

# 5 | Environmental



## Environmental Group

### RESPONSIBILITY

With "becoming a green corporation" as our sustainability goal, we established an Environmental Division under the Sustainable Development Execution Committee to be in charge of setting short-, medium-, and long-term goals in our operational plans for net zero emissions, energy conservation, and environmental sustainability. We also formulated internal environmental protection guidelines and green energy/GHG reduction goals.

### STRATEGY

- Improve energy efficiency and increase use of renewable energy
- Develop an in-house smart energy management system to effectively control carbon emissions
- Actively seek resource recycling and reuse opportunities

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The SDGs CHT contributes to in this chapter



# Key Environmental Performance Data



## Environmental Information Disclosures

- Annual Execution of **100%** Greenhouse Gas Inventory at All Operation Sites with External Verification Statements
- Responded to the annual Carbon Disclosure Project (CDP) questionnaire and **receive an 'A' rating (highest possible rating)**
- Signed on as a supporter of the Task Force on Climate-related Financial Disclosures (TCFD) initiative, certified at the **highest level in TCFD Conformity Check** for 4 consecutive years
- Signing the **Chunghwa Telecom Biodiversity and No Deforestation Commitment**



## Improve Energy Use Efficiency

The PUE value of IDC data centers has decreased from the 2020 baseline of **1.67 to 1.63** in 2023.



## Autonomous Environmental Protection

- Replaced old vehicles with environmentally friendly ones, and introduced **electric vehicles**
- **Sponsored** the construction of the **YouBike station** at the corner of Xinyi Road and Hangzhou South Road
- Promoted clean homes, energy-saving offices, car-free days, and paperless Office Document Automation System (**ODAS**)
- Taiwan Energy Conservation Patrol: **focus on increasing energy efficiency** within small and medium enterprises and institutions for the disadvantaged
- Set industrial waste **reduction and recycling** targets

## Implement Green Energy

- Constructed **5,557 kWp** of photovoltaic systems by the end of 2023
- Total use of Renewable Energy: **73.575 MWh**
- Acquired **73,541** Taiwan Renewable Energy Certificates

## Value-Added Products and Services

- **Only in the industry in Taiwan:** Syntrend store acquired EPA Carbon Label for Services
- Promoted e-billing in conjunction with marketing promotion that stressed **eco-friendliness, energy-savings, and emission reductions**
- Electronic invoicing: invoice data were prepared for **permanent cloud storage** to save on material and human resources and receive preferential tax treatment as an incentive and exemption from fines by the government
- **iEN smart energy-saving services** and promotion of energy-saving products
- Recycled **11.551 metric tons** of used smartphones (**91.42%** recycling rate)
- MOD Set-Top Box obtained **ISO 14067** Carbon Footprint of Products



## Environmental Management Expenses

Item	2021	2022	2023
Environmental management expense (NT\$ thousand)	330,550	348,375	365,284
Turnover (NT\$ thousand)	210,477,947	216,739,234	223,199,260
Accounted percentage of turnover (%)	0.157	0.1607	0.1637

Initiative Action	Short-term Target	Mid-term Target	Long-term Target	Status
EV100	Replace 30%–50% of business and construction vehicles with new electric vehicles between 2024 and 2026	100% procurement of electric vehicles by 2027	Achieving 100% Electrification of Engineering and Public Transport Vehicles by 2030	On schedule
SBTi	<ul style="list-style-type: none"> <li>• 10.1% decrease in scope 1 &amp; 2 emissions by 2024 (vs. 2020 levels)</li> <li>• 7.5% decrease in scope 3 emissions by 2024 (vs. 2021 levels)</li> </ul>	<ul style="list-style-type: none"> <li>• 50% decrease in scope 1 &amp; 2 emissions by 2030 (vs. 2020 levels)</li> <li>• 22.5% decrease in scope 3 emissions by 2030 (vs. 2021 levels)</li> </ul>	Net zero by 2050	On schedule
PUE values of IDCs	1.61	1.55	1.5	On schedule
Rate of Renewable Energy Use	-	2030: 100% renewable energy used in IDCs	RE100 (100% of operating sites using renewable energy) by 2040	On schedule



# Climate Strategy and Management

Chunghwa Telecom recognizes that climate change poses both challenges and opportunities for the telecommunications industry. We closely monitor global climate change developments and adopt Science Based Targets (SBTi) for scientifically quantified carbon reduction. Our dual strategies of "technology-driven carbon reduction" and "renewable energy usage" underpin our commitment to 100% renewable energy by 2040 and achieving net-zero emissions by 2050, aligning with global climate goals



## Critical Climate Action

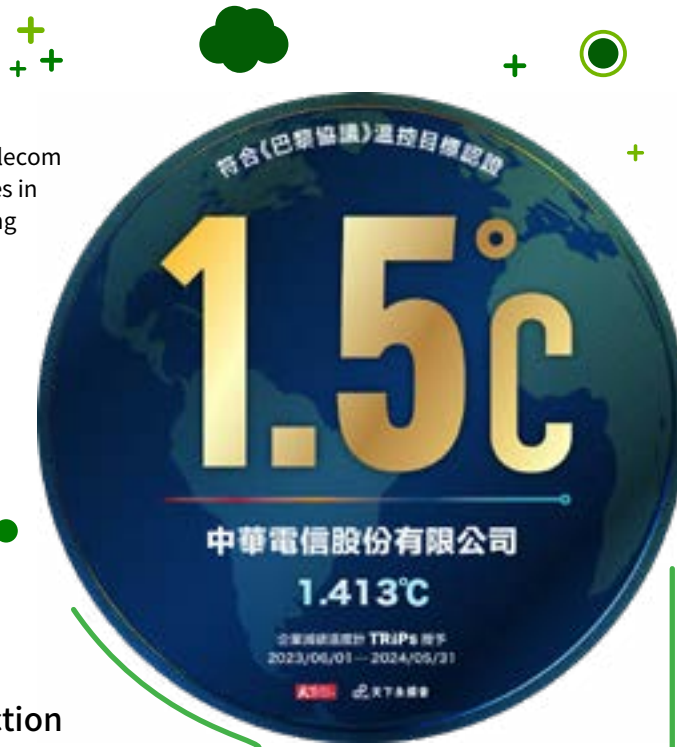
Action Item	Description
Set Science-Based Targets Initiative (SBTi)	<ul style="list-style-type: none"> <li>We became officially certified by the Science-Based Targets Initiative (SBTi) in 2023 for our GHG reduction targets</li> <li>We aim to cut Scopes 1 and 2 GHG emissions by 50% by 2030 (vs. 2020 levels) and cut Scope 3 GHG emissions by 22.5% (vs. 2021 levels) by 2030. Pledge to achieve net zero emissions by 2050 in line with the Special Report on Global Warming of 1.5 °C published by the United Nations' Intergovernmental Panel on Climate Change (IPCC).</li> </ul>
Internal Carbon Pricing and Internal Carbon Fee Fund	<ul style="list-style-type: none"> <li>Internal Carbon Fee Fund: We established an internal carbon pricing system with NT\$1,600 per tCO<sub>2</sub>e as the base price for cost calculations.</li> <li>67 Internal Carbon Fee Fund projects amounting to NT\$600 million were approved in 2023 to support R&amp;D in innovative carbon reduction technologies and solutions.</li> <li>The Internal Carbon Fee Fund is intended to support not only carbon reduction initiatives but business transformation. We hope to expand our lineup of sustainable products and services through the innovation of low-carbon technologies.</li> </ul>
RE100	<ul style="list-style-type: none"> <li>We officially joined the RE100 initiative in May 2023 with a pledge to reach 100% company-wide renewable energy use by 2040</li> <li>We are actively investing in renewable energy. In 2023, we installed 69 in-house solar power facilities.</li> <li>In 2023 we generated 73.575 MWh of renewable energy</li> </ul>
Technology-based Carbon Reduction	<ul style="list-style-type: none"> <li>Technology-based carbon reduction strategy                             <ul style="list-style-type: none"> <li>Introduction of new 5G C-RAN architecture to improve cell tower energy efficiency and overall network performance</li> <li>Closing down of 3G networks to reduce energy consumption</li> <li>In-house development of a smart energy operations center (EOC) capable of automatic data collection and analysis for real-time energy efficiency improvements</li> <li>Improvements to power usage effectiveness (PUE) at IDCs; implementation and promotion of Voice over Internet Protocol (VoIP) technology</li> </ul> </li> <li>Service as a board member of IOWN Global Forum, Inc.                             <ul style="list-style-type: none"> <li>Implementation of an all-optical network strategy to achieve the following sustainability goals: 100x energy efficiency, 125x bandwidth capacity, 200x lower latency</li> </ul> </li> </ul>
Carbon emissions trading	<ul style="list-style-type: none"> <li>Active participation in carbon emissions trading: We were among the buyers of the first batch of carbon credits issued by the Taiwan Carbon Solution Exchange (TCX)</li> <li>We purchased 3,000 metric tons worth of carbon credits for our 2020 solar power project and obtained Gold Standard certification. We plan to use the credits to offset our product's carbon footprint following ISO 14068-1.</li> </ul>



## 2030 Carbon Reduction Pathway

In response to climate change and global warming, Chunghwa Telecom actively participates in domestic and international net zero initiatives in support of the Paris Agreement, which hopes to limit global warming to under 1.5°C. In July 2023, we received SBT certification for our near-term GHG reduction goal. We also joined the RE100 initiative and pledged to meet the following targets by implementing a series of carbon reduction projects:

- Absolute Scopes 1 & 2 emissions down 50% by 2030 (compared to base year 2020 levels)
- Absolute Scope 3 emissions down 22.5% by 2030 (compared to base year 2021 levels)
- 100% use of renewable energy at IDCs by 2030
- RE100 across all sites by 2040



## Science Based Targets (SBT) for Carbon Reduction


	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Scope 1 & 2	Base Year	1.70%	3.70%	6.50%	10.10%	14.50%	20.00%	26.00%	33.00%	41.00%	50.00%
Scope 3		Base Year	2.50%	5.00%	7.50%	10.00%	12.50%	15.00%	17.50%	20.00%	22.50%



## Task Force on Climate-Related Financial Disclosures

Chunghwa Telecom was the first telecom company in Taiwan to sign on as a supporter of the Task Force on Climate-related Financial Disclosures (TCFD) initiative. Since 2020, CHT has utilized the TCFD framework to conduct analyses of climate risks and opportunities to promote climate change mitigation and adaptation for an ongoing reduction of operational risks for the Company and to encourage other industries to create low-carbon business opportunities.

Furthermore, CHT was the first telecom carrier in the world to pass the TCFD Conformity Check and has been certified at the highest level (Level 5+: Excellence) in the TCFD Conformity Check for 4 consecutive years.

\* For more information about TCFD, please refer to the Chunghwa Telecom TCFD report [🔗](#)

TCFD Framework	Disclosure	Description
<b>Governance</b> 	<b>(1)</b> Describe the Board's oversight of climate-related risks and opportunities.	<ul style="list-style-type: none"> <li>In 2023, a Board-level "Risk Management Committee" was established to enhance board functions and risk management, comprising seven directors to discuss key corporate and climate risks.</li> <li>The "Sustainable Development Committee" and "Strategy Committee" merged into the Board-level "Sustainable Development and Strategy Committee," the highest guiding body for sustainability. This committee meets quarterly to guide sustainability vision, policies, and goals.</li> <li>Dual mechanisms of the "Sustainable Development and Strategy Committee" and the "Sustainable Development Promotion Committee," along with internal controls and risk management, ensure quarterly reports to the Board, strengthening oversight on climate change issues.</li> </ul>
	<b>(2)</b> Describe management's role in assessing and managing risks and opportunities.	The Environmental Division of the Sustainable Development Execution Committee plans and implements climate change and carbon management actions, aligning with Board and Sustainable Development Committee strategies, international investment and rating requirements, and stakeholder needs.
	<b>(3)</b> Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	<ul style="list-style-type: none"> <li>We identified 11 climate risks in 2023 (3 were high-risk, 3 medium-risk, and 5 low-risk)</li> <li>Key high-risk factors include the impact of the 2050 net-zero emissions policy and changes in Taiwan's energy structure, leading to increased electricity costs, and the rising frequency and severity of typhoons and heavy rainfall, causing potential damage to facilities and equipment.</li> <li>Main climate opportunities: Development of new energy sources and green products/services</li> </ul>
	<b>(4)</b> Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	<ul style="list-style-type: none"> <li>We have determined corresponding measures for and financial impacts of each climate risk and opportunity.</li> <li>Evaluation items include climate-related risks and opportunities, direct costs, indirect costs, capital expenditures, capital allocation, acquisitions and divestment, financing channels, and assets and liabilities</li> </ul>
	<b>(5)</b> Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios	<ul style="list-style-type: none"> <li>We analyzed the short-, medium-, and long-term climate change risks and opportunities throughout our product life cycle (including upstream and downstream activities) under IEA STEPs (baseline scenario) and IEA NZE (+1.5°C scenario).</li> <li>Climate mitigation strategy (transitional risks) under IEA STEPs (baseline scenario) and IEA NZE (+1.5°C scenario)</li> <li>Climate mitigation strategy (physical risks) under IPCC SSP5-8.5 (baseline scenario) and IPCC SSP1-2.6 (+1.5°C scenario)</li> </ul>

TCFD Framework	Disclosure	Description
<b>Risk Management</b> 	<b>(6)</b> Describe the organization's processes for identifying and assessing climate-related risks.	<ul style="list-style-type: none"> <li>Following TCFD guidelines, we collected and reviewed industry risk reports from around the world and policies and regulations formulated by the Taiwan government to identify medium- to long-term climate risks and opportunities.</li> <li>We formulated a set of climate risk evaluation procedures following ISO 31000 (risk management standards) and classified risks into three levels (high, medium, and low) based on their likelihood and impact.</li> </ul>
	<b>(7)</b> Describe the organization's processes for managing	The Risk Management Committee, a Board-level functional committee, was established in 2023 to enhance board members' accountability and the Company's risk management system.
	<b>(8)</b> Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	<ul style="list-style-type: none"> <li>The Environmental Division of the Sustainable Development Execution Committee regularly reports analysis results to the Risk Management Committee, which reviews climate change and associated risks to implement mitigation measures.</li> <li>TCFD implementation results, including risk assessments, are regularly reported at Execution Committee meetings and periodically to the Board of Directors as needed.</li> </ul>
	<b>(9)</b> Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	<ul style="list-style-type: none"> <li>Climate risk mitigation: Greenhouse gas emissions (Scopes 1, 2 and 3)</li> <li>Climate risk mitigation: Severity of climate-related disasters</li> <li>Climate opportunities: Green products and services</li> </ul>
<b>Metrics and Targets</b> 	<b>(10)</b> Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	<ul style="list-style-type: none"> <li>Scope 1 GHG emissions: 18,874.8892 t-CO<sub>2</sub>e</li> <li>Scope 2 GHG emissions: 645,490.6474 t-CO<sub>2</sub>e</li> <li>Scope 3 GHG emissions: 1,814,662.2596 t-CO<sub>2</sub>e</li> </ul>
	<b>(11)</b> Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	<p><b>Climate risk mitigation:</b></p> <ul style="list-style-type: none"> <li>Ultimate goal: Net zero by 2050                             <ul style="list-style-type: none"> <li>Scopes 1 &amp; 2: Reduce by 50% by 2030 compared to 2020 levels (15.94% reduction achieved in 2023, on track)</li> <li>Scope 3: Reduce by 22.5% by 2030 compared to 2021 levels (5.76% reduction achieved in 2023, on track)</li> </ul> </li> </ul> <p><b>Climate risk mitigation: Severity of climate-related disasters</b></p> <ul style="list-style-type: none"> <li>Goal-setting based on short-, medium-, and long-term climate change mitigation plans</li> <li>For outcomes in 2023, please refer to Chunghwa Telecom's Short, Medium, and Long-term Climate Change Adaptation Plans</li> </ul> <p><b>Climate opportunities: green products and services</b></p> <ul style="list-style-type: none"> <li>In 2023, CHT gained NT\$16,799 million in revenue from its main green products, including Cloud services and IoT services (e.g., iEN, IVS, ITS, and smart buildings).</li> <li>It is projected to grow by an average of over 2.6% per year and produce a cumulative income of NT\$53,250 million in the next 3 years.</li> </ul>



## Climate Transition Plan

Extreme weather events like typhoons and floods can damage telecommunication facilities (including cell towers), disrupting communications, incurring repair costs, and affecting business. Long-term climate changes, such as global warming, altered precipitation patterns, and rising sea levels, can increase air-conditioning costs, damage key assets, and cause operational interruptions. To address these risks, we have implemented climate transition plans:



- 1. Improving Energy Efficiency:** Enhancing IDC power efficiency, replacing outdated equipment, optimizing facilities, and continuously improving product energy efficiency.
- 2. Renewable Energy:** Building and purchasing renewable energy and developing energy storage facilities.
- 3. Technology-based Carbon Reduction:** Developing smart energy conservation and IDC air conditioning monitoring systems for dynamic energy management and carbon reduction.
- 4. Internal Carbon Pricing:** Establishing a carbon tax fund to encourage innovative carbon reduction projects and low-carbon products.

These plans aim to enhance energy efficiency, and asset resilience, and reduce operating costs. We are also developing low-carbon products to meet clients' net-zero standards and explore the low-carbon market.

Additionally, we support the government's Green Growth energy transformation policy by pioneering a smart energy business model integrating AIoT, big data analytics, and energy-as-a-service (EaaS) solutions, providing innovative energy solutions for Taiwanese businesses.

## Indicators and Targets for Identifying and Managing Risks

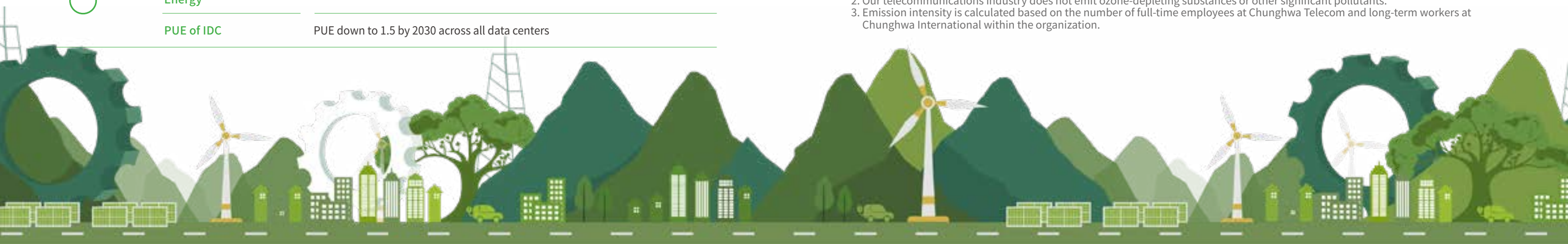
Risks	Indicators	Targets
<b>Physical risk</b> 	Severity of climate-related disasters	To protect telecommunications equipment and facilities from climate-related disasters, we formulated our first climate change mitigation plan in 2020 to address short-term (1-3 years), medium-term (3-8 years), and long-term (> 8 years) risks. The plan covers all current and planned sites and ICT equipment across Taiwan. For equipment-specific goals, please refer to the " <b>TCFD-based Short-, Medium-, and Long-Term Climate-Related Risk Mitigation Plan</b> ".
<b>Transition risk</b> 	Greenhouse Gas Emissions	50% reduction in Scope 1 & 2 emissions by 2030 (vs. 2020), 22.5% reduction in Scope 3 emissions by 2030 (vs. 2021), and net zero emissions by 2050
	Use of Renewable Energy	Achieve RE100 by 2024
	PUE of IDC	PUE down to 1.5 by 2030 across all data centers

## Greenhouse Gas Emissions Management

Chunghwa Telecom conducted its first GHG inventory in 2008, becoming Taiwan's first company to implement the ISO 14064-1 GHG protocol and receive ISO 14064-1 assurance from a third-party auditor. For 16 consecutive years, our voluntary GHG inventory has covered every site. We plan to expand this inventory to include our value chain partners, aiming to establish a robust IT foundation for systematic GHG reduction management.

Item	2021	2022	2023	Coverage
<b>Direct emissions (Scope 1)</b> t-CO <sub>2</sub> e	17,887.4701	19,185.3151	18,874.8892	Reporting entity
<b>Indirect emissions (Scope 2)</b> t-CO <sub>2</sub> e	716,979.2586	694,912.7210	645,490.6474	
<b>Other Indirect emissions (Scope 3)</b> t-CO <sub>2</sub> e	1,456,835.3440	1,827,858.7749	1,814,662.2596	
<b>Total emissions (Scope 1+ Scope 2)</b> t-CO <sub>2</sub> e	734,866.7287	714,098.0361	664,365.5366	
<b>Total emissions (Scope 1+ Scope 2+ Scope 3)</b> t-CO <sub>2</sub> e	2,191,702.0727	2,541,956.811	2,479,027.7962	
<b>Revenues</b> NT\$ in million	178,843.350	182,254.339	188,729.545	
<b>Emission Intensity ratio (Scope 1+ Scope 2)</b> t-CO <sub>2</sub> e/NT\$ in million	4.11	3.92	3.52	
<b>Emission Intensity ratio (Scope 1+ Scope 2+ Scope 3)</b> t-CO <sub>2</sub> e/NT\$ in million	12.26	13.95	13.14	
<b>Emission Intensity (Scope 1+ Scope 2)</b> t-CO <sub>2</sub> e/number of full-time employees	28.08	27.35	25.26	
<b>Emission Intensity (Scope 3)</b> t-CO <sub>2</sub> e/number of full-time employees	55.66	70.00	68.98	

- Notes:
1. Indirect emissions (Scope 2) are calculated based on market-based standards.
  2. Our telecommunications industry does not emit ozone-depleting substances or other significant pollutants.
  3. Emission intensity is calculated based on the number of full-time employees at Chunghwa Telecom and long-term workers at Chunghwa International within the organization.



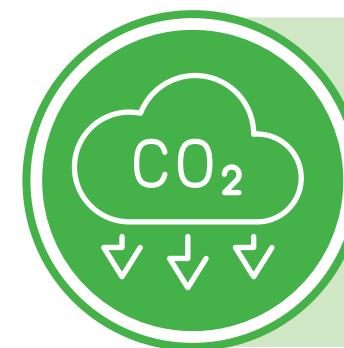
## Scope 3 Inventory and Verification

Unit: t-CO<sub>2</sub>e

Value Chain	Category	Item	Emissions
Upstream	③	Upstream transportation and distribution	1,332.5493
		Downstream transportation and distribution	56.5917
		Business travel	2,948.2363
	④	Employee commuting	6,550.9741
		Purchased goods and services	721,023.7360
		Capital goods	471,191.2877
		Fuel- and energy-related activities	130,772.6964
Downstream	⑤	Waste generated in operations	936.1923
		Upstream leased assets	17,728.1869
		Use of sold products	449,619.6431
		End-of-life treatment of sold products	594.9099
		Downstream leased assets	10,346.9498
		Investments	1,560.3061
		<b>Total</b>	<b>1,814,662.2596</b>

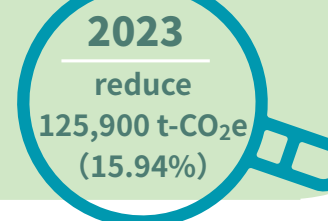
## 2023 Carbon Reduction Progress

To achieve our strategic goals in carbon reduction and climate issues, we are committed to reducing carbon emissions, diversifying our renewable energy portfolio, and obtaining state-issued renewable energy certificates (Taiwan-RECs, or T-RECs).



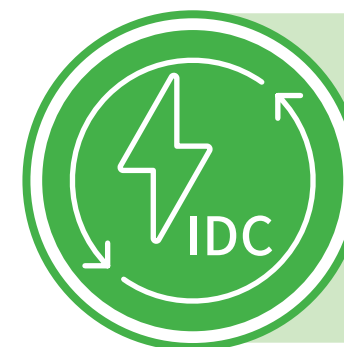
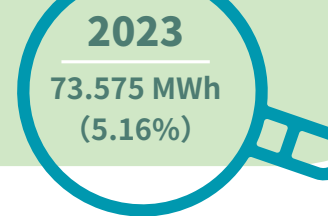
### Carbon Emissions (Compared to 2020 base year)

2022  
reduce  
76,000 t-CO<sub>2</sub>e  
(9.6%)



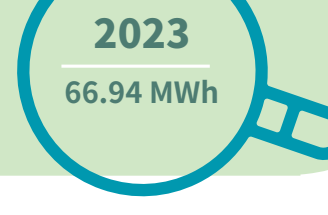
### Usage of Renewable Energy of all Company

2022  
24.049 MWh  
(1.67%)



### Usage of Renewable Energy in IDC

2022  
18.9 MWh



### Number of T-RECs

2022  
24,029



Notes:

1. Carbon Emissions: Emissions from Scope 1 + Scope 2.
2. Total Renewable Energy Usage: Includes self-generated and self-consumed energy, and energy from corporate Power Purchase Agreements (PPAs).
3. Baseline Year Explanation: The target is to reduce Scope 1 + Scope 2 carbon emissions by 50% by 2030 compared to the 2020 baseline, approved by the Science Based Targets initiative (SBTi) and aligned with the 1.5° C goal.





# Biodiversity

## Commitment

In today's digital era, telecommunications extend beyond service provision, driving economic, cultural, and societal growth. With the rapid development of 5G and digital transformation, our activities impact the ecosystem. For instance, ICT infrastructure expansions can threaten natural habitats and resources, while energy consumption and electronic waste pose additional challenges. Minor business decisions can significantly affect biodiversity and ecological balance.

Recognizing our responsibility, we actively engage in environmental protection to support biodiversity and zero deforestation, aligning with the UN 2030 Agenda and Vision 2050. In June 2023, CHT Chairman Shui-Yi Kuo signed the Biodiversity and Zero Deforestation Commitment. This commitment involves CHT, its tier-1 and non-tier-1 suppliers, and partners in preserving biodiversity, avoiding deforestation, restoring forests, and supporting UN SDGs 6, 12, 13, 14, and 15.



The Biodiversity and Zero Deforestation Commitment is summarized below:



\* For more information on Biodiversity, please refer to 'Chunghwa Telecom Biodiversity and No Deforestation Commitment' at [\[link\]](#)



## Biodiversity Main Actions



### Supplier Environmental Education - Biodiversity



- 1 In 2016, CHT became the first in the industry to offer environmental education programs for suppliers.
- 2 In 2023, we took 70 representatives from 45 suppliers to visit the Luodong Water Resource Recycling Center and Cardinal Tien Junior College of Healthcare and Management in Yilan County.
- 3 We organize biodiversity workshops to promote green energy, organic food, water conservation, and environmental protection, encouraging our suppliers to incorporate sustainable thinking into their day-to-day operations while promoting the sustainable development of local communities.

\* Video [🔗](#)

### The CHT 100 Preservation Project



As part of our Plant Ark Program collaboration with the Taiwan Forest Research Institute, we launched the CHT 100 Preservation Project with the following goals:

- 1 Inventory ecological characteristics and assess species recovery potential at operating sites.
- 2 Formulate standard operating procedures (SOPs) for species preservation, including species selection, culturing, plantation, management, and monitoring.
- 3 Establish a species preservation demo site, selecting an appropriate location and revising the SOPs as needed.
- 4 Conduct internal training programs for employees and preservation forums to share project achievements.

### Biodiversity and Zero Deforestation Commitment for Suppliers



- 1 In the "Chunghwa Telecom Co., Ltd. Supplier Code of Conduct," suppliers are encouraged to support the "Biodiversity and No Deforestation Commitment" and complete the annual key supplier training.
- 2 Partnered with 8 key suppliers, including Ericsson Taiwan, Sercomm Corporation, and Zyxel Communications, Chunghwa Telecom has collectively signed the "Biodiversity and No Deforestation Commitment."



### Biodiversity Considerations in Cell Tower Site Selection



We commit to considering biodiversity factors and taking necessary mitigation measures in selecting sites for cell towers and base stations to minimize environmental impacts.

#### 1 Site Selection

- (1.) Utilize TNFD's Location Assessment Tools to assess environmental impact, ensuring sites are not in protected areas and identifying endangered species (IUCN Red List) in surrounding areas.
- (2.) For projects near biodiversity-sensitive areas, conduct stringent environmental impact assessments per regulations, evaluate the project's impact on biodiversity and forestation, and develop mitigation plans.

#### 2 Construction

- (1.) Apply TNFD LEAP tools to develop indices for surveying, evaluating, and monitoring environmental impacts.
- (2.) Adopt the SBTi AR3T framework to minimize impacts on threatened or endangered plant species, protecting the local ecosystem.

### Biodiversity Strategic Blueprint and Pathways—Short-, Medium-, and Long-Term Goals



We have formulated the following four major strategies in preparation for our net positive impact (NPI) and no net deforestation (NND) goals by 2030:

- 1 **Science-based targets:** We established a science-based target evaluation mechanism and developed and are implementing mitigation measures
- 2 **Zero deforestation:** We are eliminating the use of resources/products that cause deforestation and we promote zero deforestation initiatives
- 3 **Net positive impact:** We participate in net positive associations and promote net positive initiatives
- 4 **Nature-positive mainstreaming:** We are setting an example of a nature-positive business and promoting nature-positive mainstreaming



# Water

Chunghwa Telecom primarily uses water for general office needs and air conditioning. Our in-house EARTH system records and analyzes water usage in real time, detecting abnormalities and serving as a centralized water management system across Taiwan.

To enhance water resource management, we developed a smart water meter monitoring platform using IoT technology. This platform retrieves water meter readings, collects and stores usage data, issues advance warnings, generates statistics and analytics, projects water usage, and enables systematic management and maintenance. This automation has improved our water management process, helping us achieve our annual water efficiency goals.



## Water efficiency management

To ensure the effective use of water resources, we formulated a water efficiency plan in which we set a 1% annual reduction target (with 2020 as the base year). We expect that our ISO 46001 (water efficiency management systems) coverage rate will reach 100% of our sites by 2024. Through daily water usage reviews, performance evaluations, and water management equipment optimization initiatives, we are able to improve water efficiency, reduce water usage, and minimize water-related costs.

Management Project	Description
Water use assessment	<ul style="list-style-type: none"> <li>Company-wide water usage management and analysis through the in-house EARTH system</li> <li>Water usage monitoring, analysis, and control, as well as implementation of the appropriate water conservation measures through the in-house smart water management system</li> </ul>
Water conservation measures	<ul style="list-style-type: none"> <li>Installing sprinkle-type nozzles at faucets to reduce water flow</li> <li>Installing dual flush toilets to reduce water use</li> <li>Water supply in office buildings set to turn on and shut off at predetermined times</li> <li>Strict water conservation guidelines to prevent wasteful use of water</li> <li>Timely restoration of faulty or leaking water equipment</li> <li>Reclamation of rainwater for irrigation</li> </ul>
Effluent quality improvements	Installing water reclamation facilities in new buildings to collect, treat, and recycle wastewater for reuse as non-drinking water.
Water reclamation	<ul style="list-style-type: none"> <li>IDC water reclamation: Collection and reuse of rainwater and water condensation from cooling and air conditioning equipment at IDCs for irrigation purposes.</li> <li>Water resources recycling for offices: Underground raft foundation rainwater reclamation system installed to collect clean rainwater from rooftops and grounds; condensate water reclamation equipment added to office air conditioning systems to reclaim water for tree watering and cleaning on campus.</li> </ul>
Employee water conservation awareness	Three types of training courses based on ISO 46001:2019 (water efficiency management systems) guidelines to promote employee awareness of the importance of water conservation and encourage employees to conserve water and minimize waste in their daily lives.

Unit: in million m<sup>3</sup>

Water Resource	2020	2021	2022	2023
Water withdrawal	2.297	2.170	2.175	2.168
Water discharge	0.680	0.598	0.566	0.635
Total net fresh water consumption	1.617	1.572	1.609	1.533

Notes:  
 1. The data scope covers 100% of operational sites.  
 2. Water Withdrawal: Currently, only municipal water usage is calculated. After implementing ISO 46001, both municipal and groundwater usage will be included.  
 3. Water Discharge: Currently calculated using domestic water usage plus recycled water. In the future, following the results of ISO 46001, it will be calculated by subtracting water usage and reused water from the total water withdrawal.

Unit: tonnes

Item	2021	2022	2023
Tap Water	598,435	566,165	634,908
AC Water	1,571,508	1,609,038	1,533,227
Reclaimed Water	1,534	7,453	4,143

Notes:  
 1. Air Conditioning Water: Primarily used for cooling towers.  
 2. Recycled Water: Collected and reused water that would otherwise be discharged.



# Waste

Chunghwa Telecom understands the importance of reduction, recycling, and reuse. In addition to setting waste reduction targets and plans, we leverage our in-house EARTH system to reach our 5R goal (Refuse, Reduce, Reuse, Repair, Recycle). This system is used to manage the use of resources and control energy efficiency, as well as to conduct systematic management of recyclables and waste treatment.

Using 2021 as the baseline year, our goal is to reduce household waste by 3% annually. We contract professional and certified waste disposal companies to manage waste incineration. For industrial waste, 100% is handled by certified disposal companies registered with the Ministry of Environment, utilizing methods such as recycling and incineration. We encourage these companies to prioritize recycling to ensure efficient resource utilization and to implement the principles of a circular economy.



## Waste Management

Unit: tonnes

Water Resource	2020	2021	2022	2023
Waste recycled/reused	3,846.6950	5,455.5190	5,220.0486	5,179.5849
Waste disposed	3,498.1613	3,414.4116	1,912.969	1,875.1916
Waste landfilled	0	0	0	0
Waste incinerated with energy recovery	3,484.2413	3,369.5316	1,912.969	1,875.1916
Waste incinerated without energy recovery	0	0	0	0
Waste otherwise disposed: Outsourcing	13.92	44.88	0	0
Waste with unknown disposal method	0	0	0	0

Note: Data coverage includes 100% operation sites.

## Industrial Waste

Scrapped lead-acid batteries are recyclable industrial waste regulated by the EPA. To reduce and recycle pollutants, we use open bidding for recycling and require service providers to be legal treatment providers. In 2023, 37,680 lead-acid batteries, weighing 2,207,156 kg, were scrapped and sold for NT\$23,563,883. This process fulfills our environmental responsibilities and increases company revenue. Recognized public and private waste disposal companies handle other industrial waste, such as cement poles, fiber optic cables, wood, and cadmium batteries.

Unit: tonnes

Category	2021	2022	2023
Cement poles	803	637	935
Fiber optic cables	600	316	398
Woods	41	49	45
Batteries containing cadmium	45	0	0
Disposal fee (NT\$ thousand)	20,642	7,788	9,847

Note: Batteries containing cadmium were treated completed in 2021.



## Key Achievements in Industrial Waste Disposal

### 1 Reduction:

- Targeting fiber optics with a lower recycling burden, the Chunghwa Telecom Laboratories developed small-diameter grooved optical cables, reducing the outer diameter by 10% and weight by **35%**
- The new **600-core** fiber optics have a **30%** smaller outer diameter and weigh **55%** less than traditional gel-filled fiber optics



### 2 Circular economy:

- We sold **260** secondhand iPad Airs through our asset auction system, increasing our asset value recovery rate by close to **50%** over traditional asset disposal means.
- Secondhand asset disposal: The auction price for used **19-inch** server racks reached several times the starting price.



### 3 Increasing the recycling rate:

We work with the Industrial Technology Research Institute and other academic institutions to research feasible recycling plans.



### 4 Waste management training:

- We hold a Warehousing Practices Workshop—Waste Management course.
- We provide online and in-person courses to familiarize employees with waste recycling/ treatment knowledge and skills.



## Waste Management Project

The types of waste common to ICT companies include waste paper, electronic waste, and waste packaging materials. We have a comprehensive waste management plan in place to minimize the negative impacts of waste production on the environment and protect natural resources and the ecosystem. By recycling and reusing waste, we are improving resource efficiency and achieving our environmental sustainability and circular economy goals.

Management Project	Description
Identifying hotspots for potential improvements	Periodic review of internal procedures to identify opportunities for waste reduction: Achieving industrial waste reduction through optimized materials specifications and precise construction; assisting suppliers in improving manufacturing processes and optimizing resource use
Waste reduction measures	<ul style="list-style-type: none"> <li>Waste and plastic reduction: Reducing plastic use by encouraging employees to choose reusable cups or green-mark-certified containers</li> <li>Recycling: Enforcing the recycling and reuse of waste paper, plastics, and metals; creating effective recycling channels with professional waste collection and disposal companies</li> <li>Packaging reductions: Optimizing product packaging design to reduce unnecessary packaging materials and packaging waste</li> </ul>
R&D investment	Investment in waste reduction R&D
Employee waste reduction awareness	<ul style="list-style-type: none"> <li>Waste management training: Offering regular waste management training to familiarize employees with waste recycling/treatment knowledge and skills</li> <li>Promotional campaigns: Organizing waste reduction and recycling promotional campaigns to encourage employees to take part in waste management</li> </ul>
Integrated recycling plan	Circular economy action plan: Creating value by auctioning off secondhand assets through the CHT Asset Auction System; donating depreciated but still usable equipment to remote schools and disadvantaged groups
Landfill substitution rate	Zero waste sent to landfill and 100% waste transfer rate.

## BS 8001 Circular Economy

In support of the UN SDG 12: Responsible Consumption and Production and the circular economy promotion in Taiwan's 5+2 Industrial Innovation Plan, CHT drive the transition to a circular economy. With BS 8001 Circular Economy guidelines introduced in 2021, we became the first telecom operator in Taiwan that obtain the BS 8001 Conformity Statement. We proposed five commitments with the 5R Principle higher than the statutory requirements at home and abroad:



- 1. REDUCE:** Establish a green operation and consumption model to properly manage and reduce consumption of energy and resources, along with enhanced education and promotion for employees, suppliers, and customers.
- 2. REUSE:** Increase circularity and improve resource cycling technology for resource regeneration and recycling.
- 3. REPAIR:** Promote eco-friendly design and extension of service life of products and offer circular products that are more durable, easy to repair, and recyclable.
- 4. REFUSE:** Promote green procurement, reject products with no green concept, and purchase products with green labels or with an equivalent efficiency thereof.
- 5. RECYCLE:** Facilitate an industrial chain symbiosis and develop forward-looking energy technologies to elevate energy/resource efficiency and promote recycling.



# Energy Resources

CHT sees energy management efficiency as a key indicator of overall operational efficiency. With an overpowering system of telecommunication infrastructure, we must rely on a stable electricity supply. Therefore, we established a smart energy management system to implement a wide range of energy conservation initiatives, improve equipment energy efficiency, strengthen employees' awareness of energy conservation, explore innovative energy technologies and solutions, and ultimately, minimize energy use and enhance corporate competitiveness.



Unit: 10,000 kWh

Year	Total Electricity Consumption (A)	General Consumption (B)	Business Consumption - Meter Rate Lighting Service (C)	Business Consumption - Flat Rate Lighting Service (D)	Consumption of Meter Rate Lighting without Customer Number (E)	Consumption of Flat Rate Lighting without Customer Number (F)
2007	135,180	9,420	125,151	609	0	0
2021	142,825	6,871	126,848	8,163	374	569
2022	136,525	4,440	123,280	8,029	537	239
2023	130,402	4,920	116,363	8,042	296	781

- Notes:
- B: office buildings and employee dormitories.
  - C: base stations, depot, and public telephone of Meter Rate Lighting.
  - D: base stations, depot, and public telephone of Flat Rate Lighting.
  - E: Consumption of Meter Rate Lighting without Customer Number.
  - F: Consumption of Flat Rate Lighting without Customer Number.
  - A=B+C+D+E+F; the general consumption comes from CHT office buildings; the business consumption includes the Flat Rate and Meter Rate Lighting. Renewable energy is not included.
  - The Flat Rate is calculated based on the electricity fee. The electricity fee is converted into kWh based on announcements from the Ministry of Economic Affairs and Taipower. The average electricity price was NT\$2.8064 per kWh in Q1 2023 and NT\$3.1154 in Q2-Q4 2023.
  - This table presents the power consumption with customer numbers and the fluctuated power consumption of equipment without customer number, which have been included in the GHG inventory data.
  - 2023 Electricity Intensity: 0.69 (total electricity consumption in ten thousand kWh per NT\$100 million revenue).
  - 2023 Total Electricity Consumption: 4,694.477 GJ.

## Energy Savings for Data Centers

CHT values the energy efficiency and power supply quality of its data centers. We are deprecating and replacing old and energy-intensive equipment, introducing smart conservation technologies, and adopting energy-efficient solutions to achieve our IDC energy conservation goals.

We leverage our in-house developed iEN smart energy conservation system and EOC energy operation center to automate data collection and analysis, allowing us to keep track of energy stats in real-time. In 2023, we conserved 63,480 MWh of energy across all IDC locations, effectively reducing 31,400 t-CO<sub>2</sub>e in carbon emissions.

## Renewable Energy

We are investing years of innovation, research, and development into renewable energy. As of the end of 2023, we have installed solar power equipment at 69 locations across Taiwan with a total capacity of 5,557 kWp, generating 6,110 MWh of electricity and reducing 3,024.5 t-CO<sub>2</sub>e in carbon emissions every year.

Item	2021	2022	2023
Total renewable energy consumption (A) (10,000 kWh)	11.1	2,405	7,357.5
Total non-renewable energy consumption (B) (10,000 kWh)	147,926	141,810	135,281
% of renewable energy consumption [A/(A+B)] (%)	0.01	1.67	5.16

- Notes:
- The figure for (A) only includes self-generated renewable energy for in-house use.
  - The figures for (A) in 2022 and 2023 include self-generated and purchased renewable energy.

## Key Actions for Energy Saving and Carbon Reduction

Project	Main Performance
Green Energy Base Station	<p>In 2023, the "Green Energy Base Station" was established.</p> <p><b>Core features</b></p> <ul style="list-style-type: none"> <li>Integration of wind power, solar power, and power storage systems</li> <li>Combined capacity of 113.8 kW (12 kW wind power and 101.8 kW solar power)</li> <li>Power generated in 2023: 134.5 MWh</li> <li>Estimated 100 T-RECs obtained from the Bureau of Standards, Metrology &amp; Inspection, M.O.E.A.</li> </ul> <p><b>Energy Storage System</b></p> <ul style="list-style-type: none"> <li>The energy storage system compensates for base station power when solar or wind energy is insufficient.</li> <li>Ensures stable power supply to the base station and optimizes peak shaving and valley filling.</li> </ul>
Network energy conservation	<ul style="list-style-type: none"> <li>Our cell towers operate on the C-RAN architecture, conserving 5.894 MWh of power and reducing 2,918 t-CO<sub>2</sub>e of carbon emissions every year.</li> <li>Gradual deprecation and replacement of old, energy-intensive cell towers and air conditioning equipment, saving 1,129 MWh of power and reducing 560 t-CO<sub>2</sub>e of carbon emissions every year.</li> <li>Optimizing cell tower configurations, saving 1,443 MWh of power and reducing 714 t-CO<sub>2</sub>e of carbon emissions every year.</li> <li>Deprecation of 2G gateways, shutting down 3G-F2 cells, and powering of 4G base towers during the night, saving 3,267 MWh of power and reducing 1,617 t-CO<sub>2</sub>e of carbon emissions every year.</li> <li>Energy conservation initiatives at ICT data centers, saving 1,259 MWh of power and reducing 623 t-CO<sub>2</sub>e of carbon emissions every year.</li> <li>Deprecating and replacing 2,810,000 old, energy-intensive PSTNs, saving 19,100 MWh of power and reducing 9,455 t-CO<sub>2</sub>e of carbon emissions every year.</li> </ul>





# Environmental Sustainability Actions

To fulfill our environmental protection, sustainable development, and net zero pledge, Chunghwa Telecom is actively pursuing environmental sustainability initiatives. We have incorporated sustainable thinking into business operations as well as our products and services. We hope to become a green corporation and a leader in the low-carbon industry.



## Environment Artificer Theurgy (EARTH)

We developed the Environment ARTificer THEurgy (EARTH) system to manage resources and protect the environment more efficiently as well as to reduce spending on energy consumption. EARTH system features including:

- Energy Savings and Innovation
- Performance Evaluations
- Power Management
- Water Management
- Water Resources Statistics
- Fuel Management
- Corporate Tree Planting
- Lighting Statistics
- Recycling Statistics

### EARTH2.0 System Enhancements

In response to the need for systematic organizational audits, the EARTH2.0 system has been continuously optimized since 2023:

- 1 Incorporates all source system carbon emission items, covering approximately 90% of emission sources, reducing data omissions from manual collection.
- 2 Automates consolidated utility bill receipts, integrates VO and approval processes, and optimizes utility cost allocation, enhancing responsibility distribution.
- 3 Includes site coding (Recode) for better control and analysis of renewable energy costs and profitability.
- 4 Systematizes green electricity transfer and internal carbon fee management to address renewable energy and carbon fee issues.
- 5 Enhances subsidiary audit records and certificate management, improving digitalization and transparency of sustainability governance within the group.

## Green Hostels

Chunghwa Telecom's 18 Green Hotels provide quality services for employees' business trips, accommodations, and leisure activities. As an environmental measure, they do not offer disposable supplies or towels. Sustainability practices include solar water heaters, heat pump air conditioning, and LED lighting.



## Green Revenue

In addition to developing environmentally friendly products, we have been promoting Green Stores and were the first telecom company in Taiwan to fully turn our service centers into Green Stores. In 2023, green revenue reached NT\$ 346.78 million, which was 16% of our commercial product revenue.

Category	2021	2022	2023
Green revenue (million)	260.64	289.58	346.78
Turnover (million)	2,174.55	2,043.15	2,167.14
Accounted percentage of turnover (%)	11.99	14.17	16.00



## Paperless Receipt Service

We promote paperless receipts to all our customers. In 2023, 73% of receipts were paperless receipts, which successfully reduced the consumption of paper by 621 million sheets, equivalent to 56,500 trees. This is not only good for protecting forest resources and biodiversity, it also led to an 11,000 metric ton reduction in carbon emissions and so contributed to the mitigation of global warming.

Item	2021	2022	2023
Customer applying for e-bills (10 thousand sheets)	1,994	2,039	2,072
Ratio of customers applying for e-bills	71%	72%	73%
Quantity of paper saved (per 1,000 sheets)	598,200	611,603	621,560
Number of trees saved	54,382	55,600	56,504
Reduction of carbon emission volume (metric ton)	10,768	11,009	11,188

Notes:

1. The paper savings data and carbon emissions reduction data are based on both e-bills (including SMS) and combined bills.
2. Each e-bill reduces the use of envelopes and paper by 2.5 sheets of A4 paper. Total amount of paper saved = number of customers applying for e-bills × 2.5 × 12 (months).
3. 1 sheet of A4 paper generates 18 grams of CO<sub>2</sub>; Carbon emissions reduction = paper saved (1,000 sheets) × 18 grams.
4. Number of trees saved: Each ton of paper pulp produced = 20 trees; one ton of paper pulp = 220,000 sheets of A4 paper. Therefore, the number of trees saved = sheets of paper saved ÷ 220,000 × 20.



## ESG Highlights

### Sustainable actions at customer service centers

1. Thanks to the simplification of in-person payments and digitalization of the distribution process, we saved 18.36 million sheets of A4 paper, reducing carbon emissions by 117,523 kg.
2. All fluorescent lights at customer service centers were replaced with energy-saving LED lights. To further reduce our carbon footprint, we are in the process of installing air conditioning units that meet the latest environmental protection standards.
3. In support of the Earth Hour initiative, we turned off all signboard lights at our owned and contracted locations (62,100 lamps in total) for an hour, saving 1,117.8 kWh of power and reducing GHG emissions by 568.9 kg-CO<sub>2</sub>e.





## Green Procurement

We prioritize green procurement across all operational sites, focusing on Category 1 (Environmentally labeled products), Category 2 (Recycled, recyclable, low-pollution, or energy-saving products), Category 3 (Products with energy-saving, water-saving, or green building labels, and FSC or PEFC-certified materials). We also include self-declared green products (e.g., EPEAT Gold-certified devices) and products with lower life cycle impacts.

Our target is for green procurement to exceed 50% of total procurement, following ISO 20400 guidelines. We aim to strengthen sustainable procurement through the ISO PDCA system.

To boost green procurement, we promote renewable energy (solar, wind) and electric vehicles. From 2023, fuel motorcycles will be replaced with electric ones, enhancing green procurement and reducing carbon emissions. In 2023, with suppliers, we established "Product Environmental Footprint Category Rules (PEFCR)" for network equipment, approved by the Ministry of

Environment. This enables manufacturers to calculate and reduce product environmental footprints.

Our procurement of home gateways (HW), Mesh APs, and set-top boxes (STB) requires ISO 14067 certified products, ensuring compliance with carbon footprint/reduction labels, thus increasing green procurement capacity.

Item	2021	2022	2023
Total green procurement (NT\$ million)	14,994	17,605	18,238
Accounted percentage of total procurement (%)	22.37	28.67	29.39



## ESG Highlights

### Circular economy - Public Umbrellas made from plastic bottles

- Chunghwa Telecom embodies the concepts of circular and shared economy by creating 5,000 "Recycled PET Bottle Umbrellas" from daily recycled PET bottles or beach cleanup efforts. These umbrellas are available for borrowing and returning at 445 stores nationwide, promoting green initiatives among customers and employees.
- We implement SDG #17 partnerships, achieving a net-zero circular future through innovative collaboration.



## ESG Highlights

### Biodiversity - Shoot for Victory by Planting Trees project

- In April 2023, in partnership with the Forestry and Nature Conservation Agency, we launched a nationwide tree-planting initiative to restore forests and enhance biodiversity.
- Tzu-Ying Tai, Olympic medalist, was named CHT Sustainable Development Ambassador, announcing our goal to plant 150,000 trees in eight years, contributing 1,680 t-CO<sub>2</sub>e in carbon sequestration.
- By the end of 2023, we adopted four forests in Yilan, Taoyuan, Chiayi, and Tainan, planting 10,643 trees over 4.33 hectares, adding 255 t-CO<sub>2</sub>e in carbon sequestration capacity.

