

2021 TCFD

Formosa Petrochemical Corporation Task Force on Climate-related Financial Disclosures (TCFD) Report



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Preamble

Global warming caused by the emission of greenhouse gases has brought significant risks to the growth of the global economy in recent years and will affect a greater number of businesses in the future. However, it may be difficult for investors to learn which companies are susceptible to risks of climate change, which companies are adequately prepared, and which ones are taking response actions. This was the reason why the Financial Stability Board (FSB) has assembled a special task force called the Task Force on Climate-related Financial Disclosures (TCFD), which published its "TCFD Recommendations Report" in June 2017 after spending 18 months gathering opinions from business and financial leaders. The Recommendations Report provides businesses and investors with a complete and well-defined assessment framework for disclosing risks and opportunities associated with climate change and for reflecting risks in financial reports.

As a response to global trends, Formosa Petrochemical Corporation (Formosa Petrochemical) has disclosed risks and opportunities associated with climate change in accordance with the TCFD Recommendations Report and made a more reasonable and efficient allocation of capital in line with the Company's responsibilities and strategies to realize our vision toward low-carbon transition.











1 Governance

1.1 Company introduction

Formosa Petrochemical Corporation (“The Company”) was incorporated in 1992, mainly engaging in the production and sales of petroleum products and basic petrochemical raw materials. The Company is the only privately-owned petroleum refining company in Taiwan, producing and selling various petroleum products, including gasoline and diesel. Our naphtha cracker plants produce basic petrochemical raw materials, including ethylene, propylene, and butadiene, with the largest production capacity in Taiwan. In addition, there are the qualified heat and power combined co-generation system to supply various public utility fluids such as steam and power at its facilities in the Formosa Plastics Group Mailiao Industrial Park.

Table 1.1 Basic information on Formosa Petrochemical

Formosa Petrochemical Corporation		
 Date of incorporation April 6, 1992	 Capital NT\$95,259,596,520	 Operating sites Headquarters: No. 1-1, Taisu Industrial Park, Zhongxing Village, Mailiao Township, Yunlin County Taipei Office: 4F, No. 201, Formosa Building, Dunhua N. Rd., Songshan Dist., Taipei City
 Date of listed on TWSE December 26, 2003	 Number of employees in 2021 5,274	
		 Credit ratings Taiwan Ratings: twAA; Standard & Poor's: BBB+; Moody's Investors service: A3
 Consolidated revenue in 2021 NT\$620.06233 billion		

Note: As of December 31, 2021

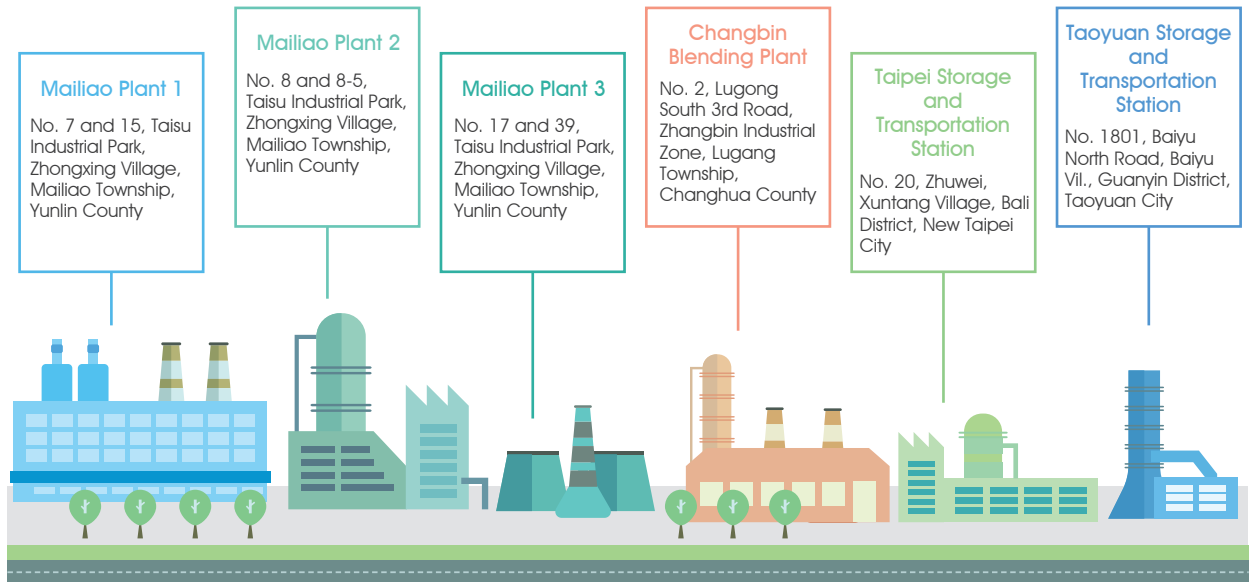
In the aspect of oil refining business, our refinery has a daily refining capacity of 540,000 barrels, of which the output of naphtha can reach 3.75 million metric tons, which are supplied to relevant factories in the Mailiao Industrial Park, while producing gasoline, diesel, aviation fuels, and liquefied petroleum gas.

In the olefins business, we have three naphtha cracker plants in place, with a total annual production capacity of 2,935,000 tons of ethylene. In addition, in terms of public utilities, FPCC has electricity generation facility which can generate a total electric capacity of 2.75 million KW, and 2.15 million KW of it is qualified as cogeneration facility. All the electricity and steam produced is distributed to our plants, with the remaining power sold back to Taipower. In addition, multiple facilities were set up, including industrial water, ultrapure water, air compressors, and an oxygen plant, to meet the demand of utility fluids in the Mailiao Industrial Complex.

The annual output in 2021 remained stable without major differences from 2020. Oil products accounted for 60.7% of our business revenue in 2021, while petrochemical products accounted for 32.5%. These are the most important core business items. The Company's consolidated revenue was NT\$620,062,330 thousand in 2021, up 49.3% compared to 2020. Consolidated net profit before tax was NT\$60,484,980 thousand, up 598% compared to the previous year. We flexibly responded to the rapidly changing global market trends through flexible production and sales adjustments, and benefited from the rise in international crude oil prices, which generated profits from raw material purchase and inventory; the price difference between main products and raw materials increased compared with the same period last year, and resulted in the significant increase in our profits this year.

1.2 Organizational boundaries

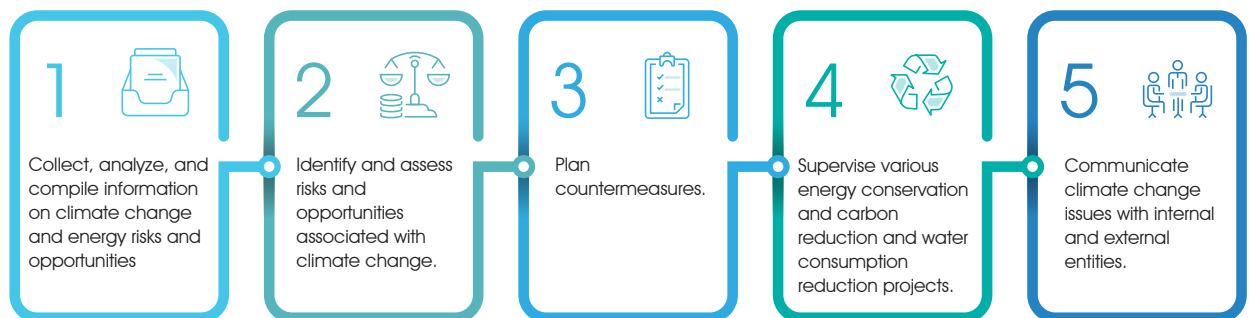
Table 1.2 Organizational Boundaries of Formosa Petrochemical



1.3 Organization and responsibilities

The Board of Directors of Formosa Petrochemical is the highest governing body in response to climate change. To strengthen the Board's responsibility for supervising the ESG tasks, the Company will establish the Sustainable Development Committee under the Board of Directors in 2022 to be responsible for reviewing sustainable development policies, strategies, and management approaches and supervising the implementation of sustainable development initiatives.

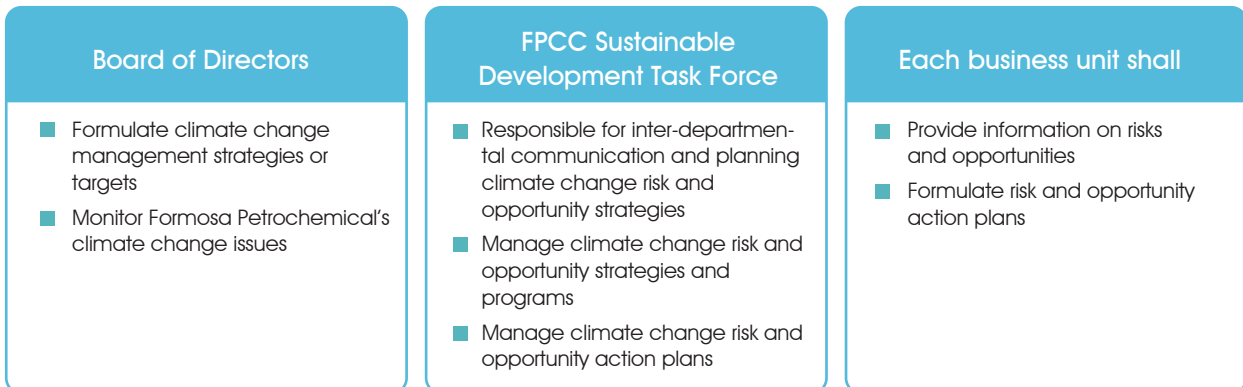
To ensure the sustainable development of the Company, the FPCC Sustainable Development Task Force has been established, with the Chairman as the convener and the President as the deputy convener. It is an inter-departmental team under the Board of Directors to coordinate the heads of various business units and facilitate inter-departmental communication. As for climate change issues, the Company has identified relevant risks, established management strategies, and carried out strategic risk management under the framework of TCFD. The main responsibilities of FPCC Sustainable Development Task Force:



The President convenes FPCC Sustainable Development Task Force on a monthly basis. The President is responsible for supervising various energy conservation and carbon reduction and water consumption reduction projects and reviewing the progress of the energy conservation and carbon reduction projects and the achievement of goals, and then reporting on the implementation results of such projects to the Chairman at the Company's weekly meeting on a quarterly basis, and the relevant materials are compiled into attachments to the agenda of Board meetings for reference and discussion.

The Company holds at least six Board meetings per year and reports climate-related issues to the Board of Directors on a regular basis, such as long-term strategic goals for coping with climate change, energy conservation and carbon reduction strategies, medium- and long-term vision, annual energy conservation and carbon reduction performance, green production, and green product plans, etc.

Figure 1.3 Division of Responsibilities under TCFD



2

Management of Climate Change Risks and Opportunities

2.1 Risk and opportunity identification and assessment process

With extreme climate change events, climate change has caused significant impacts on the planet and on enterprises. To reduce the impact of climate change on Formosa Petrochemical, the Company, with the Chairman as the convener, established the Formosa Petrochemical ESG Promotion Team (as shown in 1.3 Organization and responsibilities), as an inter-departmental team to coordinate the promotion of sustainable development. It is responsible for convening the heads of various business units for inter-departmental communication. In response to climate change, we, under the TCFD framework, have identified relevant risks and established management strategies to conduct strategic risk management. When formulating risk scenarios, we consider transition risks (policy and law, market, technology, and reputation) and physical risks (chronic and acute) and illustrate potential risk events, including the level of financial impact, impact duration (short, medium, long), parties impacted in the value chain, and risk likelihood. In the evaluation of opportunities, we consider resource efficiency, energy, products and services, markets, and adaptability. Formosa Petrochemical's risk identification and assessment of climate-related risks are as follows:

1. Background information collection:

- (1) Collect background information from news, the internet, and events happening in other countries or companies.
- (2) Consider transition risks (including policy and law, market, technology, and reputation) and physical risks (including acute and chronic).

2. Scope of risk and operations assessment:

Conduct climate change risk assessment of the upstream and downstream of the value chain within the scope of direct and indirect operations. (See Figure 2.1-1 and Figure 2.1-2)

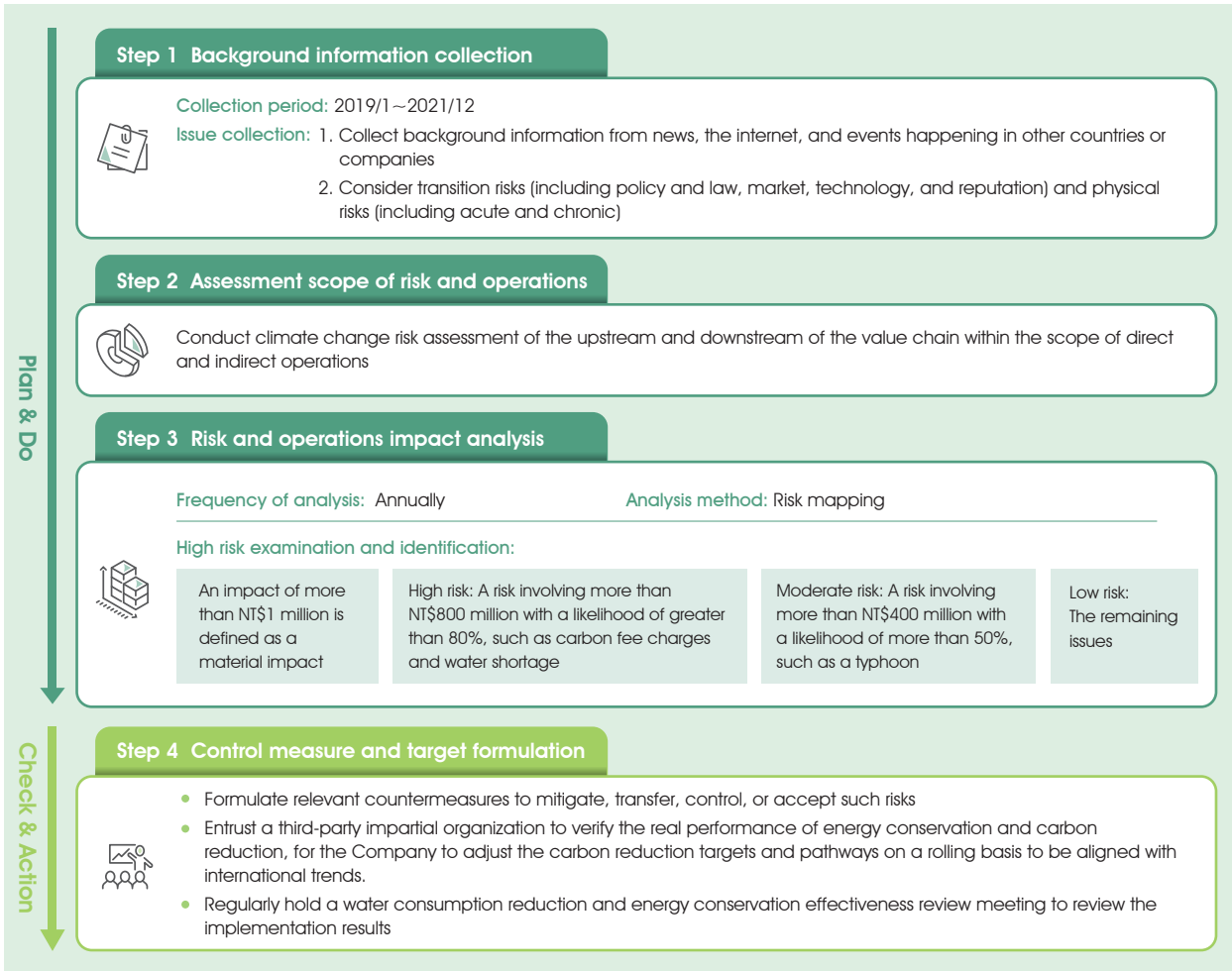
3. Risk and operational impact analysis

- (1) Frequency of analysis: Annually.
- (2) Analysis method: Risk mapping.
- (3) High risk examination and identification: When identifying and assessing climate-related risks and opportunities, we define a financial impact of more than NT\$1 million as a material impact and define 40 risk levels: a risk involving more than NT\$800 million with a likelihood of greater than 80% as high risk; a risk involving more than NT\$400 million with a likelihood of more than 50% as a moderate risk; the rest as low risks. Low risks are acceptable risks, and moderate risks do not require immediate action but still need to be continuously monitored for any changes. For a high-risk event, a corresponding management program must be formulated to reduce loss from the risk, such as reducing the number of incidences, mitigating the financial impact, and transferring and avoiding risks.

4. Control measure and target formulation

The Formosa Petrochemical ESG Promotion Team produces a risk index according to the consequences and likelihood. After risks and opportunities are identified, relevant countermeasures to mitigate, transfer, control, or accept risks are formulated to set short-, medium-, and long-term targets.

Figure 2.1-1 Climate change risk issue analysis process



1 Governance

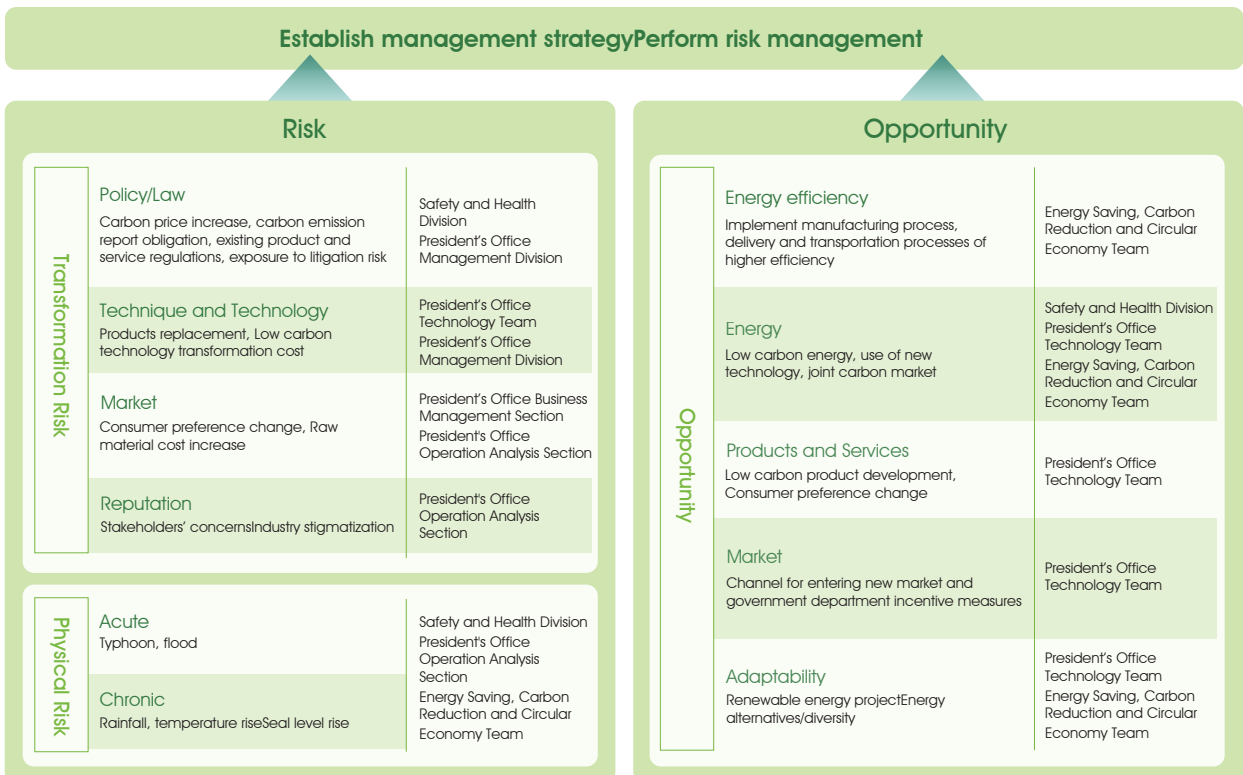
2 Management of Climate Change Risks and Opportunities

3 Strategy

4 Indicators and targets

Appendices

Figure 2.1-2 Climate change risk and opportunity identification and analysis framework



2.2 Risk and opportunity management method

“The Formosa Petrochemical ESG Promotion Team,” after identifying climate risks and opportunities, produces a risk index according to the consequences and likelihood. After the levels of risks and opportunities are identified, relevant countermeasures to mitigate, transfer, control, or accept risks are formulated to set short-, medium-, and long-term targets. To formulate a plan for each target, “the Formosa Petrochemical ESG Promotion Team” reviews the progress of implementation and the achievement of each target through monthly meetings and participates in the monthly company-wide energy conservation and carbon reduction review meeting, while reporting on the energy conservation and carbon reduction implementation results to the Chairman and the President at the Company’s weekly meeting on a quarterly basis, and the relevant materials are compiled into attachments to the agenda of Board meetings for reference and discussion.

The Company comprehensively evaluates global ESG trends and Formosa Petrochemical’s operational and development goals, analyzes major issues in governance, economy, environment, and society, and discloses the countermeasures formulated for issues with greater impact as per the evaluation result, as shown in Tables 2.2-1 and 2.2-2:

Table 2.2-1 Assessment and management of issues with the greatest financial impact in each risk category

Risk type Transition/ Physical	Risk issue	Risk category	Major climate event Associated risk factors	Risk management program
Transition risk	Policy and law	High risk	<p>Greenhouse Gas Reduction and Management Act - carbon fee charges</p> <p>1. Non-excessive carbon emissions: The Taiwan government announced in 2021 that the Greenhouse Gas Reduction and Management Act will be amended into a draft of the Climate Change Response Act with a proposed carbon emission charge estimated to be at NT\$100 per metric ton. It was estimated that the greenhouse gas emissions in 2020 were about 25.55 million metric tons of CO₂e. If no measures to reduce carbon emissions are implemented, the carbon fee is estimated to be at NT\$100 per metric ton, and it is estimated that it will cause a financial cost of NT\$2.555 billion per year.</p> <p>2. Excessive carbon emissions: For carbon emissions that exceed the amount approved by the central competent authority, the upper limit of the penalty for excessive carbon emissions remains at NT\$1,500 per metric ton. The Company’s greenhouse gas emissions in 2020 were estimated to be roughly 25.55 million metric tons of CO₂e. If the carbon emissions are not reduced and no carbon credit is purchased to offset the emissions by 2050, we may pay a carbon fee of NT\$1,500 per ton for the excess part.</p>	<p>1. To increase all employees’ awareness, the Company will implement an internal carbon pricing mechanism in 2022 with reference to the draft of the Climate Change Response Act in terms of carbon fees and charges for excessive carbon emissions. The carbon emission cost is included in the internal income statement as the basis for the implementation of carbon risk management. In addition to continuing to formulate greenhouse gas emission reduction measures, the relevant information is a crucial indicator for performance evaluation, products and operations, and investment evaluation to maintain the Company’s competitiveness.</p> <p>2. We implement various energy conservation and carbon reduction programs to gradually transition to a low-carbon company, while evaluating investments in (1) green energy power generation facilities (wind or solar energy) and energy storage systems, (2) recycling and reuse of waste oil and waste plastic, and (3) hydrogen energy and ammonia industries.</p>
Transition risk	Changes in clients’ behavior	High risk	<p>The International Energy Agency stated that about 300 million electric vehicles will be on the road by 2040, which will reduce the global demand for petroleum by 3.3 million barrels per day. The transportation demand for petroleum will fall by 7% based on an estimate of 45.1 million barrels of petroleum for transportation per day in 2021.</p>	<p>Due to the falling demand for transportation petroleum, we plan to produce high-value products, to respond to property losses caused by changes in client behavior.</p>

Risk type Transition/ Physical	Risk issue	Risk category	Major climate event Associated risk factors	Risk management program
Physical risk	Acute- Extreme climate Extreme torrential rain/flooding/ typhoon	Low risk	Due to climate change, the frequency of extreme weather events is increasing, and equipment may be flooded and damaged due to torrential rains and strong typhoons, which will affect the stable operation of the process and cause losses when the operations are halted.	High density water barriers (+1.2M) have been installed and pumping facilities have been set up in low-lying areas to alleviate puddles in the low-lying areas, pump water into a drainage, and increase the flood discharge and storage capacity, (completed in April 2019 with an investment cost of NT\$60,418,000)
Physical risk	Acute- Extreme climate - water shortage/ drought	Low risk	The impact of water shortage/drought caused by abnormal climate events, if we are unable to reduce the production of each process when water resources are limited, the production load of the process will decrease or the production will be halted in the event of a serious water shortage.	The Company plans an annual budget of more than NT\$40 million to carry out various water consumption reduction projects. In 2021, we invested a total of NT\$420 million and implemented 50 water consumption reduction and improvement projects. The daily water consumption reduced reached 5,691 tons with an annual benefit of NT\$26.39 million. The main water consumption reduction projects include wastewater recycling, water consumption reduction and improvement, and the establishment of a rainwater reusing system.

Table 2.2-2 Assessment and management of issues with the greatest financial impact in each opportunity category

Opportunity	Opportunity type	Major climate event Associated risk factors	Risk management program
Low-carbon energy technology and transition	Transition	<ol style="list-style-type: none"> 1. Low-temperature cogeneration system and waste heat recovery technology program 2. Refuse derived fuel (RDF) program 	<ol style="list-style-type: none"> 1. It is planned to implement a ten-year greenhouse gas offset program (low-temperature waste heat recovery for power generation), and it is estimated that 13,220 tons of CO₂e carbon credits can be obtained. Also, the annual output of electricity is 1,622,186 kWh. If the average electricity price is NT\$2.2 yuan/kWh, the power generated during the 10-year period can enable us to save an electricity purchase cost of NT\$36 million. 2. Since 2019, RDF has been used to partially replace coals. It is estimated that the maximum consumption of RDF is 49,932 metric tons per year, and the cost per metric ton is NT\$900. It is estimated that the fuel cost increases by NT\$45 million, while 23,349 metric tons of coal are reduced. If calculated at US\$150 per metric ton of coal, it can reduce the energy purchase cost of NT\$105 million, while it can reduce greenhouse gas emissions by around 72,000 tons. As per the Company's annual carbon reduction cost of NT\$1,532.8 per metric ton, the carbon reduction expenditure will be reduced by NT\$110 million, and the total potential financial income of this program is estimated to be about NT\$215 million.
Improvement to energy efficiency	Transition	The Company emits tail gas from the production processes. To reduce air pollution, we recover about 100,000 tons of tail gas and convert it into fuel per year, to reduce the amount of fuel used.	From 2013 through 2021, we had recovered a total of 1.01 million tons of excess process gas for heat recovering, which can reduce greenhouse gas emissions by roughly 321,000 tons and the coals by around 447,000 tons per year on average. If calculated at US\$150 per ton of coals, a cost of coals of around NT\$2.01 billion can be reduced.
Establishment of renewable energy facilities	Transition	Renewable energy power generation system establishment project: At present, three sets of solar energy systems are planned to be built, with a total installed capacity of 1.8 MW + 0.081 MW + 13.054 MW = 14.935 MW.	The total investment cost of the three sets of solar energy systems is NT\$1.34 billion, and it is estimated that an annual electricity cost of NT\$43 million can be reduced (as per the solar photovoltaic capacity factor in Yunlin area of 15.07% and the electricity price of NT\$2.2 per kWh).

2.3 Integration of climate change-related issues

An enterprise must take into account various potential risk issues and assess its operations to achieve sustainable development. Formosa Petrochemical has continued to observe the global risk trends in order to achieve sustainable development. Risk issues have evolved from the single “economic” aspect in the past to multiple aspects of the environment, society, technology, and geopolitical issues, and climate change-related issues have been integrated into the environmental aspect. The Formosa Petrochemical ESG Promotion Team is placed at the center of risk management. It identifies the risks that may affect the Company's operations and works with different business units to jointly evaluate the likelihood of occurrence and the level of impact of such risks according to their nature, while reporting to the Company in a timely manner to adjust the operating strategy.

For risk management, the Company further divides risks into two categories: “inherent operational risks” and “emerging risks.” The inherent operational risks are based on the 12 risks required to be disclosed in accordance with the “Regulations Governing Information to be Published in Annual Reports of Public Companies,” and the ESG Promotion Team conducts analysis and evaluation one by one. The emerging risks are based on the risks that may be faced in operations in the following five years and collected under the Enterprise Risk Management (ERM) framework released by the Committee of Sponsoring Organizations of the Treadway Commission (COSO), and ESG experts are invited to analyze the emerging risks together. At present, most of the issues related to climate change fall in the category of emerging risks.

Inherent operational risks and emerging risks have been identified as per the Company's integrated risk analysis and assessment process. The risks analyzed and evaluated related to climate change include corporate image change, technological change, physical risks of climate change, stakeholders’ attention to low-carbon energy, energy transition, and compliance with domestic and international energy policies.

“The Formosa Petrochemical ESG Promotion Team” re-examined the physical risks of climate change, and identified the transition risks of climate change (policy and law, market, technology, and reputation) and physical risks of climate change (chronic and acute). In terms of opportunities, the aspects considered included improvement in resource efficiency, other alternative energy sources, low-carbon products and services, low-carbon product markets, and low-carbon product adaptability.

After identifying and assessing climate-related risks and opportunities, we defined a financial impact of more than NT\$1 million as a material impact, as shown in Figure 2.3-1, and classified risks and opportunities as i) great financial impact and high likelihood, ii) great financial impact but low likelihood, iii) low financial impact but high likelihood, and iv) low financial impact and low likelihood.

We adopted a climate change risk identification procedure and a matrix of financial impact and risk likelihood to determine high risks. The indicators for risk likelihood is divided into eight levels: 5%, 5–20%, 20%–35%, 35%–50%, 50%–65%, 65%–80% , 80%–95%, and higher than 95%. As the financial impact involving more than NT\$1 million is considered material, the indicator is divided into five levels: over NT\$1.7 billion; between NT\$1.7 billion and NT\$800 million; between NT\$800 million and NT\$400 million; between NT\$400 million and NT\$20 million; between NT\$20 million and NT\$1 million. Then, a risk matrix was drawn, with the horizontal axis representing the risk likelihood and the vertical axis representing the financial impact, as shown in Figure 2.3-2.

The completed risk matrix, as shown in Figure 2.3-3, has defined 40 risk levels: a risk involving more than NT\$800 million with a likelihood of greater than 80% as high risk; a risk involving more than NT\$400 million with a likelihood of more than 50% as a moderate risk; the rest as low risks. Low risks are acceptable risks, and moderate risks do not require immediate action but still need to be continuously monitored for any changes. For a high-risk event, corresponding management program must be formulated to reduce loss from the risk, such as reducing the number of incidences, mitigating the financial impact, and transferring and avoiding risks.

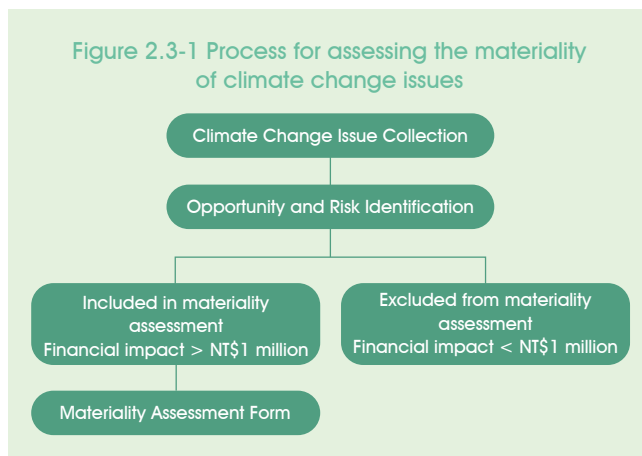


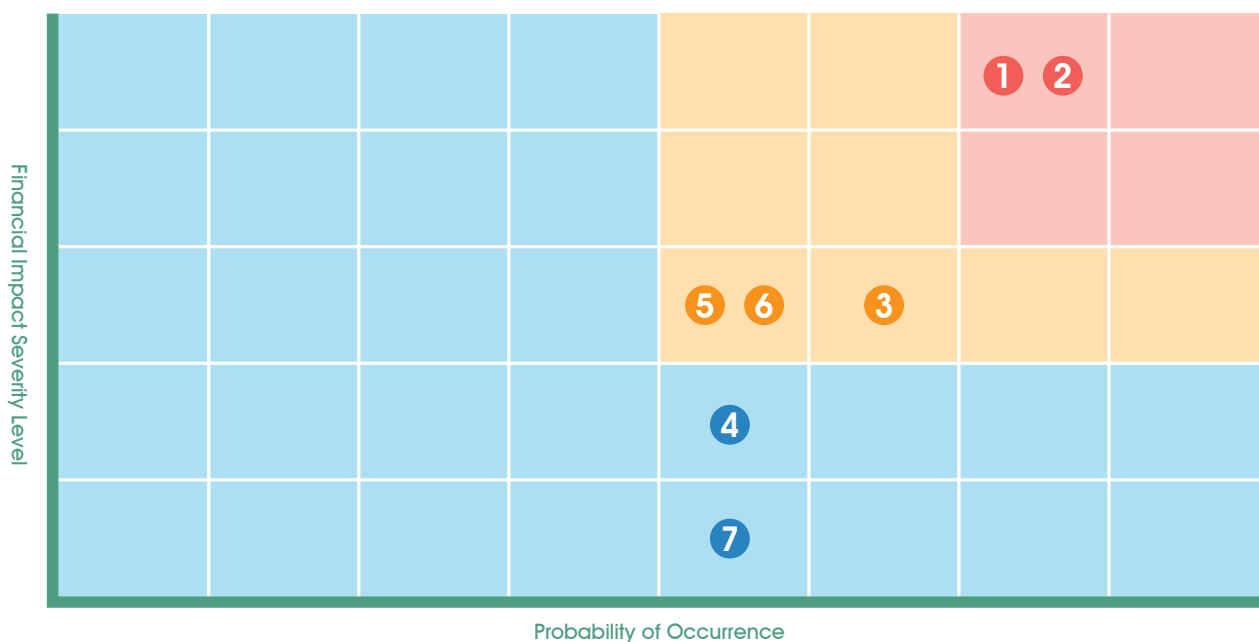
Figure 2.3-2 Risk matrix

Financial impact level	Amount	Almost never	Very unlikely	Not likely	Rarely	Somewhat likely	Likely	Very likely	Almost certain
		(<5%)	(5% < X < 20%)	(20% < X < 35%)	(35% < X < 50%)	(50% < X < 65%)	(65% < X < 80%)	(80% < X < 95%)	(>95%)
High	Above NT\$170 million	■	■	■	■	■	■	■	■
Medium to high	NT\$800 million-NT\$1.7 billion	■	■	■	■	■	■	■	■
Medium	NT\$400 million-NT\$800 million	■	■	■	■	■	■	■	■
Medium to low	NT\$20 million-NT\$400 million	■	■	■	■	■	■	■	■
Low	NT\$1 million-NT\$20 million	■	■	■	■	■	■	■	■

1 Governance

2 Management of Climate Change Risks and Opportunities

Figure 2.3-3 Climate change risk and opportunity and risk map



3 Strategy

4 Indicators and targets

Appendices

Low Risk
Acceptable Risk

- 4 Transformation Risk/Reputation - ESG investment
- 7 Transformation Risk/Policy and Law - Carbon border tax

Medium Risk
Presently, no action is adopted; continue to monitor changes

- 3 Opportunity/Adaptability - Energy saving and carbon reduction / Low carbon process development
- 5 Physical Risk / Chronic - Water shortage / Drought
- 6 Physical Risk / Acute - Heavy rainfall

Major Risk
Plan corresponding management solution in priority, and track the solution performance

- 1 Transformation Risk / Policy and Law - Carbon tax/Carbon border tax
- 2 Transformation Risk/Market - Change of consumer behavior. Electric Vehicle/Reduction of fuel

2.4 Table of the impact of risks and opportunities on the Company

 Low Risk/Opportunity
  Medium Risk/Opportunity
  Major Risk/Opportunity

Climate Issues	Impact analysis	Level of risks/opportunities
Potential impact on company/organization	Issue category	Risk level
Current risk or opportunity analysis		
<p>As per Taiwan’s nationally determined contribution (NDC) announced by Environmental Protection Administration (EPA) in 2017, Taiwan aims to reduce greenhouse gas emissions by 2% by 2020, with 2005 as the base year. The EPA has formulated the Greenhouse Gas Reduction and Management Act as the main domestic regulation to regulate enterprises’ carbon reduction. In the risk identification in the category of environmental policies, the Greenhouse Gas Reduction and Management Act is estimated to cause a financial impact. As the National Action Plan on Climate Change and the Greenhouse Gas Reduction and Management Act clearly define our country’s long-term greenhouse gas emission reduction target and specify a mechanism to control and allocate the total greenhouse gas emissions from the manufacturing sector. In the future, the government will impose control over the total amount, determine the emission intensity for each industry, and establish a carbon trading system. In response to the regulatory requirements, it is necessary for us to reduce the greenhouse gas emissions from the processes. After the control is imposed, we may have to purchase emission amounts, and energy bills will rise, causing our production costs to go up. We assume that we cannot pass on these carbon costs as product prices will not be competitive, which will cause a material financial impact. EPA controls companies that emit more than 25,000 tons of CO₂e. As we emit more than 20 million tons per year and are defined as large carbon emitters, we are one of the first batch of businesses to be put under control. The EPA also plans to levy carbon fees from 2024 onwards.</p>	Transition risk/ Policy and law	
<p>The government’s “Greenhouse Gas Reduction and Management Act,” “A Nuclear-Free Taiwan by 2025,” “policy for the renewable energy to reach 20% of total power generated by 2025,” “gas-fired power generation,” Renewable Energy Development Act - Energy-heavy Industries Claus, as well as carbon reduction and energy transition, leading to electricity price hikes and electricity instability issues, are the Company’s medium-term high risks.</p> <p>In response to the risk of the adjustment to the renewable energy policy, companies are actively investing in the establishment of renewable energy facilities, including wind and solar power.</p>	Transition risk/ Technology	
<p>The European Union (EU) will begin to levy a carbon border adjustment tax after 2026. The initially regulated products are the direct emissions from the products in the five major industries of electricity, cement, chemical fertilizers, steel, and aluminum. Formosa Petrochemical’s current export products are not included in the scope of the levy as VCM, PVC, phenol, and acetone set out in the product emission standards under the Commission Implementing Regulation (EU) 2021/447 are not used in our products. In the risk identification in the environmental policy category, the EU carbon border adjustment tax may have an impact in the future. The U.S., the U.K., Japan, Canada, and Singapore have shown their support for the tax. It will not cause any impact in the short term, and we will continue to pay attention to the latest development.</p>	Transition risk/ Policy and law	
<p>The Glasgow Climate Pact at the UN Climate Change Conference (COP26) is an indication that the UN COP has clearly stipulated the reduction of coal consumption, and the phasing out of subsidies for unabated coal and fossil fuels for the first time in the history. This is a medium- and long-term high risk for the Company. In the identification of climate change risks and opportunities in the energy supply category, Formosa Petrochemical identified the consumption of high carbon emission fuels as a medium-to-long-term high risk and formulated the RDF program. This demonstration program is carried out in alignment with government policies to help the government reduce the amount of domestic waste in the private sector and effectively improve the Company’s reputation, which echoes the government’s policy by adopting a mechanical processing system to turn waste into RDF. To find other alternative energy sources, we plan to partially replace coals with RDF and actively plan to install renewable energy equipment. We will install wind turbines and solar power generation equipment.</p>	Transition opportunity/ Energy	

Climate Issues	Impact analysis	Level of risks/ opportunities
Potential impact on company/organization	Issue category	Risk level
Current risk or opportunity analysis		
The categories of “climate change risk and opportunity identification” and “design and development” include risks of product design and development, raw material, market, business, and process technology. We reviewed changes in client behavior based on consumer preferences (such as reduced gasoline demand due to electric vehicles and reduced plastics consumption), resulting in a decrease in demand for goods and services, and further assessed such an impact on our revenue. With the gradual growth of the electric vehicle market, the International Energy Agency stated that the global demand for petroleum will be reduced by 3.3 million barrels per day by 2040. The transportation demand for petroleum will fall by 7% based on an estimate of 45.1 million barrels of petroleum for transportation per day in 2021.	Transition risk/ Market	
In recent years, with the boom in ESG, investment institutions will evaluate clients’ ESG performance when evaluating their investments and lending. If a business fails to meet the ESG requirements, its reputation will be negatively affected, and financial institutions may increase the interest rates on loans or even refuse to provide loans to industries with high carbon emissions. Our assessment of the “reputation” risk is immediate but low.	Transition risk/ Reputation	
Formosa Petrochemical is a major water user, with a monthly water consumption of more than 1,000 m3. Stable water quality and sufficient water supply will directly have a significant impact on the stable production and excellent product quality of various products in our plants. To reduce the dependence of our products on water and increase their competitiveness, we have continued to invest in the implementation of energy conservation and water consumption reduction projects to reduce costs. We implemented 50 water consumption reduction and improvement projects in 2021. The daily water consumption reduced reached 5,691 tons with an annual benefit of NT\$26.39 million.	Opportunities/ Adaptability	
Considering the product life cycle and product value chain, we had invested an average of NT\$540 million in R&D to develop low-carbon products between 2017 and 2020. We have made improvements in three aspects: reducing the consumption of raw materials, improving the process, and reducing transportation in the supply chain, while adopting the concept of a circular economy by recycling and recovering the exhaust gas and waste from the processes to reduce production costs and promote the sustainable use of resources as well. 1. With the pyrolysis technology, we convert waste plastics into cracked fuel oil, which is fed to the olefins plant to produce certified low-carbon products, such as low-carbon ethylene and propylene. 2. The global market for recycled plastics and waste plastics continues to grow, with great development potential. 3. Biomass energy is used, e.g., biomass naphtha can be used as one of the sources of materials for olefins plants, to produce internationally certified biomass by-products, such as ethylene, propylene, or C4.	Opportunities/ Adaptability	
Formosa Petrochemical’s production process requires a stable and large supply of high-quality water resources. Formosa Petrochemical’s production plant is located in Mailiao and the water for production is mainly obtained from the Jiji Barrage. At the beginning of 2017, we had analyzed between 2021–2040 (i.e. medium- and long-term range defined by Formosa Petrochemical) through four pathways (RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5) under RCPs (Representative Concentration Pathways) - analytical software on relevant scenarios of climate changes, where the most severe scenario of shortage in water resources faced by the plant would be a reduction of annual rainfall by 49.27%. Therefore, we have formulated water resource management strategies at the early stage of the establishment, including various water consumption reduction projects, wastewater reuse projects, rainwater reuse projects, and a project establishment of a desalination plant with a capacity of 100,000 tons/day implemented in recent years, to gradually reduce the Mailiao plant’s dependence on water resources and cut production costs. These measures also bring opportunities for Formosa Petrochemical, reduce our operational risks, and increase our competitiveness.	Physical risk/ Seasonal	
The average rainfall decreases from 2021 through 2040 (when the maximum change is RCP6.0 and the maximum decrease is 49.27% in Yunlin) 1. Torrential (heavy) rain occurs most often in the plum rain season from May through June, the typhoon season from July through September, or convectional rainfall caused by fronts in spring and autumn or strong southwesterly airflows in summer. 2. Due to global climate change, the frequency of extreme weather events (such as heavy rainfall/flooding) is increasing, and equipment may be flooded and damaged due to torrential rains, which will affect the stable operation of the process and cause losses when the operations are halted.	Physical risk/ Acute	

Climate Issues	Impact analysis	Level of risks/ opportunities
Potential impact on company/organization	Issue category	Risk level
Current risk or opportunity analysis		
<p>Estimation of the Mailiao Plant with 1986–2005 as the base period</p> <p>The recent (2016–2035) climate conditions in RCP4.5 and RCP8.5: the maximum days of consecutive rainfall is 7.5–7.7 days, 1078 mm–1085mm; the total rainfall increases by 15% compared with the average; in the RCP8.5 scenario, the number of typhoons in Taiwan decreases by 15%, the percentage of strong typhoons increases by 100%, and the typhoon rainfall increases by 20%.</p> <ol style="list-style-type: none"> 1. Considering the impact of water shortage or drought caused by abnormal climate events, it is necessary to take relevant water consumption reduction and improvement measures for the processes, or adopt water-saving processes or equipment, which will lead to an increase in the investment cost of improving or updating equipment. 2. If we are unable to reduce the production of each process when water resources are limited, the production load of the process will decrease or the production will be halted in the event of a serious water shortage. 	Physical risk/ Acute	
<p>Estimation of the Mailiao Plant with 1986–2005 as the base period</p> <p>The recent (2016–2035) climate conditions in RCP4.5 and RCP8.5: the maximum days of consecutive rainfall is 7.5–7.7 days, 1078 mm–1085mm; the total rainfall increases by 15% compared with the average; in the RCP8.5 scenario, the number of typhoons in Taiwan decreases by 15%, the percentage of strong typhoons increases by 100%, and the typhoon rainfall increases by 20%.</p> <ol style="list-style-type: none"> 1. Typhoons are representative of extreme climate events in Taiwan. Around three to four typhoons strike Taiwan every year on average as per the statistics. The direct property loss caused by weather disasters in Taiwan is roughly NT\$15 billion per year on average, of which typhoons account for about 85%. 2. Typhoons are representative of extreme climate events in Taiwan. Affected by global climate change, Taiwan is facing increasingly stronger typhoons. Take 2020 as an example. Taiwan issued a total of five typhoon warnings. The Formosa Petrochemical production plant is located at the seaside of Mailiao. The typhoons were all classified as strong typhoons in terms of wind and rain. Our equipment may be damaged due to the strong winds and torrential rains, affecting our production. 	Physical risk/ Acute	
<p>In pursuit of sustainable development, we carry out risk management, corporate social responsibility, and climate change adaptation initiatives through the Sustainable Development Promotion Team. In response to climate change, we make every effort to reuse raw materials, water resources, energy, and waste across plants and companies to strive toward the goals of energy conservation, emission reduction, resource integration, and zero waste. In recent years, we have continued to enhance resource efficiency and reduce our operating costs, while reducing greenhouse gas carbon emissions due to the possibility of recovering process waste heat or exhaust gas in the plants, to achieve Formosa Petrochemical’s sustainable development goals.</p> <p>The excess process gas produced from Formosa Petrochemical’s processes was originally sent to the flare tower for combustion before being emitted. After the Company’s integration of energy resources across plants, the excess process gas is recovered to the boilers of Utility Plants 3 and 4 to partially replace coals. From 2013 through 2021, we had recovered a total of 1.01 million tons of excess process gas, which can reduce greenhouse gas emissions by roughly 321,000 tons and the coals by around 447,000 tons per year on average. If calculated at US\$150 per ton of coals, a cost of coals of around NT\$2.01 billion can be reduced.</p>	Opportunities/ Adaptability	

Types of risk recommended by the TCFD	Relevance and inclusivity	Impact of risks and opportunities on the Company
Existing regulations	Relevant and inclusive	<p>In the existing regulations, the Yunlin County Government announced the Air Pollutant Emission Standard for Electrical Facilities, and Formosa Petrochemical works to improve the process according to the regulatory requirements. Such standards will affect the operations of our power plants. For example, after the MP1 unit in Utility Plant 1 is added with a media gas-gas heater (MGGH), the MGGH lowers the temperature of the smoke from 150° C to 105° C before the electrostatic precipitator (EP) is in action, which can reduce the power consumption of the induced draft fan by 20 kWh/hour, an equivalent of a reduction of CO₂ by 131 tons/year.</p>
Emerging regulations	Relevant and inclusive	<p>Among the emerging regulatory risks, to meet the national voluntary reduction target, the EPA announced the draft of the Emission Performance Standards for Greenhouse Gas Emission Sources. The draft is available to the public. It specifies the efficiency standards for first-time applicants and encourages the continuous reduction by the parties under management when the total amount control is imposed in the future. The draft rewards businesses that implement plant-wide carbon reduction initiatives. It is an absolute reduction concept.</p> <p>As Formosa Petrochemical is a party under total greenhouse gas amount control in the future, emerging regulations are very relevant and always included in risk assessments.</p> <p>Although Taiwan has implemented total greenhouse gas control and established a greenhouse gas trading platform, which has not yet been opened for trading. Formosa Petrochemical estimates that the government will impose total amount control and implement an open carbon trading mechanism in three years. Therefore, the Company will implement the internal carbon pricing mechanism in 2022 with reference to the draft of the Climate Change Response Act in terms of carbon fees and charges for excessive carbon emissions. We will begin to include the planning of investments in energy conservation and carbon reduction projects to cope with the formation of a domestic carbon trading market in the future in advance.</p>
Technology	Relevant and inclusive	<p>Technological developments and/or the emergence of disruptive technologies may affect Formosa Petrochemical's performance. For example, if these technologies are for greenhouse gas emissions and carbon capture, utilization, and storage, when Formosa Petrochemical cannot catch up with our competitors in terms of innovation, there is a risk of competition. The Company had a CO₂ capture and reuse project at the Mailiao Plant in conjunction with National Tsing Hua University. We are developing projects with the aim of obtaining more value from our processes. Therefore, technology development is an important aspect of the risk assessment by the risk management department.</p>
Litigation	Relevant and inclusive	<p>Formosa Petrochemical's legal department monitors all lawsuits. There were two lawsuits in 2021, but none of them were related to climate change. The legal risks caused by climate change are not strongly relevant. According to the past experience, different disputes will arise due to the standards and regulations under the future greenhouse gas reduction and management regulations. The Company will file lawsuits to strive for rights and interests if necessary, so lawsuits are included in the assessment. However, emerging risks may be considered before a lawsuit occurs, and countermeasures will be formulated.</p>
Market	Relevant and inclusive	<p>It is estimated that electric vehicles will partially replace fossil fuel vehicles in the market by 2025, which will reduce the oil demand by 300,000 barrels per day; electric vehicles will reduce the consumption of 1.3 million barrels of oil per day by 2040. Oil products account for around 67.2% of Formosa Petrochemical's revenue, and the development of electric vehicles will likely affect our revenue. Formosa Petrochemical has begun to evaluate and invest in high value-added petroleum by-products since 2017 to alleviate the impact of a shrinking oil market in the future. We researched and developed the application of C4 and C5 downstream products for our naphtha cracker plants. We have worked with Idemitsu Kosan Co., Ltd., Japan's second-largest petroleum company, and Kraton, a U.S. business, to invest in high-value petrochemical applications. Kraton Formosa Polymers Corporation is our first high-value petrochemical investment project and is also the only plant that produces hydrogenated styrenic block copolymers (HSBC) in Taiwan. Kraton Formosa Polymers Corporation went into production at the end of 2017, with an annual output of 40,000 tons of HSBC and an annual output value of around NT\$4.5 billion, including medical-grade soft and hard tubes (blood transfusion tubes and infusion tubes), medical film materials, high-end bicycles, and golf club grips. It is to reduce the impact of electric vehicles on the gasoline and diesel market and reduce the percentage of motor oil products in our revenue. In addition, Formosa Petrochemical and Japan Idemitsu Kosan Co., Ltd. jointly established Idemitsu Formosa Specialty Chemicals Corporation to produce hydrogenated hydrocarbon resins (HHCR). It is responsible for the manufacturing and sales of HHCR, which is mainly used as an adhesive for sanitary products, such as disposable diapers. In response to climate change, we have turned to investing in high value-added petroleum by-products to reduce the impact of a shrinking oil market in the future and move toward sustainable development.</p>

Types of risk recommended by the TCFD	Relevance and inclusivity	Impact of risks and opportunities on the Company
Reputation	Relevant and inclusive	The greenhouse effect is one of the main reasons for global climate change, and the petrochemical energy is not the only reason for the aggravation of the greenhouse effect but is the most important factor. The Company is among the top 10 sources of greenhouse gas emissions in Taiwan, accounting for about 10% of the greenhouse gas emissions. The external entities evaluated companies' ability to manage greenhouse gases with reference to the results of the CDP questionnaires and questioned the industry's high CO ₂ emissions, which affects Formosa Petrochemical's reputation and indirectly affects investors' investment willingness. Therefore, the reputation risk is relevant to the Company, so we have included reputation in the risk assessment.
Acute physical	Relevant and inclusive	Formosa Petrochemical has included extreme physical risks in the climate-related risk assessment and continues to pay attention to the extreme physical risks the Company encounters. With reference to various monitoring data and research reports at home and abroad, we evaluate the risks posed to the Company's operations and take countermeasures to reduce extreme physical risks posed to the Company's operations. For example, extreme weather events in Taiwan include frequent natural disasters, such as typhoons and torrential rains, which in turn cause damage to our process equipment, e.g., the Company's flare tower was damaged by a typhoon, resulting in reduced production capacity. Therefore, extreme physical risks are very relevant to the Company and are always included in the risk assessment.
Chronic physical	Relevant and inclusive	Formosa Petrochemical has included chronic physical risks in the climate-related risk assessment. With reference to various monitoring data and research reports at home and abroad, we evaluate the risks posed to the Company's operations and take countermeasures to reduce chronic physical risks posed to the Company's operations. For example, the Company needs 46 million tons of water from the Jiji Weir every year, which accounts for 5% of the water used in the Jiji Weir in the non-dry season and 6.5% in the dry season. There is often a risk of water shortage due to droughts in winter. Therefore, we plan to build a desalination plant with a daily capacity of 100,000 tons to cope with droughts in winter. Therefore, chronic physical risks are relevant to Formosa Petrochemical and are taken into account.

2.5 Analysis of climate change scenarios

Formosa Petrochemical referred to the scenario model used to analyze the NDC targets by government agencies and provided the analysis results to the Formosa Petrochemical ESG Promotion Team as the basis for strategic planning of risk and opportunity identification, assessment, and management. Details of identified risks and opportunities and associated financial impacts and management approach are as follows:

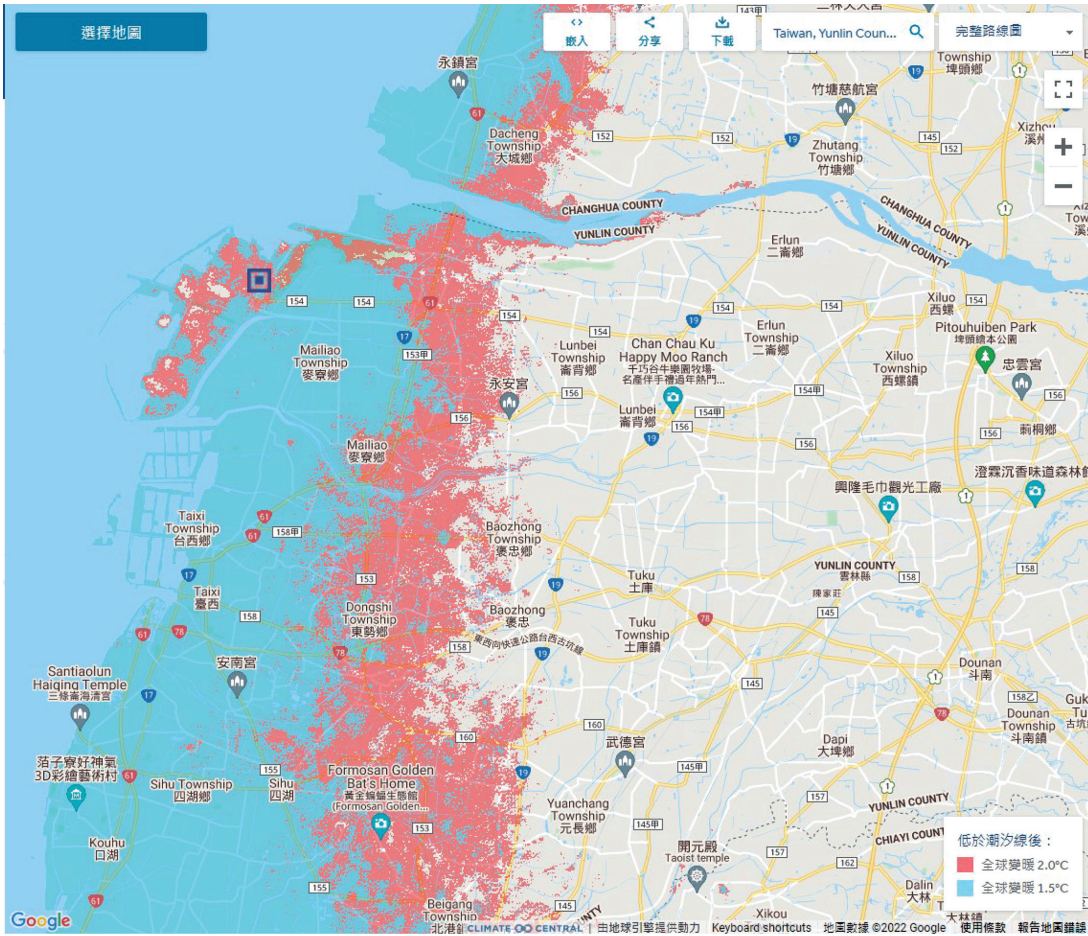
Formosa Petrochemical mainly adopted the climate change scenario models of RCP 2.6, RCP4.5, RCP 6.0, and RCP 8.5 for future simulation with reference to the IEA WEO 450 Scenario (2016) and the NDCs at all manufacturing sites. In Taiwan's Intended Nationally Determined Contribution (INDC) report, the greenhouse gas emissions are set to be reduced by 50% by 2030 based on the business-as-usual (BAU) scenario. In this scenario, the power generation structure in 2025 will be 20% for renewable energy, 30% for coals, and 50% for gases. After the above scenarios are imported, the impact on the Company is analyzed in terms of market, technology, reputation, finance, and operations in the future.

As for physical risks, with reference to World Bank's Climate Change Knowledge Portal, Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), and National Science & Technology Center for Disaster Reduction, the temperature rise and rainfall between 2020 and 2040 in the scenarios of RCP2.6, RCP4.5, and RCP8.5 are estimated.

Table 2.5-1 Table of climate change scenarios

Physical risk scenario Mailiao Plant	Rising sea levels Impacted	Below-tidal-line area (risk of flooding) Partially impacted	Area below the 2050 flood line Impacted
Average drought length 2 months	Rise in temperature 2.59	Total rainfall 1,085mm	Maximum rainfall intensity Maximum 7.5 days of consecutive rainfall

Figure 2.5-1 Simulation of sea level rise in 2050 in the Mailiao Plant in the RCP 8.5 scenario



資料來源：<https://coastal.climatecentral.org/>

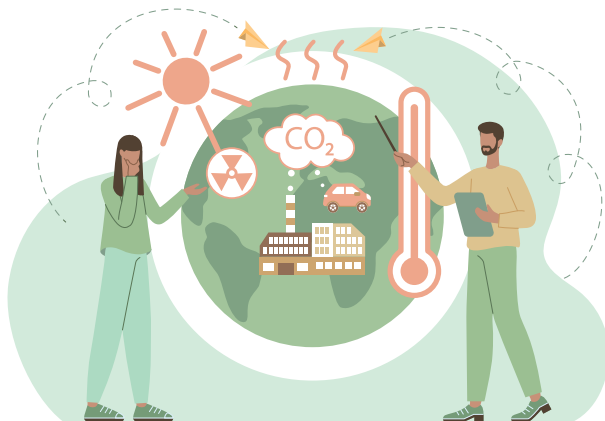


Figure 2.5-2 Simulation of the area below the tidal line in the Mailiao Plant in 2050

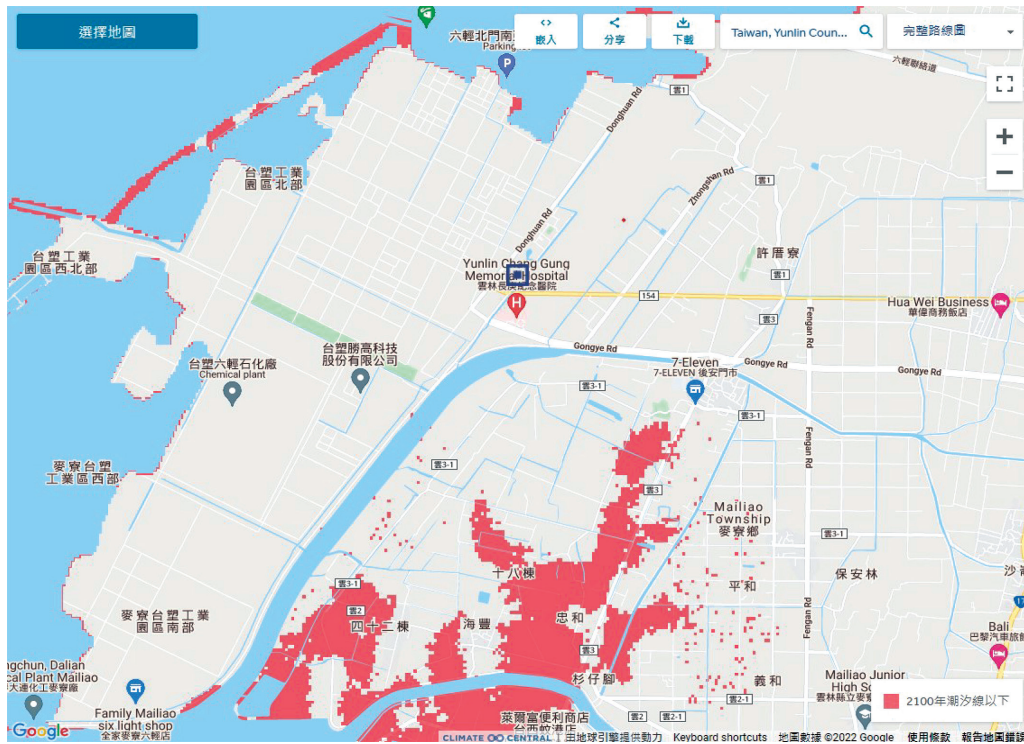
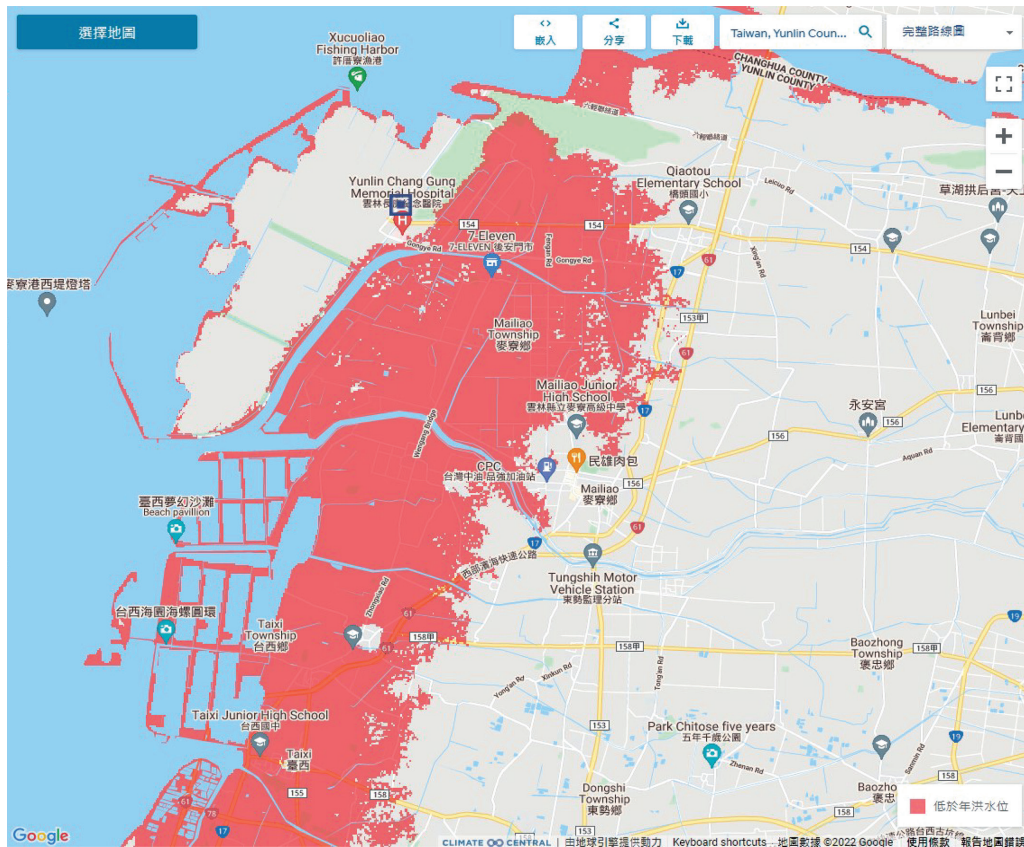


Figure 2.5-3 Simulation of flood water level in the Mailiao Plant in 2050



3 Strategy

With the goal of achieving carbon neutrality by 2050, we will continue to implement low-carbon measures, reduce energy consumption per unit of product, and establish (invest in) green energy power generation facilities to transition to a low-carbon economy. The table below shows Formosa Petrochemical’s short-, medium-, and long-term reduction targets:

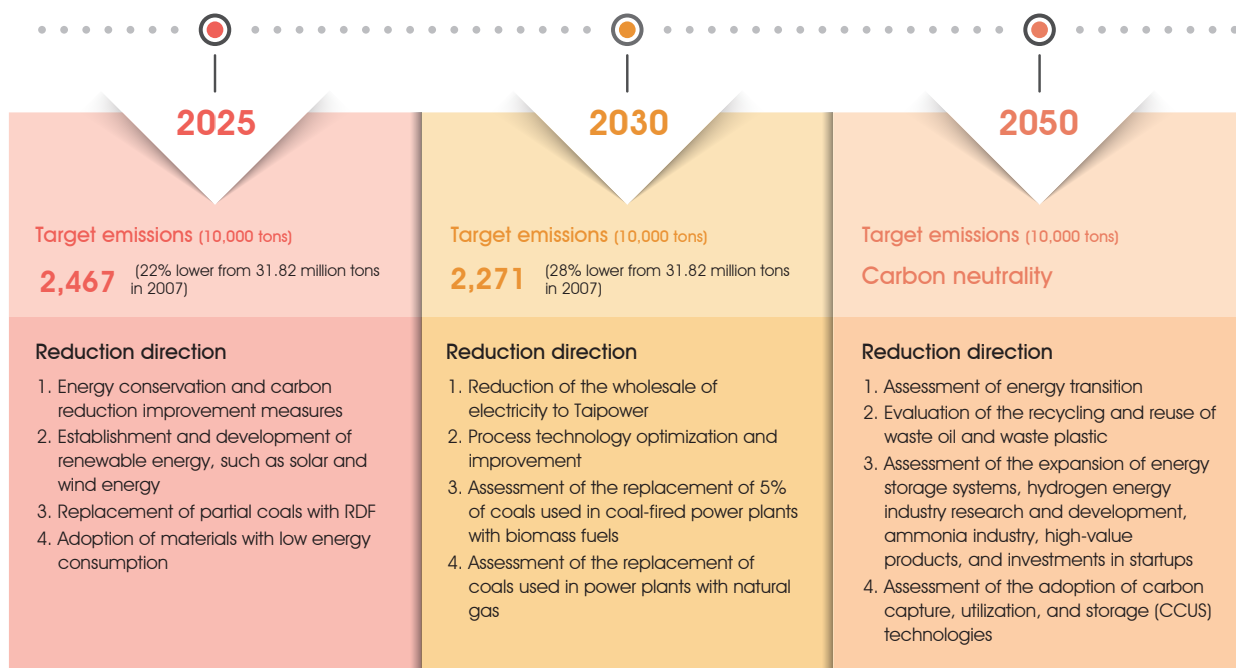
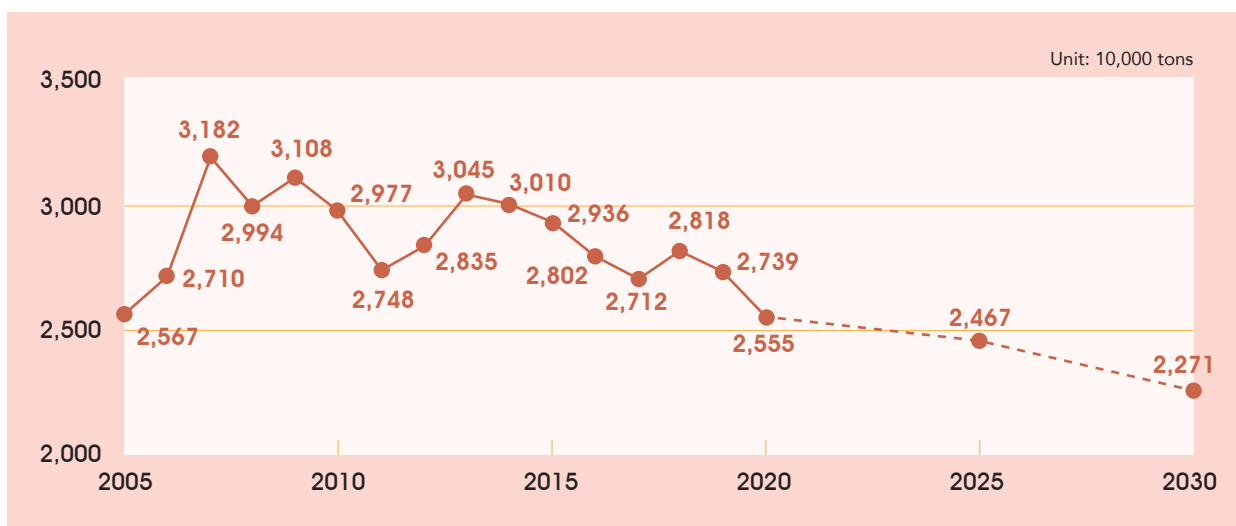


Figure 3.1 Formosa Petrochemical’s greenhouse gas emission trend (2005–2030)



To achieve carbon neutrality by 2050, we have formulated five strategies, namely process energy reduction, equipment efficiency improvement, heat recovery, energy management, and green power, which are further described below. The short-term strategic plan from 2021 through 2025 is shown in Table 3.2 Specific carbon reduction strategies between 2021 and 2025. The strategies implemented in 2021 have led to a reduction of carbon emissions by about 173,524 tons. The implementation result of each strategy is shown in Table 3.3 Carbon reduction strategy performance in 2021.

3

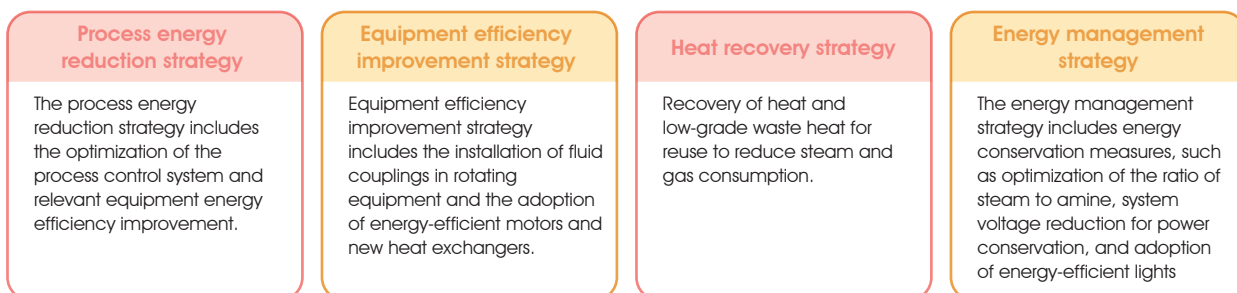


Table 3.2 Specific carbon reduction strategies between 2021 and 2025

Year	Promotion Strategy	Item Description
2021 年	Process energy consumption reduction	Oil refinery plant WOU running section with hydrogen reduction, PRU#1 unit reduce the flare usage during maintenance.
	Equipment efficiency improvement	Utility II UPA MGGH using variable-frequency circulating pump with additional installation of filter to save energy, UPA IDF(B) with additional installation of hydraulic shaft to improve energy saving
	Waste heat recovering	Oil refinery plant ISO unit hydrogen supply pipe modification to increase feeding temperature in order to reduce fuel usage, oil refinery plant RDS#1 Unit diesel output waste heat recovered with steam production improvement
	Energy management	Oil refinery plant HDS#1 Unit amine production optimized operation for steam saving/electricity saving improvement, RDS#2 P-3705B turbine shaft seal steam saving improvement
	Green power	Solar power generation
2022 年	Process energy consumption reduction	Oil refinery plant GHU#1 unit C-6710 stripping tower with automatic control improvement, RCC#2 PRT high pressure steam consumption optimization improvement
	Equipment efficiency improvement	Oil refinery plant Oil division ECT submersible pump energy saving improvement (P-8208), GHU#2 C-6770AI operation navigation steam saving improvement
	Waste heat recovering	Oil refinery plant SRU#4 unit E-6919 steam recycling during startup and shutdown, Utility I MP2 MGGH with additional heater for boiler water to reduce coal consumption.
	Energy management	Oil refinery plant HDS#2 Unit B-2201A with additional installation of stepless load increase for electricity saving improvement, oil refinery plant HVGO with additional installation of pipelines to E-9708 and aR for heat exchange
	Green power	Solar power generation
2023 年	Process energy consumption reduction	Oil refinery plant RCC unit LCO lean oil air cooler (E-5520F1) with electricity saving improvement, SHU#2 C4 separation tower operation optimization for steam saving improvement
	Equipment efficiency improvement	Utility IV CFB#1 steam turbine modification to increase the steam volume and efficiency
	Waste heat recovering	Utility I MP6 MGGH with additional installation of heat exchanger for water supply
	Energy management	Oil refinery plant CDU#2 Unit stripper with increased steam pressure for recycling and power generation
	Green power	Solar power generation
2024 年	Process energy consumption reduction	Olefin Plant I depanelizer tower C-720 feed divergence to reduce E-720 steam consumption, butadiene first extractive distillation tower operation optimization
	Equipment efficiency improvement	Oil refinery plant HYD#3 Unit naphtha P-2703A with impeller replacement for electricity saving improvement
	Waste heat recovering	Olefin Plant II V-120 system with additional installation of ORC waste heat recovering for power generation, Utility II UPB unit MGGH exhaust waste heat recovering for energy saving
	Energy management	Olefin Plant I with additional installation of P-701C for small volume use
	Green power	Solar power generation

Year	Promotion Strategy	Item Description
2025 年	Process energy consumption reduction	Olefin Plant I storage tank area equipment cooling water with improved divergence and independent system
	Equipment efficiency improvement	Utility II UPC FDF(A) energy saving blade improvement
	Green power	Solar power generation
	Search for biomass energies	Search for wooden particles and palm kernel shell as the biomass fuel (Utility assess the feasibility to co-fire 5%wt biomass with coal)
	Reduction of the wholesale of electricity to Taiwan Power Company	Utility with reduction of the wholesale of electricity to Taiwan Power Company
	Mass-burning of RDF	Utility IV co-fire 5%wt RDF with coal.
	Adoption of materials with low energy consumption	HHCR Plant with optimized process to use raw materials of low energy consumption

Table 3.3 Carbon reduction strategy performance in 2021

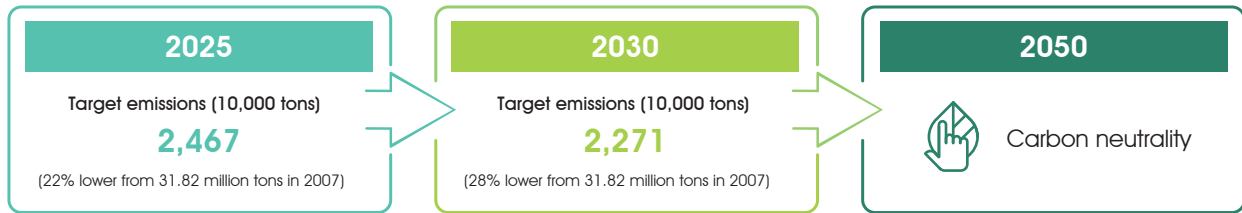
Promotion Strategy	Main Project Content	Carbon Reduction	Carbon Reduction Total	Number of Cases
Process energy consumption reduction	ARU5 stripper tower temperature reduction to save steam	17,432	78,414	86
	HYD2 methane gas feeding improvement to reduce the gas burning of the reformer furnace	14,412		
	UPB unit with additional installation of coal-burning control optimization system	23,430		
Equipment efficiency improvement	UPC unit with additional installation of coal-burning control optimization system	32,919	75,218	62
	#2 Oxygen factory main air compressor surge-prevention vibration revision and improvement	5,000		
	UPA IDF(A) with additional installation of hydraulic shaft energy saving improvement	2,630		
Waste heat recovering	DCU LCGO waste heat recovering	13,841	15,140	2
	ISOM C-6750 steam heated changed to condensed water heated	1,299		
Energy management	Newly installed one small air compressor B-930D	2,508	4,752	16
	HDS2 amine with optimized operation for steam saving/ electricity saving improvement	1,180		
	HDS1 amine with optimized operation for steam saving/ electricity saving improvement	475		
Total			173,524	166

4

Indicators and targets

4.1 Carbon neutrality by 2050

To transit to a low-carbon economy, we have adopted carbon neutrality by 2050 as our long-term target and have set short- and medium-term targets (short-term by 2025 and medium-term by 2030) to inspect the progress of our efforts. The timeline and target emissions are shown in the table below.



4.2 Information on greenhouse gas emissions

Formosa Petrochemical has been conducting greenhouse gas inventory in accordance with ISO 14064-1 since 2005, and entrusted BSI Taiwan to conduct relevant verifications. The greenhouse gas emissions in 2021 were still under investigation prior to the publication of this report. This report discloses the greenhouse gas emissions in 2020 with the inventory and verification completed. After the verification was completed in 2022, the data was reported and registered on the National Greenhouse Gas Registration Platform at the end of August in accordance with the EPA's Greenhouse Gas Emissions Inventory Registration Management Regulations. The greenhouse gas emissions from each plant disclosed in this report are the data for 2020, as shown in the figure below:

Table 4.2-1 Formosa Petrochemical's greenhouse gas emissions in 2020

Plant (metric ton/year)	Scope 1	Scope 2	Total emissions
Mailiao Plant 1	13,406,280	0	13,406,280
Mailiao Plant 2	4,706,921	228,526	4,935,447
Mailiao Plant 3	7,216,533	75,501	7,292,034
Taipei Storage and Transportation Station	15	15	15
Taoyuan Storage and Transportation Station	20	827	847
Changbin Blending Plant	10	604	614
Total	25,329,780	221,111	25,550,891

The Company has inspected the relevance with and the emission data of Scope 3 every year since 2019, and such data has been verified by a third party (please refer to Table 4.2-2 for details).

Table 4.2-2 Scope 3 emission indicator information in 2020

Scope 3 emission sources	Relevance	Emissions (ton of CO ₂ e)	Scope
Products and services purchased	Relevant and counted	7,410,727	The scope of this inventory is the emissions from the first-tier raw material suppliers' manufacturing, covering 100% of the main raw material suppliers.
Capital goods	Relevant and counted	151,985	The scope of this inventory covers 100% of capital goods in 2020.
Fuel and energy-related activities (not included in Scope 1 or 2)	Relevant and counted	2,068,870	The scope of this inventory covers 100% of fuel and energy activities not included in scope 1 or 2, such as the mining of coal, transportation of pyrolysis low sulfur fuel oil and natural gas..
Upstream transport and distribution	Relevant and counted	6,586,764	The scope of this inventory covers 100% of emissions from the first-tier raw material suppliers' transport activities.
Business waste output	Relevant and counted	12,882	The scope of this inventory covers 100% of the emissions from the disposal of business waste.
Business trips	Relevant and counted	52	The scope of this inventory covers 100% of the emissions from business trips by air.
Employee commuting	Relevant and counted	683	The scope of this inventory covers 100% of the emission from transportation services of vehicles used for employee commuting.
Upstream asset leasing	Irrelevant	-	Formosa Petrochemical does not engage in upstream asset leasing activities.
Downstream transport and distribution	Relevant and counted	699,385	The scope of this inventory covers 100% of products shipped to main clients.
Processing of sold products	Relevant and counted	8,508,673	The Company's products are usually upstream products. Formosa Petrochemical has identified that the existing products include naphtha, gasoline, diesel, aviation fuel, and base oil. Among them, naphtha and base oil are used in products in the value chains, such as food, medical care, agriculture, automobiles, and consumer goods. For example, we have more than 20,000 different clients in different areas for our products, and these clients' greenhouse emissions are very different. Clients will sell their products to a wider variety of end users. Gasoline, diesel, and aviation fuels are used in mobile transportation. After identification, gasoline, diesel, and aviation fuels are used in automobiles, scooters, and airplanes. There are no greenhouse gas emissions from the processing of sold products. Naphtha is processed into other products after being sold, and there are many such processed products, which cannot be identified and counted for now. The base oil is mainly reprocessed into lubricating oil, and the carbon emissions from the processing of sold products are mainly based on the carbon emissions from the processing of base oil into lubricating oil.
Use of products sold	Relevant and counted	30,105,075	The Company's products are usually upstream products. Formosa Petrochemical has identified that the existing products include naphtha, gasoline, diesel, aviation fuel, and base oil. Among them, naphtha and base oil are used in products in the value chains, such as food, medical care, agriculture, automobiles, and consumer goods. For example, we have more than 20,000 different clients in different areas for our products, and these clients' greenhouse emissions are very different. Clients will sell their products to a wider variety of end users. Gasoline, diesel, and aviation fuels are used in mobile transportation. After identification, gasoline, diesel, and aviation fuels are used in automobiles, scooters, and airplanes. Emissions from the use of sold products are based on the carbon emissions from the use of Formosa Petrochemical's products in automobiles, scooters, and airplanes.





4

Scope 3 emission sources	Relevance	Emissions (ton of CO ₂ e)	Scope
Final disposal of sold products	Irrelevant	-	The Company's products are usually upstream products. Formosa Petrochemical has identified that the existing products include naphtha, gasoline, diesel, aviation fuel, and base oil. Among them, naphtha and base oil are used in products in the value chains, such as food, medical care, agriculture, automobiles, and consumer goods. The range is too wide to quantify the emissions associated with the disposal of the end products.
Downstream asset leasing	Irrelevant	-	Formosa Petrochemical does not engage in downstream asset leasing activities. None of the downstream assets leased generated additional greenhouse gas emissions in 2020.
Franchising	Irrelevant	-	Formosa Petrochemical does not have franchise rights.
Investment	Irrelevant	-	Investments are mostly in specific product innovation activities with limited impact. Therefore, we believe that this category is irrelevant to the three scopes.
Others (upstream)	Irrelevant	-	Formosa Petrochemical has not considered other relevant upstream greenhouse gas emission sources in the assessment of greenhouse gas emission sources.
Others (downstream)	Irrelevant	-	Formosa Petrochemical has not considered other relevant downstream greenhouse gas emission sources in the assessment of greenhouse gas emission sources.



Appendices 1: Report management

- This report covers the period from January 1, 2021 to December 31, 2021.
- Frequency of report preparation: Annually.
- Correspondent of the report

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Appendices 2: TCFD Index

Core Elements	Recommended Disclosures	Pages
Governance	Describe the board's oversight of climate-related risks and opportunities.	P2-5
	Describe management's role in assessing and managing climate-related risks and opportunities.	P2-5
Strategy	Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	P19-21
	Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	P19-21
	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2° C or lower scenario.	P16-18
Risk Management	Describe the organization's processes for identifying and assessing climate-related risks.	P6-P7
	Describe the organization's processes for managing climate-related risks.	P8-P16
	Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	P8-P16
Metrics and Targets	Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	P22-P24
	Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	P22-P24
	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	P22-P24



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