived from employee occupational accidents include financial and human costs. Financial costs included a loss in productivity, medical and recovery expenses, administrative and legal fees, salary, and insurance claims. Human cost refers to the individual's willingness to pay to reduce the risks of occupational injuries or death. While calculating the social externality derived from occupational accidents, this report includes disability and deaths in the assessment. The financial cost covered in this report contains loss in productivity and compensation for occupational accidents. In contrast, human cost consists of the willingness to pay to avoid occupational accidents and the economic loss caused by death in occupational accidents.

Calculation

- The financial cost caused by occupational accidents came from CTCI's internal statistic data. In contrast, the human cost came from the studies by Jiune-Jye Ho (2005) and Charng-cheng Tsaur et al. (2013) on the willingness to pay to avoid occupational accidents and the economic loss caused by deaths in occupational accidents.
- Loss in productivity and employer compensation for occupational accidents are reflected in a company's financial statement and thus are excluded.
- Since the methodology involving occupational illnesses is more complex, it is excluded from the assessment.

Result

In 2022, the social externality cost arising from occupational accidents in CTCI operations amounted to approximately NT$27.06 million. These costs were solely associated with occupational accidents involving subcontractors, resulting in 2 fatalities and 43 lost workdays. The main causes of these accidents were attributed to falling objects and collapse. CTCI conducted a thorough examination and review of the causes of accidents and proposed relevant improvements. A team was established to conduct audits during weekdays and holidays, and the team makes periodic visits to construction sites to strengthen safety management awareness. Safety measures are enhanced by installing camera systems at construction sites, with authorized personnel or supervisors monitoring site footage periodically to stay updated on construction progress. Any unsafe behaviors are identified, immediately reported, corrected, and improvements made. Additionally, CTCI also turns occupational accidents into learning opportunities, which are then shared with on-site safety management teams. Implementation is required across all construction sites to reduce reoccurence thereof.



Social Value of Health Promotion

According to statistics from the Ministry of Health and Welfare, cardiovascular diseases have always been the top three on the list of top 10 causes of death in Taiwan. Epidemiologists view hypertension, high cholesterol, diabetes, and obesity as potential causes of cardiovascular diseases (Anderson et al., 1991). The report assesses the medical costs reduced by CTCI's measures to eliminate or reduce the risks of employees getting cardiovascular diseases from a risk attribution perspective. The measures include regular examinations, personalized health management, and health promotion activities.

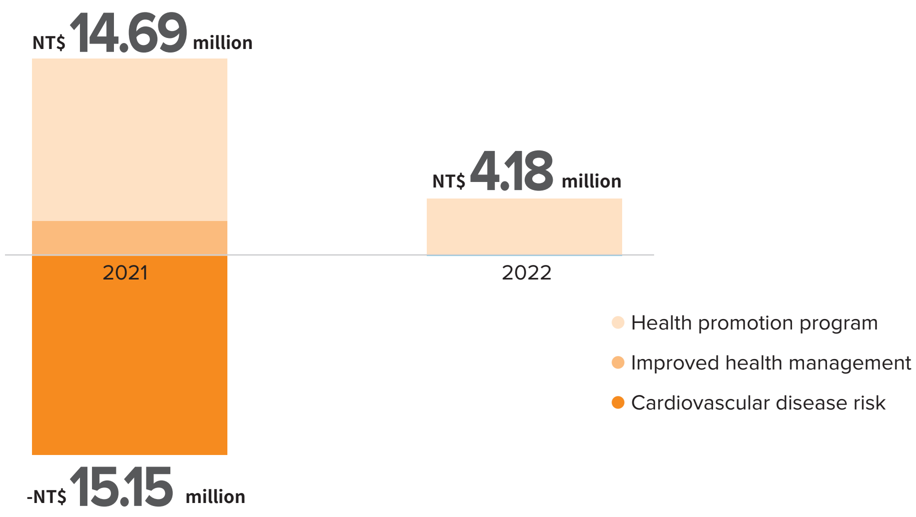
Calculation

- The World Health Organization (WHO, 2008) stated that harmful work conditions would lead to a series of harm to the employees' health. In particular, 50% of the increased risk of cardiovascular diseases is related to stress at work (Marmot, 2004; Kivimäki et al., 2006).
- Chieh-Hsien Lee (2010) illustrated the attributing risk factors of hypertension, high cholesterol, diabetes, and obesity that may lead to cardiovascular diseases and applied the Travel Cost Method to discuss the economic benefit of eliminating cardiovascular diseases.

Result

Comprehensive health check-ups contribute to the early detection of diseases. Each year, CTCI subsidizes health check-ups, and employees are encouraged to undergo requisite examinations within the regulatory time frame[6] . CTCI has a network of 18 partner hospitals across Taiwan, ensuring that employees have access to a wide range of examination options tailored to their individual health conditions. Employees may make informed decisions regarding suitable health check-up plans, self-care, and timely medical intervention when necessary. To ensure coverage across all age groups of employees, the health check-up statistics are based on data between 2017-2021 - during which 4,423 employees received health check-ups. Among them, 17.1% had high blood pressure, 4.5% had high blood sugar, 12.1% had high cholesterol, and 24.5% were obese. The potential healthcare costs surmounted to NT$15.15 million.

CTCI Healthcare Center provided individual health monitoring and arranged for doctors to give health advice and remind patients to seek medical help. The subsequent health improvements for employees conserved roughly NT$2.41 million in healthcare costs. CTCI is dedicated to creating a health and friendly workplace environment. We continue to care for and ensure the health of our employees to provide them with a stable and safe working environment. Recently, the Healthcare Center has been making breakthroughs in traditional healthcare management with system models. CTCI invested a total of NT16.46 million in health promotion between 2021 and 2022 for services including employee health management, a health management platform, and pandemic control measures. The hope is to provide comprehensive health management to our employees by preventing occupational diseases and promoting individual health.



Note 6: According to the Taiwan Ministry of Labor's regulations on labor health protection, the employer must provide regular health check-ups to working employees. Employees aged 65 and over should receive health check-ups once a year; Employees aged 40 to 65 should receive health check-ups once every three years; Employees under the age of 40 should receive health check-ups once every five years.

EPC Projects Create Output Value for Our Clients

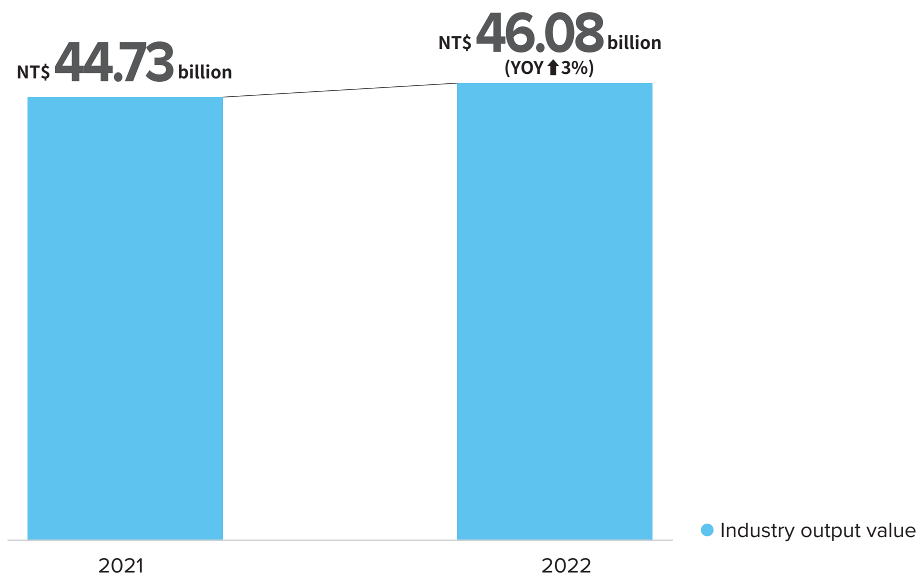
CTCI mainly offers feasibility analysis, planning, design, procurement, equipment supply, construction, and testing services. Construction and maintenance operations also create revenue for our client industries. The report calculates the indirect economic value that CTCI creates for client industries, but takes into account the supply-demand relationship between EPC contracts and client industries to determine fair distribution.

Calculation

- Based on BASF (2017) evaluation method.

Result

In 2022, CTCI's EPC projects generated NT$46.08 billion in social externality benefits by increasing production for client industries - an increase of 3% from last year. In the future, CTCI has plans to extend its existing EPC services both vertically and horizontally. We aim to strengthen our international presence in current production lines. We are also actively exploring new technologies and venturing into new fields such as liquefied natural gas, green energy, circular economy, non-ferrous metal smelting, carbon capture, and more. CTCI seeks potential business opportunities by innovating our service models. Moreover, CTCI is committed to incorporating green tech throughout the entire project life cycle to minimize environmental impact. We strive to optimize construction methods and reduce the carbon footprint of plant construction to distinguish ourselves from our competitors. CTCI also aims to create a mutually beneficial arrangement with clients in advancing ESG initiatives. We aim to be the most trusted provider of engineering and constructions services worldwide, so that we may become an important driver for the growth of the economy and civilization.



Environmental Benefits of Green Engineering

CTCI has long been developing green engineering technology. We approach projects by taking in the entire life cycle, from design, procurement, construction, testing, operation, to decommission. By providing clients with economically viable environmental and energy-saving solutions, we aim to reduce pollution and the negative impacts on human health and the environment. The goal is to achieve win-win outcomes for all concerned - CTCI, our business partners, stakeholders, and the public. We aim to do our best in maintaining the sustainability of our environment and ecosystem. In our drive to safeguard sustainability and implement net zero EPC's, CTCI has made "Green Engineering" a goal - focusing on green technology, green contracting, and green investments. We hope that all of our projects can save energy, reduce carbon, and promote resource recycling.

Calculation

- Compared to traditional methods, green engineering reduces the negative impacts on the environment. including the social costs of carbon emissions, loss of human health, and damages to the ecosystem.
- The"Green Technology"category encompasses the projected environmental benefits that CTCI will provide for clients by incorporating green technology in project designing in 2022.
- The"Green Contracting"category encompasses the projected environmental benefits created upon completion of ongoing projects in 2022.
- The"Green Investments"category encompasses the actual environmental benefits derived from the operations of CTCI's investment projects in 2022.

Result

Green technology refers to the technical solutions that CTCI provides for the design, procurement, and construction phase of EPC projects. Through the use of green technology in our 2022 projects, CTCI generated an anticipated environmental benefit of NT$840 million for clients.

Green Engineering Category/Actions		Environmental Benefits			Currency Value (NTD)
Green Technology	Low-power solenoid valves	Conserve energy	684	kWh	531
	Use of high-efficiency motors	Conserve energy	1,051,555	kWh	816,806
	Green building HVAC (Heating, Ventilation, and Air Conditioning) systems	Conserve energy	41,900	kWh	32,546
	Process renewal for energy efficiency and process heat recovery	Conserve energy	908,534,349	kWh	705,712,942
	Air conditioning condensate water recycling	Conserve water	2,600	m^3	118,881
	Rainwater/greywater harvesting and reuse	Conserve water	3,000	m^3	137,171
	Secondary RO concentrate water recycling and reuse	Conserve water	37,700	m^3	1,723,778
	Process water pollution control/water recycling	Conserve water	1,504,780	m^3	68,803,899
	Concentration and treatment water recycling for wastewater discharge	Conserve water	37,200	m^3	1,700,916
	Partial substitution of cement with fly ash or slag in concrete materials	Carbon reduction	38,075	ton CO_2e	58,104,836
	Use and promotion of mechanical joints	Carbon reduction	105	ton CO_2e	160,693
	Use of inert gases for fire suppression systems to replace GHGs	Carbon reduction	1,441	ton CO_2e	2,198,276
	Green building architecture - vegetation	Carbon dioxide sequestration	71	ton CO_2e	108,913
	Use of low-leakage valves	Reduce VOC emissions	53	ton VOCs	71,859

Green contracting refers to the implementation of environmentally beneficial engineering projects. The proportion of low-carbon and green enginering projects at CTCI has increased from 23% in 2015 to 66% in 2022 - a significant growth of 396% in ongoing construction projects. In 2022, the expected environmental benefits generated by CTCI's completed construction projects amounted to approximately NT$17.5 billion.

Green Engineering Category/Actions		Environmental Benefits			Currency Value (NTD)
Green Contracting	Production of recycled water	Recycled water capacity	21,900,000	m^3	1,001,345,973
	Offshore wind power generation	Power generation capacity	19,520,000,000	kWh	16,526,664,620
	Major power generation equipment upgrade and expansion at the Tunghsiao Power Plant	Reduction in natural gas use	400,000,000	m^3	Methodology is developing
		Carbon reduction	1,000,000	ton CO_2e	

Green investments refer to environmentally beneficial investments made via BOO and BOT models. Examples include the Water Reclamation Plant, Biomass Energy Center, and the Solar Power Plant, etc. In 2022, the actual operational environmental benefits generated by CTCI's investment projects amounted to approximately NT$1.3 billion.

Green Engineering Category/Actions		Environmental Benefits			Currency Value (NTD)
Green Investments	Recycled water treatment	Recycled water capacity	26,483,645	m^3	1,210,926,541
	Solar power plant	Power generation capacity	109,500,000	kWh	81,211,837
	Energy-from-Waste Plant	Power generation capacity	1,426,000,000	kWh	Methodology is developing
	Emissions from the group's waste treatment plant is below regulatory standards (conventional incineration plants)	Reduce NOx emissions	2,413	ton	
		Reduce SOx emissions	2,390	ton	
	Recycling and reuse of waste IPA solvents	Carbon reduction compared to incineration	14,710	ton CO_2e	
		Carbon reduction compared to virgin IPA	2,381	ton CO_2e	

Through these green projects, CTCI not only advances towards our own net zero goals, but are also collaborating with clients and supply chain partners to establish a green supply chain, ensuring sustainability for the planet. Since 2022, we have been requiring disclosure of GHG emissions from our suppliers, and asking them to set reduction targets. In 2023, we will establish a net zero alliance among our suppliers for mutual support and collaboration. Beginning in 2024, we will ask suppliers to conduct GHG inventories and report their emissions. We aim to showcase carbon reduction efforts and provide customers with net zero EPC value services as we collectively strive towards a sustainable future and create mutually beneficial arrangements for all.

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