

4 SUSTAINABILITY RISKS AND OPPORTUNITIES



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CHT places emphasis on the control of the corporate operation and sustainability risk. In 2016, the Company established a Risk Management Committee with the President as convener and high rank managers as members. The committee supervises risk management throughout the organization and is responsible for prioritizing identified risks, formulating response strategies to key risk issues, and reporting to the board of directors when deemed necessary. Through control of the mechanism at each level, potential risks and loss to the Company can be minimized.

The SDGs CHT contributes to in this chapter:

<p>7 AFFORDABLE AND CLEAN ENERGY</p>	<p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>
<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>13 CLIMATE ACTION</p>



The **first** telecom operator in the world to pass "**TCFD Conformity Check**" by BSI with **the highest grade obtained for 2 consecutive years**.



CHT is actively looking into the development of **renewable energy**, self-built or **for solar energy**.



Our "**Risk Management Committee**" adopts Enterprise Risk Management (ERM) software and the "**Risk Analysis Matrix**" as our assessment tools, governing every business decision made by our employees.



The development of the Artificial Intelligence of Things (AIoT) will popularize edge computing, IoT phone numbers, drones, AR, VR, and smart homes. These emerging industries will **propel the development of hardware and operating systems**.

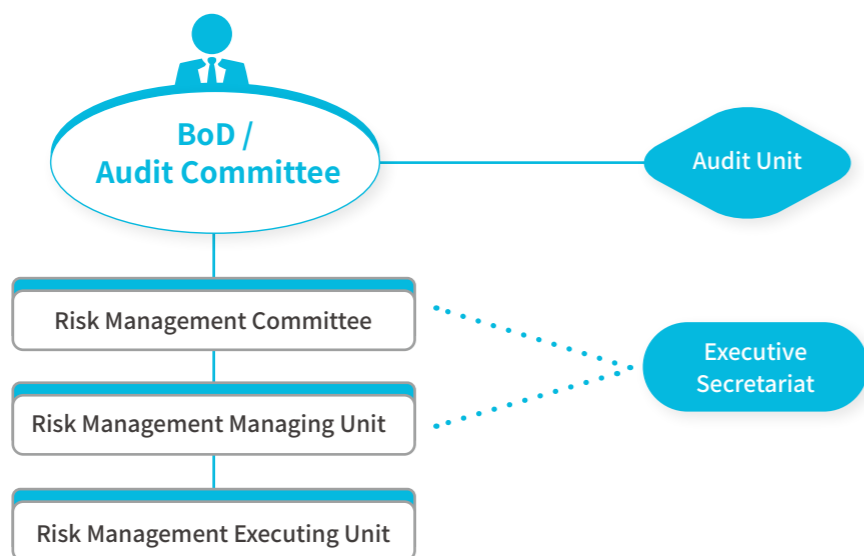


Adopting a risk-based approach, CHT **established the "Chunghwa Telecom Cybersecurity and Privacy Protection Framework."**

Based on NIST's Cybersecurity Framework (CSF) and domestic and international standards and regulations, the framework includes five steps: identify, protect, detect, respond, and improve.



CHT Risk Management Organization Structure



Aspects	Description
Organizational Aspect	<ul style="list-style-type: none"> "Risk Management Committee" was established in 2016 to inform the Audit Committee of significant risk incident and related information. The Committee reports to the Board of Directors at least once a year.
Strategic Aspect	<ul style="list-style-type: none"> The BoD established the risk management strategy and structure. The Risk Management Regulations were established as a foundation and are followed by all employees engaged in business operations.
Management	<ul style="list-style-type: none"> Four management targets: strategic goals, operative goals, financial reports, and compliance The Enterprise Risk Management (ERM) system was established for the regular control of the risks from each division and business. Management is conducted on a rolling basis in response to environmental changes with enhanced execution of sensitivity analyses and stress tests for focused businesses. Potential losses are reduced to the minimum through risk acceptance, risk transfer, risk reduction, and risk avoidance.
Assessment Tool	<ul style="list-style-type: none"> We use the Risk Analysis Matrix as our assessment tool to assess legal, network maintenance, market and financial operation risks, etc. For the major operational items and relative ESG issues, including climate-related risks, we enhance the performance of sensitivity analysis and the pressure test. Pursuant to Recommendations of the Task Force on Climate-related Financial Disclosures (referred to as "TCFD Framework" hereinafter), we analyzed the scope of operation, upstream and downstream, as well as the climate-related risks and opportunities throughout the life cycles of assets in the short-, mid-, and long-terms.
Audit Aspect	<ul style="list-style-type: none"> Risk Management Committee promotes implementation of risk management efforts of the Company and evaluates performances in risk management. The Auditor reviews the risks and reports to the BoD.
Feedback and Improvement	<ul style="list-style-type: none"> Risk status is followed up monthly and reported to the Risk Management Committee and the Audit Committee generally. The Committee improves the current risk management mechanism based on feedback from individual units to ensure the process is up to date and satisfies the operational need.
Implementation Outcomes in 2021	<ul style="list-style-type: none"> 3 meeting were convened with focuses on the corporate-level risks tied with the objectives in the BP and deliberations on directions of material risk topics. "2021 Risk Management Promotion" was reported on the Board of Directors meeting in May.

For more information about Risk Management, please refer to 2021 Annual Report p.125-134.

Emerging Risks

CHT continues with advanced technological research and development to take advantage of many business opportunities in this digital convergence era and reduce operational risk. We absorb, cultivate and make good use of excellent available talent to integrate Internet and marketing resources.

We cooperate closely with our strategic partners in the launch of new services and products that satisfy our customers. We have become The Digital Economy Motivator and The Creative Industry Pilot, and we create values for clients, shareholders, employees and society.



Risk Factor

Dwindled advantage in the mobile services market due to the merger of competitors

Potential Influences **Obstacles**

Increased bandwidth and user population of competitors that leads to impact to our mobile market share

Countermeasures **Risk Avoidance and Opportunity Seizure**

- Strengthen 4G/5G construction, introduce 5G dual band service, and preemptively deploy during the merger of competitors to increase the leading advantage in the mobile network quality.
- Establish the network advantage of "Always Broadband Connected" with triple networks of mobile networks, optical networks, and Wi-Fi services combined to boost the QoE of users.



Risk Factor

Twists in the energy transition for the net-zero emissions policy that affects the power supply stability

Potential Influences **Obstacles**

Twists in the energy transition for the net-zero emissions policy that affects the power supply stability

Countermeasures **Risk Avoidance and Opportunity Seizure**

- Strengthen the resiliency of networks to ensure business continuity, e.g. strengthen the emergency backup capacity of networks and IDCs, request Taipower to adopt dual-feeder power supply for critical IDCs, increase the emergency power generation units and batteries installed, phase out old energy-consuming equipment, and introduce low-carbon network equipment, etc.
- Preemptively deploy and invest in industries of energy transformation to have the upper hand.

Emerging Opportunities

The 5G technology will drive intelligent technological applications. AI will be everywhere around us in the future. Completely new types of services such as AIoT (AI and IoT) will become the core of fast convergence. The rise of new industries, edge computing, the volume of the IoT, drones, AR, VR and the intelligent family will push corporations in Taiwan to move their business emphasis. We predict that the global output value of AI hardware will exceed NT\$ 5 trillion. This will inevitably become an important force in pushing global economic growth. With the advent of Industry 4.0 and the rapid emergence of new online applications, cybersecurity specialists are issuing warnings regarding the looming threat of multimodal, multifaceted attacks. However, this also creates an opportunity for companies that offer an integrated cybersecurity service package. The government has classified information security as a matter of national security, including it as part of the national defense industry in the 5+2 New and Innovative Industries Policy.

In the face of the trends of user-friendliness and rapid launch of diversified emerging technological applications, security perimeters are blurred as a result. Meanwhile, openness and softwareization increase the chance of exposure as well, which in turn pose a threat to security. Hence, apart from taking user experience and service functions into consideration, corporations are to employ the concept of Secured by Design in the beginning of development in order to effectively reduce potential information security risks.

CHT spares no effort in the refinement of cybersecurity technology. In response to the government's cybersecurity automatization and industry innovation policies, in 2017, CHT founded Chungwa Cybersecurity International, a subsidiary dedicated to the development of integrated cybersecurity solutions especially for emerging technologies. We hope that our endeavors will encourage other companies to follow suit, while effectively broadening opportunities in information security and driving the growth of revenues apart from the reinforcement of national cybersecurity defense capability.



Opportunity Factor IoT / Big Data

Potential Business Opportunity

International research institute Gartner predicts that the IoT product and service providers will create a marginal benefit of US\$6 trillion in 2025.

Countermeasures Risk Avoidance and Opportunity Seizure

- We developed the IoT intelligent internet platform on our own, combining 5 main services, including information security, big data, the blockchain, AI, and AR.

* CHT IoT Smart Platform [🔗](#)



Opportunity Factor Development of 5G

Potential Business Opportunity

Forecasts show that 5G technology will result in an output of US\$ 134 billion to the companies in Taiwan in 2035.

Countermeasures Risk Avoidance and Opportunity Seizure

- Launching "Taiwan 5G Industry Development Alliance - CHT leading team" with the 5G office in DoIT, ITRI, and III.
- CHT Pilot Team extends laboratory testing to practical "5G Testing and Training Site." All industries in Taiwan can take advantage of this environment to develop innovative applications and grasp the opportunities.
- Participate in the Asia Silicon Valley Development Plan of the National Development Council to offer open 5G network system integration and reliability verification services, establish the demo site for domestic open 5G networks, and promote domestic open 5G networks and reliability verification mechanisms; create the National Team of Open Network of Taiwan with the R&D prowess of the ICT industry in Taiwan integrated for the international competition and the next industry of trillion dollars' worth.
- With the advantages of the largest customer base of 5G services and the largest bandwidth available, we work with ICT manufacturers and relevant 5G product suppliers at home and abroad in line with the philosophy of Extensive Alliance to invest in the market of applications for the private 5G networks and build the 5G venues with the high bandwidth, low latency, and great connectivity of the 5G private networks.



Opportunity Factor Information Security Management

Potential Business Opportunity

- Popularization of emerging technological applications (e.g. IoT, AI, and cloud services) as well as diversified attacks by hackers boost the challenge of protection against cybersecurity threat while create new opportunities in the cybersecurity area.
- The FSC promulgated "Financial Cyber Security Action Plan" to drive the demands for cybersecurity protection, monitoring, and joint defense in the financial sector.
- The Executive Yuan announced the Cybersecurity Industry Development Action Plan. The gross output of the industry is expected to exceed NT\$ 78 billion dollars by 2025.
- Gartner pointed out that the global cybersecurity market accounted for approximately 3.32% of the global IT expenditures and rising.

Countermeasures Risk Avoidance and Opportunity Seizure

- The cyber intelligence joint defense platform we developed and key emerging technologies like MEC security monitoring offer an environment for 5G and IoT that is more secured and reliable.
- Developing inter-disciplinary financial security solutions, such as blockchain and CloudHSM, we strive to become a cybersecurity service provider for digital finance.
- With our current IT solutions, we offer complex solutions for clients using ICS/OT infrastructure connected to a hybrid network.
- As a managed security service provider (MSSP), we dedicated to the provision of a wide range of cybersecurity solutions. In addition to extending our market reach within the border, we are actively seeking business opportunities overseas.
- With quality domestic and international products integrated, ISP networks utilized, and advantages in channels and R&D, we offer overall solutions to big corporations and become the leader in the cybersecurity industrial chain integration.



Opportunity Factor Climate Change (low carbon products and services)

Potential Business Opportunity

- The World Economic Forum (WEF) predicted that of the potential risks in the next decade, four out of the top five risks are environmental issues, especially the "extreme weather."
- Businesses around the globe are investing in low carbon emission infrastructure, including green energy, electric automobiles, and smart cities to reduce reliance on electricity.
- The bonds issued by green enterprises worldwide in 2021 were up to \$416.5 billions' worth, accounting for 3.51% of the corporate bonds issued globally and rising.

Countermeasures Risk Avoidance and Opportunity Seizure

- Green Product and Service Program — we provide businesses with energy-saving technology and services.
- We reduce carbon footprints through innovative green services, cloud products, and other technologies and build smart cities through technology by tapping into our core advantages in the ICT industry.
- We are building a cloud service platform that enables clients to access real time data regarding their energy usage and equipment status so that failures can be predicted and prevented.
- We developed the Green ICT technology for deployment in renewable energy. As of 2021, either the installed solar PV capacity for CHT itself or for others continued to rise significantly.
- The sustainable development bond of NT\$3.5 billions' worth was issued in 2022 as the first sustainable development bond issued by the domestic telecom operator. The fund raised shall be directed to green buildings, comprehensive VoIP for telephone networks, and extensive broadband construction in the offshore islands and rural areas to bridge the urban-rural divide, so as to realize the carbon reduction for all via technology.

Climate Change Risks and Opportunities

Chunghwa Telecom builds a systematic and organized corporate governance structure to ensure that climate change related challenges are incorporated into the Company's annual strategy in real time and that relevant projects are implemented.

The Supervisory Responsibility of the Board of Directors

In 2021, in line with the organizational transformation and the ESG trend, Chunghwa Telecom officially renamed the CSR Committee as the "Sustainable Development Committee" with the Chairman and President serving as the Chairperson and Vice Chairperson. Also, the President serves as the Convenor of the "Risk Management Committee." With the dual mechanisms, we ensure that risks and opportunities related to climate change can be fully deliberated and reviewed in the Sustainable Development Committee and the Board of Directors. In addition, with the existing internal control and risk management mechanisms combined, the links between the climate change topics and the Board of Directors' responsibility in the oversight thereof is strengthened through the report to the Board of Directors every half a year.

The Role of Management

The "Environmental Group" is set up under the CHT Sustainable Development Committee, responsible for the strategic planning for environmental sustainability, climate change, carbon management, and environmental protection actions as well as execution of action plans. Pursuant to the ESG vision and carbon management strategies laid out by the Board of Directors and the Sustainable Development Committee, in line with the needs of international institutional investors, rating agencies, and key stakeholders, it plans, enforces, and manages execution of various climate change and carbon management action plans. The relevant mechanisms include:



Target Setting:

Target setting for the net-zero emissions, GHG reductions, and climate resilience improvement of CHT.

Strategic Planning:

Strengthening the carbon management competencies of the Company and its supply chain with mitigation and adaptation at the core, along with improvement of climate resilience of the telecom infrastructure and communication equipment, to ensure business continuity.

Solutions:

Oversight and proposal of innovative solutions to reduce GHG emissions from itself and the industrial chain; planning and execution of "Action Plans for Adaptation to Climate Change in the next 20 Years for Chunghwa Telecom Communication Networks" to deploy climate change adaptation actions.

Chunghwa Telecom Disclosures to TCFD

Framework	Disclosures
Governance	· The board's oversight of climate-related risks and opportunities
	· Management's role in assessing and managing climate-related risks and opportunities
Strategy	· The climate-related risks and opportunities the company has identified over the short, medium, and long-term
	· The impact of climate-related risks and opportunities on the Company's businesses, strategy, and financial planning
Risk Management	· The potential impact of the Company's businesses, strategy, and financial planning in different scenarios
	· The Company's processes for identifying and assessing climate-related risks
	· The Company's processes for managing climate-related risks
Metrics and Targets	· Processes for identifying, assessing, and managing climate-related risks and how they are integrated into the Company's overall risk management
	· The metrics used by the Company to assess climate-related risks and opportunities
	· Scope 1, Scope 2, and Scope 3 greenhouse gas emissions
	· The targets used by the organization to manage climate-related risks and their implementation

Task Force on Climate-related Financial Disclosures (TCFD)

Chunghwa Telecom is the first telecom company in Taiwan to sign on as supporter of the Task Force on Climate-related Financial Disclosures (TCFD) initiative. The Task Force on Climate-related Financial Disclosures (hereinafter as "TCFD") has been introduced in 2019 to conduct analyses of climate risks and opportunities so as to promote works of climate change mitigation and adaptation for an ongoing reduction of operational risks for the Company and drive the low-carbon transformation in the industrial chain. In 2021, CHT was certified to the highest grade of TCFD Conformity Check for 2 consecutive years.



CHT Climate Change Strategies

Strategy	Mitigation	Adaptation
Description	Attainment of net-zero emissions is the foremost mission, along with facilitation to partners, upstream and downstream, to collectively realize the target of 1.5°C set in the Paris Agreement.	Improvement of the climate resilience for the infrastructure and communication equipment of the Company is the foremost mission to ensure business continuity for the Company.

To analyze the future impacts of climate change on the Company, we employed the Sustainable Development Scenario (SDS) proposed by the International Energy Agency (IEA) and the RCP 2.6 scenario proposed by the Intergovernmental Panel on Climate Change (IPCC) to conduct our climate scenarios analysis.

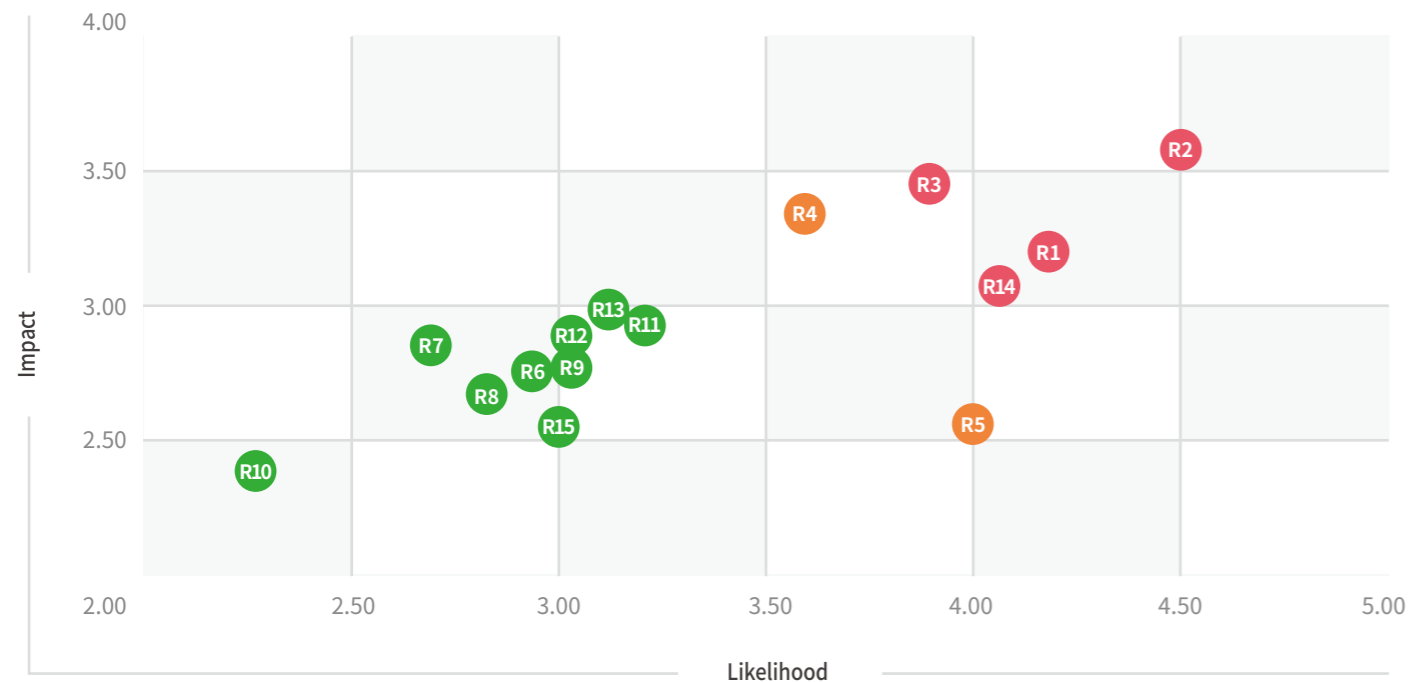
Climate Change Scenarios for "Mitigation and Adaptation"

Strategy	Mitigation	Adaptation
Climate Scenario	Sustainable Development Scenario, SDS	IPCC RCP 2.6
Description	<p>Energy efficiency improvement: IDCs and base stations are our primary sources of energy consumption. Hence, a series of energy efficiency plans are deployed. For instance, with the advantage of the fixed-line facilities combined, the 5G construction was deployed with the "C-RAN" architecture, which is low in failure rate, easy for maintenance, and more energy efficient.</p> <p>Use of Renewable energy: Aside from active installation of renewable energy capacities, we also work with external entities to build their solar power plants, which not just complies with the renewable energy development policy of the country but also contributes to our revenue.</p> <p>In addition, according to the IEA SDS, regarding the issues of projected elevated carbon prices, increased electricity bills, energy efficiency, and regulatory trends, we analyzed the risks and opportunities in the short-/mid-/long-term and proposed responses and management measures for material and potential risks to mitigate risks and seize the opportunities ahead.</p>	<p>Our climate adaptation strategy is to elevate the climate resiliency of facilities/equipment to reduce threats from the extreme weather events. Hence, the Action Plans for Adaptation to Climate Change in the next 20 Years for Chunghwa Telecom Communication Networks was proposed and relevant budgets were allocated to carry out focused improvement and adaptation projects for equipment at high climate risk in order to improve the climate resiliency of the Company.</p> <p>In addition, based on the physical risk topics under the IPCC RCP2.6 scenario, the impact levels to the Company were identified. Material and potential Climate risk topics are managed and supervised continuously to the level of preemptive preparedness to strengthen our capacity for climate disasters.</p>



We classified risks related to the industry as transition risks and physical risks and established the list of topics of risks and opportunities by combing through the industrial risk management reports worldwide as well as the regulations and policies in Taiwan. Also, to capture changes to the climate change risks, the risk assessment results are reviewed yearly to adjust our climate change strategies, reduce risk impacts, and seize climate opportunities. There are 15 risk topics identified in 2021, which include 10 transition risks and 5 physical risks.

Referring to the ISO 31000 risk management guidelines, the strategy group assess the hazard caused by each climate-related risk (risk hazard = likelihood × impact), through Delphi method, which investigates the professional experience of senior executives in related departments, and focuses on the likelihood from five levels, which are "very unlikely", "unlikely", "probable", "likely" to "very likely", and the degree of impact is divided into five levels based on the proportion of CHT's paid-in capital, which are "extremely high", "very high", "high", "moderate", and "minor". A total of 4 high risks, 2 medium risks, and 9 low risks were identified in the assessment.



No.	Risk	Risk level	Time
R1	Increased sustainability laws and regulations (e.g. Renewable Energy Development Act)	High	Short- and Mid-term
R2	Increased electricity bill derived from changes to the energy mix in Taiwan	High	Short- and Mid-term
R3	Increased costs from GHG emissions (e.g. additional costs of carbon fee in line with the regulations)	High	Short-, Mid- and Long-term
R4	More costs required to achieve net-zero emissions due to rise of carbon credit prices	Medium	Mid- and Long-term
R5	Replacement with equipment of lower energy consumption (e.g. electric vehicles) to improve energy efficiency	Medium	Short-, Mid- and Long-term
R6	Failed new technology investment (e.g. a technology developed not meeting the low-carbon benefits, rendering failure of the new technology invested)	Low	Short-, Mid- and Long-term
R7	Miss the involvement in the low-carbon R&D trend for failure of investment in the low-carbon transformation technologies	Low	Short-, Mid- and Long-term
R8	Changes in customer behaviors (e.g. elevated consumer awareness for climate change or shift in product/service demands)	Low	Mid- and Long-term
R9	Impact to reputation arising from supplier carbon reduction performance lower than expected	Low	Short-, Mid- and Long-term
R10	Impact to reputation from litigation risks	Low	Short-, Mid- and Long-term
R11	Facility/equipment damages arising from an increased frequency and severity of severe typhoons	Low	Short-, Mid- and Long-term
R12	Facility/equipment damages by floods due to an increased frequency and severity of torrential rain	Low	Short-, Mid- and Long-term
R13	Product supply disruption/delay arising from impacts to supplier operation and production due to extreme weather events	Low	Short-, Mid- and Long-term
R14	Increased energy consumption due to rising average temperature	High	Short-, Mid- and Long-term
R15	Operational assets are damaged owing to the rise of sea level covering the low-lying coastal areas	Low	Short-, Mid- and Long-term

The short-term is 2021-2025; the mid-term is 2026-2030; and the long-term is 2031-2050.

CHT Material Climate Risks & Opportunities in 2021

Risks



Increased electricity bill derived from changes to the energy mix in Taiwan

Risk Impact Summary: In line with the renewable energy development policy in Taiwan, an accelerated use of renewable energy in the energy mix and a rising cost in electricity shall be a future trend in Taiwan. The Ministry of Economic Affairs estimated that the energy price will rise by 30% by 2025. CHT has a high demand in electricity consumption. The operating cost will rise as a result.

Risk Responses: With a high demand in electricity, we know for sure an increased electricity bill will pose a significant impact on the operating costs. Therefore, we attach importance to corporate actions for energy saving and energy efficiency improvement. Take the IDCs for example, the self-developed Intelligent Environment Network (iEN) Service and the Power Operation Supervisory System (POSS) for IDCs are used to dynamically manage energy online to achieve the benefits of carbon reduction and environmental protection via technology.



Increased costs from GHG emissions (e.g. additional costs of carbon fee in line with the regulations)

Risk Impact Summary: Our country has proposed the plan to achieve net-zero emissions by 2050. The Greenhouse Gas Reduction and Management Act in force sets a maximum of NT\$1,500 per metric ton of carbon. Meanwhile, it is planned to enact the carbon fee mechanism (the current plan is to levy NT\$100 per metric ton of carbon on the focused manufacturers). If the carbon fee is expanded to Chunghwa Telecom in the future, it will increase the operating costs of CHT.

Risk Responses: Pursuant to the IEA recommendations, energy efficiency improvement is an effective mean to carbon reduction. Thus, CHT set the target of net-zero emissions by 2050. Aside from active actions for energy saving and energy efficiency improvement, it also began to invest in renewable energy.

As of 2021, CHT reached 4,506 kWp of installed solar PV capacity and is planning to procure renewable energy so as to cut its carbon emissions step by step.



Increased energy consumption due to rising average temperature

Risk Impact Summary: Based on the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), MOST, it is estimated that the average temperature in Taiwan will rise by 1.35°C in 2021-2060.

According to the Bureau of Energy, every 1 °C lower for air-conditioning comes with an additional 6% energy consumed. Since CHT relies on AC system to maintain IDC operation, the rising temperature will lead to rising operating costs for CHT as well.

Risk Responses: With the emphasis on energy efficiency, apart from the development of the Environment ARTificer Theurgy (EARTH) system, iEN Service, and POSS to manage and cut energy consumption, the advantage of the fixed-line facilities is combined to deploy the 5G construction with the "C-RAN" architecture, which is low in failure rate, easy for maintenance, and more energy efficient.

Opportunities



Adoption of low-carbon technologies to raise energy efficiency

Opportunity Impact Summary: CHT has a high demand in electricity due to its industrial characteristics that 97.57% of the total emissions is from Scope 2. If CHT adopts low-carbon technologies to raise the energy efficiency, it may effectively cut the energy demand and carbon emissions of the Company.

Opportunity Responses: By active adoption of low-carbon technologies, for instance, we are the first domestic telecom operator to adopt the "Centralized RAN (C-RAN)" architecture for 5G deployment. Through the centralized management, we effectively reduce costs and enjoy the benefits of rapid failure response and repairment. Also, it saves the energy consumption and space for AC installation to individual sites, which comes with the benefits of efficiency and energy saving that helps in the performance of carbon reduction.



Popularization of 5G, IoT, big data, and other emerging technologies to drive industrial transformation

Opportunity Impact Summary: The International Telecommunication Union (ITU) pointed out that to achieve the climate goal in the Paris Agreement, the ICT sector will have to utilize its technical strengths and capabilities to contribute to the global carbon reduction efforts. Take IoT for instance, the IoT sector in Taiwan yielded approximately NT\$1.76 trillion worth of output value in 2021.

Opportunity Responses: Active investment of resources in innovation and development to drive the low-carbon transformation in the industry:

1. Active exploration of emerging businesses; utilization of R&D resources and energy of strategic partners to build the industrial ecosystem to expand the domestic and international markets
2. Intelligence, digitalization, Network Virtualization, Software-Defined Networking (SDN) and other technologies to elevate the resource output/input ratio and effectively optimize the costs in investment and construction



GHG emissions reduction to lower operating costs

Opportunity Impact Summary: We have set the target of net-zero emissions. Also, with energy efficiency improvement and renewable energy as the two axes for carbon reduction, we work to cut the carbon emissions at CHT. Under the assumption that CHT is subject to the relevant laws and regulations of carbon emissions in Taiwan and required to pay carbon fees, if CHT successfully achieve net-zero emissions, it may offset the regulatory requirements posed by the government and be exempted from the carbon fees.

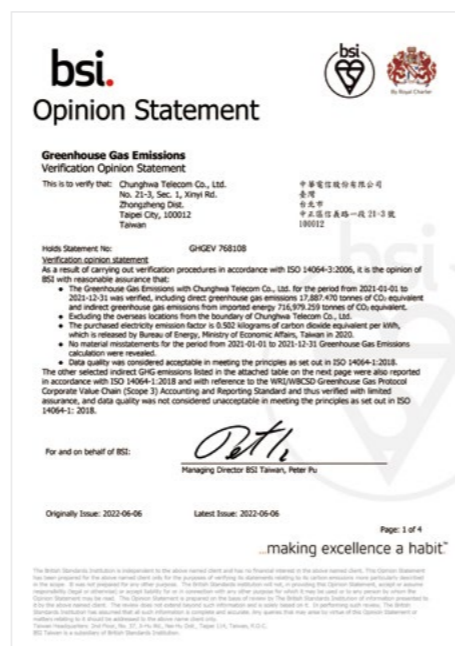
Opportunity Responses: Following the opinions from the International Energy Agency (IEA), we employ energy efficiency improvement and renewable energy as our two axes for carbon reduction to achieve our target of net-zero emissions by 2050 step by step.

In terms of energy efficiency improvement, through the self-developed management and energy-saving systems, we manage and reduce the energy consumption at CHT. In terms of renewable energy, we have achieved 4,506 kWp of self-installed solar PV capacity and are planning to procure renewable energy.

Greenhouse Gas Emissions Management

Unit: t-CO ₂ e	2019	2020	2021
Direct emissions (Category 1)	28,455.5921	22,192.9316	17,887.470
Indirect emissions (Category 2)	795,295.4952	768,128.0670	716,979.259
Total emissions (Category 1+ Category 2)	823,751.0873	790,320.9986	734,866.729
Emission Intensity (t-CO ₂ e/NT\$ in million)	4.0	3.8	3.5
Percentage of category in revenue	100%	100%	100%

1. Indirect emissions (Category 2) are measured on a location-based method.
2. The decrease of total emission in 2021 shows that the switch from PSTN to SVG, the power consumption optimization which does not affect the network operation, the replacement of old access and high energy consumption base equipment, and reduction of IDC PUE.



GHG Inventory and Verification

		Emissions (t-CO ₂ e)	
Upstream	Category 3	Upstream transportation and distribution	571.0138
		Downstream transportation and distribution	141.8628
		Business travel	4,771.1007
		Employee commuting	8,665.2226
Downstream	Category 4	Purchased goods and services	466,201.0584
		Capital goods	364,752.9818
		Fuel- and energy-related activities	135,568.0273
		Waste generated in operations	1,359.3998
		Upstream leased assets	18,492.1388
Downstream	Category 5	Use of sold products	307,742.3346
		End-of-life treatment of sold products	383.1154
		Downstream leased assets	145,217.4281
		Franchises	2,969.6603
Total		1,456,835.344	

Cybersecurity Risks

Driven by the Industry 4.0 development and emerging network applied technologies (e.g. 5G application, softwareization, virtualization/cloudification, and IoT), cybersecurity threats have evolved into multi-faceted mixed attacks that increase challenges for enterprises in cybersecurity management.

We continue to study and analyze measures for risk protection, align ourselves with international cybersecurity standards, and establish the joint defense mechanisms with governments and international cybersecurity organizations, effectively enhancing the overall cybersecurity defense and response capabilities of the Company. Furthermore, we are actively developing key information technology and strengthening supply chain security, which not only facilitate developments of emerging businesses but also offer secured, reliable digital environment to our customers.



Corresponding Strategies

Aiming to achieve the cybersecurity vision of "establishing the most valuable, secure, reliable, and trustworthy telecom service provider that meets international standards," we uncover hidden, malicious behaviors and hunt down potential threats in time in the early stage of hacker attacks in a more proactively fashion. We implement "Cybersecurity Policy" and "Privacy Policy" right from the start. Pursuant to the spirit of ISO 27001 Information Security Management System and the Plan-Do-Check-Act (PDCA) cycle, we constantly review and improve in these regards before embedded into the everyday operations, so as to achieve the goal of "zero tolerance" for both major cybersecurity breach and privacy incidents.

In addition, to ensure the security of "ICT systems" and "critical infrastructure," with reference to the NIST Cybersecurity Framework (CSF) and in pursuance of the standards and regulations, domestically and internationally, we established "Cybersecurity and Privacy Protection Risk Management Framework" to put in place specific and effective measures for cybersecurity and privacy protection so as to prevent any potential cybersecurity risk.

Our performance of cybersecurity and privacy risk management has been incorporated into the monthly tracking by the Risk Management Committee for management. Any material risk issue will be submitted to the Audit Committee or directly reported to the Board of Directors. There was no business impact or penalty arising from cybersecurity or privacy breach as of 2021. "Cybersecurity Insurance - Data Protection Insurance" has been purchased to protect the rights of customers and investors.

Opportunities and Actions

With the goal of "Attention & Implementation of Cybersecurity by All," we have incorporated "Information Security" in the KPIs for employees. Also, we regularly conduct internal/external audits and have passed inspections by competent authorities. At present, all of the IT infrastructures of Chunghwa Telecom are 100% certified to international cybersecurity standards (ISO 27001 / ISO 27011 / ISO27017 / ISO27018 / BS10012 / CSA STAR Certifications).

For more information of the specific measures for cybersecurity and privacy protection, including Diversity and Defense-in-Depth for cybersecurity protection and management, intelligent security operation center, and cybersecurity threat detection and warning, critical infrastructure and ICT system Business continuity management, real-time incident report and rapid response mechanism, third-party vulnerability analysis and cybersecurity health diagnosis, and so forth, please refer to p.113-118 of our Annual Report.

* For more information of Chunghwa Telecom Cybersecurity and Privacy Protection, please refer to the official website/ Sustainability/ Customer Care/ Cybersecurity



Cybersecurity Management Strategy and Structure

- 1 To ensure an effective operation of cybersecurity management, "Cybersecurity and Privacy Protection Management Committee" has been established at Chunghwa Telecom. The Chairman represents the Board of Directors to oversee the Cybersecurity Policy. Meanwhile, the President has been appointed as the convener, and a SEVP as the Chief Information Security Officer (CISO), dedicated to the supervision of matters concerning the Company's internal cybersecurity.
- 2 To ensure implementation and compliance with relevant cybersecurity regulations, meetings of "Cybersecurity Working Group" and "Privacy Protection Working Group" are held regularly. The Cybersecurity Department serves as the executive secretariat to compile the cybersecurity management performance and the reviews and improvements of issues involving cybersecurity risks; review appropriateness of the policy directions for cybersecurity and privacy protection; oversee and assess the compliance and effectiveness of management measures; and report to the Board of Directors.
- 3 The CHT SOC, established in 2013, is seasoned with experiences in large-scale hacking and defense scenarios. A department dedicated to ICT security management was approved to be set up in 2016 to exercise the policy directions laid out by the Cybersecurity and Privacy Protection Management Committee, align with the laws and regulations and technical development for new businesses, and coordinate matters concerning the companywide cybersecurity policies and regulations, risk control and management, cybersecurity surveillance and management, and joint defense, education and promotion, efficacy assessment, as well as compliance checks. The works of cybersecurity management are improved ceaselessly in line with the standards, laws, and regulations at home and abroad to reduce the corporate cybersecurity risks, promote new business development of the Company, and offer a safe and reliable digital environment to customers.
- 4 Under the Cybersecurity and Privacy Protection Management Committee, the "Cybersecurity and Privacy Protection Executive Committee" and dedicated units are instituted in all Business Groups (Laboratories), supervised by the Deputy Cybersecurity Supervisors of Business Groups (Laboratories), to carry out and exercise various works for cybersecurity and privacy protection.

* For more information, please refer to p.113-118 in our Annual Report. Check the Annual Report here. [↗](#)

Creation of the Most Valuable, Secure, and Reliable Digital Environment & Promotion of Smart Living and Digital Economy Development

Huge resources are allocated and talents are cultivated in response to the government's policy "Cybersecurity as National Security":



Internally

We have established a sound cybersecurity management system and the security operation center to ensure the security of the critical telecom infrastructure and customers' privacy. Meanwhile, we work with national-level cybersecurity organizations domestically and internationally for mutual assistance and joint defense. In 2021, we assisted in the handling of 50,871 user incidents and shared 1,445 intelligences to lower the overall risk to hacking for the country and customers.



Externally

Pursuant to the government policies of cybersecurity autonomy and industrial innovation, we commit ourselves to the cybersecurity technology development. In 2017, CHT Security Co., Ltd. was established. With 68 cybersecurity products it developed, CHT Security Co., Ltd. is the only cybersecurity service provider with the highest rating, 5A-rated in cybersecurity services for 3 years in a row. Hence, it provides cybersecurity services to 300,000 families, over 20,000 SMEs, over 100 large corporations, and hundreds of government agencies. As a result, we consolidated the national competency in cybersecurity defense, established a basic enabling environment for digital innovation, and attained the vision of a wealthy, digital country.