



中國信託金控  
CTBC HOLDING

# 2021 Climate Risk Assessment Report



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# Foreword

Decades of research has proved beyond doubt that human activity is directly causing increases to atmosphere, ocean, and land temperatures. Every year since 2016, the World Economic Forum's Global Risks Report has ranked "extreme weather" or "climate action failure" among the top two risks in terms of "likelihood of occurrence" and "impact", indicating the potentially severe global effects of climate change. More than 130 countries have set or plan to set net-zero emissions targets and are working together to limit global warming in line with the objectives of the 2015 Paris Agreement.

For companies, climate change poses significant risks and challenges to their business operations. CTBC Holding initiated the disclosure of its own greenhouse gas (GHG) emission reductions in 2011 and became one of Taiwan's first CDP Climate Change Questionnaire signatories a year later. Soon after the publication of the Task Force on Climate-related Financial Disclosures (TCFD) recommendations by the Financial Stability Board in 2017, CTBC Holding adopted the framework for use in disclosing its climate change-related financial impacts and strategies. In 2020, CTBC Holding became the first in Taiwan to join the Partnership for Carbon Accounting Financials

(PCAF), an industry-led initiative committed to the measuring and disclosure of carbon emissions associated with investing and financing activities. With such climate governance and strategies in place, we are able to more effectively promote the low-carbon transition of customers and investments at home and abroad through our products, services, and engagements while at the same time better ensuring climate resilience when addressing risk management and business opportunities.

As our first climate risk assessment report, this report focuses on the governance, policy-making, measurement, and analysis of climate-related risks of CTBC Holding and its major subsidiaries as well as describes their climate risk management framework, risk measurement, stress testing, and future prospects. We hope this report can facilitate the exchange of ideas in the financial services industry and help us engage more substantially with our stakeholders on climate change issues, in turn helping our industry as a whole exert a greater positive influence on the capital market and ultimately achieving net-zero emissions in Taiwan.

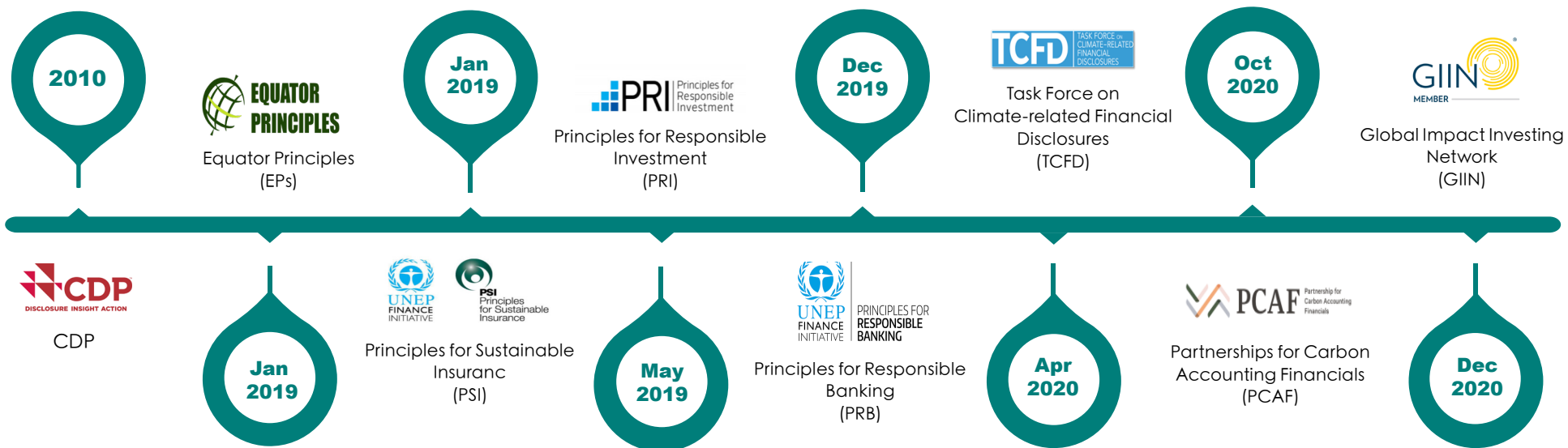
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<sup>1</sup> The Paris Agreement's stated goal is to limit global warming to well below 2° C, preferably to 1.5° C, from pre-industrial revolution levels.

<sup>2</sup> This report focuses on climate-related risks. For climate-related opportunities, please refer to the "07 Task Force on Climate-related Financial Disclosures" chapter of CTBC Holding's 2020 Sustainability Report.



## CTBC Holding sustainability initiatives membership and milestones





# 01

## Introduction to climate-related risks

According to the Sixth Assessment Report issued by the U.N. Intergovernmental Panel on Climate Change (IPCC) in 2021, human-induced greenhouse gas emissions were responsible for approximately 1.1°C of the global temperature increase from 1850 to 1990; over the next 20 years, global temperatures are expected to increase by 1.5°C from pre-industrial levels, exceeding the maximum rise aimed for under the Paris Agreement. These warming temperatures are changing existing climate features, bringing more frequent and extreme heatwaves and altering precipitation patterns. While climate-related risks are irreversible, the world's resolution to accelerate the low-carbon transition will shape the future risk profile of the financial services industry and require financial institutions to understand and manage climate-related risks.

# 1.1 | Understanding climate-related risks

Human-caused global warming has brought about numerous climate-related risks. The TCFD recommendations divide these risks into two major categories: those related to the transition to a lower-carbon economy and those related to the physical impacts of climate change.

## ● Transition risks and their socioeconomic impacts

Transition risk	Description	Socioeconomic impacts
<b>Policy and legal</b>	These include policy actions that attempt to constrain actions that contribute to the adverse effects of climate change or policy actions that seek to promote adaptation to climate change. For example, governments may levy energy taxes/carbon taxes/carbon fees to reduce GHG emissions.	<ul style="list-style-type: none"> <li>• Increased corporate or personal expenses (e.g., compliance costs)</li> <li>• Policy changes resulting in stranded assets or early write-offs</li> </ul>
<b>Technology</b>	While companies invest in resources to support the transition to a low-carbon, energy-efficient business model, they may face risks such as excessive increases in development costs and failures in technological development.	<ul style="list-style-type: none"> <li>• Increased operational risks due to high uncertainty in technology transformation and increased investment costs</li> </ul>
<b>Market</b>	There are structural changes in market supply and demand or customer preferences (e.g., lower interest in investing in carbon-intensive industries and decreased consumer demand for energy-intensive products) due to a global consensus on the need for energy conservation and emissions reduction.	<ul style="list-style-type: none"> <li>• Repricing or falling prices of carbon-intensive assets or financial products</li> </ul>
<b>Reputation</b>	Increases in industrial stigma or negative feedback from stakeholders.	<ul style="list-style-type: none"> <li>• Decreased demand for carbon-intensive products</li> </ul>

● Physical risks and their socioeconomic impacts

Physical risk	Description	Socioeconomic impacts
Acute	Acute physical climate risks refer to those that are event-driven such as floods caused by typhoons/heavy rainfall and droughts. The frequency and severity of extreme weather events increase due to climate change.	<ul style="list-style-type: none"><li>• Damage to national infrastructure or increased expenditure on public works</li><li>• Falling value of assets in high-risk areas, early asset write-offs, or assets becoming more difficult to insure</li><li>• Damage to workers' health, decreased capacity/productivity, or business/production interruption</li></ul>
Chronic	Chronic physical risks refer to long-term shifts in climate patterns such as higher mean temperatures and rising sea levels.	<ul style="list-style-type: none"><li>• Increased insurance claims (property and life insurance)</li></ul>

## 1.2 | Transmission channels to traditional financial risks

Climate change risk is not a new or independent risk category. Given its socioeconomic impacts, it is a direct or indirect aggravating factor for the traditional financial service industry's existing risks (e.g., credit risk, market risk, insurance risk, and operational risk) in various business activities of financial institutions.

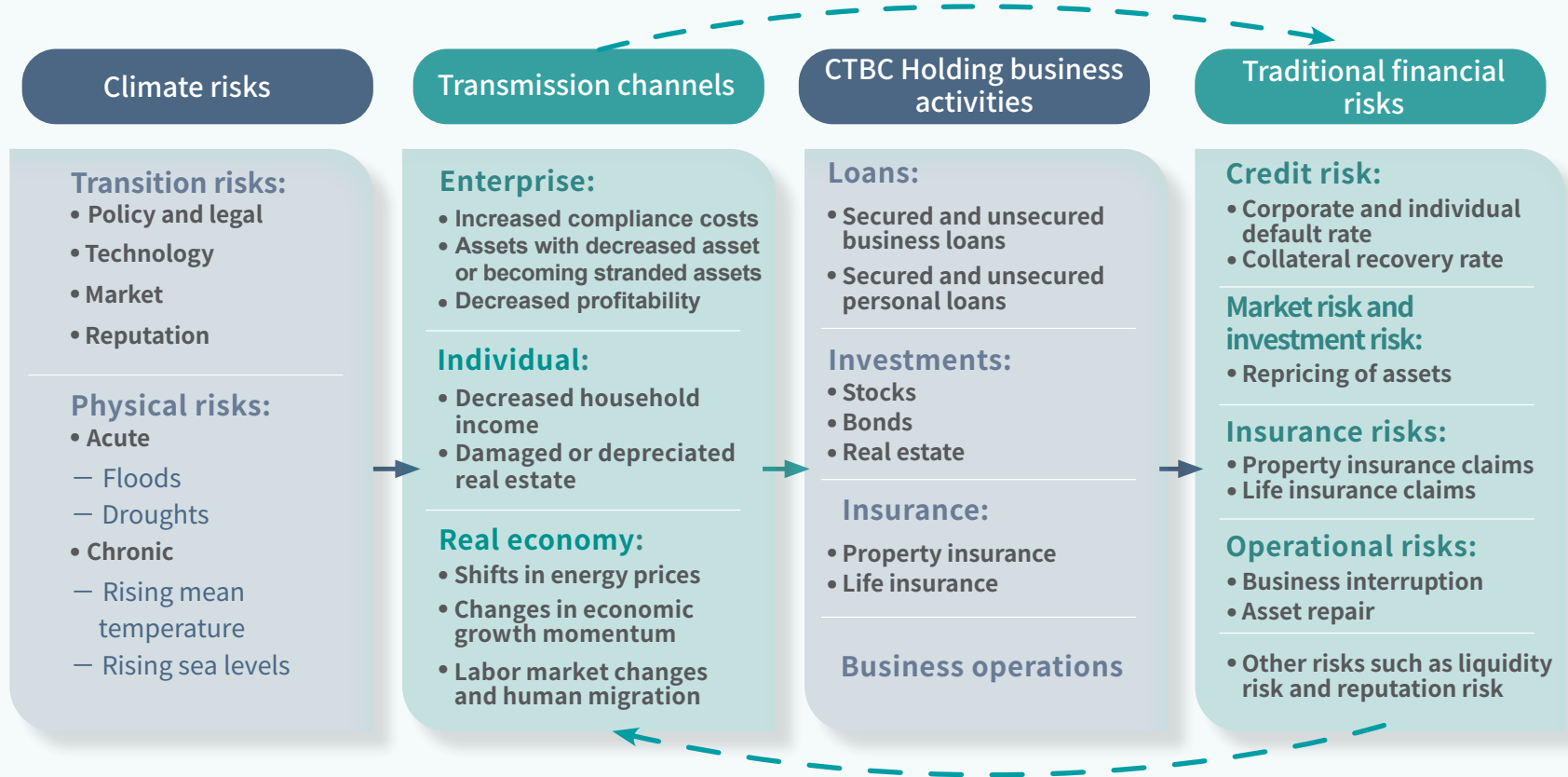


Figure: Relationship between climate-related risks and traditional financial risks

In order to identify the level and degree of impact for the above climate-related risks on the various business activities of the group, we ranked the impact of each risk on the respective units through a workshop discussion with the risk, strategy, lending, and investment units of major subsidiaries in 2020. The identification and ranking results of the workshop discussion are disclosed in the “07 Responsibility: Environmental Sustainability” and “07 Task Force on Climate-related Financial Disclosures” chapters of CTBC Holding’s Sustainability Reports for 2019 and 2020, respectively.



# 02

## Overview of CTBC Holding's climate risk management

### 2.1 | Risk governance structure and three lines of defense



The Board of Directors serves as the highest supervisory unit on climate-related risks and is responsible for the approval, review, and monitoring of risk strategies and policies. The Sustainability Committee and the Risk Management Committee, functional committees under the Board of Directors, are responsible for the supervision of key strategies in relation to climate change as follows:

- The Sustainability Committee is comprised of independent directors and meets at least twice a year to validate the group's annual sustainability plan, strategic direction, and implementation of action plans (including regarding climate-related issues).
- The Risk Management Committee must include at least one independent director. It is responsible for the communication, reporting, and recommendations for the group's risk governance and meets on a monthly basis to deliberate on climate-related risks and other issues.



The ESG Taskforce under the President of CTBC Holding consists of officers of CTBC Holding and each subsidiary's management, who are charged with establishing different teams according to the spirit of sustainable development. As the supervisor of its TCFD Team, the Chief Risk Officer of CTBC Holding leads risk management units to draw up climate risk management policies and regulations, design methods for risk measurement, and monitor climate risk management results. In 2020, external experts were invited to hold a two-hour training course for the Board of Directors as well as the management of CTBC Holding and its subsidiaries to familiarize them with international trends in climate governance and key opportunities for the transition to a low-carbon economy. To build a culture of sustainability and meet ESG targets (including for climate issues), the presidents of CTBC Holding and its subsidiaries as well as officers and ESG-related executives of CTBC Holding were also required to set their ESG-related KPIs at 2% or more every year starting from 2021.

# CTBC Holding



# Subsidiaries





The TCFD Team was established in 2019. The Chief Risk Officer of CTBC Holding acts as the supervisor of the TCFD Team and oversees the Risk Management Department in formulating a climate risk management and measurement framework based on the TCFD recommendations as well as coordinating and assigning tasks in relation to the three lines of defense for climate-related risks. Team members are organized into groups based on the issues and tasks. Team members come from the Corporate Sustainability Office and the risk, strategy, business, and investment units of CTBC Holding's subsidiaries.

## As of publication, the TCFD Team had executed the following tasks:



Held a workshop for CTBC Holding and its major subsidiaries to help them identify and prioritize climate-related risks involved in various business activities.



Introduced climate risk management mechanisms and amended related policies and regulations to incorporate them into the overall risk management framework of CTBC Holding and its subsidiaries.



Developed a climate-related risk assessment methodology and selected key risks and related business activities to analyze losses in the following scenarios in 2020:

- Physical risks: Introduced the application of potential flood hazard information and analyzed the impacts of floods on mortgages and commercial real estate loans.
- Transition risks: Created a group-wide list of carbon-intensive industries for use in evaluating climate-related risks, and analyzed the cost of carbon for investing in and financing the steel and iron/smelting industry.



Improved climate risk measurement technologies and took part in cross-bank projects promoted by the domestic competent authorities in 2021:

- Physical risks: Worked with external research institutes to improve the methods for flood risk measurement, and created a flood loss model for residential buildings.
- Transition risks: Measured and disclosed the carbon emissions associated with investing and financing activities stage by stage based on the PCAF standards.
- Integrated physical and transition scenarios to expand stress testing for climate-related risks across the group.
- Published the first annual Climate Risk Assessment Report.

## 2.2 | Risk policy framework

In December 2020, CTBC Holding amended its Risk Governance Policy to incorporate climate-related risks into the group's overall risk management in addition to specifying its climate risk management framework and climate risk appetite statement. In June 2021, the company amended its Credit Risk Management Policy, Financial Market Risk Management Policy, and Operational Market Risk Management Policy to further specify the impacts of climate-related risks on traditional risks facing the financial services industry, thereby consolidating ties between climate-related risks and traditional financial risks. The framework of the group's risk policies is as follows:

Regulation	Sustainability Management Policy	Sustainable Finance Policy		
Regulation	Risk Governance Policy			
Key points	<p><b>Climate risk management</b></p> <p>Define climate-related risks Set out the principles of climate risk management</p>	<p><b>Climate risk appetite statement</b></p> <p>The employees of CTBC Holding and its subsidiaries should avoid being involved in or having dealings with companies or industries that are highly sensitive to environmental or climate risks (including but not limited to carbon emissions, natural resource or energy consumption, pollution, and non-compliance with environmental regulations) if it is difficult to control related risks after careful assessment.</p>		
Regulation	Climate Risk Management Guidelines	Credit Risk Management Policy	Financial Market Risk Management Policy	Operational Risk Management Policy
Key points	<ul style="list-style-type: none"> <li>• Sources, identification, and prioritization of climate-related risks</li> <li>• Measure climate-related risks</li> <li>• Monitor and report group-wide climate-related risks</li> </ul>	<ul style="list-style-type: none"> <li>• Specify that the impacts of climate-related risks be considered in the identification of credit risks, and provide information regarding corporate sustainability and climate-related risks</li> </ul>	<ul style="list-style-type: none"> <li>• Specify that the principles for responsible investment be implemented to fulfill corporate social responsibility and business viability</li> </ul>	<ul style="list-style-type: none"> <li>• Draw up the requirements for reporting operational losses arising from climate change/extreme weather incidents</li> </ul>



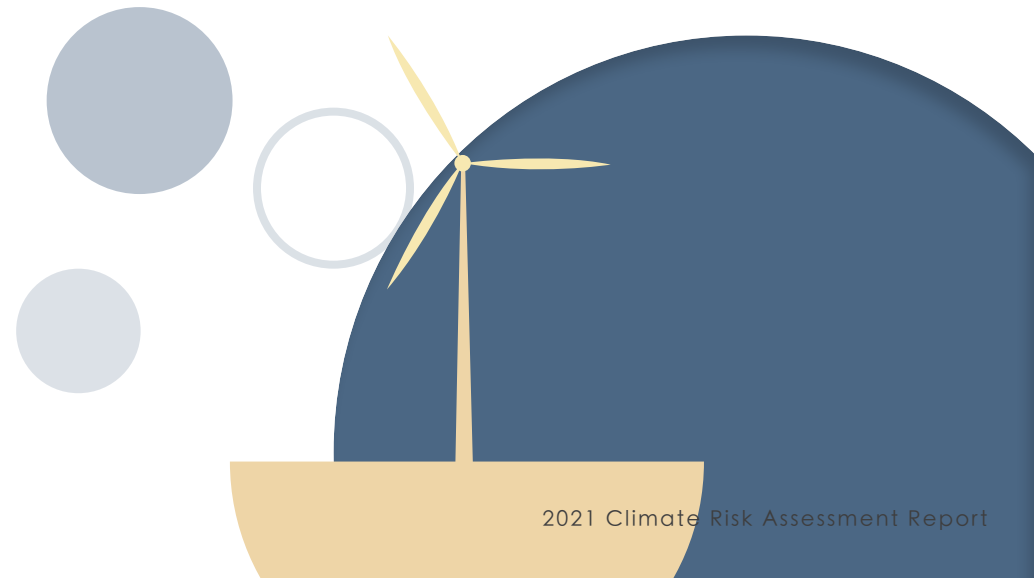
At CTBC Holding's request, major subsidiaries, including CTBC Bank and Taiwan Life, have drawn up regulations for ESG or climate risk management, as detailed below.

## CTBC Bank

In 2021, CTBC Bank incorporated the principles of climate risk management into its Risk Governance Policy and formulated a Sustainability Management Policy and a Guideline for Sustainable Finance in Institutional Banking. The latter stipulates that the ESG impacts of a borrower's business activities be taken into account. It also clearly defines the following: (1) an ESG exclusion list (e.g., pornography and armament); (2) ESG-sensitive sectors (e.g., thermal coal extraction, thermal coal power generation, tobacco, and oil sands sales and extraction); (3) high ESG risk companies; and (4) carbon-intensive sectors (e.g., power generation, marine shipping and airlines, iron and steel/smelting, cement, petrochemicals, and fossil fuel mining). In addition, it sets related credit access conditions, credit management mechanisms, and ESG thresholds. If a significant ESG risk or related serious negative information is found, its impact is to be disclosed, explained, and assessed in the credit investigation report. Separate credit conditions may be set on a case-by-case basis. Customers in carbon-intensive sectors are also required to submit their GHG emissions. Furthermore, CTBC Bank will review customers' potential climate-related risks and opportunities at present and in the future as well as determine whether they have related response measures in place, such as transition or improvement plans.

## Taiwan Life

Taiwan Life stipulates in its Sustainable Insurance Policy, which was adopted by its Board of Directors and took effect in 2020, that ESG criteria (including climate-related risks and opportunities) be incorporated into its insurance practices. In 2021, Taiwan Life incorporated the principles of climate risk management into the Risk Governance Policy and formulated a Responsible Investment Policy and Responsible Investment Regulations, which identify carbon-intensive oil sands/coal extraction and thermal coal power generation as high environmental risks as well as stipulate that the investment unit review such cases according to the regulations and avoid being involved in or undertaking such cases until after the heads of related units approve of their ESG compliance.



## 2.3 | Risk measurement framework

Since 2019, the TCFD Team has worked with external consultants and research institutes to develop methods and procedures for measuring climate-related risks in accordance with the U.N. Environment Programme Finance Initiative and TCFD guidelines. This subsection explains the overall structure of CTBC Holding's climate risk measurement practices. The risk measurement and assessment results for 2021 are provided in Chapters 3–5.

### Transition risks

The first priority is to identify carbon-intensive industries whose business continuity is expected to bear the brunt of the low-carbon transition. CTBC Holding has created a group-wide list of carbon-intensive industries based on the definition of carbon-intensive/energy-intensive industries by the IPCC, international government agencies and research institutes, and domestic authorities such as Environmental Protection Administration (EPA) and Bureau of Energy. Second, we checked the carbon emissions associated with investing and financing activities in accordance with the PCAF's Global GHG Accounting and Reporting Standard for the Financial Industry to manage the transition risks facing our investing and financing activities. Building on our pilot scenario analysis, we expanded the scope of our transition scenario analysis between 2020 and 2021 and further refined the assessment methods in order to set concrete carbon reduction targets for years to come.

### Physical risks

Considering the materiality of physical risks, high-risk areas of our major subsidiaries, and data availability, we first developed a flood risk assessment model and process and applied it in our scenario analysis to analyze the financial impacts of floods. Other physical risks, including but not limited to landslides, droughts, and rising mean temperatures, were also included in the analysis. We will continue refining the methods for loss assessment and the estimation of risk parameters.



### Physical risk profile and analysis

#### -Risk profile:

The occurrence of physical risks such as heavy rainfall, floods, and landslides may depreciate the real estate collateral, real estate investments, or business operations of CTBC Holding, thereby increasing risk.

#### -Risk measurement:

Define the risk area and level of disasters and check and monitor the risk areas



### List of carbon-intensive industries

#### -Risk profile:

In the race to net-zero emissions, carbon-intensive industries around the world will bear the brunt of transition-related policies and regulations and face more challenges in terms of funding and competition.

#### -Risk measurement:

Define and identify carbon-intensive industries; check and monitor investing and financing risks



### Financed emission analysis

#### -Risk profile:

Companies' business operations hinge on carbon emissions as governments worldwide are imposing strict restrictions on GHG emissions (e.g., total emissions control and carbon taxes/carbon fees or carbon tariffs).

#### -Risk measurement:

Measure financed emissions according to the PCAF's Global GHG Accounting and Reporting Standard for the Financial Industry

## Physical risks

## Transition risks



### Scenario analysis/stress test

#### -Purpose:

- Since climate-related risks may last for short, medium, or long periods and have different impacts, simulating and predicting future risks by setting scenarios is necessary.
- A potential loss in a specific scenario is calculated through qualitative or quantitative assessment.

#### -Analysis process:

- Set a scenario
- Classify investing and financing risks and identify climate risk transmission pathways (including but not limited to credit, market, and operational risks)
- Study the loss model and then calculate the loss in the scenario

# 03

## Transition risk measurement and indicators

### 3.1 | Exposure to carbon-related assets

To combat climate change, new policies and international trade rules have been formulated to reduce carbon emissions. For instance, the EU has proposed the Carbon Border Adjustment Mechanism, while Japan and the U.S. are also planning to roll out new policies aimed at limiting carbon footprints. Carbon-intensive sectors (e.g., iron and steel/smelting, cement, and power generation) will be among the first sectors to be affected.

In view of this, CTBC Holding has clearly defined the carbon-intensive industries that are sensitive to transition risks and applicable to investing and financing activities across the group. Such carbon-intensive industries are identified based on the industry codes and opinions from internal experts, and they have been specified in the subsidiaries' business management regulations for assessment and classification prior to investing and financing.

#### List of carbon-intensive industries

##### (1) Power generation



Power generation from fossil fuels such as coal, oil, and natural gas

##### (2) Marine shipping and airlines



Marine shipping and air transport

##### (3) Iron and steel/smelting



Companies with an energy-intensive and carbon-intensive process

##### (4) Cement



##### (5) Petrochemicals



Companies with an energy-intensive and carbon-intensive process

##### (6) Fossil fuel mining



Mining for coal, oil, natural gas, oil shale, oil sands

##### (7) Other carbon-intensive companies

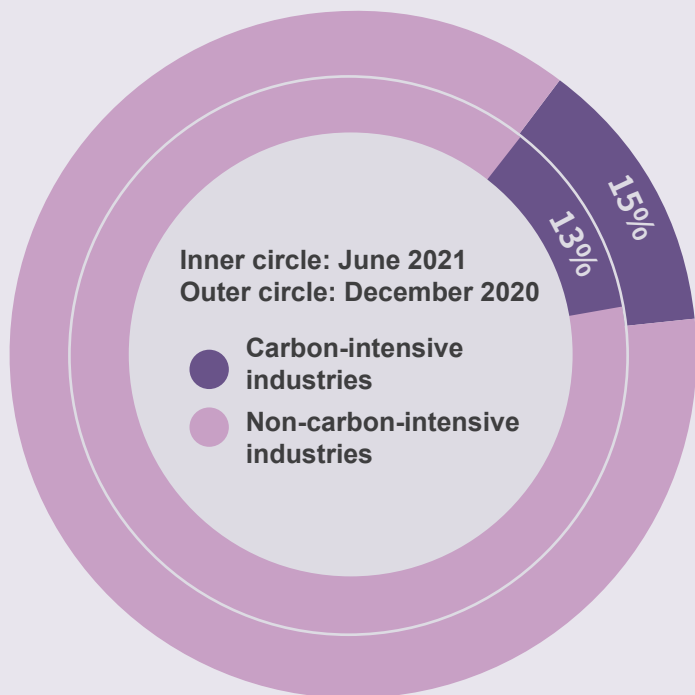


Companies that are not classified as carbon-intensive industries in Categories 1 to 6 but are listed in the Taiwan GHG Emissions Registry

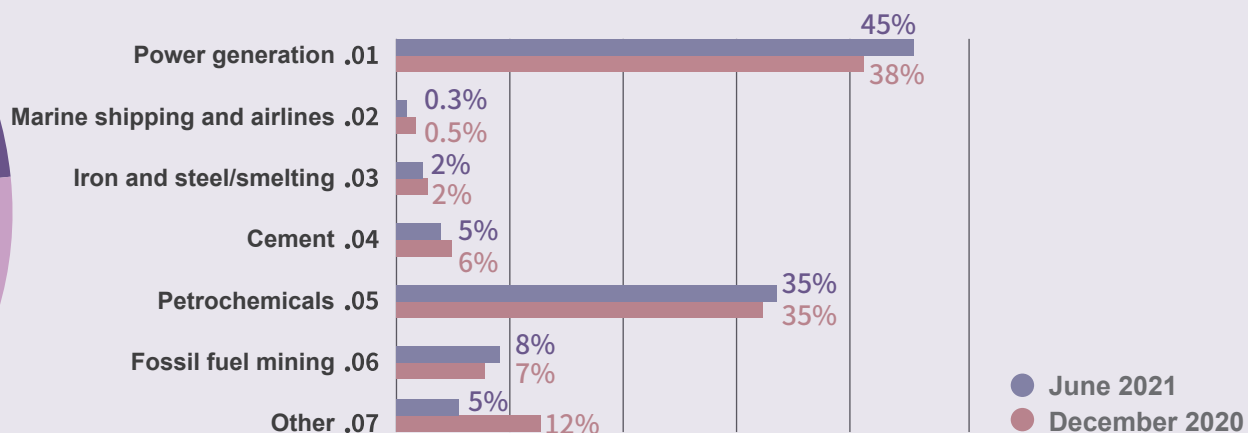


According to the above definitions, the group’s investing and financing activities that are associated with carbon-intensive industries are shown in the figures below. While classified as carbon-intensive companies, some have taken the initiative to reduce carbon emissions in order to become more competitive while others are planning to do so. Therefore, such classification does not relate to high carbon density or carbon risk.

**1. Group investment portfolio: As of June 2021, carbon-intensive industries accounted for 13% of the group’s investment portfolio—a 2% decrease from December 2020. Power generation followed by petrochemicals were the two industries accounting for the greatest proportions of investment.**



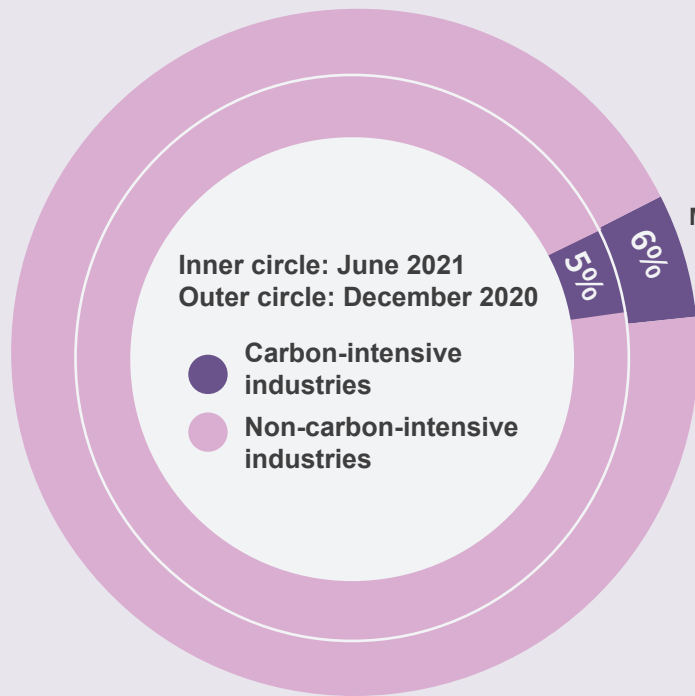
**Group investment portfolio risk: Carbon-intensive industries**



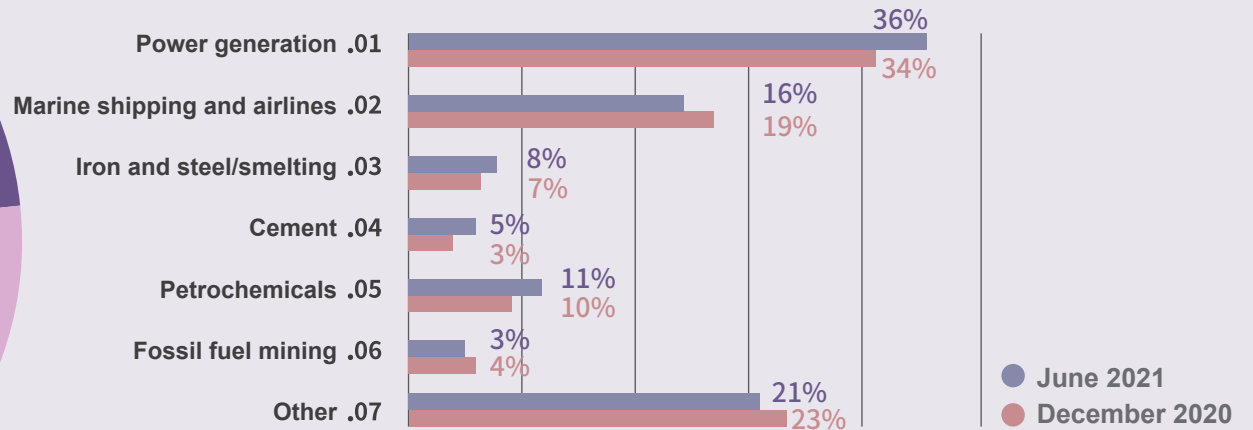
Note 1: The scope of group risk comprises CTBC Bank (consolidated), Taiwan Life (consolidated), and CTBC Securities (consolidated).

Note 2: The investment portfolio comprises equity and fixed-income instruments.

2. CTBC Bank's lending portfolio: As of June 2021, carbon-intensive industries accounted for 5% of CTBC Bank's lending portfolio—a 1% decrease from December 2020. Power generation was the top carbon-intensive industry, followed by companies that are not classified as carbon-intensive industries in Categories 1 to 6 but are listed in the Taiwan GHG Emissions Registry.



CTBC Bank's lending portfolio risk: Carbon-intensive industries



Note 1: The scope of risk is solely CTBC Bank, excluding overseas branches.

Note 2: The lending portfolio comprises business loans and personal loans, including general lending and collection.

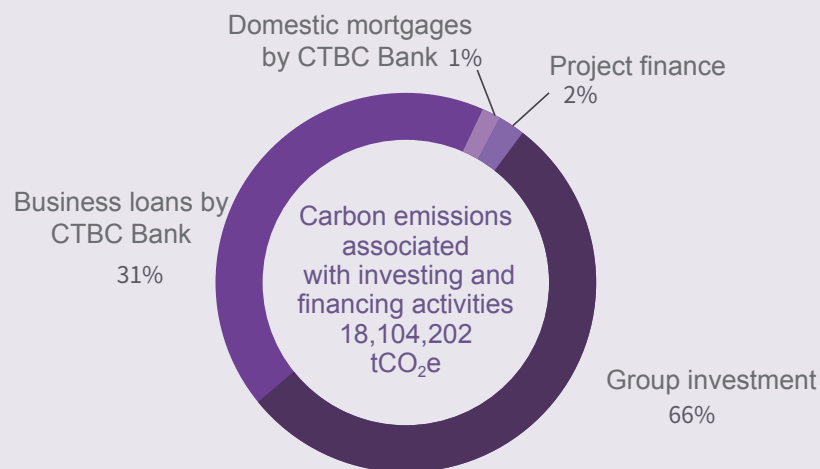
# 3.2 | Financed emissions (PCAF method)

In October 2020, CTBC Holding joined the PCAF, for which we served as the regional chair for Asia-Pacific. On Nov. 18, 2020, the PCAF released the first edition of the Global GHG Accounting and Reporting Standard for the Financial Industry, enabling financial institutions to measure and disclose GHG emissions associated with their business operations and investing and financing activities. Only by conducting a precise GHG inventory can financial institutions realize effective carbon reductions and exert their influence to promote a low-carbon transition.

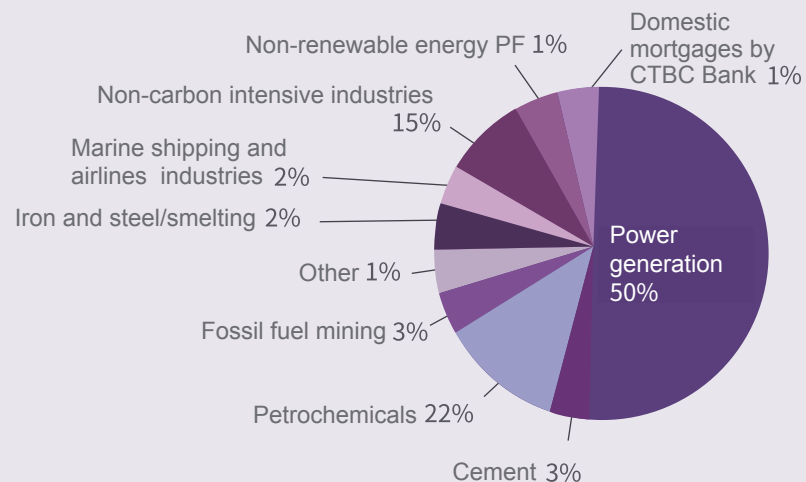
In accordance with the PCAF's classification of financial assets and methodology, CTBC Holding started to carry out a GHG inventory in 2020. The scope of the GHG inventory covered investments (listed equity and unlisted equity and corporate bonds, business loans, and project finance on power generation) and mortgages. By June 2021, the financed emissions from investing and financing activities totaled 18,104,202 tCO<sub>2</sub>e, with a data quality score of 2.7 (with 1 being the best and 5 being the worst). Taking a closer look at the source of the carbon footprint (tCO<sub>2</sub>e/TWD MM) reveals non-renewable energy project finance and power generation to be the main sources of GHG emissions, followed by the petrochemical and cement industries. While these sectors are relatively sensitive to transition risks, the investment/lending units of subsidiaries require better understanding of the transition plans made by customers and target investments in the process of lending/investment evaluation.

## Carbon emissions associated with investing and financing activities

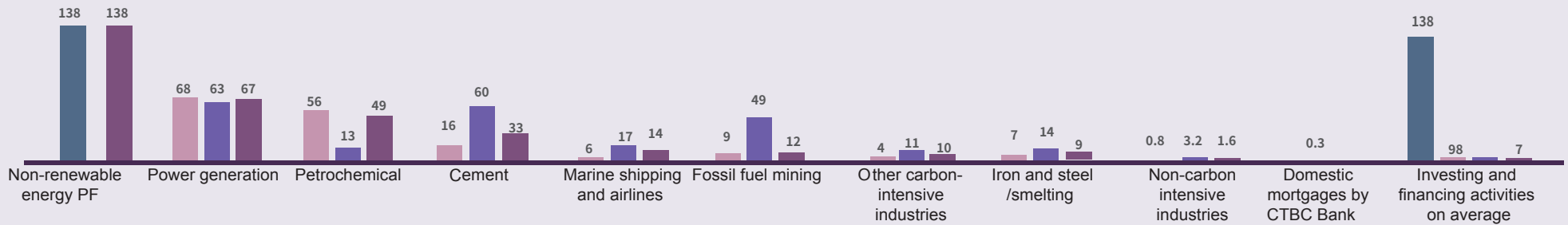
Financed Emissions by Asset



Financed Emissions by Industry/Business



## Carbon footprint (tCO<sub>2</sub>e/TWD MM) by industry/business

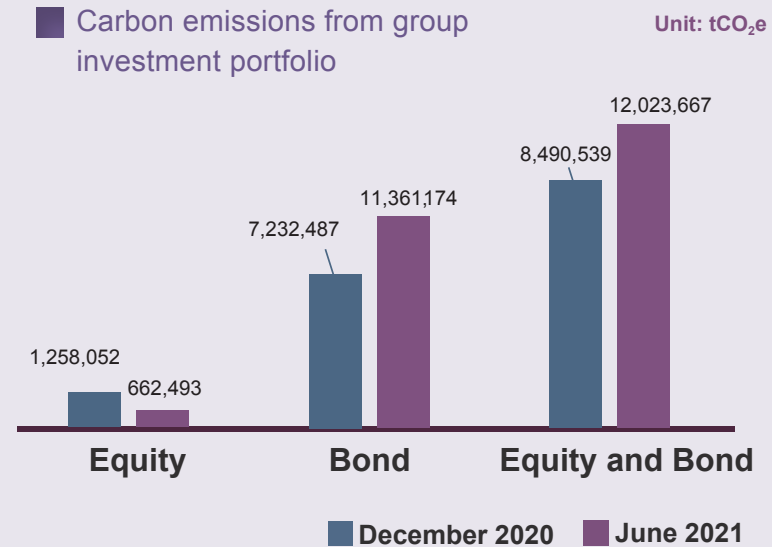


Note 1: The carbon footprint of each asset is based on the balance as of June 2021 except for project financing, which is as of December 2020.

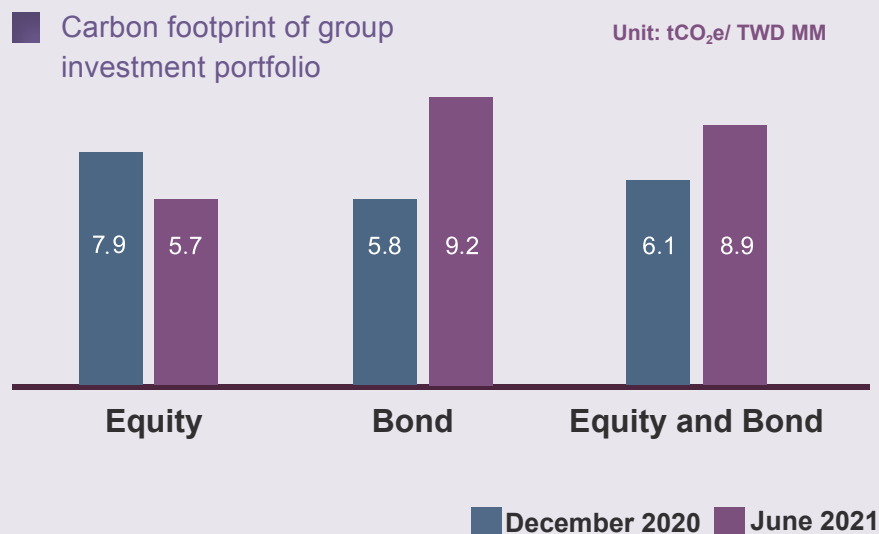
■ Project Finance ■ Investment ■ Loan ■ Subtotal

## 1 Investments (listed equity and unlisted equity and corporate bonds)

As a responsible investor, CTBC Holding deems it our duty to manage the carbon footprint of the group's investment portfolio; to this end, we work closely with investees to reduce carbon emissions in pursuit of the global net-zero goal. As of June 2021, the carbon emissions from the group's investment portfolio totaled 12,023,667 tCO<sub>2</sub>e, with a data quality score of 1.6 (with 1 being the best and 5 being the worst); the carbon footprint was 8.93 tCO<sub>2</sub>e/TWD MM—an increase from December 2020.







Note 1: The scope of group risk comprises CTBC Bank (consolidated), Taiwan Life (consolidated), and CTBC Securities (consolidated).

Note 2: In accordance with the Global GHG Accounting and Reporting Standard for the Financial Industry (page 44) released by PCAF in November 2020, the scope of assessment excluded financial assets for which the said standard is yet to propose a clear calculation method, including assets held for sale, private equity that refers to investment funds, green bonds, sovereign bonds, exchange traded funds, derivatives (e.g., futures, options, and swaps), and initial public offering underwriting.

Note 3: Listed equity and unlisted equity and corporate bonds accounted for 99.6% and 99.5% of the financed emissions as of December 2020 and June 2021 respectively; in particular, the coverage of financed emission calculation for listed companies is 100%.

### Carbon emissions and carbon footprint of group investment portfolio as of June 2021

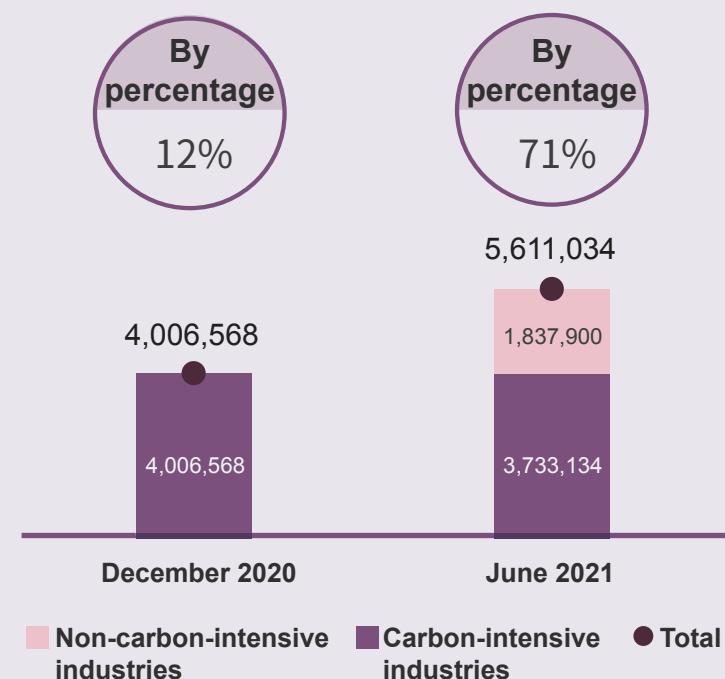
Industry	Investment proportion	Financed emissions (tCO <sub>2</sub> e)	Carbon footprint (tCO <sub>2</sub> e/ TWD MM)
Power generation	7%	6,555,093	68
Marine shipping and airlines	0.5%	42,488	6.0
Iron and steel/smelting	1.7%	167,556	7.2
Cement	0.7%	159,380	16
Petrochemicals	5.1%	3,832,857	56
Fossil fuel mining	3.3%	407,885	9.2
Other domestic carbon-intensive companies	0.1%	8,428	4.3
Non-carbon-intensive industries	81 %	849,980	0.8
<b>Total</b>	<b>100%</b>	<b>12,023,667</b>	<b>8.9</b>

## 2 Business loans

To support the U.N. Sustainable Development Goals, CTBC Bank has set clear acceptance conditions for industries that are highly sensitive to climate-related risks, including thermal coal power generation and coal extraction. For borrowers belonging to carbon-intensive industries, relevant documentation will be collected for risk scenario analysis and the related credit assessment process is under evaluation. For companies without low-carbon transition plans, CTBC Bank will conduct engagement to encourage them to work toward carbon reduction. To develop effective climate-friendly net-zero investing/financing strategies, putting a GHG inventory system in place for credit assets in accordance with the PCAF standards is critical. To respond to challenges concerning data collection and data quality, CTBC Holding, based on the materiality of risks, introduced a GHG inventory system to CTBC Bank's loans to carbon-intensive industries first in 2020 and then to all other business loans in the following year.

As of June 2021, the financed emissions from business loans totaled 5,611,034 tCO<sub>2</sub>e, with a data quality score of 3.5 (with 1 being the best and 5 being the worst). Taking a closer look at the source of the carbon footprint (tCO<sub>2</sub>e/TWD MM) reveals that power generation was the main source of GHG emissions, followed by the cement and petrochemical industries.

### Financed emissions from business loans (Unit: tCO<sub>2</sub>e)



Note 1: The scope of risk comprises business loans made by the domestic and overseas branches of CTBC Bank and does not include loans to central or local governments or personal business loans.

Note 2: The financed emissions from business loans as of December 2020 shown here have been updated since the 2020 Sustainability Report.

■ Carbon emissions and carbon footprint of business loans as of June 2021 (by industry)

Industry	Loan proportion	Financed emissions (tCO <sub>2</sub> e)	Carbon footprint (tCO <sub>2</sub> e/TWD MM)
Power generation	6%	2,417,238	63
Marine shipping and airlines	2%	280,576	17
Iron and steel/smelting	1%	126,671	14
Cement	1%	359,314	60
Petrochemicals	2%	154,703	13
Fossil fuel mining	1%	187,576	49
Other domestic carbon-intensive companies	3%	247,055	11
Non-carbon-intensive industries	84%	1,837,900	3.2
<b>Total</b>	<b>100%</b>	<b>5,611,034</b>	<b>8.1</b>

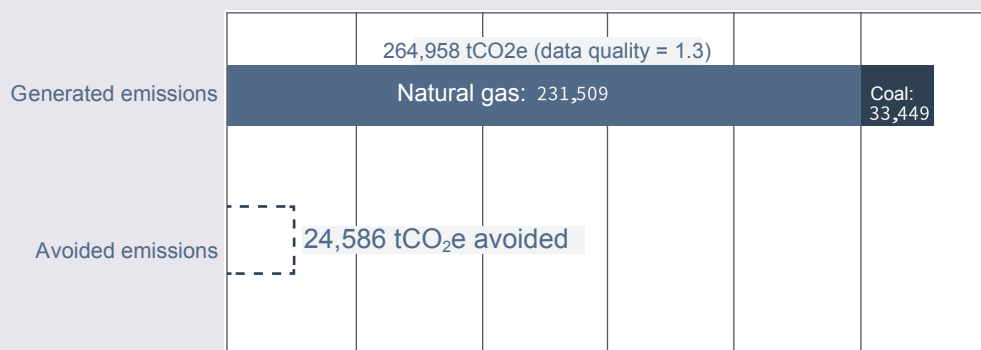
### 3 Project finance for power generation

As defined by the PCAF standards, any loans or investments in equity and bonds with a clear use of funds (e.g., operation of specific gas-fired power plants, wind power or solar power construction projects, energy efficiency improvement projects, transportation procurement financing, or mining projects) are to be categorized as project finance, and their financed emissions are to be calculated using the project finance methodology. In 2021, CTBC Holding worked with the PCAF to carry out a GHG inventory of its project finance for power generation, including renewable and non-renewable power generation, using December 2020 as the basis.

For project finance for non-renewable power generation, the annual generated emissions are calculated on a case-by-case basis. For project finance for renewable power generation (e.g., solar and wind power generation), the annual avoided emissions are also calculated case by case. Then, as with other asset classes, financed emissions from the sum of project finance cases and the portfolio are calculated based on the contribution of CTBC Holding and its subsidiaries to the financing of the project (or attribution factor).

In 2020, the group's project finance totaled NT\$4.5 billion; financed emissions from project finance on non-renewable power generation (including natural gas and coal) totaled 264,958 tCO<sub>2</sub>e, with a data quality score of 1.3 (with 1 being the best and 5 being the worst), and avoided emissions from project finance for renewable power generation totaled 24,586

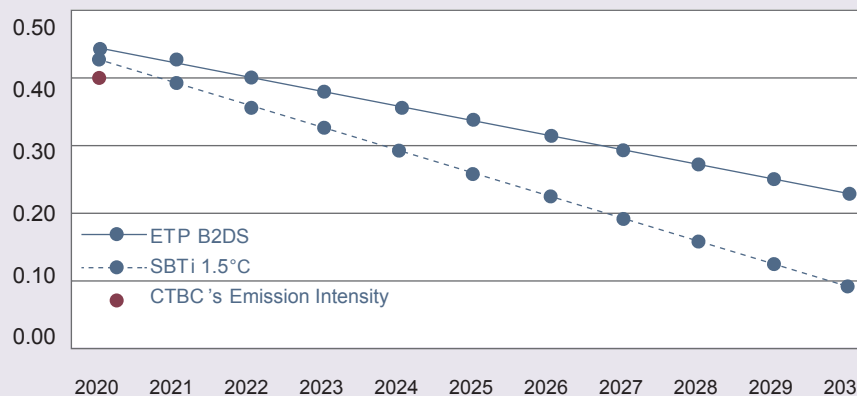
■ Financed emissions from project finance for power generation (Unit: tCO<sub>2</sub>e)



tCO<sub>2</sub>e (compared with carbon emissions from domestic thermal power generation).

According to the methodology and carbon density (tCO<sub>2</sub>e/MWh) recommended by the Science Based Targets initiative (SBTi), the emission intensity of CTBC Holding's project finance for power generation reached 0.41 tCO<sub>2</sub>e/MWh in 2020, which was better than the SBTi's Energy Technology Perspectives recommendations for the power sector, namely B2DS (Beyond 2°C Scenario) and SBTi 1.5°C. The completion and power supply of key clean energy projects such as offshore wind power is expected to contribute to net-zero emissions in the long term.

■ Carbon density of project finance for power generation (Unit: tCO<sub>2</sub>e/MWh)



## 4 Mortgages

In late 2019, the European Commission rolled out the European Green Deal, one of the priorities for which is energy conservation and carbon reduction in buildings. According to data released by Taiwan's EPA, carbon emissions from residential and commercial sectors totaled 57.53 million tCO<sub>2</sub>e (MtCO<sub>2</sub>e) in 2020, accounting for approximately 20% of total carbon emissions and ranking second of six sectors—above the manufacturing and transportation sectors.

Aware of the importance of carrying out a GHG inventory of financial assets in relation to buildings, CTBC Holding followed the PCAF's methodology for calculating financed emissions from mortgages and initiated the assessment of more than 80% of CTBC Bank's domestic mortgages. As of June 2021, financed emissions from these domestic mortgages totaled 204,543 tCO<sub>2</sub>e, with a data quality score of 4 (with 1 being the best and 5 being the worst); carbon density was estimated to be 0.31 tCO<sub>2</sub>e/TWD MM, with an average of 0.02 tCO<sub>2</sub>e generated per square meter (m<sup>2</sup>).

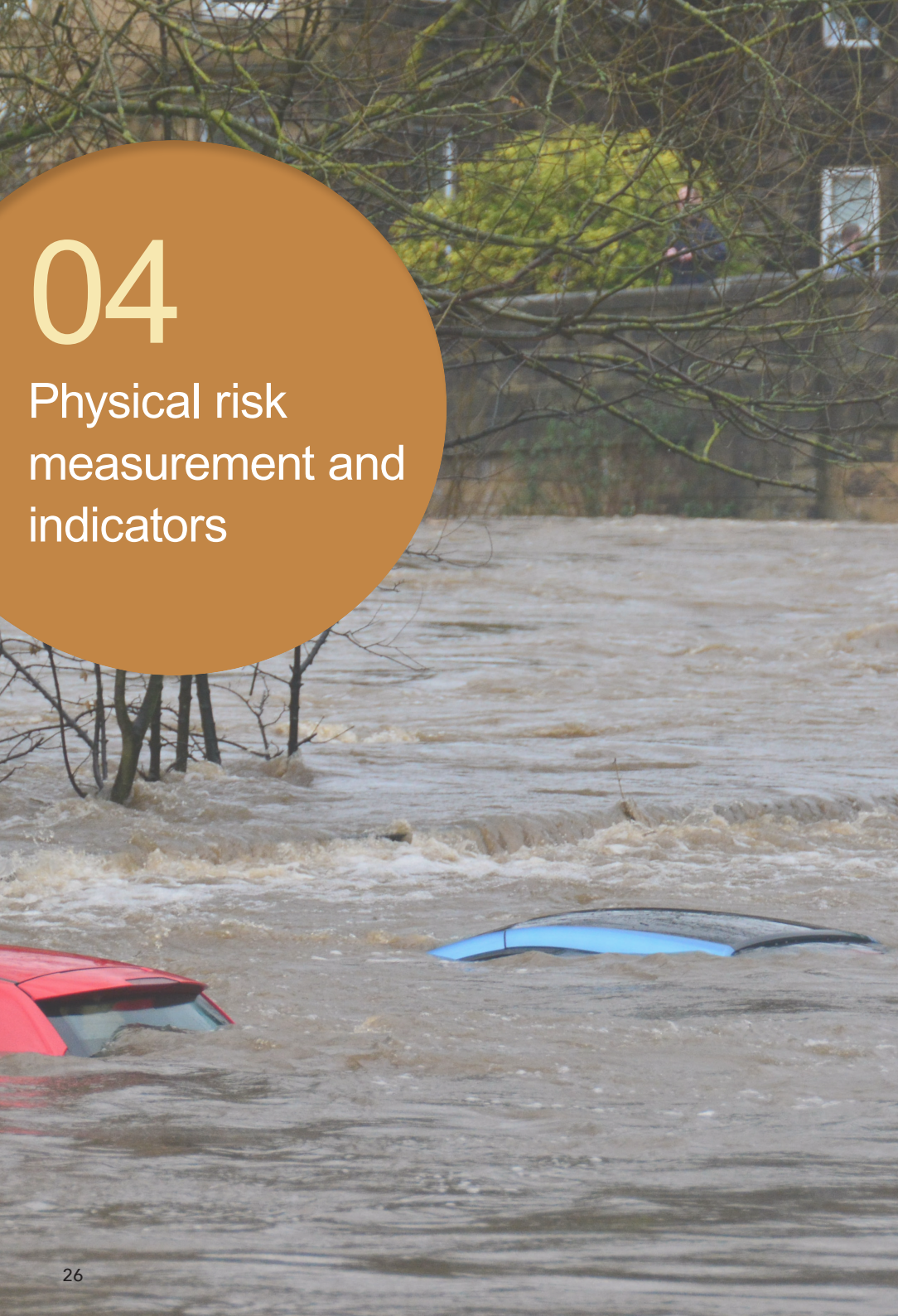
Asset type	CTBC Bank domestic mortgage
Outstanding (NT\$1 billion)	661
Financed emissions (tCO <sub>2</sub> e)	204,543
Carbon footprint (I) (tCO <sub>2</sub> e/TWD M)	0.31
Carbon footprint (II) (tCO <sub>2</sub> e/m <sup>2</sup> )	0.02
Average data quality	4

Note: According to the PCAF standards, this asset class includes the purchase and refinance of residential property but do not include mortgages not for the purpose of home purchase, construction and repair loans.



# 04

## Physical risk measurement and indicators



In the group workshop on climate-related risks, CTBC Holding deemed the probability of floods or landslides caused by "extreme weather events - typhoon/heavy rainfall" to be relatively high. Such natural disasters could cause financial losses to collateral for commercial real estate loans and mortgages, real estate investments, property insurance claims, and business operations. This is a material physical risk factor.

To identify business activities that are highly sensitive to floods or landslides, in 2020, CTBC Holding periodically checked and monitored high-risk areas in accordance with the Taiwan-wide Disaster Risk Map published by the National Science and Technology Center for Disaster Reduction (NCDR) on its Dr.A Climate Change and Disaster Risk Adaptation Platform. To improve the scale and accuracy of its flood risk analysis, CTBC Holding partnered with Formosa Climate Smart Service (FCS) in 2021. By using FCS' climate data and flood model<sup>3</sup>, CTBC Holding was able to classify the flood risk of commercial and residential real estate and build an internal loss model.

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<sup>3</sup>By improving the spatial and temporal resolution, the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), supported by the Ministry of Science and Technology, converted IPCC AR5's Global Climate Model (GCM) into local data suitable for Taiwan. The FCS selected five groups of the GCM (i.e., CCSM4, CESM1-CAM5, GISS-E2-R, HadGEM2-AO and MIROC5) and referred to the flood protection standards formulated by the Water Resources Agency (WRA) in order to estimate under different climate change scenarios, each administrative district across Taiwan may face flood event at different periods of time due to rainfall.

# 4.1 | Exposure to flood risk

Based on data from 1986 to 2005, FCS calculated the probability of flooding due to heavy rainfall (more than 600 mm for consecutive 24 hours) for each administrative district across Taiwan. 86 of the 368 administrative districts were found to have a 50% or higher chance of being flooded (defined as high-risk areas).

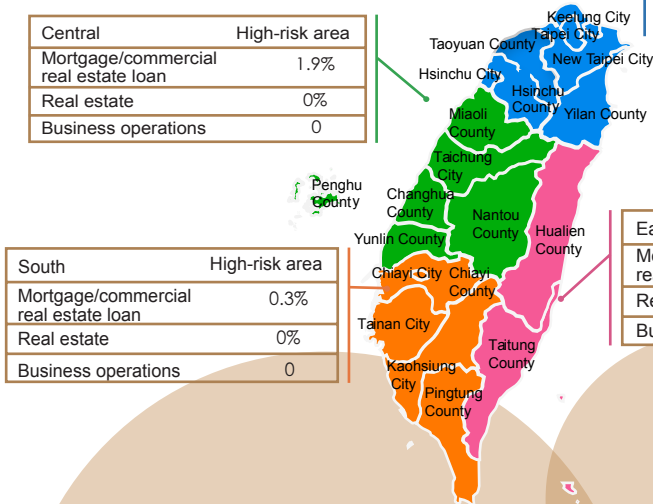
As of June 2021, the following are the group's business activities that could be sensitive to flood risks:

Item	High-risk area for flooding
Mortgage/commercial real estate loan	Percentage of total loan
Real estate	Investment proportion
Business operations	Number of operations

North	High-risk area
Mortgage/commercial real estate loan	2.9%
Real estate	0.1%
Business operations	0

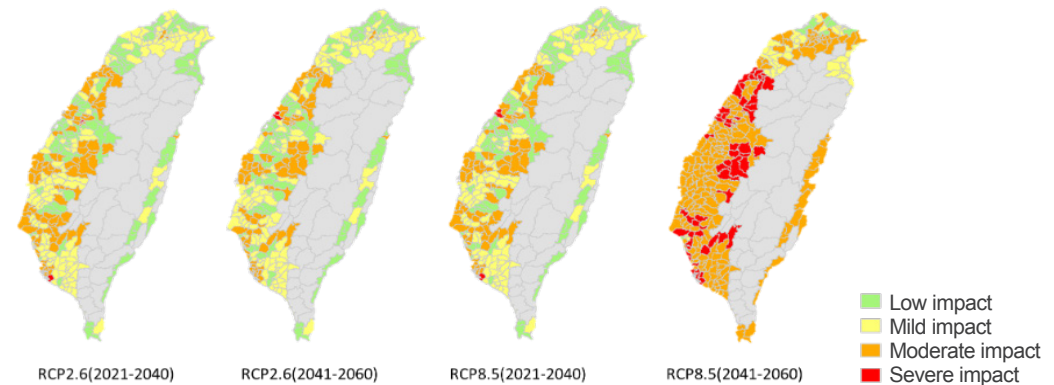
Central	High-risk area
Mortgage/commercial real estate loan	1.9%
Real estate	0%
Business operations	0

East	High-risk area
Mortgage/commercial real estate loan	0.1%
Real estate	0%
Business operations	0



# 4.2 | Impacts of flooding on real estate values

To further assess the changes in the values of different real estate types after the occurrence of flood events, CTBC Bank's personal banking risk management team developed a risk model for buildings, apartments, and detached houses by synthesizing the real estate appraisal data and actual price registrations in Taiwan over the past 15 years or more and using FCS' flood data. The following figure shows the impacts of flood events caused by heavy rainfall on the values of residential buildings for different climate change scenarios and periods of time:



Note: An administrative district in gray means that the density of the population is less than 50 people per square kilometer; CTBC Bank has no collateral located in such districts.

For commercial buildings such as stores (shops), factories, factory offices, farmhouses, office buildings, and other types of real estate, we used FCS' loss model as the basis and calibrated it based on internal loss experience to calculate the impacts of flood events on them.



# 4.3 | Exposure to landslide risk

According to the National Science and Technology Center for Disaster Reduction's landslide hazard map, 39 of Taiwan's 368 administrative districts are high-risk landslide areas.

As of June 2021, the following are the group's business activities that could potentially have landslide risks:

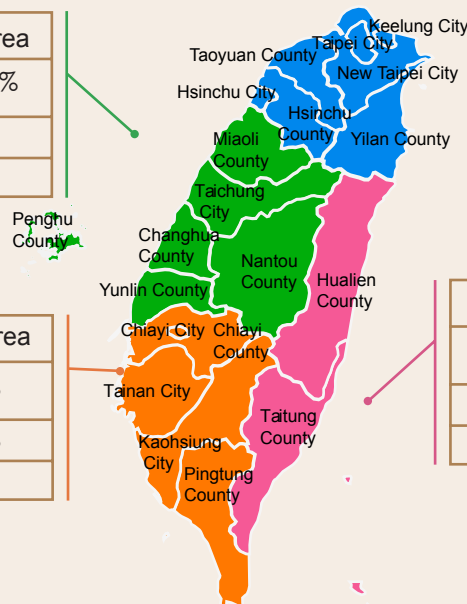
Item	High-risk area for flooding
Mortgage/commercial real estate loan	Percentage of total loan
Real estate	Investment proportion
Business operations	Number of operations

Central	High-risk area
Mortgage/commercial real estate loan	0.001%
Real estate	0%
Business operations	0

South	High-risk area
Mortgage/commercial real estate loan	0%
Real estate	0%
Business operations	0

North	High-risk area
Mortgage/commercial real estate loan	1.9%
Real estate	1.0%
Business operations	0

East	High-risk area
Mortgage/commercial real estate loan	0%
Real estate	0%
Business operations	0







# 05

## Scenario analysis/stress testing

With climate-related risks increasing, a growing number of financial supervisory agencies worldwide are conducting stress tests covering the entire financial industry or issuing guidelines requiring individual financial institutions to assess potential losses under different climate change scenarios. For example, the Bank of England published biennial exploratory scenario guidance this year, while in 2020, the French Prudential Supervision and Resolution Authority encouraged financial institutions to take the initiative to conduct loss assessments based on its own climate change scenarios and assumptions . In June 2021, the Network for Greening the Financial System (NGFS), established by central banks and supervisory bodies around the world, released new climate change scenarios for countries to use in order to establish consistent scenario settings.

Building upon its 2020 pilot scenario analysis of climate-related transition risks and physical risks, CTBC Holding has quickly adopted international climate change stress-testing frameworks and methods and the latest climate change scenarios published by the NGFS this year for use in its annual group-wide climate change stress test.

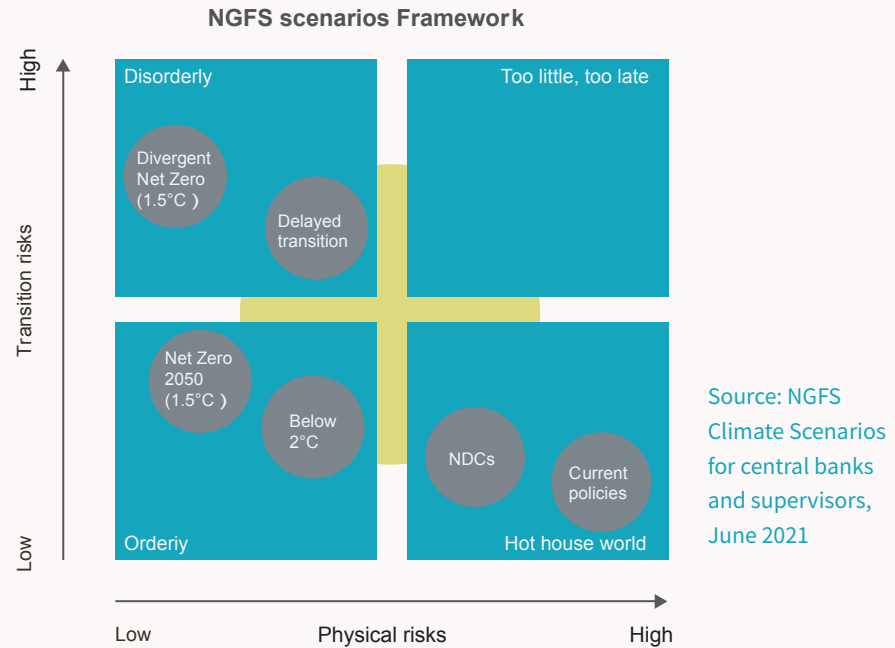
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<sup>4</sup>The biennial exploratory scenario guidance published by the Bank of England refers to “Guidance for participants of the 2021 Biennial Exploratory Scenario: Financial risks from climate change”.

<sup>5</sup>The ACPR’s climate change scenarios and assumptions refer to “Scenarios and main assumptions of the ACPR pilot climate exercise”.

# 5.1 | Scenario setting

The NGFS scenarios released in June reflect countries' net-zero commitments and have been enriched with an expanded set of macroeconomic variables at country-level granularity. Built on SSP2<sup>6</sup>, the NGFS scenarios explore a set of six scenarios based on the progress and effect of a low-carbon transition.



Based on the latest international climate policies and Taiwan's low-carbon transition goal, CTBC Holding selected three climate change scenarios for subsidiaries to conduct climate change stress testing in a consistent manner. Individual scenarios represent different degrees of transition risks and physical risks. Carbon prices (or carbon taxes) are the main variable of transition risks. Physical risks are linked to different representative concentration pathways (RCPs)<sup>7</sup> in the IPCC AR5 based on the rise in temperature.

<sup>6</sup>SSP (Shared Socioeconomic Pathways) is an estimation of the future society and economy. There are five SSPs, with SSP 2 considered "middle of the road" (i.e., medium challenges to adaptation and mitigation).

<sup>7</sup>The Representative Concentration Pathways (RCPs) are the climate change scenarios adopted by IPCC AR5. In each scenario, the different warming effect results in different radiative forcing per square meter, with RCPs 2.6 and 8.5 the scenarios with the least and most severe warming, respectively.

### Scenario 1

Represents the global goal of achieving net zero by 2050. To achieve this goal, countries or regions will start enforcing carbon prices (or carbon taxes) and other policies in 2021. Considering the differences in carbon reduction commitments and economic developments, the intensity of policies such as carbon prices may vary from country to country.

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### Scenario 2

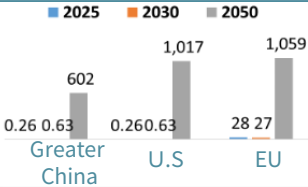
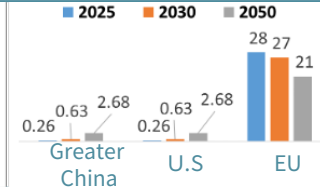
Assumes that no proactive action is taken to reduce carbon emissions by 2030; however, to achieve the Paris Agreement goal of limiting the temperature rise to 2°C by the end of this century, rolling out strong transition policies (e.g., a rapid increase in carbon prices) after 2031 is imperative. The NGFS argues, with reason, that affordability may vary from country to country in each region. Although carbon prices in each region in 2050 will be significantly higher than those in 2030, the final carbon prices will vary by region. For example, carbon prices in the U.S. and EU will presumably exceed \$1,000 in 2050 while those in Greater China (Taiwan, China, and Hong Kong) will presumably rise to \$602 in 2050—still lower than the \$623 in Scenario 1.

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### Scenario 3

Assumes that no new carbon reduction measures are added to current policies. Carbon prices in Greater China and the U.S. remain close to zero and those in the EU even drop year by year. In this scenario, the temperature will increase by 3°C or more by the end of this century, indicating the highest physical risk (RCP 8.5).



Scenario	Scenario 1	Scenario 2	Scenario 3
NGFS scenario	Net-Zero 2050	Delayed transition	Current policies
Aim	Orderly transition to net zero by 2050	Delayed transition to the Paris Agreement goal (< 2°C)	No carbon reduction measures added to current policies
Temperature rise by the end of this century	1.5°C	1.8°C	3°C and above
Transition risks	Moderately low risk Steady enforcement of climate policies starting from 2021	Moderately high risk Urgent enforcement of climate policies starting from 2031	Low risk Maintaining status quo without issuing new policies
Carbon by region (USD/tCO <sub>2</sub> e)			
Physical risks	Moderately low risk RCP 2.6	Moderately low risk RCP 2.6	High risk RCP 8.5
Global GDP growth	Mild impact: 	Acute impact in five years after 2031: 	Long-term downtrend with uncertainty: 

Note 1: Carbon prices (USD/tCO<sub>2</sub>e) in each region are based on the scenarios released in the NGFS Scenario Explorer; the Integrated Assessment Model is REMIND-MAGPIE 2.1-4.2; for reference, visit <https://data.ene.iiasa.ac.at/ngfs/#/workspaces>.

Note 2: Global GDP growth is based on the scenarios released by the Bank of England (source: variable paths).

Note 3: Physical risk-related parameters and pathways are based on the FCS' flood risk model and the NGFS' CA Climate Impact Explorer (website: <http://climate-impact-explorer.climateanalytics.org/>).

# 5.2 | Methodology

CTBC Holding adopted the methodology below, referring to the climate change stress-testing framework released by the Bank of England and the French Prudential Supervision and Resolution Authority:

### 1. Reference date:

Dec. 31, 2020

### 2. Period:

Risks in the three scenarios continue to evolve in the next three decades (2021–2050); considering strategic planning and the period of manifestation of physical risks, this report focuses on the impacts of climate-related risks on the positions as of the reference date in 2030 and 2050.

### 3. Risk factors and scope of analysis:

<sup>8</sup>Equity - market risk - annualized value at risk represents the expected loss for equity portfolio investment in each scenario for different assessment dates of 2030 and 2050.

<sup>9</sup>CTBC AMC : CTBC Asset Management

Risk factor		Type of business activities	Subsidiaries	Territory	Result of risk transmission
Transition risks	Policy and legal - cost of carbon Technology Market	1. [Counterparty-level assessment] business loans (carbon-intensive industries)	CTBC Bank	Domestic and overseas branches	Credit risk - expected credit loss (ECL)
		2. [Counterparty-level assessment] bond investments for non-trading purposes (all industries) [Counterparty-level assessment] equity investments for non-trading purposes (all industries)	CTBC Bank Taiwan Life CTBC Securities	Worldwide	Bond - credit risk - ECL Equity <sup>8</sup> - market risk - annualized value at risk
Physical risks	Heavy rainfall/flood Drought Power shortage Warming mean temperature	3. [Counterparty-level assessment] mortgages and commercial real estate loans	CTBC Bank Taiwan Life	Taiwan	Credit risk - ECL
		4. [Counterparty-level assessment] income-generating real estate investments	Taiwan Life CTBC AMC <sup>9</sup>		Investment risk - asset repair or write-down
		5. [Counterparty-level assessment] typhoon/flood insurance	CTBC Insurance		Insurance risk - property insurance claims
		6. [Counterparty-level assessment] business operations	CTBC Bank Taiwan Life CTBC Securities		Operational risk - asset damage or loss
		7. [Counterparty-level assessment] selected 10 business loans	CTBC Bank		Credit risk - ECL
Comprehensive assessment - impacts of transition risks and physical risks on the overall economy of each country (variables such as GDP growth and price index)		8. [Portfolio-level assessment] business loans (non-carbon-intensive industries) and unsecured personal loans	CTBC Bank Taiwan Life	Taiwan and overseas branches of CTBC Bank	Credit risk - ECL

# 5.3 | Analysis results

## Results overview:

In 2021, CTBC Holding adopted the group-wide common scenarios and had all subsidiaries simultaneously conduct stress testing on positions using the same reference date and methodology. The purpose was to explore the impacts of climate-related risks on individual business activities and on the group as a whole for the development of long-term business strategies

In this year's climate change stress testing, we planned three scenarios and two time dates for discussion; in individual scenarios, we also took into account the effect of low-carbon transition policies on corporate emissions. Costs were further estimated in two simulations, resulting in a total of 12 outcomes of the scenario analysis. Internally, we concluded that Scenario 1 (net-zero 2050) in Simulation 1 was the most likely result and thus used it as the "reference scenario". (For more information on the calculation logic of Simulations 1 and 2, please refer to "1. Impact of transition risks on business loans (carbon-intensive industries)" in the following section.)

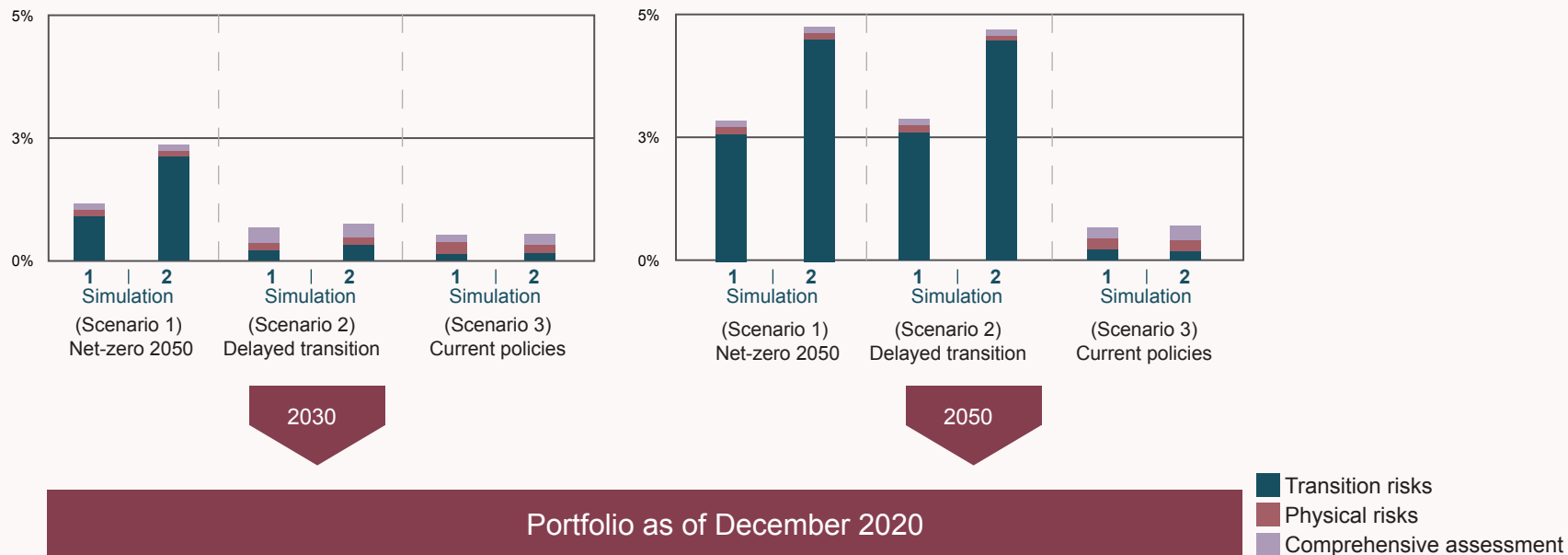
Based on the assessment results on business activities, the impact on the group as a whole by capital at risk is explained below.

## Results of scenario analysis under the 2030 risk profile:

- ▶ For scenarios in 2030, where external indicators in relation to climate change (e.g., carbon prices) and the frequency and intensity of risk events (e.g., flood) materialize, our losses to positions on the reference date were assessed. According to the analysis results, in the reference scenario, the consolidated net value of CTBC Holding would decrease by less than 1%, and in the scenario with the largest loss (Scenario 1 in Simulation 2), the consolidated net worth of CTBC Holding would decrease by approximately 2%.
- ▶ In Scenario 1, the estimated losses from transition risks were much higher than those from physical risks. In Scenarios 2 and 3, the estimated losses from physical risks were higher than those from transition risks.

## Results of scenario analysis under the 2050 risk profile:

- ▶ For scenarios in 2050, where external indicators in relation to climate change (e.g., carbon prices) and the frequency and intensity of risk events (e.g., flood) materialize, our losses to positions on the reference date were assessed. According to the analysis results, in the reference scenario, the consolidated net value of CTBC Holding would decrease by approximately 3%, and in the scenario with the largest loss (Scenario 1 in Simulation 2), the consolidated net worth of CTBC Holding would decrease by less than 5%.
- ▶ In Scenarios 1 and 2, the estimated losses from transition risks were much higher than those from physical risks. In Scenario 3, the estimated losses from physical risks were higher than those from transition risks. With the aggravation of physical risks in the long term, the estimated derivative losses would be higher than those in 2030.



### 1. Impacts of transition risks on business loans (carbon-intensive industries)

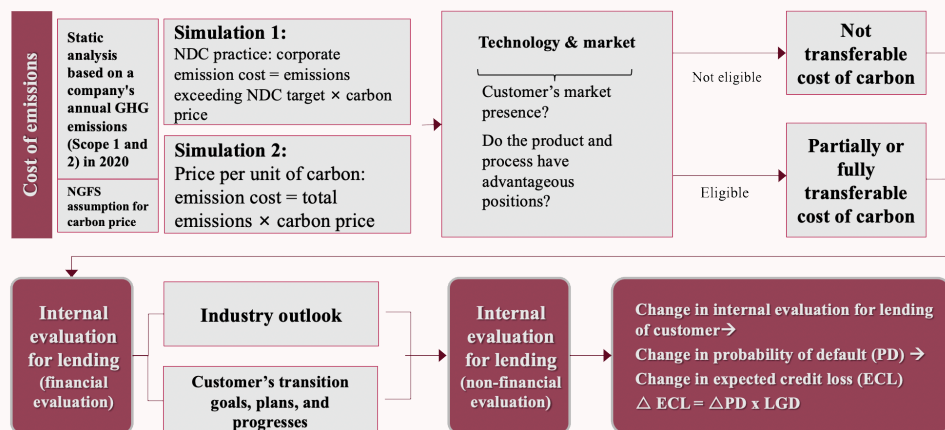
**Purpose:**

To achieve carbon-reduction goals, carbon-intensive industries or large GHG emitters will become the main carbon fee or tax payers domestically and abroad, increasing their operating costs. If the development of energy-saving and carbon-reducing technologies remains uncertain or market preferences change, shift costs to consumers will be difficult, thus affecting the finances and operations of businesses. Given the rising risks of borrowers, CTBC Bank must reassess changes in default risk and analyze the possibility of increasing the allowances for ECLs accordingly.

**Scope of analysis:**

150 carbon-intensive businesses to which domestic and overseas branches of CTBC Bank provided loans (including large GHG emitters designated by the EPA)

## Methodology:



## Analysis results:

For changes in the internal ratings of borrowers under the reference scenario, the transition risk profile at 2030 would see credit rating downgrades, with approximately 20% of borrowers being downgraded three or more notches, and with the expected credit loss rate (ECL%) of each industry increasing by 5–148 basis points<sup>10</sup>; the transition risk profile at 2050 caused a credit rating downgrade of approximately 30% of the borrowers by 3 and above, with the ECL% increasing by 9–159 basis points.

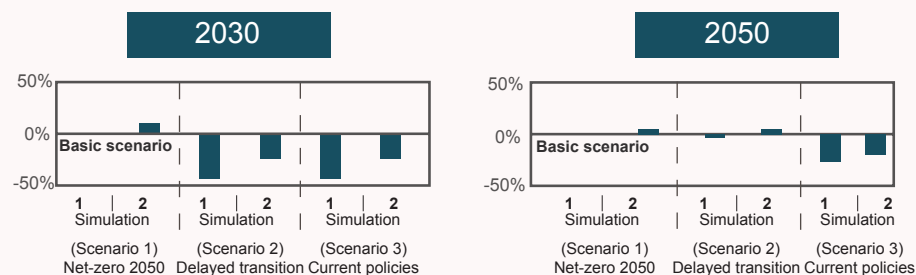
Under the risk profile of 2030, the credit risk for fossil fuel mining increased the most. As large GHG emitters designated by the EPA were mostly large companies with competitive advantages, they were less affected by transition risks than other businesses. Under the risk profile of 2050, the credit risk of marine shipping and airlines increased the most. Large GHG emitters designated by the EPA still maintained better business resilience.

In the comparison of borrowers in different industries, those with relatively stable finances, high market shares, and high barriers to entry or gross profit margins

were less susceptible to the impact of transition policies. According to the analysis results, the credit ratings of such borrowers mostly remained the same or were downgraded by one notch.

Changes in ECL in other scenarios compared to the reference scenario are shown in the figure below. The carbon price in Scenario 1 started to increase in 2021 whereas those in Scenarios 2 and 3 did not change until 2030; therefore, the credit risk in Scenarios 2 and 3 were milder than that in the reference scenario. Under the risk profile of 2050, the carbon price in Scenario 2 rose sharply to compensate for the environmental impact caused by the delayed transition; therefore, the credit risk in Scenario 2 increased, and ECL was about the same as that in Scenario 1.

## Basic scenario vs. other scenarios in terms of ECL



<sup>10</sup>One basis point represents 0.01%.

## Response strategies:

CTBC Bank has a Guideline for Sustainable Finance in Institutional Banking in place. In addition to setting concrete access conditions for thermal coal power generation, coal extraction, and other industries highly sensitive to transition risks, the guideline stipulates that a review of carbon-intensive borrowers' abilities to respond to transition risks be included in the credit analysis process; for example, regarding borrowers' GHG emissions, whether borrowers assess the present and future climate-related risks and opportunities should be examined through interviews and public disclosures, and their response measures noted (e.g. transition or improvement plans). Such information is collected and analyzed to help the group quantify customers' abilities to respond to transition risks. CTBC Bank may further discuss with the customers how to make low-carbon transition plans to mitigate their rising transition risks or make decisions to adjust or optimize the loan portfolio.

## 2.Impacts of transition risks on bond and equity investments for non-trading purposes

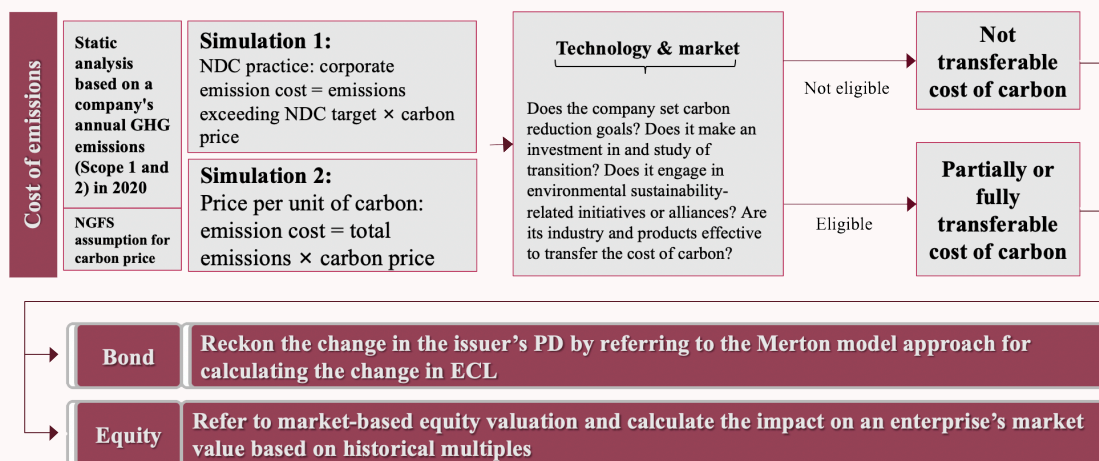
### Purpose:

Investments made by each subsidiary within the group for non-trading purposes are to maintain a reasonable and stable credit risk or market risk and to ensure good risk adjusted returns. New transition policies are assumed to be rolled out. Each subsidiary is required to fully review the potential changes in the risks of equity/ bond issuers in order to manage fluctuations in gains or losses on investments and further optimize the long-term investment portfolio.

### Scope of analysis:

Bond investments held by CTBC Bank, Taiwan Life, and CTBC Securities for non-trading purposes

## Methodology:



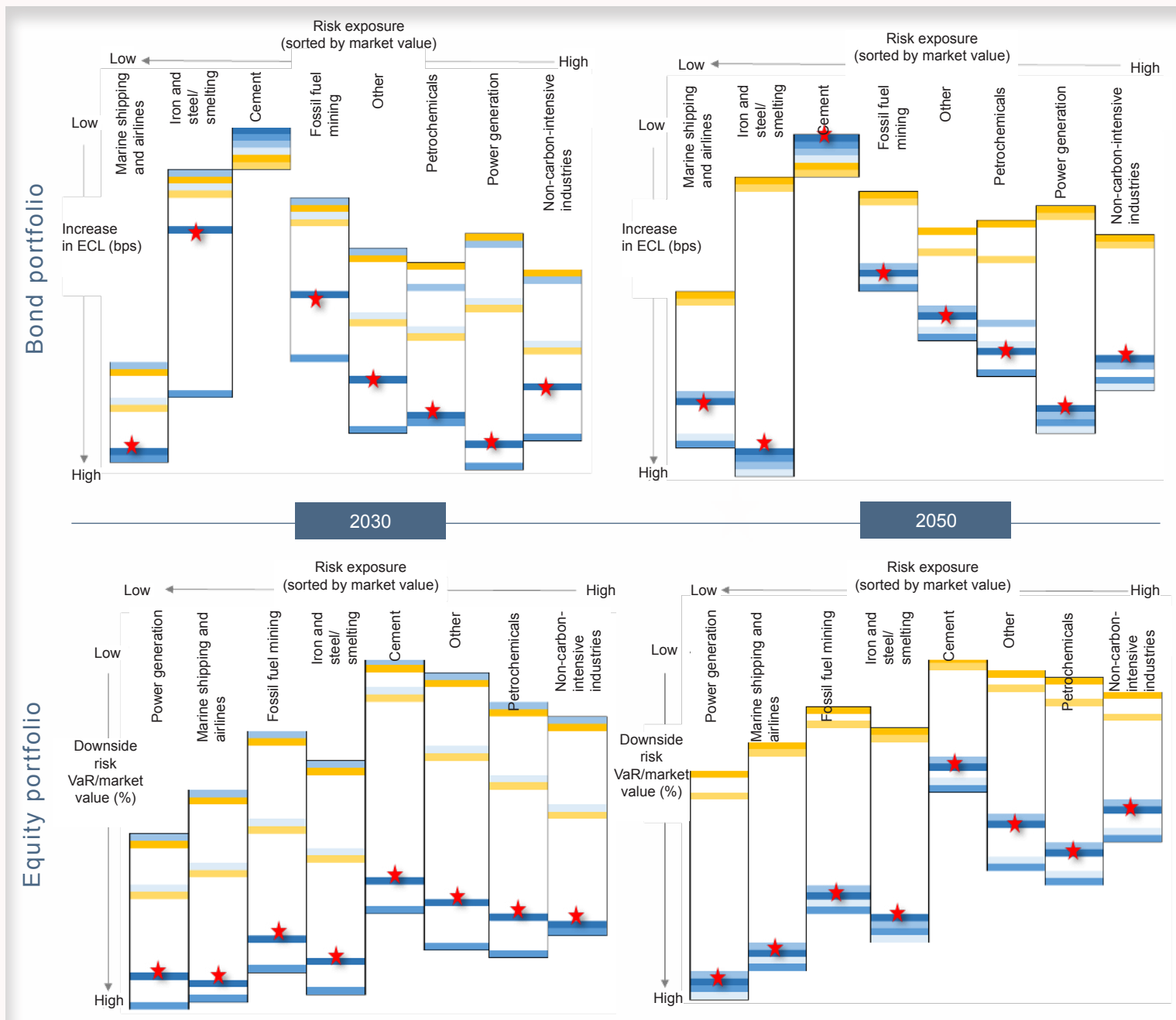
## Analysis results:

For changes in bond investment risks under the reference scenario, the transition risk profile at 2030 caused the ECL% to increase by only 0.3 basis points<sup>11</sup> on average, with marine shipping and airlines impacted the most; the transition risk profile at 2050 caused the ECL% to increase by 20 basis points, with iron and steel/smelting impacted the most.

For changes in equity investment risks under the reference scenario, the transition risk profile at 2030 caused the value at risk (VaR%) to decrease by 0.1%, with marine shipping and airlines impacted the most; the transition risk profile at 2050 caused the value at risk (VaR%) to decrease by 4.6%, with power generation impacted the most.

<sup>11</sup>One basis point represents 0.01%.





### Response strategies:

In their sustainable investment policies and regulations, subsidiaries specify exclusion lists and the scope of carbon-intensive industries that should be strictly assessed. When creating investment portfolios, subsidiaries are required to take ESG risks into account by reviewing whether the target investments' ESG scores given by third-party institutions are up to the standard set by the subsidiaries or by assessing the target investments using the internal ESG risk assessment form in order to reduce fluctuations in the overall return on investment and related investment risks.

Note: The above figure consists of four risk assessment results based on the type of investment (bond/equity) and time of analysis (2030/2050). Results across different types are not comparable. °

### 3.Impacts of physical risks (heavy rainfall/flood) on mortgages and commercial real estate loans

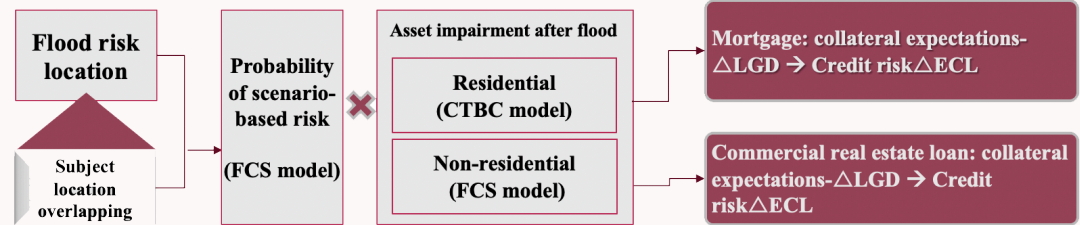
#### Purpose:

Heavy rainfall and flood have been commonly identified in climate risk identification seminars as physical risks with a higher probability of occurrence and greater damage in Taiwan. Such business activities as mortgages and commercial real estate loans are impacted by these risk factors. The scope of risk covers CTBC Bank and Taiwan Life. For the first time in 2020, CTBC Holding conducted pilot physical risk (heavy rainfall/flood) scenario analysis for mortgages and commercial real estate loans and proposed improvements in risk assessment, including scientific data on flood hazard and loss rate, reasonable segmentation of scenario analysis period, and refinement of collateral loss rate. This year, CTBC Holding cooperated with a third-party expert (FCS) to make various improvements. In addition to introducing the flood risk model and pathways linking IPCC RCPs 2.6 and 8.5 and using the flood database, CTBC Bank’s retail banking risk management team developed a flood loss model for collateral (including apartments, apartment complexes, and detached houses) in order to build and accumulate the group’s ability to assess climate-related physical risks.

#### Scope of analysis:

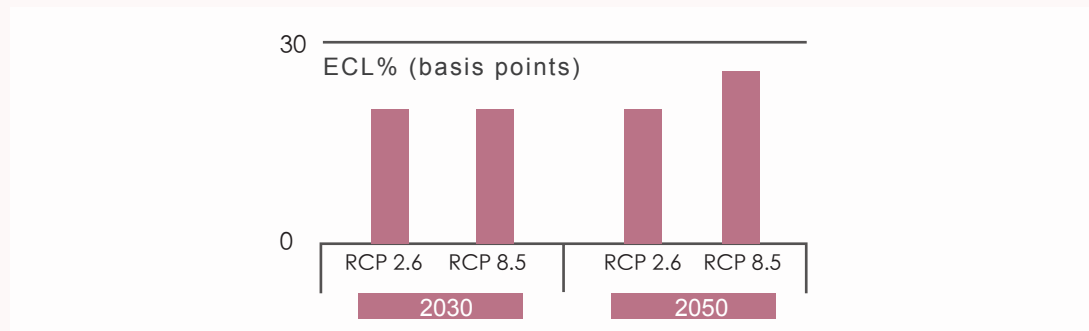
Domestic mortgages and commercial real estate loans by CTBC Bank and Taiwan Life

#### Methodology:



#### Analysis results:

Physical risks gradually increase over time. Under RCP 8.5, the scenario with the highest physical risk, in 2050, the expected credit losses on the group’s mortgages and commercial real estate loans would total approximately NT\$500 million, with the ECL% reaching 26 basis points<sup>12</sup>. The following figure shows the ECL% of the physical risk scenario at different points in time:



#### Response strategies:

Subsidiaries have put in place sound credit-granting measures such as collateral review and valuation/appraisal management. In the credit analysis process, subsidiaries are required to determine whether collateral is located in flood-prone areas and use these findings in their credit granting decision-making or as a reference in determining loan-to-value ratio. CTBC Holding’s risk management unit is responsible for regularly monitoring changes in the overall positions located in disaster-prone areas. If the percentage of the positions in high-risk areas is mounting significantly, it will initiate the relevant subsidiary’s internal review process.

<sup>12</sup>One basis point represents 0.01%.

## 4.Impacts of physical risks (heavy rainfall/flood) on income-generating real estate investments

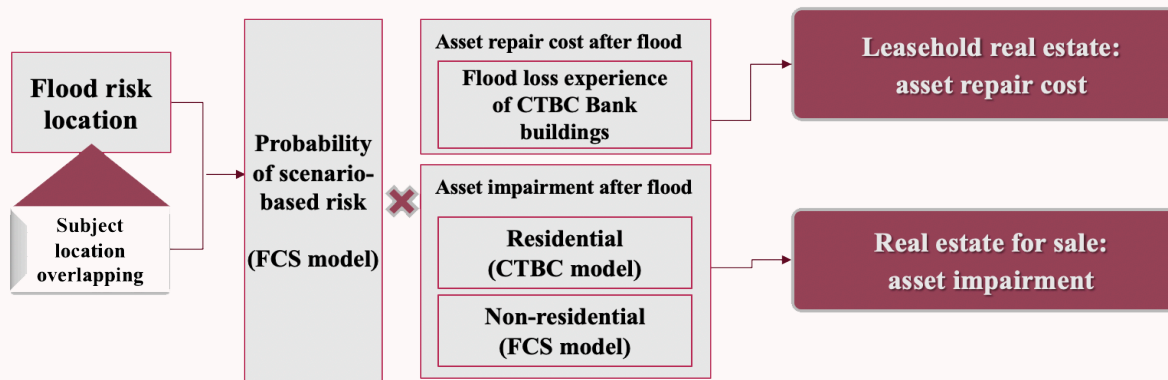
### Purpose:

The occurrence of physical risks (heavy rainfall/flood) may result in derivative financial losses on subsidiaries' income-generating real estate investments, such as through repair costs of leasehold real estate or impairment of real estate for sale. Regarding subsidiaries' real estate portfolios, CTBC Holding estimated the losses and impairments that could arise in different scenarios based on the flood risk model of FCS or CTBC Bank and major flood events experienced by CTBC Bank's buildings.

### Scope of analysis:

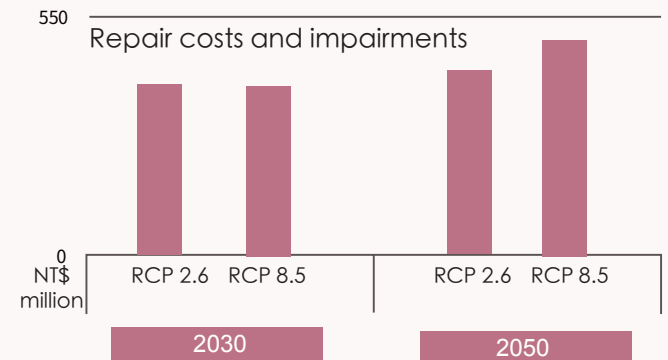
Domestic real estate portfolios created by Taiwan Life and CTBC AMC

### Methodology:



### Response strategies:

Subsidiaries have established regulations governing real estate investments, which stipulate that risk factors that may affect the transaction prices of real estate purchases must be fully assessed. For investments in real estate development, subsidiaries must evaluate the positive and negative impacts of the investments on local communities and the environment in the four aspects of the ESG checklist (i.e., energy, water, waste, and stakeholder engagement) in order to achieve sustainable development together with local communities and the environment.



### Analysis results:

At 2030, there won't be any significant differences in possible financial losses under RCP 2.6 and RCP 8.5. However, the financial losses from buildings due to flooding under RCP 8.5 will be approximately 1.2 times higher than those under RCP 2.6 at 2050.

## 5. Impacts of physical risks (heavy rainfall/flood) on typhoon/flood insurance

### Purpose and methodology:

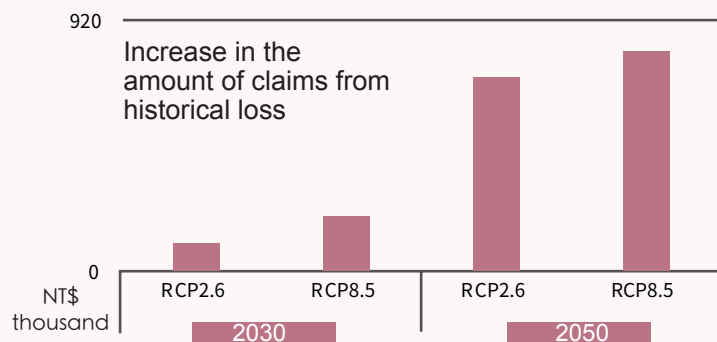
In climate change scenarios, flood incidents caused by typhoons/heavy rainfall may increase the number of claims received by CTBC Insurance. To estimate possible risks and financial losses arising from these events, CTBC Insurance used an internal database to sort several types of insurance associated with typhoon and flood events and fully considered historical claims and reinsurance cession rates.

### Scope of analysis:

CTBC Insurance's products associated with typhoon and flood events

### Analysis results:

The short-term flood risk (2030) had little impact; however, flood claims would gradually become significant in the mid to long term (2050), with the greatest loss under RCP 8.5, showing an increase of NT\$914,000 in claims compared to the historical loss experience.



### Response strategies:

CTBC Insurance regularly checks underlying climate-related products (e.g., typhoon/flood insurance) and analyzes their risks by location to avoid excessive concentration in specific areas; in addition, CTBC Insurance has carried out underwriting more carefully and processed reinsurance whenever necessary to limit claims to a tolerable range and effectively transfer climate-related risks.

## 6. Impacts of physical risks (heavy rainfall/flood) on business operations

### Purpose and methodology:

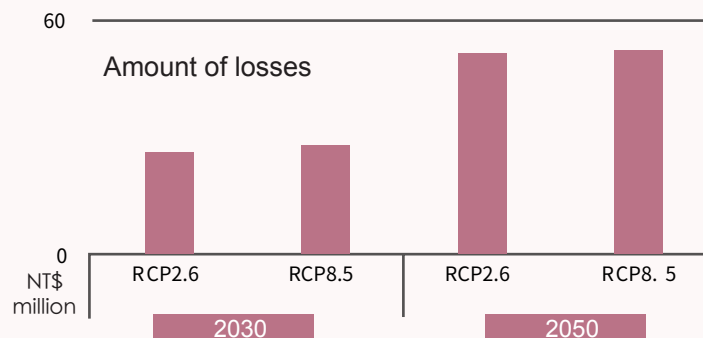
To assess the financial losses on subsidiaries' buildings due to flood events caused by typhoons/heavy rainfall (e.g., asset repairs and equipment replacements), operational risks were estimated based on FCS' flood risk model and CTBC Bank's historical damage reports arising from typhoons/heavy rainfall.

### Scope of analysis:

Domestic operations of CTBC Bank, Taiwan Life, and CTBC Securities

### Analysis results:

Since the group's operations are in principle located in metropolitan areas with relatively complete flood control facilities, no significant difference in the estimated losses between the two scenarios (RCP 2.6 vs. RCP 8.5) was found. In the long term (2050), however, the frequency of risk events would increase and the estimated losses would mount compared with the short term (2030).



### Response strategies:

CTBC Holding and its subsidiaries have all made business continuity plans and regularly hold disaster prevention and remote backup drills to respond to sudden natural disasters; related units have also formulated contingency plans in accordance with the Disaster Emergency Response Handbook for Financial Institutions (Template) and real practices, and make preparations and conduct drills to respond to and reduce the impacts of natural disasters such as floods and typhoons on business operations.

## 7. Impacts of physical risks (drought, power shortages, and rising average temperatures) on business loans

### Purpose:

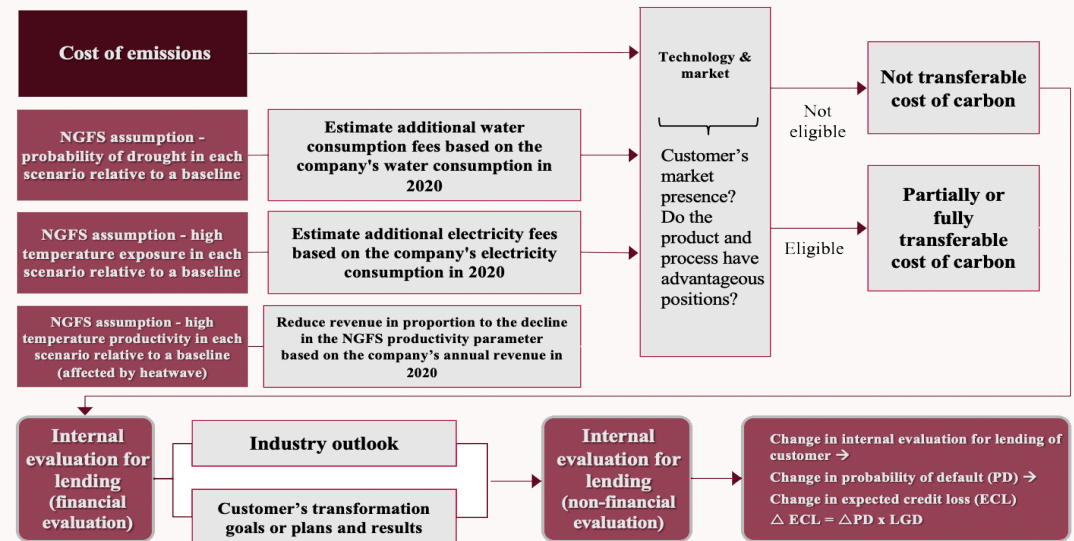
In the first half of 2021, Taiwan experienced a once-in-a-century drought and large-scale power outages at the same time. Such crises not only reduce companies' willingness to make new investments but could increase their existing production and operating costs. Facing such irreversible climate-related risks, CTBC Holding assumed the probability of drought and water shortages, power shortages, and rising mean temperatures under the three scenarios set in Chapter 5.1 of this report and sampled borrowers in order to calculate the possible impacts of the simultaneous occurrence of these three physical risks.

### Scope of analysis:

10 domestic businesses to which CTBC Bank provided loans in the electronics, textile, petrochemicals, iron and steel/smelting, and cement industries with relatively high water or electricity consumption in the manufacturing process

### Methodology:

We estimated the additional operating expenses incurred by the sampled businesses due to drought and water shortages and power shortages as well as the reduction in revenue due to low productivity under high temperatures; then, we followed the analysis process in "1. Impacts of transition risks on business loans (carbon-intensive industries)" to analyze the changes in the internal ratings and probability of default of the borrowers and the ECLs on the loans.



For analysis results and response strategies, please refer to "1. Impacts of transition risks on business loans (carbon-intensive industries)".

## 8. Macroeconomic impacts on business loans (non-carbon-intensive industries) and unsecured personal loans

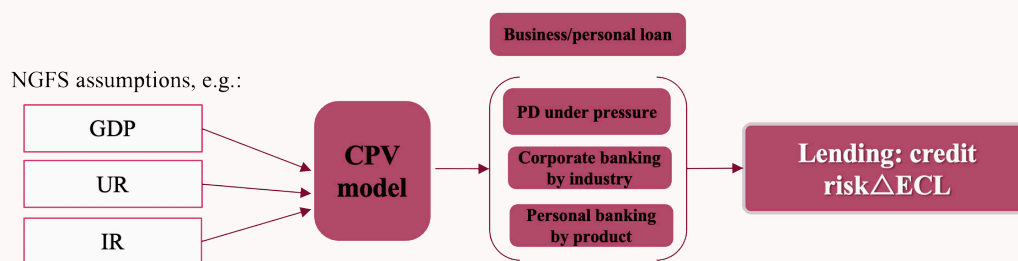
### Purpose:

Climate-related transition risks and physical risks will impact climate-sensitive industries and counterparties directly and the macro economy indirectly, exposing all industries, households, and individuals to risks such as reduced demand and income. After conducting the analysis of impacts on climate-sensitive business activities by borrower/loan type, the impacts of residual risks on non-climate-intensive businesses (i.e., non-carbon-intensive industries) and products (e.g., personal loans) were also assessed given changes in the overall environment, so as to complete the analysis.

### Scope of analysis:

Business loans (non-carbon-intensive industries) and unsecured personal loans made by CTBC Bank and Taiwan Life; the scope of risk includes the domestic operations of CTBC Bank and Taiwan Life as well as CTBC Bank’s overseas branches.

### Methodology:



Note 1: GDP means economic growth rate; UR means unemployment rate; and IR means interest rate.

Note 2: The credit portfolio view (CPV) model is a quantitative model proposed by McKinsey and Company in 1997. It established a regression model using macroeconomic factors to predict the target's probability of default.

### Analysis results:

Under three scenarios, the changes in climate-related risks of countries and territories at 2030 and 2050 are in the right side :

Country/territory	Scenario	2030	2050
Taiwan	Scenario 1	Green	Green
	Scenario 2	Red	Green
	Scenario 3	Green	Green
Hong Kong	Scenario 1	Yellow	Yellow
	Scenario 2	Red	Red
	Scenario 3	Red	Red
U.S.	Scenario 1	Red	Red
	Scenario 2	Red	Red
	Scenario 3	Red	Red
Japan	Scenario 1	Green	Green
	Scenario 2	Green	Green
	Scenario 3	Green	Green
Singapore	Scenario 1	Green	Green
	Scenario 2	Green	Green
	Scenario 3	Green	Yellow
Vietnam	Scenario 1	Green	Green
	Scenario 2	Green	Green
	Scenario 3	Green	Green
China	Scenario 1	Yellow	Yellow
	Scenario 2	Yellow	Yellow
	Scenario 3	Yellow	Yellow

### Legend :

Green	Risk remaining unchanged
Yellow	Risk heating up
Red	Risk aggravated



# 06

## Prospects

Conducting the exploratory climate risk assessments from 2020 to 2021 is CTBC Holding's first step in optimizing our climate risk database and model over the long term. As climate risk measurement methods continue to evolve globally, the current assessment results and observations should be viewed with care and caution.

CTBC Holding is fully aware that long-term climate change and natural disasters, which have already incurred record losses in recent years, pose severe risks for the global economy as well as our own business activities, customers, investors, and local communities. We also understand that socioeconomic inequality caused by the COVID-19 pandemic may also be aggravated by the impact of extreme weather. Adhering to our "We are family" brand spirit, CTBC Holding has been linking business development with sustainability issues and developing a financial ecosystem that has a positive social and environmental influence. We deem the management of climate-related risks and opportunities one of our key strategies for such sustainable development.

This report is the first full disclosure of CTBC Holding's efforts and performance in climate risk assessment and management. To more clearly understand the impacts of climate change, we have taken this first step of carrying out climate risk analysis; climate risk stress testing has also allowed us to quickly identify the sources of potential losses arising from climate-related risks. We understand that there are knowledge gaps that we must fill in the future. While keeping abreast of and learning about new insights, data, models, and tools, CTBC Holding will also further cooperate with all its stakeholders in order to raise climate awareness and enhance response strategies to climate change. By doing so, we hope to become the leader in sustainable finance in both Taiwan and Asia.

## Appendix 1: Disclosure instructions

The climate-related indicators and values disclosed in this report should be carefully evaluated for their effectiveness in decision-making or determining the level of risk as information on climate change is highly uncertain compared with data in financial statements.

According to a report issued by the Bank for International Settlements in 2020, past experience is no representation of future changes since climate change is unprecedented; in addition, climate change is a new type of systemic risk involving interaction and non-linearity, making it complex and inherently unpredictable. According to CTBC Holding's observations, the uncertainty of climate change-related information mainly originates from (but is not limited to) the following:

### Information on financed emissions:

To calculate the financed emissions from investment/loan portfolios, it is necessary to collect annual GHG emissions from borrowers or investees; however, such data may not have been publicly disclosed or may be adjusted after reporting, or no GHG inventory data may be available for the reporting year. If GHG emissions have not been publicly disclosed, financial institutions may estimate the emissions according to the PCAF standards. For borrowers or investees whose GHG emissions have not been publicly disclosed, CTBC Holding estimates their GHG emissions mainly with their annual revenue or total assets (according to the PCAF standards, the data quality scores for estimation using annual revenue and total assets are 4 and 5, respectively) and uses the PCAF emission factor database. Since there is no unified source of carbon emission factors (including sustainability-related database companies, consulting companies, international organizations, and local government agencies), the results of financial institutions' estimations may be inconsistent and uncertain.

### Scenario analysis assumptions:

The evolution and impact of climate change are highly uncertain and cannot be based on or verified by past experience. Therefore, the parameters or assumptions used in the scenario analysis and the losses estimated based on such parameters or assumptions also share high uncertainty.

- In view of this, we recommend that the stakeholders of this report take such uncertainty into account when referring to related indicators and values and applying them in their decision-making.

## Appendix 2: TCFD index

The following table details where to find our disclosures corresponding to the four aspects of the TCFD recommendations published by the Financial Stability Board in 2017:

Aspect	Recommended disclosure	Chapter	Page number
Governance	The board's oversight of climate-related risks and opportunities	Ch. 2.1	P. 8–10
	Management's role in assessing and managing climate-related risks and opportunities	Ch. 2.1	P. 8–10
Strategy	Identified short, medium, and long term climate-related risks and opportunities	CTBC Holding's 2020 Sustainability Report	P. 51–53
	The impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning	Ch. 1	P. 4–7
	Climate scenario analysis, including a 2°C or lower scenario	Ch. 5	P. 28–42
Risk management	The processes for identifying and assessing climate-related risks	Ch. 5.1–5.2	P. 28–32
	The processes for managing climate-related risks	<ul style="list-style-type: none"> <li>●Ch. 2.2</li> <li>●CTBC Holding's 2020 Sustainability Report</li> </ul>	<ul style="list-style-type: none"> <li>●P. 11–12</li> <li>●P. 55–56</li> </ul>
	How processes for identifying, assessing, and managing climate-related risks are integrated into the organization's existing risk management	Ch. 2.2	P. 11–12
Metrics and targets	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>●Ch. 3–4</li> <li>●CTBC Holding's 2020 Sustainability Report</li> </ul>	<ul style="list-style-type: none"> <li>●P. 15–27</li> <li>●P. 58–67</li> </ul>
	Scope 1, 2, and 3 (if applicable) GHG emissions and the related risks	<ul style="list-style-type: none"> <li>●Ch. 3.2</li> <li>●For Scope 1 and 2 GHG emissions, please refer to CTBC Holding's 2020 Sustainability Report</li> </ul>	<ul style="list-style-type: none"> <li>●P. 18–24</li> <li>●P. 57</li> </ul>
	The targets used by the organization to manage climate-related risks and opportunities and performance against targets	<ul style="list-style-type: none"> <li>●Ch. 3–4</li> <li>●CTBC Holding Sustainability Report 2020</li> </ul>	<ul style="list-style-type: none"> <li>●P. 15–27</li> <li>●P. 58–67</li> </ul>



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