



Powertech Technology Inc.

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# 2022 TCFD Report



## ■ About the Report

The TCFD Report is based on the Task Force On Climate-related Financial Disclosures (TCFD) published by the Financial Stability Board (FSB), which discloses four core elements: "Governance", "Strategy", "Risk Management" and "Metrics and Targets". The Report is published in both English and Chinese and is available on the official website of PTI. If you have any feedback, advice, or suggestion, please feel free to contact us.

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All photos presented in the Report were taken from PTI's events or photography competitions.

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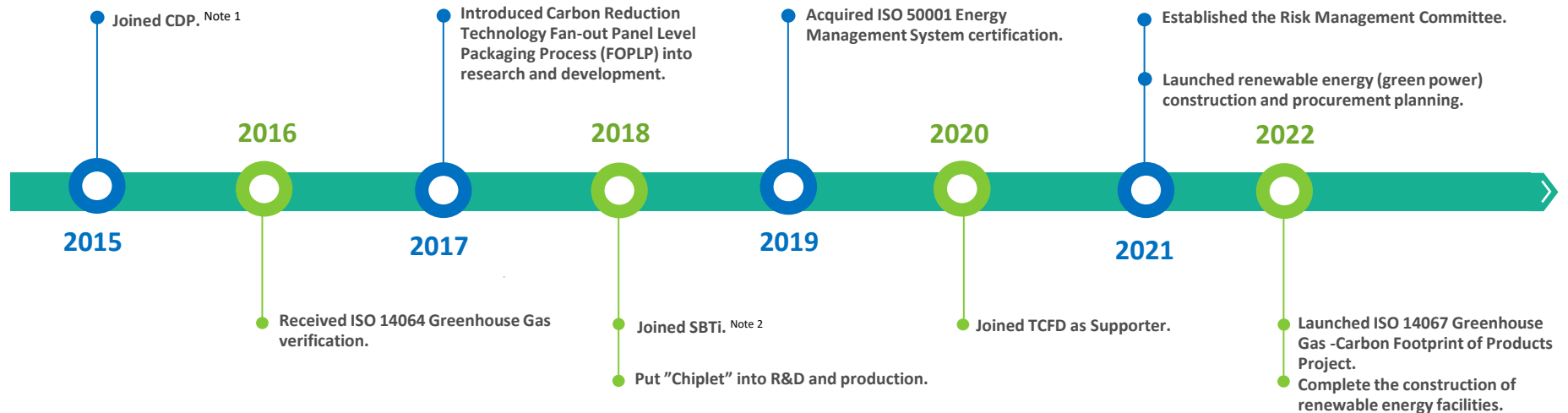
# 1 Preface

Climate change caused by global warming is a crisis faced by all mankind and an issue that the international community attaches great importance. Faced with the threat of extreme weather, PTI has been actively involved in environmental protection initiatives. Since 2015, it has participated in the climate change project initiated by CDP, revealing climate change and water resources questionnaires; officially signed in July 2020 become a supporter of "Task Force on Climate-related Financial Disclosures (TCFD)", support climate adaptation governance, propose climate risk and opportunity identification based on the TCFD framework every year, and measure climate transition and physical oriented to global risks and opportunities, formulate environmental management policies and implement

measures to adapt and mitigate the impact of climate change, reduce environmental hazards, and ensure the sustainable development of enterprises.

In recent years, in order to curb the threat of climate change, "carbon reduction" has become the top priority. PTI has formulated a Net Zero Roadmap in 2022, promising to improve "Clean Technology (Clean Tech)", "the use of renewable energy" and "energy conservation and carbon reduction" in parallel, joining hands with employees, customers and suppliers to move towards the goal of net zero in 2050.

## The Climate Change Response Milestone of PTI



Note 1: Carbon Disclosure Project (CDP), which invites companies to complete questionnaires designed by CDP to disclose their greenhouse gas emissions and strategies for addressing climate-related investment risks and opportunities.

Note 2: The Science Based Target initiative (SBTi) is a joint effort between the CDP, the UN Global Compact, the World Resources Institute and the World Wildlife Fund (WWF). It is based on a scientific approach and a weighted calculation of a reasonable amount of emissions (carbon reduction) for a specific industry and a specific company in a global carbon budget scenario.

## Strengthening Climate Resilience - TCFD Report

Faced with the possible impact of climate change on operations, with the support of senior executives, PTI implements climate-related risks and opportunities in accordance with the framework of the "Task Force on Climate-related Financial Disclosures Recommendations (TCFD Recommendations)" to identify and assess climate change risks and responses across organizations.

PTI regularly holds the "Climate Change Risk and Opportunity Workshop" every year, identifies and ranks risks and opportunities for issues such as policies, regulations, markets, technologies, reputation, and physical risks, and formulates response measures based on the identification results to reduce the impact of climate risks and strengthen climate resilience.

### ● PTI TCFD Framework

#### Governance

- The Board of Directors regularly reviews the risks and opportunities associated with climate change.
- The Risk Management Committee regularly reports to the Board of Directors concerning the assessment and management of relevant risks and opportunities.

#### Strategy

- Conducted short, medium, and long-term climate risks and opportunities through cross-departmental discussions.
- Evaluated the impact of major risks and opportunities on company operations and finances.
- Identified risks and opportunities for impacts under different climate change scenarios.

#### Risk Management

- Established management mechanisms and countermeasures for major risks and opportunities, and report regularly to the Board of Directors and management team on the effectiveness of implementation.
- Evaluated future management measures and monetize the resources required to calculate financial costs.
- Organized workshops to strengthen the employees' climate change awareness.
- Described how climate risk identification, assessment and management processes are integrated into the overall risk management system.

#### Metrics and Targets

- Developed management objectives for climate change risks and opportunities and regularly review progress and performance.
- Followed the ISO 50001 standard for energy management to reduce energy consumption.
- Determined the scope of the inventory after regular reviews of potential sources of carbon emissions with the materiality principle based on ISO 14064-1 standards.
- Based on PTI's Net-Zero Roadmap, review renewable energy use targets and carbon reduction targets.
- Practiced "Clean Tech" to face the impacts of extreme weather.
- Conducted ISO 14067 Carbon Footprint Verification and energy saving and carbon reduction measures to implement carbon reduction.





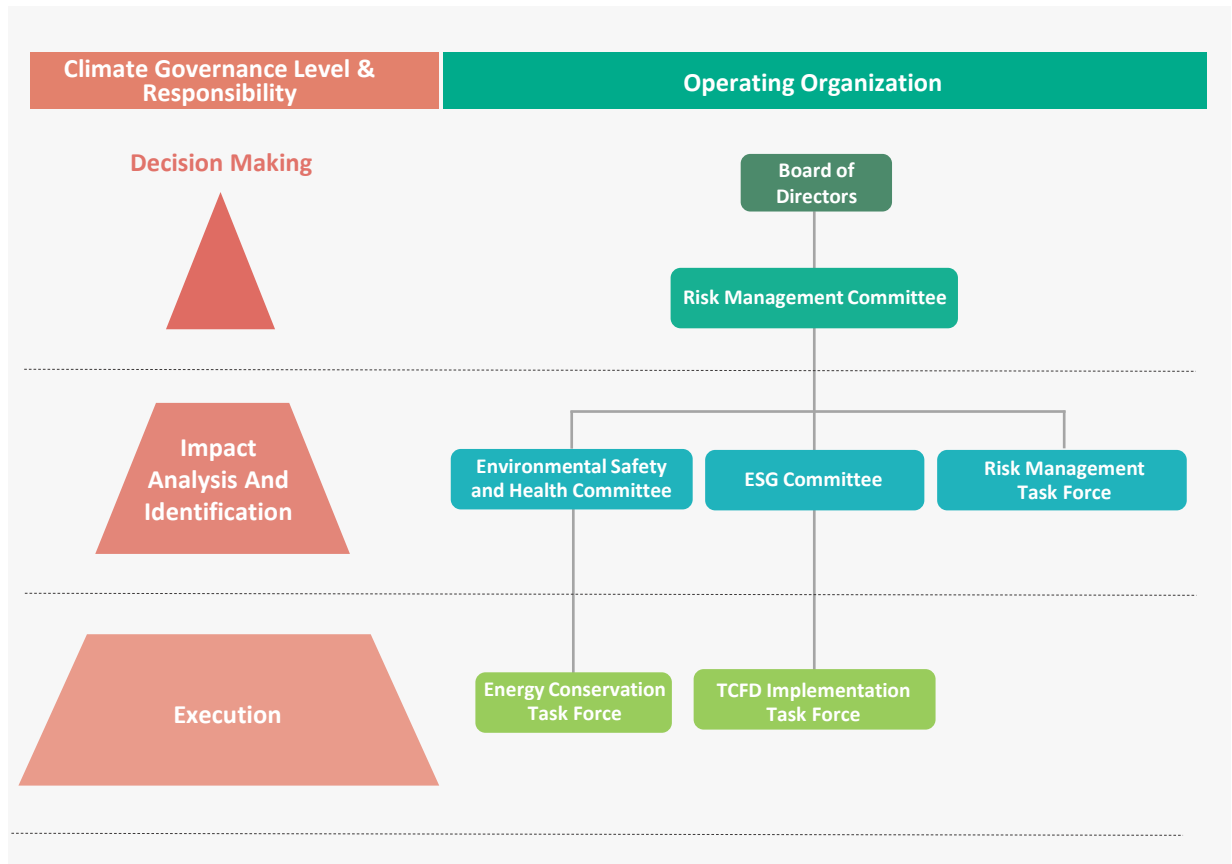
## 2 Climate Governance

PTI attaches great importance to the governance function of the senior management for corporate sustainability. We established climate risk identification and response procedures, completing the operating mechanism of climate governance by the approach of "top-down command and supervision, bottom-up response and report". Every year, regularly report the implementation of issues such as sustainability and climate change to the board of directors and various inter-organizational committees, and continue to strengthen the organization's resilience in the face of climate change.



### Operating Model

In response to climate impacts, PTI mitigates the impacts of climate change on business operations through the risk identification and cross-functional communication.



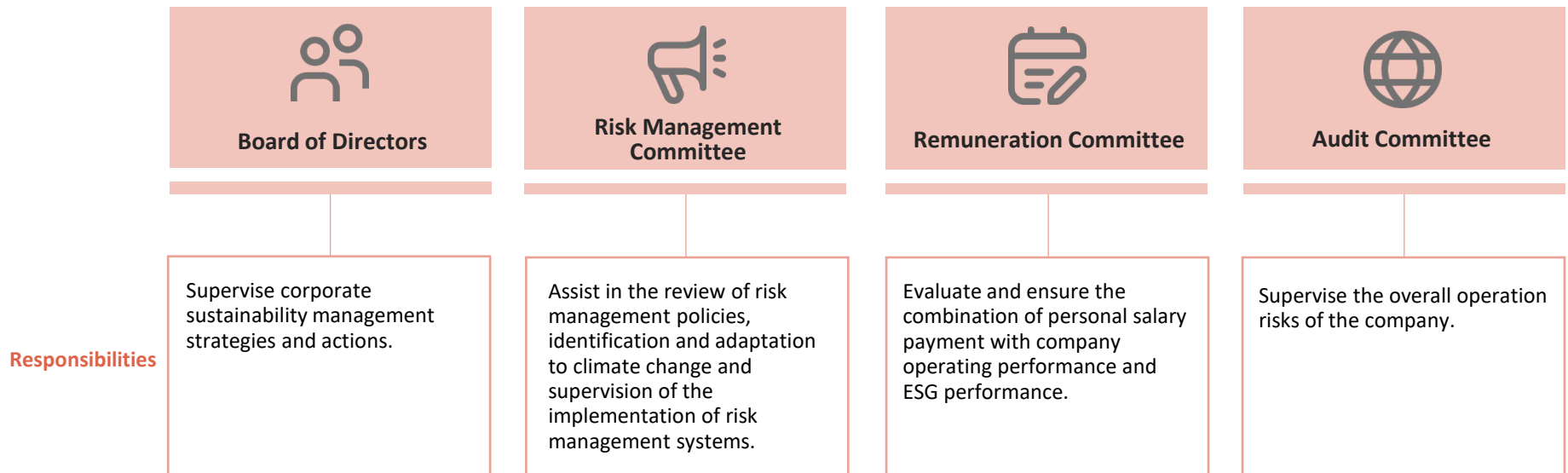
## 2.1 Board of Directors Participation and Operating Organization

PTI pays attention to sustainable development issues and attaches great importance to shareholders' rights and interests. The climate risk management organization takes the board of directors as the highest management and decision-making unit. There are 11 members of the board of directors, including 4 independent directors. The main responsibilities are to approve the company's business plan, financial report,

to formulate important rules and regulations, to approve major investment cases, to supervise the risks and the impact of climate change, etc., affecting the company's operations, and to formulate strategies and response measures. A total of 5 board meetings were held in 2022, and a number of important proposals were passed. In promoting climate change and sustainable

management strategies, the board of directors plays the role of supervision and command. Under it, there are the Audit Committee, the Remuneration Committee and the Risk Management Committee to assist in supervising the company's sustainable development and climate change related management actions, and regularly report the resolutions to the board of directors.

### Climate Risk Operating Organization Responsibilities



## 2.2 Responsibilities and Roles of the Management

In the promotion of carbon reduction, environmental sustainability and other issues, in addition to the support of senior management, the participation and cooperation of all units are also required. Taking sustainable goals as the longitude and cross-functional organizations as the latitude, PTI outlines the content of environmental sustainability comprehensively in all aspects. It offers senior executives and management with a glimpse of the whole picture, providing effective support and cooperation.

### Responsibilities of Climate Risk Management

	Risk Management Task Force	ESG Committee	Environmental Safety and Health Committee
Meeting Frequency	Meetings are held quarterly, and relevant content is reported to the Risk Management Committee.	Meetings are held quarterly, and reported to the Board of Directors.	Meetings are held quarterly.
Responsibilities	In order to operate climate governance smoothly, a "Risk Management Task Force" was established under the Risk Management Committee. It operates in the form of task grouping. The president serves as the team leader, appoints a deputy team leader, and the corporate governance supervisor serves as the executive secretary. Quarterly meetings are held to discuss risk issues, including the impacts and hazards of extreme weather on the company's operations. Submit relevant contents to the risk management committee for discussion to implement the effectiveness of risk management.	<p>To discuss corporate sustainable development management affairs, the president acts as the convener, and the Sustainability Management Office acts as the executive secretary, assisting in the promotion of sustainable development policies, goals and other related businesses, and communicating and discussing issues of concern to stakeholders.</p> <p><b>"TCFD Implementation Task Force"</b> The Sustainability Management Office acts as the convener to carry out TCFD climate-related risk and opportunity identification every year, compiling the results of identification to report in the "ESG Committee" and provide them to the management team as decision reference.</p>	<p>President acts as the convener and is responsible for the research and discussion of industrial safety and environmental protection related matters to prevent occupational accidents and pollution incidents, improve the safety and hygiene of the working environment, and strengthen environmental safety and health management. Meeting are held once a quarter, the discussion includes climate change and environmental protection issues, e.g. formulating environmental and energy-saving performance indicators, tracking and improving greenhouse gas inventory results.</p> <p><b>"Energy Conservation Task Force"</b> The Factory Affairs Department acts as the convener, conducts discussions and discussions on energy conservation issues and energy management in each factory area every year, and compiles and provides annual energy conservation statistics in the report of the Industrial Safety and Environmental Protection Committee.</p>

## 3 Climate Risk and Opportunity Management

The identification of climate change risks and opportunities at PTI is processed by the Sustainability Management Office which serves as the convener. After integrating external information and the Company's operation conditions to create climate risk and opportunity assessment items, it assembles personnel from plant engineering, ESH, R&D, sales, supply chain management, legal affairs and finance to convene the TCFD Workshop to review and discuss evaluation items for risks and opportunities. 9 climate change risks and 6 climate change opportunities were identified in 2022: 2 were high-risk factors and 2 were major opportunities while the others were low-risk factors and opportunities. PTI will continue to focus on the changes in related trends and issues.

Through the TCFD implementation task force and cross-departmental communication and discussion, PTI conducts climate risk and opportunity identification in consideration of the company's current operating conditions and scenario 2°C. Evaluate according to the probability of occurrence and the degree of impact, quantify the possibility and the degree of impact, and produce a climate risk and opportunity matrix.

### Climate Scenario Setting

Climate-related risks and opportunities impact PTI's strategic and financial planning, and we use quantitative and qualitative climate-related scenario analysis to inform our response strategies. PTI refers to the 2°C scenario (2DS), 1.5°C scenario and Representative Concentration Pathway Scenario (RCP), etc., discusses them in the project meeting, and conducts climate change risk and opportunity and other issues assessment.

### Identification of Climate Change Risks and Opportunities

#### Step 1

The Task Force collects issues and produces the list for evaluating climate risks and opportunities.

#### Step 2

Identify climate risks and opportunities.

#### Step 3

Assess the climate risk and opportunity impact level / likelihood of occurrence.

#### Step 4

Rank the climate risks and opportunities.

#### Step 5

Produce the risk and opportunity matrix.

#### Step 6

Formulate response strategies.

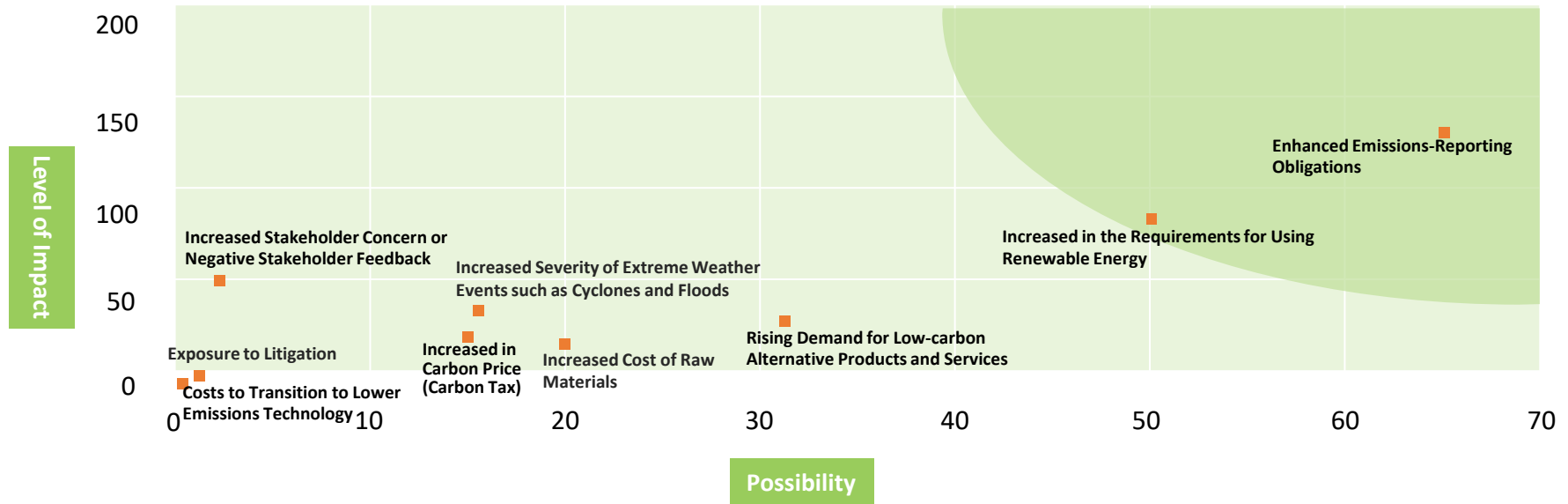




### 3.1 Climate Risks Identification

PTI assesses the impact of climate-related risks and opportunities on the company, and ranks the risks according to the importance of the relevant risks; proposes response strategies for the climate-related risks and opportunities faced. For the risk part, we carry out management and control measures for two high-risk factors, and conduct resource inventory for the response measures. The result of the risk matrix shows that the first two major risks mainly focus on the category of "policies and laws", which are "enhanced emissions-reporting obligations" and "increase in the requirements for using renewable energy" in order.

#### Climate Risks Matrix



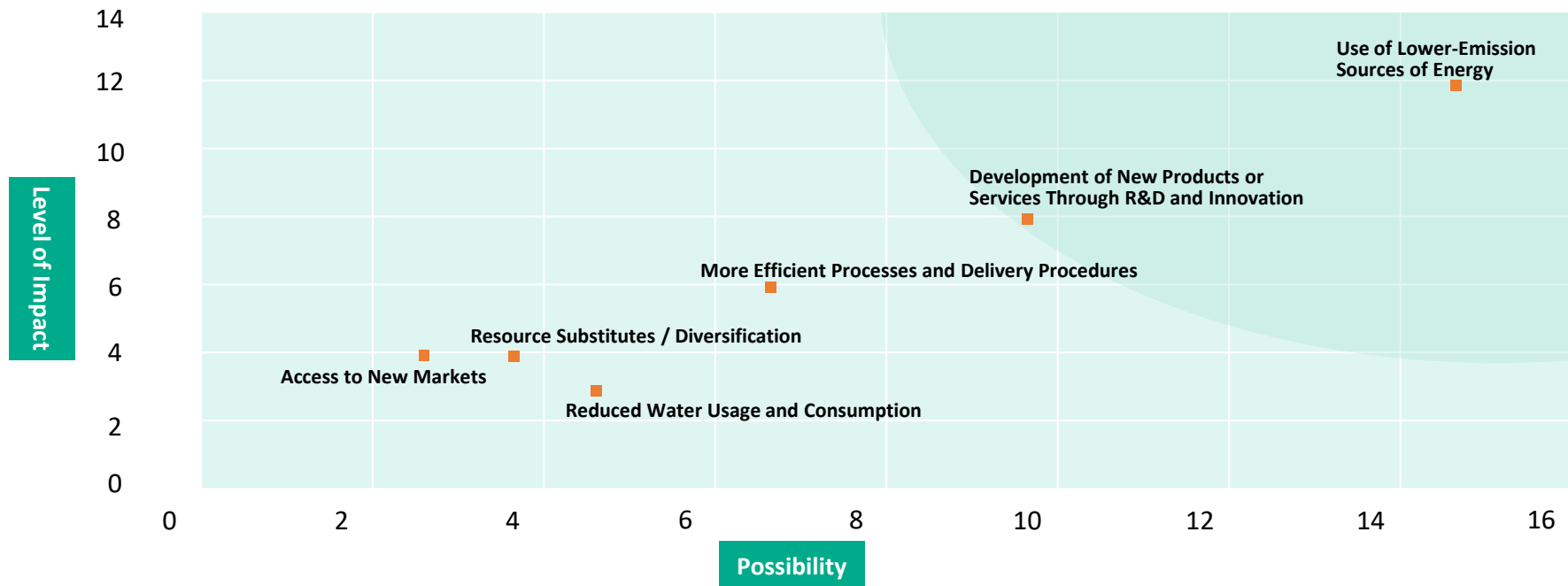
The identification of climate risks is explained by risk category as follows:

Risk Category	Risk Factor	Time	Degree of Possibility	Degree of Financial Impact	Risk Ranking
Policies and Laws	Enhanced Emissions-Reporting Obligations	Short Term, Medium Term, Long Term	Very High	High	1
Policies and Laws	Increased in the Requirements for Using Renewable Energy	Short Term	Very High	High	2

## 3.2 Climate Opportunities Identification

Based on the importance of opportunity categories such as “Resource Efficiency”, “Energy Sources”, “Products and Services”, “Market” and “Resilience”, and the importance of opportunity factors, PTI identifies the company's top two opportunities, “Use of Lower Emission Sources of Energy” and “Development of New Products or Services Through R&D and Innovation”. In terms to opportunities, PTI has actively evaluated future feasible solutions, with the aim of maximizing the benefits generated by potential opportunities, along with reviewing the necessary resources and analyzing potential financial costs in order to strengthen the company's assessment of the resources required to practice opportunities.

### Climate Opportunities Matrix



The identification of climate opportunities is explained by opportunity category as follows:

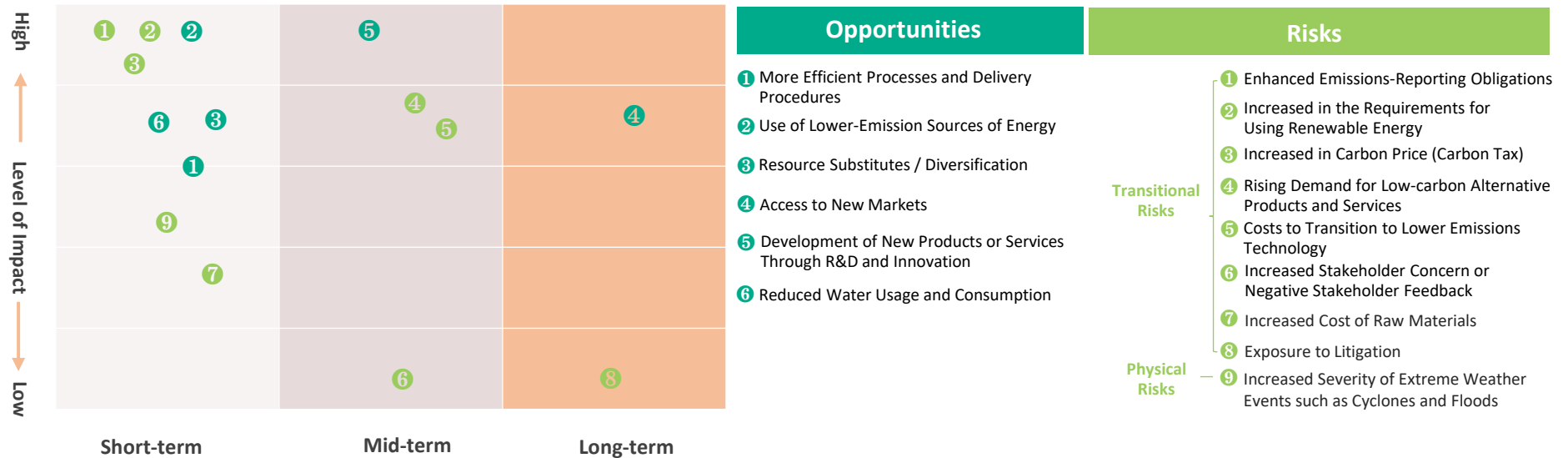
Opportunity Category	Opportunity Factor	Time	Degree of Possibility	Degree of Financial Impact	Opportunity Ranking
Energy Sources	Use of Lower-Emission Sources of Energy	Short Term	Very High	High	1
Products and Services	Development of New Products or Services Through R&D and Innovation	Long Term	Very High	High	2



## 4 Climate Strategy

PTI assesses the impact of climate-related risks and opportunities on the company and ranks the risks according to the importance of the relevant risks; proposes response strategies for the climate-related risks and opportunities faced. For the risk part, we carry out management and control measures for two high-risk factors, and conduct resource inventory for the response measures. The results of the risk matrix show that the first two major risks mainly focus on the category of "policies and laws", which are "Enhanced Emissions-Reporting Obligations" and "Increased in the Requirements for Using Renewable Energy" in order. Based on these risks, PTI establishes

management measures and evaluates actions that can be strengthened in the future. The results of the opportunity matrix show that the top two major opportunities are mainly in the categories of "Energy Sources" and "Products and Services", followed by "Use of Lower-Emission Sources of Energy" and "Development of New Products or Services Through R&D and Innovation". For such opportunities, PTI will also actively evaluate possible future options, hoping to maximize the benefits of climate opportunities. For actions in response to climate change, please refer to "Ch. 5 Climate Mitigation and Adaptation" in this report.



## Climate Change Financial Impact Analysis

	● Risk ● Opportunity	Potential Financial Impacts ⊖ / ⊕	Key Response Strategies
Transitional Risks / Climate Opportunities	● Enhanced emissions-reporting obligations.	⊖ Increased operating costs due to customer and regulatory disclosure requirements.	<ul style="list-style-type: none"> <li>Formulate energy conservation and carbon-reduction policies and measures to attain low-carbon emissions and environmental protection.</li> <li>Conduct regular annual ISO 14064 greenhouse gas certification for each factory in advance of regulatory requirements.</li> <li>Voluntarily implement ISO 14067 carbon footprint certification for specific products each year.</li> </ul>
	<ul style="list-style-type: none"> <li>Increased in the requirements for using renewable energy.</li> <li>Use of lower-emission sources of energy.</li> </ul>	<ul style="list-style-type: none"> <li>⊖ It directly increases the cost of operations and requires additional expenditures for renewable energy.</li> <li>⊕ Early planning for renewable energy installation projects, which helps expand production capacity and increase revenue.</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of the Renewable Energy Procurement Project Team in 2021: Bought renewable energy usage devices, energy storage facilities and renewable energy certificates, and signed contracts with renewable energy suppliers to ensure the supply of renewable energy.</li> <li>Set renewable energy purchase targets and regularly track the attainment status.</li> <li>Continue to focus on renewable energy regulations, development trends, and customer requirements and plan follow-up management measures.</li> <li>Increase energy efficiency and optimize existing equipment.</li> <li>Communicate renewable energy development trends and PTI's actions to management team in the ESG Committee.</li> </ul>
	<ul style="list-style-type: none"> <li>Increased in carbon price (carbon tax).</li> <li>Resource substitutes / diversification.</li> </ul>	<ul style="list-style-type: none"> <li>⊖ Increased operating costs (e.g., purchase/repairs of energy conservation and carbon reduction facilities and operating costs).</li> <li>⊕ Using renewable energy to reduce greenhouse gas emissions and carbon fee expenditures</li> <li>⊕ Disperse electricity consumption risks to maintain stable operations of the Company.</li> </ul>	<ul style="list-style-type: none"> <li>Actively implement carbon reduction, promote energy saving projects, use renewable energy and innovate processes and technologies in plants to achieve the carbon reduction target and attain net zero emissions.</li> <li>Set target for reducing carbon emissions by 1% in 2022; set the medium to long-term target of reducing carbon emissions to 3% by 2025 and 15% by 2030; and attain net zero emissions by 2050.</li> </ul>
	<ul style="list-style-type: none"> <li>Rising demand for low carbon alternatives and services.</li> <li>Costs to transition to lower emissions technology.</li> <li>Access to new markets.</li> <li>Development of new products or services through R&amp;D and innovation.</li> <li>More efficient processes and delivery procedures.</li> </ul>	<ul style="list-style-type: none"> <li>⊖ Increased R&amp;D and operating costs.</li> <li>⊖ Capacity planning constraints (reduction in the demand for existing specific services and technologies).</li> <li>⊕ Expand existing scope of cooperation and increase opportunities for cooperation with new customers.</li> <li>⊕ Satisfy customer demand for low-carbon energy conservation services to improve the Company's reputation, increase demand for its services, and increase revenue.</li> </ul>	<ul style="list-style-type: none"> <li>Continue to invest R&amp;D resources to develop energy conservation services and technologies.</li> </ul>
	● Increased stakeholder concern or negative stakeholder feedback.	⊖ Unable to satisfy the stakeholders' expectations, resulting in damage to the company's reputation.	<ul style="list-style-type: none"> <li>Maintain smooth communication with stakeholders with diverse channels such as the regular release of the Sustainability Report and the TCFD Report.</li> <li>Disclose the Company's sustainability actions with transparency and openness for responding to climate change to improve the Company's sustainability image.</li> </ul>
	● Increased cost of raw materials.	⊖ The increase in the cost of energy and other raw materials leads to increase in expenditures and decrease in profits.	<ul style="list-style-type: none"> <li>Continue to communicate with suppliers to control the increase in the cost of materials and report business conditions to evaluate whether services fees require adjustment.</li> </ul>
	● Exposure to litigation.	⊖ Litigation or violation of laws and regulations incur penalties and increase the cost of operations.	<ul style="list-style-type: none"> <li>Continue to monitor climate-related trends and changes in issues and plan response measures in advance.</li> </ul>
	Physical Risks / Climate Opportunities	<ul style="list-style-type: none"> <li>⊖ Conditions affect production and causes financial losses and decreased revenue.</li> <li>⊖ Unstable prices of material supply increases operating costs.</li> <li>⊕ Successfully satisfy the needs for product manufacturing and establishment of new production lines.</li> </ul>	<ul style="list-style-type: none"> <li>Develop contingency measures for the occurrence of extreme natural disasters based on risk assessment and develop risk mitigation measures.</li> <li>Response and development of alternative materials, regularly consult suppliers on the sourcing status and seek suppliers in other regions.</li> <li>Improve water recycling systems in plants to steadily recycle and reuse the process wastewater in the plants and regularly review water resource management performance.</li> </ul>
		<ul style="list-style-type: none"> <li>Increased severity of extreme weather events such as cyclones, floods, High temperature and drought Sea-level rise.</li> <li>Reduced water usage and consumption.</li> </ul>	



# 5 Climate Mitigation and Adaptation

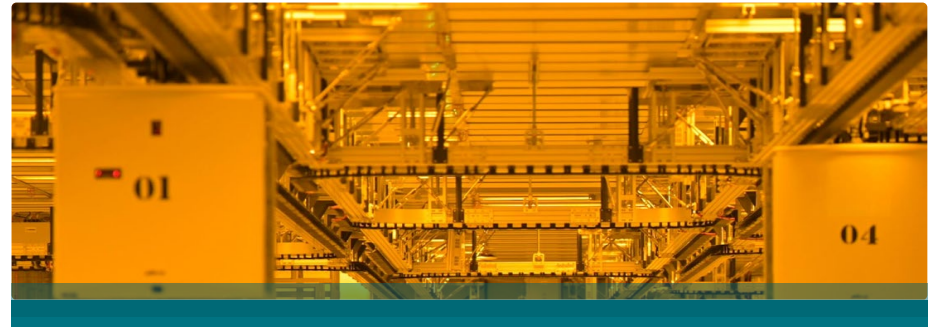
## 5.1 Implementation of Clean Tech - Face the Impact and Influence of Extreme Weather

As the regulations and requirements for environmental sustainability become more and more significant, and the investment in transformational products that meet market needs gradually brings benefits, PTI has taken a proactive approach of mitigation and adaptation, including the development of clean technology as its primary axis of action. To create a win-win situation for both the economy and the environment, PTI has developed a blueprint for sustainable corporate management.



### Strategy

- Implemented a climate-related risk and opportunity identification process in accordance with the Task Force on Climate-related Financial Disclosures Recommendations (TCFD Recommendations). (Please refer to Ch. 4 Climate Strategy in the Report for details.)
- Adopted and implemented the development strategy of "Clean Tech".
- Invested in the development of "Clean Tech", such as FOPLP (fan-out panel level packaging) and advanced packaging.



Ratio of R&D expenses to revenue	Invested in R&D expenses, such as FOPLP, advanced packaging, etc.	Annual revenue	Annual revenue ratio in FOPLP, advanced packaging, etc.
<ul style="list-style-type: none"> <li>● R&amp;D expenses accounted for 4% of net operating income in 2022, an increase from the last year.</li> <li>● R&amp;D expenses accounted for 57% of annual operating expenses in 2022.</li> </ul>	<ul style="list-style-type: none"> <li>● In 2022, the R&amp;D expenses of FOPLP and advanced packaging will account for 28.4% of the overall R&amp;D expenses, and there is a trend of continuous growth.</li> </ul>	<ul style="list-style-type: none"> <li>● PTI's individual revenue in 2022 was NT\$52.7 billion, up 2.8% from 2021.</li> </ul>	<ul style="list-style-type: none"> <li>● In 2022, the revenue of FOPLP and advanced packaging will account for &lt; 5% of the overall revenue, but there is a tendency for continuous growth.</li> </ul>

## 5.2 Climate Change Adaptation Actions

### Advanced Process Fan-Out Panel Level Packaging (FOPLP)

Facing the impact of climate change, the use of energy and resources needs to be more efficient. PTI believes that the future package and testing industry will move towards a more diversified and high-tech trend, with smaller products, more functions, lower power consumption, and more environmentally friendly materials, so we are committed to strengthening our own research and development capabilities. In response to industry and technology development trends and customers' increasing demand for advanced package and testing capacity, we have purchased new equipment to increase production capacity and meet customers' expectations for new products. Based on this, we are more actively moving towards cutting-edge, high-efficiency packaging technology.

PTI invests in the technological development of Fan-Out Panel Level Packaging (FOPLP), which has the advantages of significantly reduced package thickness, effective increase in wire density, and improved product electrical performance; compared with the transistor shrinkage process, the first large-size panel packaging can achieve large-scale production benefits and greatly improve production efficiency.



In 2018, we invested to build the world's first mass production base for fan-out panel level packaging, a technology that can be applied to products related to 5G, AI, biotechnology, self-driving cars, smart cities and the Internet of Things, which will significantly contribute to the development of related products. There is no doubt that fan-out panel level packaging will play an integral role in the semiconductor industry.

PTI has established a 300-member R&D and engineering team to develop advanced technologies for fan-out panel level packaging. As compared to Fan-Out Wafer Level Packaging (FOWLP), FOPLP reduces incomplete edge wear and tear and increases area utilization, resulting in significant improvements in production efficiency and cost reduction.



## PTI has been in the mass production stage with technical achievements:

Used RDL first (chip last) rewiring to make circuit substrate and fan-out panel level packaging technology, successfully developed the automotive system chip package combined with embedded passive components and passed the complete reliability verification of the customers.

Achieved FOPLP technology development and verification of ultra-fine line width and spacing (Line/Space/3um) redistribution process (RDL), applying to high-speed computing processing chips.

The Chip Middle process technology of fan-out panel level packaging has been successfully integrated. (1) System-on-a-Chip (SoC) and High Bandwidth Memory (HBM) can meet the usage requirements of data calculation and low-latency data transmission required by the product application in the HPC/AI field; (2) Light-emitting diodes and control chips for use in AR/VR devices in entertainment, medical, education and other fields; also successfully developed Embedded Die that can be used as a high-density heterogeneous integration solution for high-level mobile devices and high-speed computing processors.

Heterogeneous Integration integrates multiple electronic components with different properties into a single System-in-Package through 2.5D and 3D multi-dimensional space design. The scope of heterogeneous integrated packaging is not limited to individual dies, but also includes micro-electromechanical system (MEMS), passive components, independent chips and multiple electronic systems, the finished products are smaller in size but have more functions, supporting the core chips required for new-generation technological operations such as 5G, AI, Internet of Things and high-speed computing. It is an important basis for promoting generational upgrades and integrating various operating systems. PTI has successfully developed and entered the production stage.

Fine lines and large sizes are the focus of research and development. PTI has been actively cooperating and discussing with equipment manufacturers and material suppliers for a long time to overcome many challenges in the manufacturing process and realize the plan.

Panel Level Fan-Out Automated Material Handling System (Panel FO AMHS): The weight of the fan-out package is close to 40 kg and in order to meet the production efficiency, reduce manual handling and increase the design of automated factories, PTI introduces the Automated Material Handling System (AMHS) when building a new factory. Although we need to invest in higher construction costs in AMHS, it can increase the per capita output benefit in mass production factories and because of the development from 2D Layout to 3D Layout (Overhead Hoist Transfer, OHT), it can be built in the same clean room space. Better output efficiency is built to achieve intelligent and clean design.

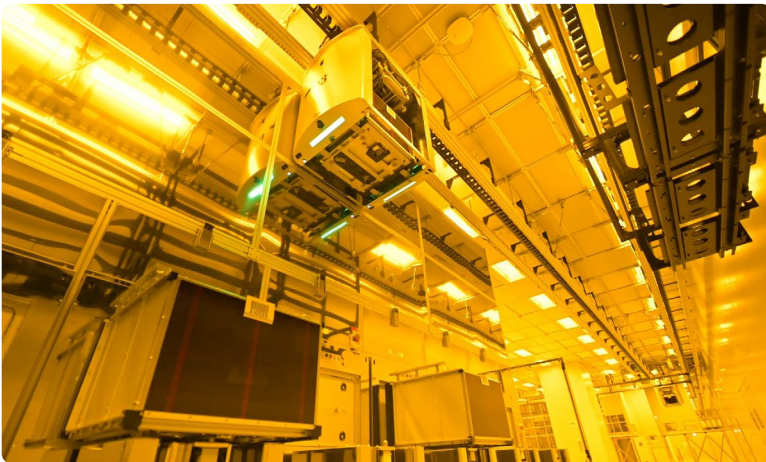
## Heterogeneous Integration - Chiplet Products and Technologies

Under the environment of climate change and the increasing demand for high-speed computing, semiconductors are driven to more advanced manufacturing processes. Therefore, the technical difficulty is high, the yield rate is low, and the manufacturing cost is also increasing. The Chiplet technology that integrates multiple chips has surfaced. The emphasis on advanced packaging is also greater than before. Seeing this trend, PTI is actively investing in research and development. Small chips are a highly flexible design configuration, which can not only speed up chip development, but also greatly reduce research and development costs. According to the data, in the case of 14nm, the cost of small chip production saves almost 50%, comparing with the System-on-

a-Chip (SoC) design method. For wafer manufacturing, when the number of defects in the wafer area is roughly fixed, chiplets can reduce the number of wafers affected by defects by a multiple, thereby improving wafer yield and reducing costs. As the front-end wafer process node (Wafer Node) continues to shrink, the communication between the chip and the substrate has undergone great changes. The progress of the traditional IC substrate factory's process capability has been unable to keep up with the pace of wafer process node miniaturization, and gradually decoupling. This gap needs to be connected by the advanced packaging technology.



### Promote low-carbon manufacturing and reduce greenhouse gas emissions from operations



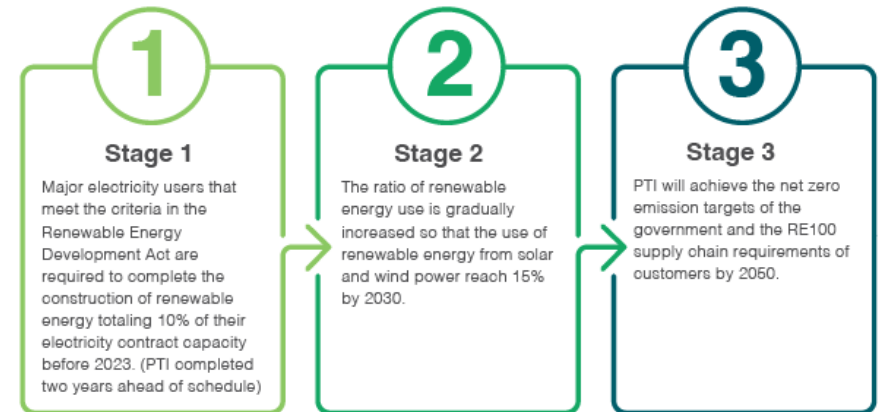
PTI fan-out packaging can replace the ABF carrier board to carry the wafer, and its line width, line spacing and power consumption can achieve performance similar to or even better than that of the ABF carrier board with fewer layers under the condition of optimized design. It can alleviate the problem of insufficient production capacity of ABF substrates, especially substrate manufacturers are relatively conservative in investing in new equipment and new factory buildings, and it is difficult to effectively respond to the demand for small chips in a short period of time. The emerging blue ocean of advanced packaging has driven traditional IC substrate manufacturers to also evaluate the layout. In the case of tight supply of ABF substrates, the unique redistribution of thin lines in fan-out packaging can effectively reduce the dependence on ABF substrates and can replaced the ABF carrier board or reducing the number of layers of the ABF carrier board and combining it with the BT carrier board solution, this demand trend is gradually taking shape, and PTI is currently having related projects in progress.

## 5.3 Climate Change Mitigation Actions

### Alternative Energy - Developing the Blueprint and Actions to Renewable Energy

Science has proved that the impact of climate change is quite urgent, and climate issues have attracted international attention. Countries have successively proposed "2050 Net Zero Emissions" declarations and actions: In March 2022, the government announced "Taiwan's Pathway to Net-Zero Emissions in 2050", provide the action pathway to net zero by 2050, and guide the green transition of industry; and in order to keep in line with the global net zero trend, Taiwan has also formally adopted the "Climate Change Response Act" to incorporate the 2050 net zero emission target into law.

PTI's plan for the use of renewable energy is mainly in line with the development trend of domestic renewable energy, and is divided into three stages:



PTI has installed a solar panel power generation system in the factory area to generate renewable energy for use in each factory area. For the outsourced renewable energy part, a renewable energy transfer contract has also been signed with the supplier. From 2023, it is estimated that about 7.5 million kWh of renewable energy can be used each year, which can reduce carbon emissions caused by electricity use and achieve the goal of reducing carbon emissions by 1%. In 2023, the second stage of the renewable energy use plan will be launched.

In the face of environmental sustainability, PTI continues to pay attention to climate change issues and increase the proportion of renewable energy usage, making every effort to achieve the goal of net zero emissions by 2050.

#### ● PTI's Renewable Energy Actions in the Recent Two Years

2022 ( Done )	2023 ( On-going )
<b>Solar Power Equipment Installation</b> <ul style="list-style-type: none"> <li>Completed the design and planning of solar power generation construction, project contracting, construction, hanging meter power transmission and other operations, generating <b>140,000 kWh</b> of renewable energy.</li> <li>Obtained <b>the approval from the Bureau of Energy for renewable energy equipment</b>.</li> </ul>	<ul style="list-style-type: none"> <li>The installed capacity of solar power generation equipment is about <b>3,000 kW</b>, and the power generation is estimated to generate <b>3 million kWh</b> of renewable energy throughout the year (all for self-use).</li> <li>About <b>4.2 million kWh</b> of renewable energy are transferred from suppliers per year, being converted to the renewable energy certificates.</li> </ul>
<b>Purchase of Renewable Energy Certificates</b> <ul style="list-style-type: none"> <li>Completed and obtained <b>the purchase of renewable energy certificates</b>.</li> <li>Added the <b>amount of renewable energy transferred by renewable energy suppliers</b>.</li> </ul>	<p>The total use of renewable energy can reach <b>7.5 million kWh/year</b>, meeting the requirements of the "Renewable Energy Development Act" two years earlier.</p>



## Implement ISO 50001 Energy Management to Improve Energy Efficiency

The energy used in each of PTI's operating bases is mainly electricity. All plants have passed the ISO 50001 energy management system with verification. It is planned to introduce green building design to reduce energy and resource consumption when the new factory is established. We select environmentally friendly refrigerants with low greenhouse effect potential, use high-efficiency motors for rotating equipment, and continue to replace old unit equipment in order to achieve the purpose of energy saving.

Implement energy-saving measures for facilities, processes, and buildings in order to reduce energy consumption. For example, changing the cooling water of air compressors to ice water systems, replacing old dryers with high-efficiency models, recycling process water, optimizing machine settings, replacing computers, lighting improvement, and turn computers off after work, etc.

In 2022, PTI saved a total of 11,435,224 kWh of electricity, achieving the target of 1% electricity saving, reducing about 5,821 tons of CO<sub>2</sub>e emissions (note), which is equivalent to the carbon dioxide adsorption capacity of 15 Daan Forest Parks.

Note: CO<sub>2</sub>e is calculated based on the emission factor published by Taiwan's Bureau of Energy in 2021 (0.509 kg CO<sub>2</sub>e/kWh).

### 2022 Energy Conservation and Carbon Reduction Measures

Category	Description of Measures	Number of Measures	Power Consumption Reduction (Unit : Kwh)	Carbon Emission Reduction (Unit : Tons)
Plant	<ul style="list-style-type: none"> <li>Annual chiller maintenance to increase equipment efficiency.</li> <li>Switch of the cooling water pump of the air compressor to a chilled water pump.</li> <li>CR lamps are replaced with LED lamps.</li> </ul>	76	10,002,115	5,021.06
Processing	<ul style="list-style-type: none"> <li>Adjustment of overtemperature protection settings for the BI Oven quarterly maintenance.</li> <li>Replacement of OS machine lighting source with LED lights.</li> <li>Shut down the loader ion gun.</li> </ul>	8	1,433,069	719.40

### 2022 Achievements in Energy Conservation and Carbon Reduction



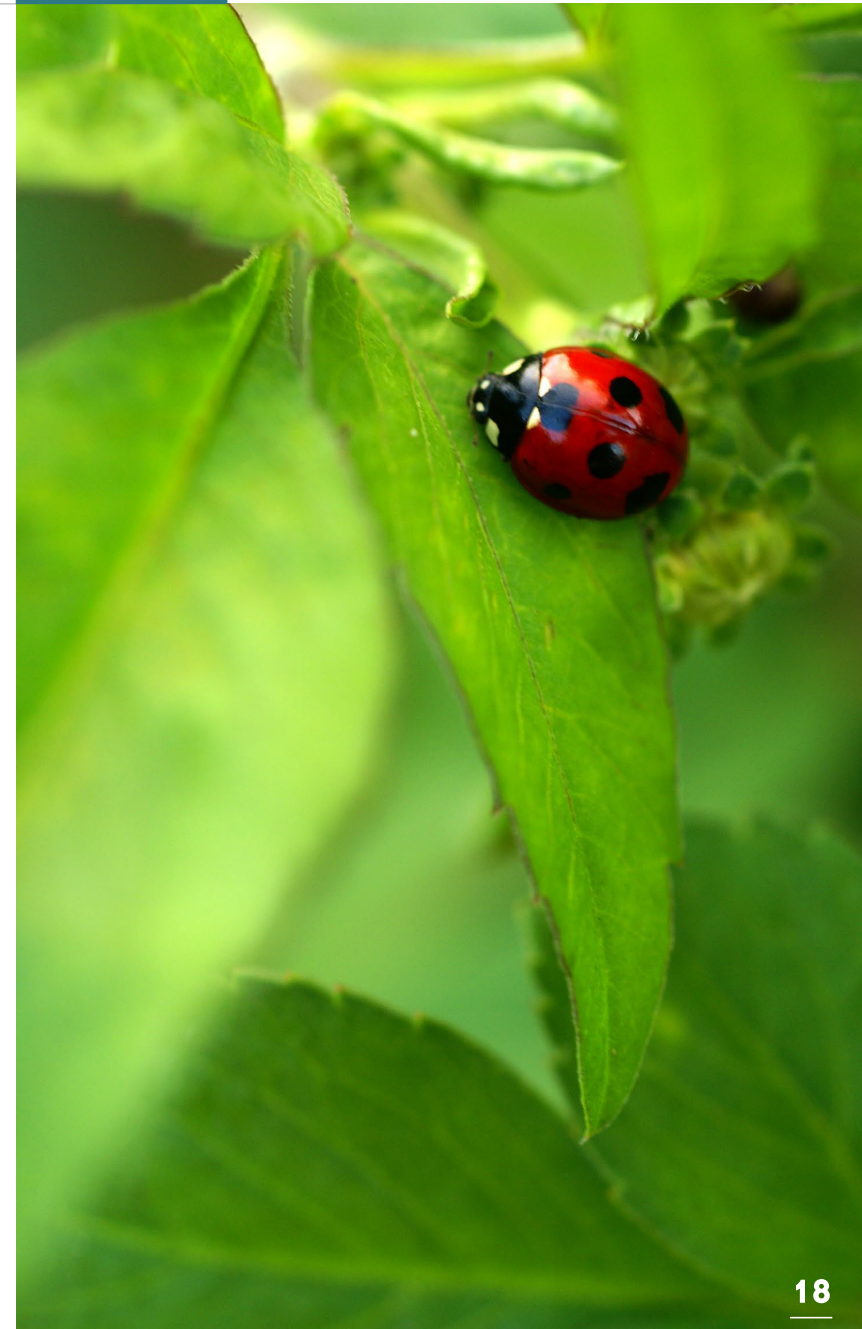
Completed **84** energy conservation and carbon reduction measures.



Reduced electricity consumption by approx. **11,435,224 kWh**.



A reduction in approximately **5,821 tons** CO<sub>2</sub>e emissions.

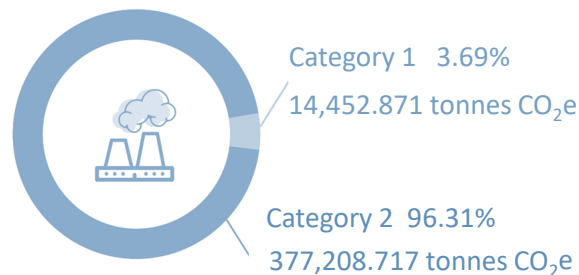


## Greenhouse Gas Inventory, Energy Conservation and Carbon Reduction

PTI referenced inventory guidelines of domestic and international institutions such as ISO 14064-1:2018 and the GHG Protocol to establish greenhouse gas inventory management procedures. Furthermore, we have conducted climate change risk analysis based on the risks and opportunities defined by TCFD, and formulated response measures to reduce potential impact.

PTI 2022 GHG emissions data were based on actual inventory checks performed at each of the plants. Among the data was operation related direct GHG emission sources (Category 1), indirect GHG emissions from imported energy (Category 2), and other indirect GHG emission sources (Category 3 to 6). BSI, a third-party impartial organization, verified the data. PTI's greenhouse gas emissions mainly come from the use of purchased electricity; therefore, our strategy for reducing greenhouse gas emissions focuses on improving electricity consumption management and reducing electricity consumption by 1% per year as a target to effectively lower greenhouse gas emissions.

### PTI Greenhouse Gas Emissions in 2022



### PTI Greenhouse Gas Emissions in the Past Two Years (unit: Tonnes CO<sub>2</sub>e / year)

Item	2021	2022	Ratio % (compared to 2021)
Category 1	18,372.82	14,452.87	-21.3%
Category 2	381,346.17	377,208.72	-1.1%
Total	399,718.99	391,661.59	-2.0%

## Waste Management and Pollution Prevention

PTI is committed to implementing the corporate mission of "Green Sustainability" and implements measures to prevent and control wastewater, waste, air pollution and noise. Since 2003, it has passed the ISO 14001 environmental management system certification, follows this management system to monitor pollution prevention equipment and waste resources. Recycling, implement the goals of environmental protection and resource conservation, and continue to use recycling and reuse to reduce emissions and waste reduction.

Most of PTI's operating bases are located in well-planned industrial areas or science parks. The areas where they are located have passed the government's environmental impact assessment. They are not located in environmentally sensitive areas and have no significant and major impact on the biodiversity of the surrounding environment. The amount of recycled waste was 1,051.53 tons at PTI Taiwan in 2022, equivalent to 87.63 tons of resources recycled on average every month.

By implementing thorough waste classification measures in the plants, we have effectively sorted wastepaper, waste iron, waste aluminum and waste plastic resources and the waste recycling volume has continued to increase each year.

### PTI Waste Composition

Category	Item	Yield (Unit: tons)		
		2020	2021	2022
General	General Sludge	1,912.39	2,508.17	1,882.30
	Plastic / Paper / Wood / Resin Filter Bag / Waste Oil / Waste Fluid	1,143.60	963.53	1,373.09
	General Waste	1,288.03	1,265.45	1,032.91
	Recycling of Resources	1,011.20	1,034.64	1,051.53
Hazardous	Waste Fluid / Empty Barrel	1,682.55	2,016.94	2,145.87
	Cloth / Gloves	69.44	115.67	120.47
	Mixed Metal Scraps	271.24	250.54	221.60
	Mercury Lamps / Waste Glass	1.41	1.32	7.31

## Sustainable Water Resources Process Water Saving, Strengthening Management and Efficiency

PTI has established a water resources management mechanism, regularly collects and supervises the use of water resources by the Environmental Safety and Health Committee and reports the identification, assessment and management process of water risks to the Risk Management Committee to complete the operation mechanism of water resources governance. The Risk Management Committee regularly reports to the board of directors every year to continuously strengthen the organization's ability to face water resource management.

PTI promotes water-saving measures in each factory area, manages water resources according to the three strategies of "reduction, reuse and recycling", and properly utilizes and protects water resources. Since 2009, PTI has actively invested in the recycling and treatment of process wastewater in the factory area to improve the situation of process wastewater containing a large amount of finely suspended particles of silicon dioxide produced during the production process.

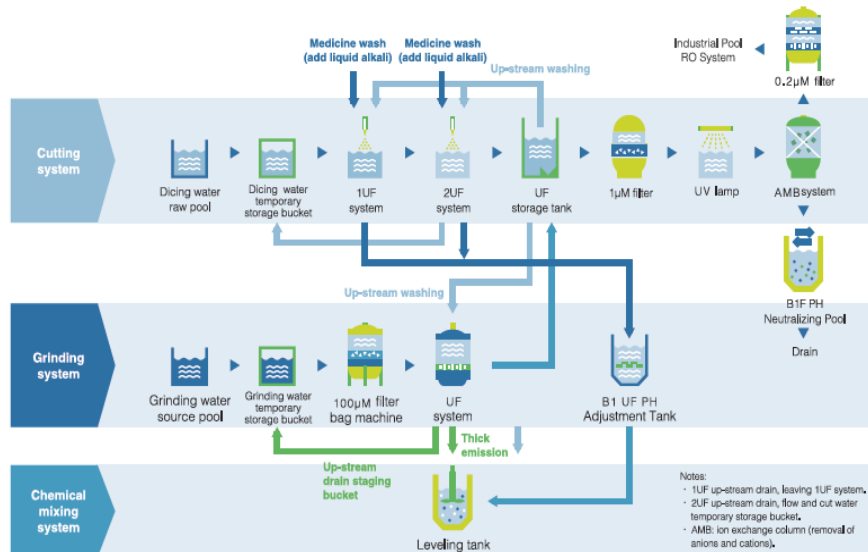
### ● Improve the Efficiency of Water Recycling

In addition to emergency preparedness measures, PTI implements water resources management in daily life, and improves water conservation and water efficiency in daily business operations. The main water cycle projects include process wastewater recycling, reclaimed water recycling, rainwater recycling and domestic water conservation.

Category	Description of Measures
<b>Process Wastewater Recycling</b>	Accounting for the bulk of the water cycle, the benefit of recycled water was 87% in 2022.
<b>Reclaimed Water Recycling</b>	Applied to cooling tower water, toilet water, etc.
<b>Rainwater Recycling</b>	Storage and application for cleaning water, gardening plant watering, etc.
<b>Domestic Water Conservation</b>	Purchasing appliances and faucets with water-saving labels; promoting personal water-saving habits.

### ● Saving Water

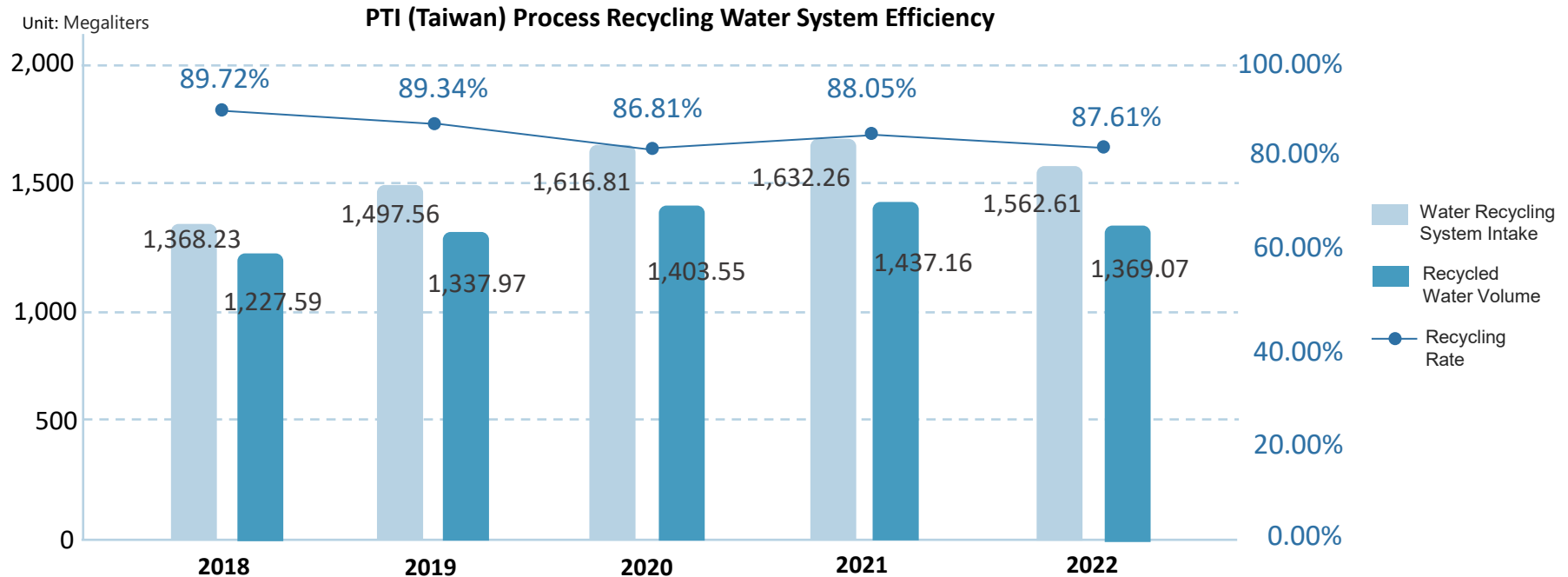
In order to improve the results of water conservation, not only installing water-saving and environmental protection equipment in the PTI facility area, but also the use of water-saving devices, such as water-saving faucets, sprinklers, toilet facilities, etc. Also, implementing habits of saving water through continuous promotion and reminder.





## ● Process Water Conservation

PTI learned that the "open source" approach was limited, it has actively implemented process wastewater recycling in all plants by applying a UF (ultra-filtration) system to filter out insoluble solids through the hollow fiber membrane, to steadily recycle and re-use the wastewater from the dicing and grinding process. In order to meet the company's capacity planning, the recycling system is still being expanded and built, and the key components with high reliability and easy maintenance are imported to increase the amount of recycled water and improve recycling. Currently, recycling water efficiency is close to 90% (87% in 2022).



## Green Building

When setting up a new facility, we properly planned and introduced green building design to reduce energy and resource consumption, selecting environmentally friendly refrigerants with low greenhouse effect potential, and high-efficiency motors for rotating equipment. At the same time, lighting was replaced with LED lights, and continue to replace the old unit equipment to achieve the goal of energy conservation. Hsinchu Science Park Plant 3 (Plant 11 B) was recognized as the certified level of Green Building.

## 6 Climate Indicators and Targets

### Short, Medium and Long-term Plans for Environmental Sustainability

The importance of sustainable corporate development and environmental sustainability is a priority for PTI. To enhance our ability to operate in a sustainable manner, we are committed to developing short, medium, and long-term plans for our business.



#### Short-Term Plan for 2023

- Complete the installation of solar power generation equipment on the rooftops of plants.
- Purchase renewable energy certificates from renewable energy suppliers.
- Reduce electricity consumption by 1%.
- Reduce carbon emissions by 1%.
- Attain 85% water recycling system effectiveness from the dicing/grinding process.
- Attain 40% in waste recycling.
- Obtained the certificate of "Cleaner Production Assessment".



#### Mid and Long-Term Plan (2024-2026)

- Continue to pay attention to climate change as well as global warming.
- Actively respond to environmental protection initiatives.
- Increase the use of renewable energy to 3% by 2025.
- Reduce carbon emissions to 3% by 2025.
- Increase the proportion of water recycling and expand the effectiveness of resources.

## GHG Emissions Targets and Goals

PTI actively organizes activities related to energy saving and GHG reduction. Each year, energy conservation goals are set, and electricity consumption efficiency is enhanced, while related incentives are provided to reward supervisors and employees that are engaging in energy conservation. We implement carbon reduction projects that are measurable, reportable, and verifiable, and these are linked to SDG 13: Climate Action to combat climate change and its impacts.

### Measure Management and Objectives

- Continuous improvement based on annual GHG inventory results, regular tracking, and regular reporting.
- Reduction of greenhouse gas emissions by 15% by 2030, with 2018 as the base year.



### 2022 for all PTI Plants in Taiwan

- Completed the greenhouse gas emission inventory (Category 1-5) ISO 14064-1 certification by third-party verification.
- Obtained ISO 50001 Energy Management certification.

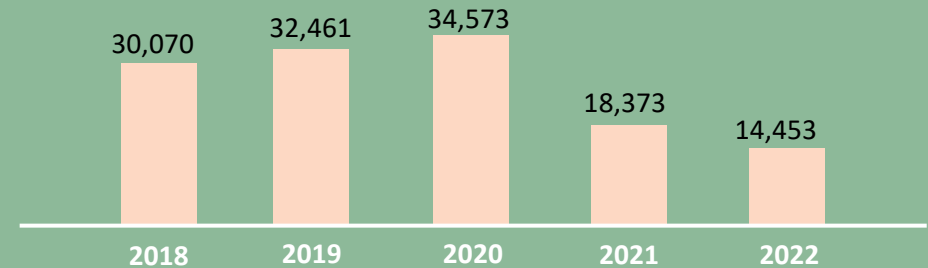


The achievements of the science and technology industry drive the convenience of human life. PTI sets medium and long-term goals for different climate management indicators, reviews the achievement status every year, and makes rolling adjustments according to external environmental trends, and mitigates the impact of climate change through management measures and goals, making good use of resources and create maximum value, actively practicing green sustainability.

## ● GHG Emissions

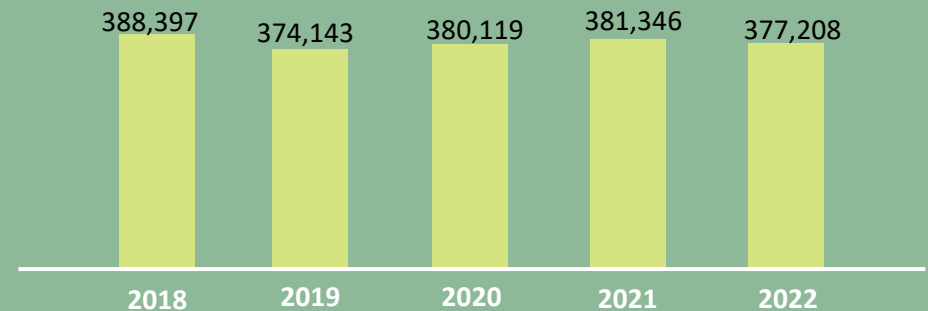
### Scope 1 GHG Emissions

Unit : Tonnes CO<sub>2</sub>e



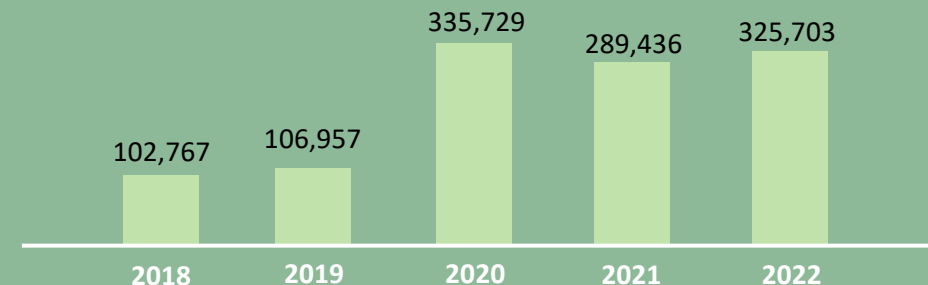
### Scope 2 GHG Emissions

Unit : Tonnes CO<sub>2</sub>e



### Scope 3 GHG Emissions

Unit : Tonnes CO<sub>2</sub>e





## Key Indicators to Environmental Sustainability

Item		2020	2021	2022	Management Measures and Targets
<b>Water Management</b>	Water Withdrawal Volume (tons)	2,919,800	3,017,359	2,967,257	<ul style="list-style-type: none"> <li>• Increase the utilization of water resources and water recycling capacity.</li> <li>• Establish a water recycling system to steadily recycle and reuse the process wastewater in the plants. Furthermore, water resource management performance is reviewed regularly.</li> <li>• Attain 85% water recycling system effectiveness from the dicing/grinding process.</li> </ul>
	Wastewater Discharge Volume (tons)	1,882,268	1,991,060	2,115,966	
	Water Intensity Water Withdrawal Volume / Revenue (million (NTD))	58.4	58.8	56.3	
	Water Recycling System Effectiveness from the Dicing/Grinding Process	87%	88%	87%	
<b>Energy Management</b>	Energy Consumption (kWh)	759,166,423	750,978,720	762,571,840	<ul style="list-style-type: none"> <li>• Continue to promote energy conservation programs and reduce electricity consumption by 1% per year.</li> <li>• Launch the Green Power Purchase Project to achieve a 10% contracted capacity renewable energy requirement by 2023.</li> <li>• The use of renewable energy will reach 3% in 2025, 15% in 2030, and 100% in 2050.</li> </ul>
	Power Consumption Reduction (kWh)	11,595,401	13,036,365	11,435,224	
	Energy Intensity (kWh / thousand (NTD))	15.19	14.65	14.47	
<b>Waste Management</b>	Waste Recycling Rate (per year)	44.0%	45.0%	50.7%	<ul style="list-style-type: none"> <li>• Strengthen waste reduction at the source and waste recycling and reuse.</li> <li>• Improve pollution prevention and decrease the impact on the environment.</li> <li>• Attain 40% in waste recycling.</li> </ul>
	Waste Intensity Amount of Waste Generated / Revenue (million (NTD))	0.16	0.16	0.15	
<b>Carbon Management</b>	GHG Scope 1 Emissions (Tonnes CO <sub>2</sub> e)	34,572.78	18,372.82	14,452.87	<ul style="list-style-type: none"> <li>• Set annual target for carbon reduction rate by 1% and continues to promote carbon reduction measures.</li> <li>• Implementation of ISO 14067 Carbon Footprint Verification.</li> <li>• Carbon reduction by 3% in 2025, 15% in 2030, and net zero in 2050.</li> </ul>
	GHG Scope 2 Emissions (Tonnes CO <sub>2</sub> e)	380,119.41	381,346.17	377,208.72	
	GHG Scope 3 Emissions (Tonnes CO <sub>2</sub> e)	335,728.72	289,436.07	325,703.24	
	Total GHG Emissions (Tonnes CO <sub>2</sub> e)	750,420.91	689,155.06	717,364.82	
	GHG Emission Intensity (Scope 1 & 2) / Revenue (million (NTD))	8.30	7.80	7.43	

## 7 Sustainable Vision

PTI attaches great importance to and pays attention to the problems caused by extreme climates, and drives the transformation of products and services through climate change mitigation and adjustment actions, as well as the use of renewable energy, the practice of energy conservation and carbon reduction, and other measures to realize the commitment to create a green environment from the inside out. At the same time, strengthen the company's operating physique and resilience, moving towards sustainable business operations.



Implement climate risk control and mitigation actions, moving towards sustainable business operations.

## 8 Appendix

### TCFD Disclosure Comparison Table

Dimension	TCFD Disclosure Recommendation	Chapter	Page
Governance	How the Board performs oversight on climate-related issues.	2 Climate Governance	05
	How management assesses and manages climate-related issues.	2 Climate Governance	05-07
Strategy	The climate-related risks and opportunities the organization has identified over the short, medium, and long term.	3 Climate Risk and Opportunity Management	08-10
	The impact of climate-related risks and opportunities on the organization's business, strategy, and financial planning.	4 Climate Strategy	11-12
	Scenarios analysis (including disclosure under a 2° C or lower scenario).	3 Climate Risk and Opportunity Management	08
Risk Management	Processes for identifying and assessing climate-related risks.	3 Climate Risk and Opportunity Management	08
	Processes for managing climate-related risks.	3 Climate Risk and Opportunity Management	09-10
	Processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	5 Climate Mitigation and Adaptation	13-21
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.	6 Climate Indicators and Targets	23
	Disclose Scope 1, Scope 2, and if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	6 Climate Indicators and Targets	23
	Management targets and related performance.	5.3 Climate Change Mitigation Actions 6 Climate Indicators and Targets	17-21 22-24





**Power To Innovate**

**Let us create new paths to sustainability one step at a time,  
towards net zero carbon emissions.**

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