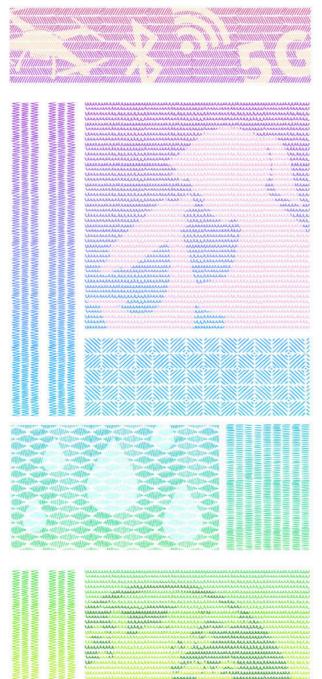
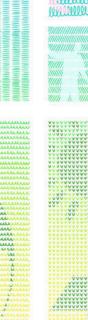


TSMC 2022 Sustainability Report



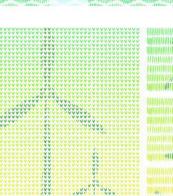












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Weaving a Sustainable Future Together

Sustainability is like weaving, pooling people's collective strengths and consolidating resources

Weaving a harmonious, symbiotic world by adopting a development model focused on the common good

Sustainability also connects people in rural and urban areas, fostering an exchange of mutual trust and mutual assistance

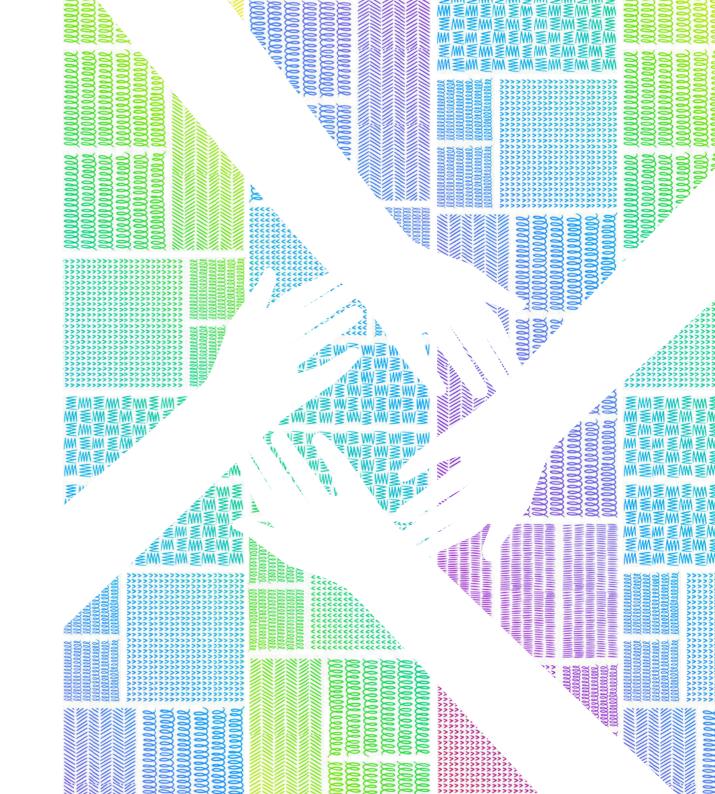
TSMC enables innovation and invites partners from all walks of life to weave a web of sustainability

Through technology and collaboration

Realizing co-prosperity between people and nature as well the society

Building on the foundation of innovative vertical applications, TSMC aspires to create a horizontal expansion of the value chain

Ensuring the resilience, breadth, and longevity of the sustainability



A Responsible Purchaser A Practitioner of Green Power

An Admired Employer

Power to Change Society

Letter from the ESG Steering Committee Chairperson

Over the past year, the world has faced numerous economic, social and geopolitical changes, including uncertainties in globalization and free trade, lockdowns caused by the COVID-19 pandemic, the war in Ukraine, global transportation bottlenecks, and inflationary pressures. This has tested the resilience of the global supply chain and the adaptability of businesses. As a responsible global corporate citizen, TSMC has accelerated the adoption of ESG (Environmental, Social, and Governance) initiatives in its operations and industrial value chain, and continues to inject positive energy into society.

2022 Sustainability Report

Prospering with the natural environment is the cornerstone of TSMC's sustainable operations, and a green and low-carbon supply chain is an important part of our 2050 net-zero emissions blueprint. As an industry leader, TSMC uses its green influence to continuously work with suppliers to deepen overall low-carbon management. By providing suppliers with guidance on carbon inventory, energy conservation, and carbon reduction, we encourage them to adopt carbon capture equipment and reduce indirect carbon emissions in the value chain. In 2022, TSMC was again selected by the Carbon Disclosure Project (CDP) as a Supplier Engagement Leader, and we continued to drive the industry towards low-carbon sustainability. In the same year, TSMC's Southern Taiwan Science Park Industrial Reclaimed Water Plant started operations, and our Zero-Waste Manufacturing Center is expected to start operation in 2023. At our Arizona fab, we also plan to build an industrial recycled water plant to gradually achieve near zero liquid discharge, advancing toward our goal of circular economy. We continue to make every effort to minimize environmental externalities through prudent decisionmaking and coordinated global action on four major issues: climate and energy, water stewardship, circular resources, and air pollution control.

As the leading provider of semiconductor process technology and manufacturing services, TSMC uses the power of semiconductor innovation to make products stronger, smarter, safer, more energy efficient, and more advanced to enrich people's lives and empower society for the common good. I am very proud of TSMC's employees across the company who work hard for this mission. Guided by our Human Rights Policy, TSMC continues to create a working environment that respects human rights. This means we provide a dignified workplace that

is diverse, equal, and inclusive (DEI) and promotes the integration of global talents, and we require our supply chain partners to follow the same standards. At the same time, we continue to deepen our connection with the society and wholeheartedly support global STEM education. Through the TSMC Education and Culture Foundation and the TSMC Charity Foundation, we deepen community relations, care for the disadvantaged, and preserve national art and culture, laying a solid foundation for social progress with common values.

In 2022, we released the UN SDGs Action Report for the first time to disclose the company's SDGs action plan and progress. We also explained the company's management policy on major issues with our Materiality Analysis Report to enhance the transparency of sustainable information disclosure. In order to make the Board of Directors more comprehensive and transparent and achieve better corporate governance, we also prepared for the establishment of the Board's Nominating, Corporate Governance and Sustainability Committee, which was approved in February 2023, strengthening the effectiveness of its sustainability governance. The Board of Directors also decided to change the Audit Committee to the Audit and Risk Committee and the Compensation Committe to the Compensation and People Development Committee to expand and deepen its supervision and review responsibilities, making the corporate governance structure more robust.

We have a deep understanding of TSMC's key position in the global semiconductor industry and its influence on many economies, and are keenly aware of our urgent responsibilities in sustainability that we shoulder as a corporate citizen. As TSMC's global business expands, we will deepen our partnership with stakeholders including employees, public associations, communities, investors and shareholders, and our supply chain and customers, listen to the voices of all parties, and open a new chapter of sustainable development together.

Chairman and ESG Steering Committee Chairperson



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An Admired Employer

Power to Change Society

Letter from the ESG Committee Chairperson

Looking back on 2022, just as the COVID-19 pandemic showed signs of easing and people could see recovery on the horizon, geopolitical conflict threw the world into disarray amidst systemic risks from crises in energy, food, human rights, and environmental damage. Fortunately, substantive progress was achieved at the 27th Conference of the Parties of the UNFCCC (COP 27) and the 15th UN Biodiversity Conference (COP 15), so that we were able to continue forwards into an inclusive and sustainable future.

2022 Sustainability Report

Facing a volatile economic environment, TSMC focused on its core competitive advantages of Technology Leadership, Manufacturing Excellence, and Customer Trust. Strong demand from 5G cellular network and high-performance computing applications enabled our total wafer shipments in 2022 to reach 15.3 million 12inch equivalent wafers, and realize 12,698 product innovations for customers. We also delivered a 13th consecutive year of record revenue, driving sustainable development through profitable growth.

TSMC responded to the call to action at COP 27 by making carbon reduction initiatives our top priority. During the course of 2022, we successfully implemented 823 energy-efficiency, water conservation, and waste reduction innovation projects. A target of Net Zero Emissions by 2050 was also set with annual progress reviews planned to dynamically adjust and set even more ambitious carbon reduction pathways. We also drew up the <u>Carbon Credits Quality Standards for</u> Voluntary Emissions Reductions based on international quidelines and industry benchmarks to ensure that carbon credits are not obtained from sensitive regions. Furthermore, we leveraged our industry leadership to invite suppliers to participate in the CDP Supply Chain Program. The program complements suppliers' existing carbon reduction actions to help us mitigate the global climate crisis together. In light of the close association between Climate Change and Biodiversity, we issued the Biodiversity Statement for the first time in 2022 as a climate citizen of the new era. The statement commits TSMC to achieving Zero Deforestation, No Net Loss of biodiversity, and Net Positive Impact. Achieving Water Positivity was also set as a future strategy to enhance our climate resilience as part of a multi-pronged approach.

In addition to our environmental commitments, TSMC also works tirelessly to build a diverse, equal, and inclusive working environment. The first <u>survey into salient</u>

human rights issues was completed in 2022, with the establishment of a transorganizational human rights working group and due diligence scheduled for 2023. The subsequent promotion of preventive, mitigation and remedial measures as well as related education and training will ensure human rights protection from a stakeholder perspective. We also founded Women@tsmc, an Employee Resource Group (ERG) primarily aimed at women, and a new dedicated ERG was set up for foreign employees to build employee cohesion and promote career development. We also completed the first safety culture investigation, and introduced free health check-ups on contractor sites to build an inclusive workplace.

Upholding the spirit of Leaving No One Behind, TSMC actively works to achieve UN Sustainable Development Goals (SDGs). In addition to continuously expanding the <u>University Collaboration Programs</u>, cultivating semiconductor talents, and helping to meet shortfalls in emergency assistance resources, we also worked to harness the power of employee volunteers for youth and rural empowerment, promotion of the arts, and assisting the disadvantaged through the TSMC Education and <u>Culture Foundation</u> and <u>TSMC Charity Foundation</u>. Using the <u>Business for Societal</u> Impact (B4SI) framework as a reference, we also evaluated the overall benefits of invested resources and identified previously overlooked social needs, so that TSMC can become a force for positive change.

TSMC is the only semiconductor company in the world to be included in the Dow Jones Sustainability Indices for 22 consecutive years. Nevertheless, we don't stop there. With the publication of the annual TSMC Sustainability Report along with the Environmental Profit and Loss (EP&L) Report, TCFD Report, UN SDGs Action Report, and Materiality Analysis Report, we continue to adopt global trends in sustainability management, and transparently share TSMC's sustainability journey and accomplishments with stakeholders. Looking ahead, TSMC will embrace the ESG vision of "Uplift Society" to bring about positive change.



Lora Ho Senior Vice President



About TSMC

2022 Sustainability Report

In the face of global climate change and geopolitical tensions, TSMC is committed to innovation to improve the well-being of human life. Upholding the three competitive advantages of Technology Leadership, Manufacturing Excellence, and Customer Trust, TSMC continues to fulfill its mission as a trusted technology and capacity provider to the global logic IC industry. In 2022, TSMC's consolidated income reached NT\$2,263.89 billion, achieving a record high for the 13th consecutive year. In addition to seeking the greatest achievements in its core business, TSMC adheres to its philosophy of responsible business, working together with employees, shareholders/investors, customers, suppliers/contractors, government/industry associations, and society to strive for excellence in the three dimensions of economy, environment and society. TSMC is determined to be a force that uplifts society and creates sustainable value.

Hsinchu Science Park

1987

73,677



\$1,016.53 Billion

Net income; 70.4% increase from 2021 (NT\$)

15.3 Million

12-inch equivalent wafers total wafer shipments reached

532 Customers

Needs were satisfied through 288 distinct process technologies

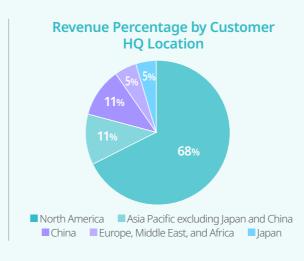
13 Consecutive Years

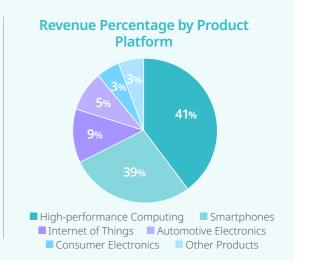
Record high revenue

53%

Of TSMC's wafer revenue came from advanced manufacturing processes with geometries of 7nm and smaller, up three percentage points from 2021

Of worldwide semiconductor output value (excluding memory) generated up four percentage points from 2021





TSMC has fabs, subsidiaries or offices in Taiwan, North America, Europe, Japan, China, South Korea, and other countries to offer real-time services and technical support to customers around the world

A Responsible Purchaser A Practitioner of Green Power Power to Change Society

2022 Sustainability Report

An Innovation Pioneer

An Admired Employer

Innovation Value

Semiconductors power almost everything in daily life and have significantly changed the way people live and work in areas including communications, data processing, agriculture, transportation, healthcare, education, clean energy, and more. Through its five technology platforms - High Performance Computing (HPC), Smartphone, Internet of Things (IoT), Automotive, and Digital Consumer Electronics, TSMC provides customers with comprehensive and competitive logic process technologies, specialty technologies, IPs, and packaging and testing technologies to help them accelerate their product innovation and move society forward with technology.

Innovations for Sustainability

TSMC continues to advance semiconductor manufacturing technologies and services, enabling customers to unleash more than 12,600 chip innovations in 2022. These innovations make products more advanced, capable, intelligent, energy-efficient, and safer, greatly increasing the quality of life and helping to build a sustainable society based on the common good.

Technology Development Focuses

- Continue to drive semiconductor scaling for both logic and specialty technologies
- Continue to expand specialty technology offerings
- Continue to advance and expand TSMC 3DFabric™ technology offerings

Benefits to Customer Product Innovation

- Boost product computing power
- Increase product energy efficiency
- Enable smaller form factors
- Provide greater chip design flexibility





A smartphone is a now a PC in our pocket. It can overcome the limitations of time and distance to make work, communication, entertainment, and life more convenient, including video conferencing, online learning, banking, shopping, and travel booking, and



Continued advancement of agricultural

drone technology is a key to sustainable

drones with a variety of sensors can help

farmers to make timely adjustments to

field management and improve farming

efficiency and quality, as well as reduce

waste.

agricultural development. GPS-fitted



The global automotive industry focuses on the four major innovation trends of connected, autonomous, shared, and electric (CASE). Electric vehicles are powered by batteries and do not emit harmful exhaust gases on the road. This, combined with continued progress in advanced driver-assistance systems (ADAS), creates a safer and more environmentally-friendly driving experience.



Supercomputers, with powerful computing capabilities, are vital to powering digital transformation and the digital economy in the era of 5G and AI. They rapidly process and analyse vast amounts of data for a wide range of applications such as accurate weather forecasts and climate predictions, which telemedicine helps protect us from the impact of increasingly severe storms, floods and

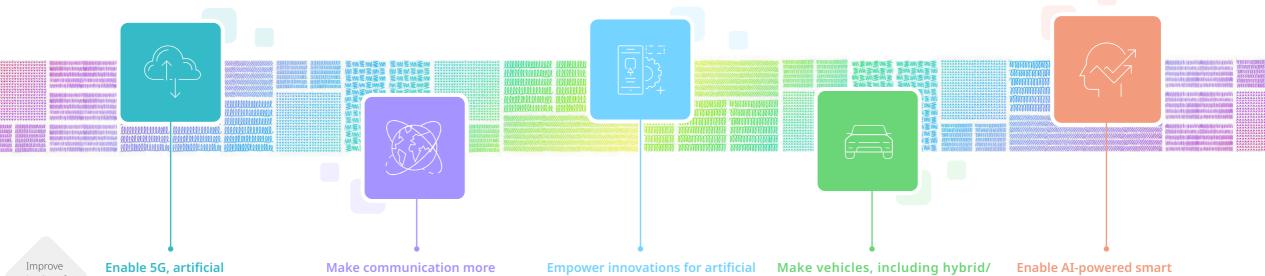
High-performance portable ultrasound scanners are becoming a common diagnostic tool. Unlike bulky traditional instruments, they are only the size of a mobile phone, and feature faster and sharper imaging capabilities, which can help medical professionals around the globe save time in diagnosis and treatment, and improve overall health care efficiency.

Photo: Courtesy of Butterfly Network

Photo: Courtesy of Fujitsu and RIKEN

snow.





Quality of Life

Products/

Applications

Customer

intelligence (AI), cloud, and datacenters to transfer and process vast amounts of data anywhere and anytime

- Central Processing Unit (CPU)
- Graphics Processor Unit (GPU)
- Field Programmable Gate Array (FPGA)
- Server CPU
- Artificial Intelligence/Machine Learning (AI/ML) Accelerator
- Network Processing Unit (NPU)
- High-speed Networking Chip, etc.

effective and work, play, and learn anytime and anywhere

- Application Processors (AP)
- Baseband
- RF Transceivers
- Wireless Local Area Networks (WLAN)
- CMOS Image Sensor (CIS)
- Near Field Communication (NFC)
- Bluetooth
- Global Positioning Systems (GPS), etc.

intelligence of things (AIoT) and accelerate digital transformation to realize more convenient and greener living and improve health care quality

- Microcontroller Unit (MCU)
- Application Processors (AP)
- Baseband
- RF Transceivers
- Wireless Local Area Networks (WLAN)
- CMOS Image Sensors (CIS)
- Near Field Communication (NFC)
- Bluetooth
- Embedded Flash Memory
- Radio Frequency Identification, (RFID) etc.

electrical cars, safer, smarter, and greener

- Microcontroller Unit (MCU)
- Baseband
- RF Transceivers
- Wireless Local Area Networks (WLAN)
- CMOS Image Sensor (CIS)
- Near Field Communication (NFC)
- Radar
- Ethernet Switches
- Power Management ICs, etc.



- Microcontroller Unit (MCU)
- Baseband
- RF Transceivers
- Wireless Local Area Networks (WLAN)
- CMOS Image Sensor (CIS)
- Near Field Communication (NFC)
- Bluetooth
- Embedded Flash Memory
- Power Management ICs
- Timing Controllers (T-CON) for Smart 8K/4K Digital TV (DTV), 4K Streaming Set-top Box (STB) / Over-the-top (OTT) services, Digital Single-lens Reflex (DSLR) Devices, and so on

Technology Platform

High Performance Computing

Smartphone

Internet of Things (IoT)

Automotive

Digital Consumer



2022 Sustainability Report

12,698 Products 100% 2.07 Trillion 5,472 Million Patent approval rate Output value (NT\$) and Leading the world in Fabricated for customers R&D expenditures increased 22.5% compared in the U.S., better than 309,000 jobs generated volume production of through manufacturing in Taiwan 3nm process technology excellence to 2021 (US\$) any other top 10 patent holders Net Zero 98.9% 54.3% 96% **Emissions** Environmental Overseas sites achieved S.T.S.P. Reclaimed Water Reduction rate of volatile The water pollution Waste recycling rate net zero emissions in Plant commenced operation organic gases composite indicator achieved and only <1% Scope 1 and 2 - the world's first industrial reached the 2030 goal of waste has been reclaimed water plant for ahead of time sent to landfills for 13 advanced semiconductor consecutive years processes 2,518,073 2,291,030 >6,800 1.779 Billion Social 239.5 Billion People received employees Invested into social Beneficiaries of social Total compensation Students around the and welfare for TSMC world participated in engagement (NT\$) engagement programs

TSMC's diverse industry-

academia cooperation

programs

employees around the

world, a 45% increase

from 2021 (NT\$)



Member of
Dow Jones
Sustainability Indices
Powered by the S&P Global CSA



2022 Sustainability Report



• "Prime" Rated by ISS ESG

Corporate Rating

ISS ESG





• SDG2000 - The 2,000 Most Influential Companies

World Benchmarking Alliance (WBA)







Dow Jones Sustainability Indices (DJSI)

- Dow Jones Sustainability World Index for the 22nd consecutive year
- Dow Jones Sustainability Emerging Markets Index

MSCI ESG Indexes

- MSCI ACWI ESG Leaders Index component
- MSCI ESG Research AAA Ratings
- MSCI ACWI SRI Index component
- MSCI ACWI Islamic Index component
- MSCI Emerging Markets ESG Leaders Index

FTSE4Good Index

- FTSE4Good Emerging Index component
- FTSE4Good All-World Index component
- FTSE4Good TIP Taiwan ESG Index component

The Asset

CDP

- 2022 CDP Supplier Engagement Leaderboard
- Water Security A Ratings
- Climate Change A- Ratings

Alliance for Water Stewardship (AWS)

• "Platinum" Class Certification with the Highest Score for the 3rd consecutive year

CommonWealth Magazine

 Excellence in Corporate Social Responsibility Award – Honorable Legion of Corporate Sustainability Top 100

Corporate Knights	2022 Global 100 Most Sustainable Corporations
Corporate Knights & As You Sow	● 2022 Carbon Clean 200 [™] List
Forbes	2022 World's Best Employers
FORTUNE	2022 World's Most Admired Companies
Institutional Investor Magazine	 Most Honored Company (Technology/Semiconductors) – All-Asia Best Overall ESG (Technology/Semiconductors) – First Place (buy-side and sell-side) – All-Asia
Morningstar	• The Best Sustainable Companies to Own in 2022
Sustainalytics	Company ESG Risk Ratings: Low ESG Risk – Semiconductor Industry

Taiwan Institute of Sustainable Energy

Taiwan Stock Exchange

- The Asset Triple A Country Awards for Sustainable Finance 2022: Best Corporate Bond
- Top 5% in Corporate Governance Evaluation of Listed Companies for eight consecutive years
- Taiwan Top 10 Sustainability Exemplary Awards for seven consecutive years
- Corporate Sustainability Report AwardsCircular Economy Leadership Awards
- Information Security Leadership Awards
- Supply Chain Leadership Awards
- Growth Through Innovation Leadership Awards
- Sustainable Water Management Leadership Awards
- Climate Leadership Awards
- English Report Gold Award

Overview

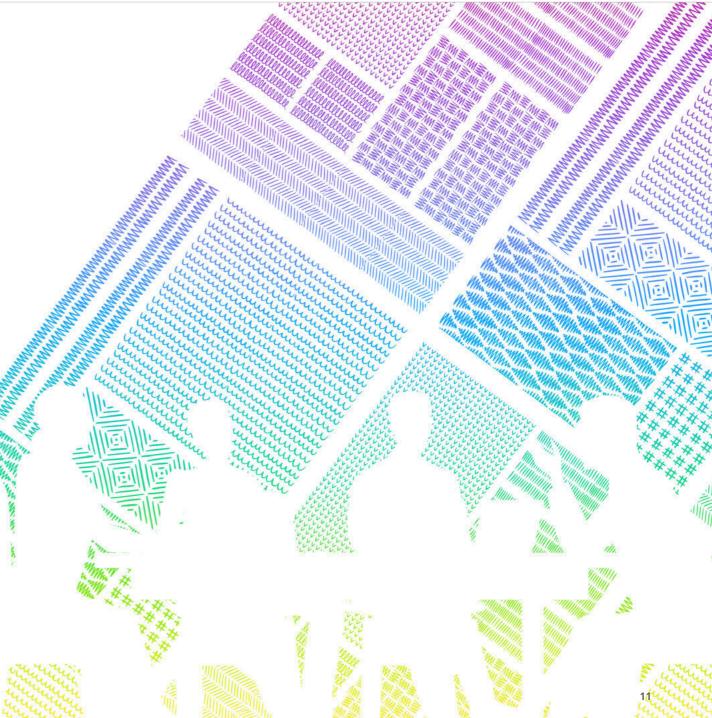
Sustainable Business Practices Operations and Governance

Appendix

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2022 Sustainability Report

An Innovation Pioneer

A Responsible Purchaser

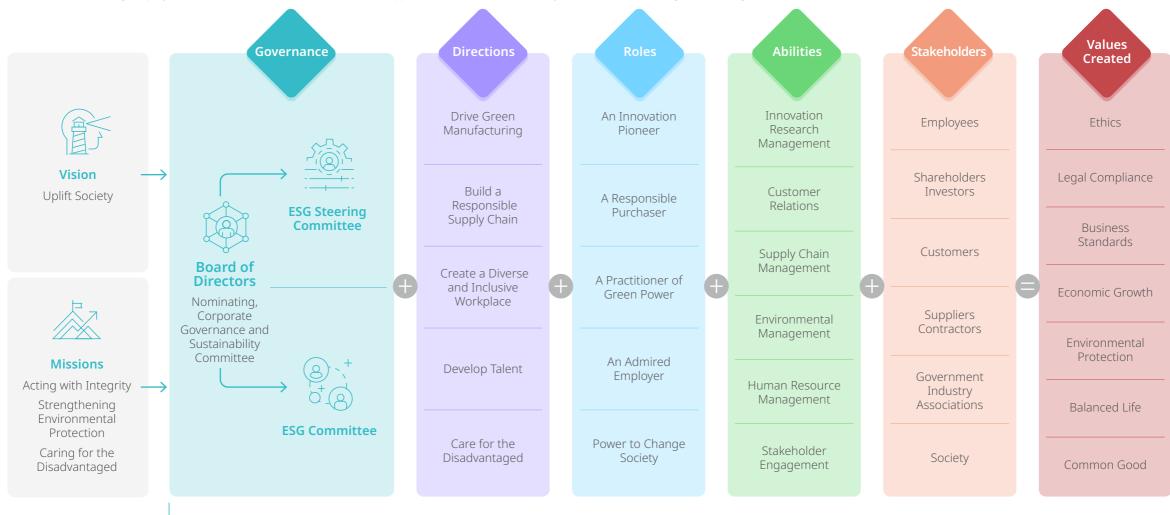
A Practitioner of Green Power

An Admired Employer

Power to Change Society

ESG Implementation Framework

With uplifting society as our vision, the <u>TSMC ESG Policy</u> serves as the foremost guiding principle for our sustainable development. The <u>ESG Matrix</u> set by TSMC's Founder, Dr. Morris Chang clearly defines TSMC's ESG scope. Through its ESG Implementation Framework, TSMC effectively carries out sustainability governance in its core business of dedicated IC foundry services. TSMC actively develops positive relationships with all stakeholders including employees, shareholders/investors, customers, suppliers/contractors, and society to create value through common good.























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Power to Change Society

ESG Management Platform

2022 Sustainability Report

In accordance with the vision and mission of the TSMC ESG Policy, TSMC's ESG Steering Committee and ESG Committee serve as management platforms to align with global trends in sustainable development and corporate growth. TSMC takes tangible actions to realize the sustainability mindset and continue to create value for stakeholders.

The board of directors supervises the overall sustainability strategy of TSMC. Chairman Mark Liu serves as the Chairperson of the ESG Steering Committee and Senior Vice President Lora Ho serves as the executive secretary of the ESG Committee. Together with senior executives from various fields, Chairman Liu and Senior Vice President Ho review ESG topics relevant to TSMC's operations, and set the mid-to-long-term development strategies and goals of the Five TSMC ESG Directions, and align the Company's core competencies with the UN SDGs to develop a blueprint for ESG. The chair of the ESG Committee reports to the board of directors each quarter on ESG achievements and future plans, receiving feedback and suggestions from the board of directors.



ESG Committee Chairperson Members Meetings **Tasks** • Identify material sustainability topics and formulate action plans Senior Quarterly Management executive representatives • Supervise interdepartmental communication and coordinate appointed by nominated resource integration Chairman Liu by functional • Compile ESG-related budgets for all functions organizations relating • Track achievements across various sustainability issues and to the economy, environment, society formulate plans for further improvement and governance • The Committee Chairperson reports achievements and work plans to the Board of Directors every quarter



Dr. Y.L. Wang Vice President, Operations / Fab Operations I

In face of the highly complex production models of globalized manufacturing, TSMC has been able to consistently inject innovations into intelligent manufacturing, enhance operational efficiency, and provide high-quality sustainable products to achieve ecological efficiency through intelligent manufacturing.



Dr. Kevin Zhang **Senior Vice** President, Business Development and Overseas **Operations Office**

Semiconductors are at the core of modern technological innovation and continue to drive advancement in our lives. We are committed to building meaningful partnerships with our customers around the world and developing a sustainable technology roadmap. Together, we provide eco-friendly products that are more powerful and more energy efficient.



Dr. L.C. Lu TSMC Fellow and Vice President, Research & Development / **Design & Technology**

TSMC endeavors to collaborate with our ecosystem partners on the Open Innovation Platform® to deliver state-ofthe-art design solutions. Furthermore, the new 3DFabric Alliance will strive to develop 3D silicon stacking and advanced packaging to facilitate the continuous innovation of global technology.

Platform



Y.P. Chin Senior Vice President, Operations and Overseas **Operations Office**

TSMC upholds commitments to environmental sustainability and continues to lead green innovation. We strive to strengthen operational efficiency through digital transformation, build green production lines, and carry out low-carbon transformation.



A Responsible Purchaser

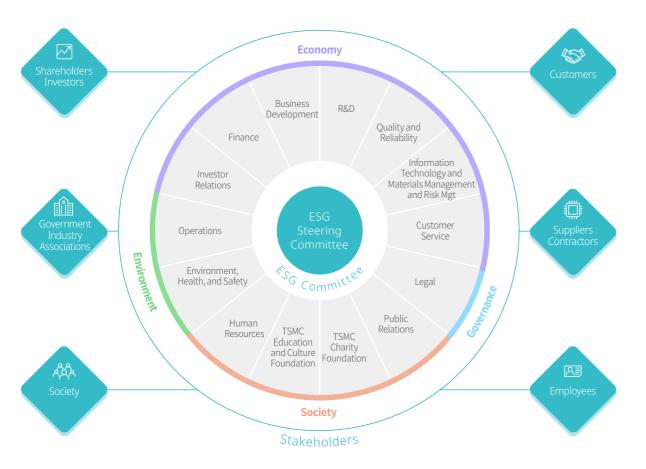
A Practitioner of Green Power

An Admired Employer

Power to Change Society

The ESG Committee carries out resolutions from the ESG Steering Committee, integrates and connects interdepartmental resources, and instructs the ESG Department, the responsible organization, and interorganizational management representatives to identify sustainability topics relevant to TSMC's operations of concern to stakeholders. The ESG Committee assembles task forces to formulate strategies, targets, and action plans, and convenes quarterly meetings to track the progress and performance of sustainability topics. In 2022, the ESG Committee oversaw the development of 72 sustainability projects and continued to host the ESG AWARD to cultivate a company-wide ESG culture and ensure that ESG strategies are fully implemented into TSMC's daily operations.

2022 Sustainability Report





Dr. Michael Wu Vice President, Research & Development / Platform Development

Technology leadership is one of the key cornerstones enabling TSMC's continuous growth. We are committed to fostering an open and innovative, as well as diverse and inclusive environment and realizing digital transformation in the R&D organization to unleash employees' full potential and achieve the goal of corporate sustainability.



Dr. Jun He
Vice President,
Quality and Reliability
and Operations /
Advanced Packaging
Technology and

We uphold our vision of sustainability by joining hands with customers and suppliers for progress. TSMC works closely with customers and suppliers on quality and service to pursue perfection and pave the way for industry progress.

Service



Dr. Cliff Hou Senior Vice President, Europe & Asia Sales and Research & Development /

Corporate Research

In an era of rapid change, TSMC continues to innovate while upholding the core value of Customer Trust, providing advanced technologies and productivity to strengthen cooperation with customers, help customers find success, and create win-win outcomes.



J.K. Lin
Senior Vice President,
Information Technology
and Materials Management
& Risk Management /
Chief Information Security
Officer

TSMC continues to uncover ESG opportunities in our operations. We also work with suppliers, collaborating closely on company operations to exert positive influence and create a green low-carbon supply chain.



A Responsible Purchaser A Practitioner of Green Power

An Admired Employer

Power to Change Society



Dr. T.S. Chang TSMC Fellow and Vice President, Operations / **Advanced Technology** and Mask Engineering

TSMC continues to research and develop advanced processes and spotlight environmental sustainability. We introduce innovative energy-efficient components at the process R&D stage to deepen lowcarbon manufacturing capabilities, enhance energy efficiency in new fabs, and work towards sustainable development.

2022 Sustainability Report



Y.H. Liaw Vice President. Operations / Fab Operations II

TSMC believes in environmental sustainability and stays true to our commitment to society. We consistently apply innovative thinking to increase energy use efficiency and work with suppliers to promote green manufacturing, expanding the use of renewable energies to strive for net zero emissions.



Dr. Arthur Chuana Vice President. Operations / **Facility**

Climate adaptability is inextricably tied to global competitiveness. The Facility Organization has been dedicated to sustainable environmental development by advancing low-carbon manufacturing technologies and building critical capabilities for circular resources.



Lora Ho Senior Vice President, Human Resources

TSMC continues to build a diverse, inclusive, dynamic, and fun workplace to strengthen talent development and employee communication, fostering a humanistic management culture with the support of digital transformation to drive the globalization of the Company.



Dr. F.C. Tseng Chairman, **TSMC Education** and Culture **Foundation**

Despite the challenges of the COVID-19 epidemic in 2022, the TSMC Education and Culture Foundation relentlessly promoted various projects, continued to introduce corporate resources to the homeland, enabled education to take root, promoted arts and culture, and endeavored to build a sustainable society of goodness.



Sophie Chang Chairperson, TSMC Charity Foundation

TSMC demonstrates our commitment to ESG in many areas. The TSMC Charity Foundation is committed to identifying what society really needs by being on the frontlines. We share experiences and practices to work with more companies and increase the scope of our influence.



Sylvia Fang Vice President, Legal and General Counsel / Corporate **Governance Officer**

TSMC's core value is integrity, committing us to reach the highest standards of corporate governance, conduct business with accountability and transparency, and appropriately balance the interests of all our stakeholders.



Wendell Huang Vice President. **Finance and Chief** Financial Officer / Spokesperson

Robust corporate governance is the cornerstone that enables us to deliver outstanding financial performances, actively respond to stakeholder needs and expectations, and increase our company's investment value to generate long-term and sustainable returns for investors.

Note: Listed in order of the chapters in this report that senior executives are responsible for.

An Admired Employer

Power to Change Society

2022 ESG Reporting to the Board of Directors

2022 Sustainability Report

2022 Achievements

- Formulated energy saving targets and actions for each stage, advanced green manufacturing performance, and increased purchasing of renewable energy in response to the strategies and targets for Net Zero Emissions by 2050
- Continued to support global sustainability trends and leveraged sustainability reports as ESG management tools to publish the TSMC UN SDGs Action Report and TSMC Materiality Analysis Report for the first time; updated the TSMC TCFD Report and Environmental Profit & Loss Report to strengthen sustainability disclosures and transparency
- Promoted low-carbon transformation across the value chain by continuing to strengthen support for suppliers on energy conservation, carbon reduction, water conservation, and waste reduction; required the supply chain to establish mid- and long-term reduction goals and propose tangible actions
- Fostered a diverse and inclusive workplace, promoted employee resource groups, strengthened the cultivation of semiconductor talents, and continued to expand <u>TSMC</u> STEM for High School Girls Program
- Promoted the implementation of AMAZING IDEAS awarded projects in the ESG Award and invited overseas subsidiaries to attend the 3rd ESG AWARD to involve the entire company

2023 Work Plans

- Continue to enhance green manufacturing performance, expand resource recycling, and develop biodiversity strategies and actions, to steadily move towards net zero emissions
- Work with the supply chain to develop green manufacturing technologies and apply TSMC's manufacturing standards to create a low-carbon value chain with suppliers
- Cultivate a diverse and inclusive culture, training programs, and related measures, expand resource groups, and empower women in tech
- Organize a cross-unit human rights task force and develop TSMC's human rights risk matrix to act as responsible stewards, promote mitigation and remedy measures, and conduct human rights training
- Expand TSMC University Collaboration Programs and science literacy programs for high school students to continue cultivating semiconductor and STEM talent

ESG Steering Committee

2022 Achievements

- Continued to connect with global ESG standards and management trends and strengthened sustainability disclosure and transparency
- Reviewed the progress of action plans for net zero emissions by 2050 to ensure strategies and pathways for energy conservation and carbon reduction as well as stakeholder communication are carried out effectively
- Promoted the 3rd ESG AWARD to inject new life into the Company's innovative culture of sustainability; the ESG AWARD attracted 1,880 proposals from employees and organizations, reaching a YoY increase of 50%
- Set and oversaw sustainability-related budgets and financial controls and coordinated the demand, allocation, planning, and execution of ESG resources

ESG Committee

2022 Achievements

- Strengthened green manufacturing, promoted source reduction and hazardous substance replacement; launched the world's first water reclamation plant to recycle industrial wastewater; bolstered the Environmental Lab's function; continued to increase the in-house recycling rate
- Mitigated climate impacts and increased the use of renewable energies; the Energy Saving and Carbon Reduction Committee proposed 684 energy-conservation programs and conserved 700GWh in energy. Formulated the Carbon Credits Quality Standards for Voluntary Emissions Reductions and completed four carbon credit programs; founded the Biodiversity Task Force and launched the Dependencies & Impacts on Nature and **Biodiversity Assessment**
- Continued to drive the low-carbon value chain by asking raw material and equipment suppliers to join the Supplier CDP Program, promoting the Supplier Material Packaging White Paper Regulations, expanding the TSMC Supplier Sustainability Academy's scale, and strengthening the supply chain's sustainable development
- Gradually fostered a diverse and inclusive corporate culture through the Diversity and Inclusion Committee to unleash the potential of diverse talent; completed a safety culture survey to strive to create the healthiest workplace.
- Completed TSMC's first survey into <u>salient human rights</u> issues, identified 11 human rights issues and formulated response measures
- The TSMC Education and Culture Foundation and TSMC <u>Charity Foundation</u> strove to bring positive change to society by supporting education for youth, promoting arts and culture education, empowering people from remote areas, and helping disadvantaged people

Materiality Analysis and Stakeholder Engagement

Materiality analysis is an important guideline for TSMC for formulating the Sustainability Report, long-term sustainability goals and stakeholder engagement. In 2021, TSMC published its first materiality methodology guideline to establish a knowledge base for ESG management. According to the requirements of GRI Universal Standards 2021, materiality analysis methodology incorporates sustainable development-related impact on the economy, environment, and people (human rights). Please refer to the TSMC 2021-22 Materiality Analysis Report for further details.

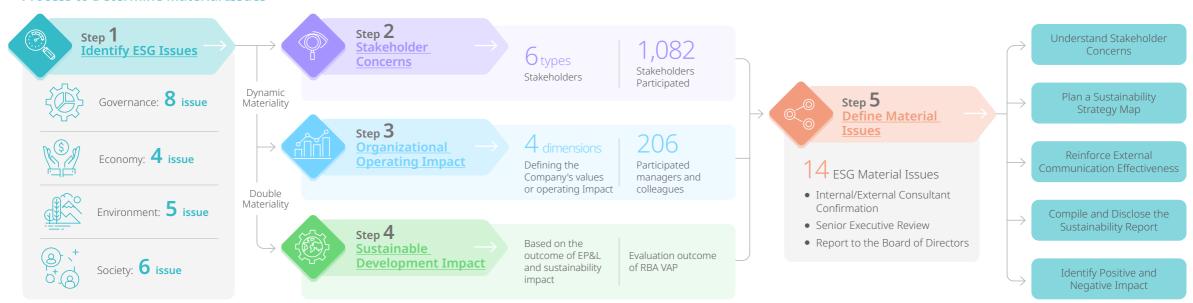
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In response to the latest GRI 3: Material Topics 2021, the World Economic Forum (WEF) suggested that materiality analysis must consider the concepts of Dynamic Process and Double Materiality advocated by the European Union. TSMC has established TSMC Dynamic and Double Materiality (TDDM) as the fundamental analysis process to continuously track changes in stakeholders' level of concern regarding ESG issues. The Company also formulated a materiality analysis methodology based on dimensions such as organizational operations and sustainable development-related impact.

By consolidating the outcome of the materiality analysis in 2021 as well as the sustainability impact assessment and the results of the Validated Assessment Program (VAP) of the Responsible Business Alliance (RBA) in 2022, TSMC has reidentified impactful material issues from the three dimensions of Stakeholder Concerns, Organizational Operating Impact and Sustainable Development Impact. At the same time, the Company also adjusted the frequency of materiality analysis to

conduct comprehensive biennial surveys to observe changing trends in ESG issues and track the progress of long-term goals. The next materiality analysis is scheduled in 2023. In the meantime, TSMC will continue to collect and respond to feedback and suggestions from stakeholders via diverse communication channels and the Company's ESG Committee will continue to carry out ESG strategies and commitments.

Process to Determine Material Issues



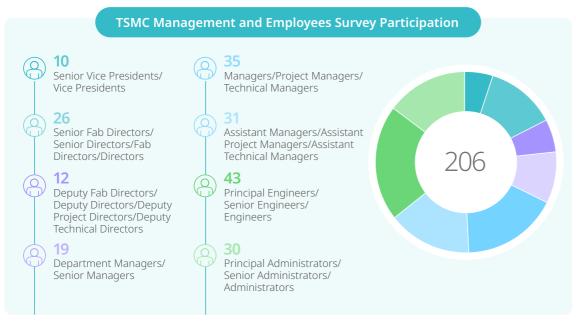
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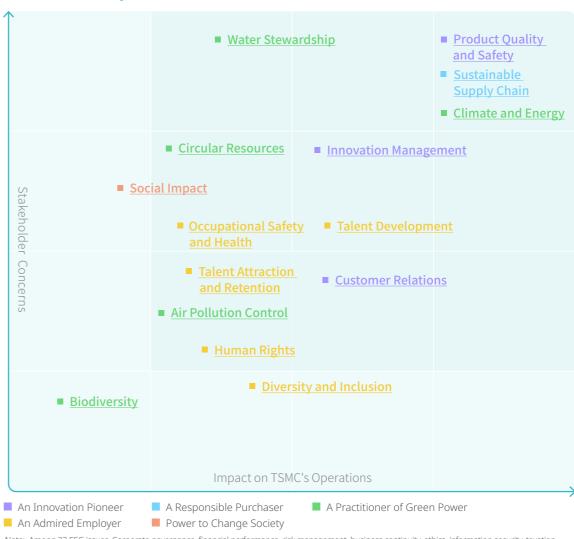
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TSMC Materiality Matrix



Note: Among 23 ESG issues, Corporate governance, financial performance, risk management, business continuity, ethics, information security, taxation, and regulatory compliance are classified under General Disclosures by GRI and are generally result-oriented. The above issues will, therefore, not be represented in the materiality matrix but relevant information will be regularly disclosed in the Company's annual report, company website, sustainability report, ESG website and ESG Newsletter

Material Issues and Value Chain

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Sustainability Roles	Material Issues	GRI-specific Topics	SASB Standards	Upstream TSMC Operation Note 2		Downstream Note 3	Operational Impact				
				Procurement Stage	Wafer Fabrication	Packaging/ Testing	Customer Use	Revenue Growth	Customer Satisfaction	Employee Cohesion	Operational Risks
	Innovation Management	Indirect Economic Impact Energy	TC-SC-410a.2		~	~	~	~	~	~	
An Innovation Pioneer	Product Quality and Safety	Customer Health and Safety	TC-SC-410a.1	~	~	~	~	~	~		~
	Customer Relations	Customer Privacy			~	~	~	~	~		
A Responsible Purchaser	Sustainable Supply Chain	Procurement Practices, Supplier Environmental Assessment, Supplier Social Assessment	TC-SC-440a.1	~				~			~
Cli	Climate and Energy	Energy, Emissions, Economic Performance	TC-SC-110a.1, TC-SC- 110a.2, TC-SC-130a.1	~	~	~	~	~	~		~
A Practitioner of Green Power	Water Stewardship	Water and Effluents	TC-SC-140a.1	~	~	~					~
or Green Power	Air Pollution Control	Emissions			~	~					~
	<u>Circular Resources</u>	Waste	TC-SC-150a.1	~	~	~					~
	Diversity and Inclusion	Diversity and Equal Opportunity			~	~				~	
	Talent Attraction and Retention	Economic Performance, Market Presence, Labor/Management Relations, Diversity and Equal Opportunity	TC-SC-330a.1		~	~		~		~	
An Admired	Talent Development	Training and Education			~	~		~		~	
<u>Employer</u>	Human Rights	Labor/Management Relations, Nondiscrimination, Freedom of Association and Collective Bargaining, Child Labor, Forced or Compulsory Labor		~	~	~				~	
	Occupational Safety and Health	Occupational Safety and Health	TC-SC-320a.1, TC-SC- 320a.2	~	~	~				~	~
Power to Change Society	Social Impact	Economic Performance, Indirect Economic Impact, Local Communities			~	~				~	

Overview

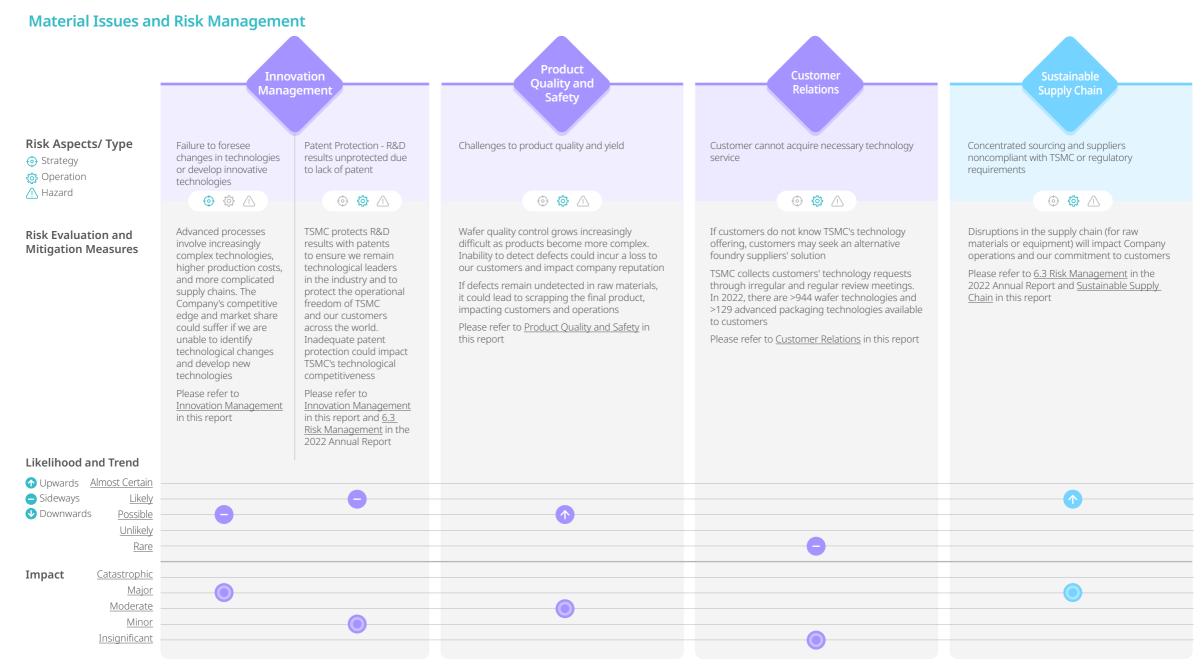


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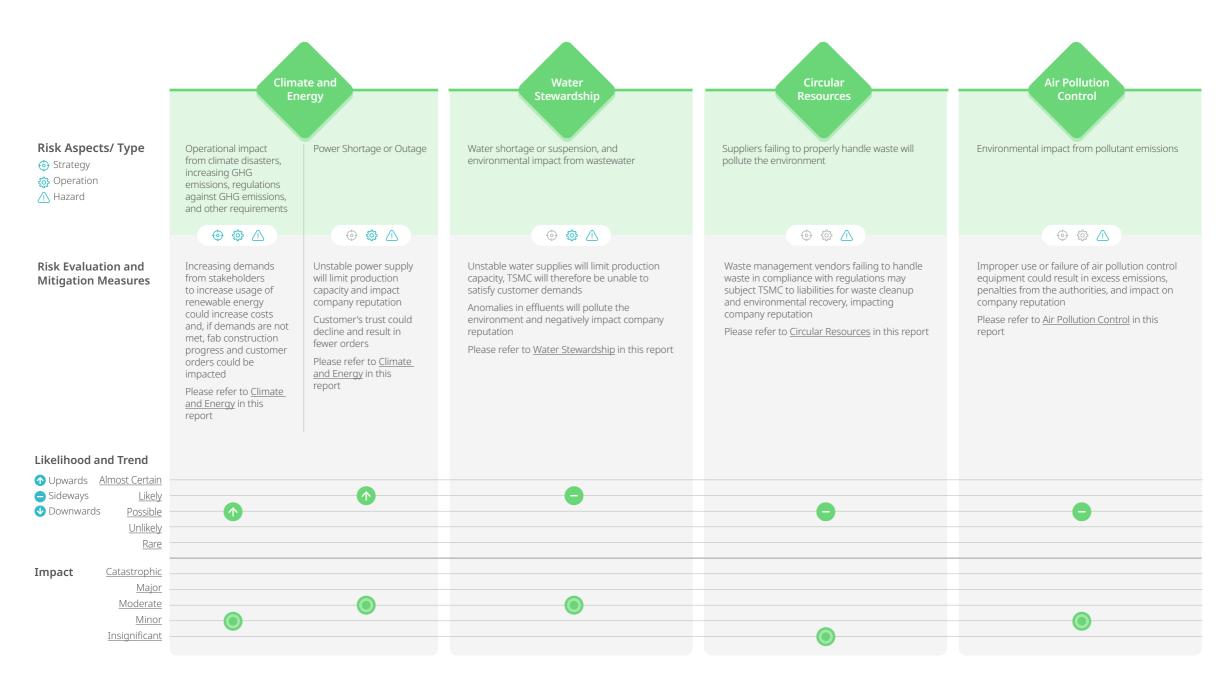
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Overview

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Sustainable Business Practices

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Operations and Governance

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Appendix

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Diversity and Human Rights Safety and Risk Aspects/ Type Failure to uncover TSMC Failure to attract or retain a Talents failing to progress Failure to protect the human Earthquakes or Occupational Pandemic sufficient number of highwith evolving landscapes injuries, occupational employees' full potentials rights of TSMC employees fires Strategy quality talents when needed and suppliers diseases, and Operation chemical hazards Risk Evaluation and The Company's understanding Company operations could The Company's competitive Company reputation, Earthquakes and Employees could Cluster infections suffer from failure to attract suffer from injuries of society and grasp of various advantage and growth employee morale, and talent fires could damage of pandemic could **Mitigation Measures** aspects of the market may and retain a sufficient momentum will suffer if recruitment could suffer from the Company's and diseases due result in disrupted suffer if the mix of employees number of high-quality talents fail to progress with the lack of proper protection equipment and to non-compliance operations is unable to reflect the current talents when needed evolving landscapes for the human rights of our to safety guidelines result in disrupted social landscape, further employees operations and Please refer to Talent Please refer to Talent impacting the Company's financial losses Attraction and Retention in <u>Development</u> in this report Company reputation and competitive advantage this report customer's interests could Please refer to <u>Diversity and</u> suffer from the lack of proper Please refer to Occupational Safety and Health in this report and 6.3 <u>Inclusion</u> in this report protection for the human Risk Management in the 2022 Annual Report rights of suppliers Please refer to Human Rights and Sustainable Supply Chain in this report Likelihood and Trend ♠ Upwards Almost Certain Sideways Likely Downwards Possible Unlikely Rare **Impact** Catastrophic Major Moderate Minor Insignificant

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Stakeholder Communication



Employees

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Issues

- Talent attraction and retention
- Diversity and inclusion
- Social impact
- Talent development
- Ethics/regulatory compliance

Engagement

- Corporate intranet (myTSMC), internal emails, and other announcement channels (such as promotion posters at facilities), TSMC Newsletter eSilicon Garden/as needed
- Human resources team/as needed
- Employee training/annually
- Communication meetings for various levels of managers and employees; e.g. the executives communication meeting, skip levels and communication meetings in individual functions or divisions/quarterly
- Employee suggestion channels, such as the Fab Caring Circle, Employee Opinion Box, Wellness Center, wellness website, employee PIP & IT Security mailbox and hot line, etc./as needed
- Ombudsman system, whistleblower reporting system, irregular business conduct reporting system, and sexual harassment investigation committee/as needed
- Employee Opinion Survey on Company Core Values, Employee Engagement Survey, employee pulse surveys and service satisfaction surveys, and employee welfare committee event questionnaire survey/as needed
- Silicon Garden Meetings (labor-management meetings)/ quarterly



TSMC provides employees with parenting resources and holds STEAM Holiday Optoelectronics, Audio, and Science Exploration



My children learn about the profoundness of science in the Company's holiday STEAM camp, and they cherish the models made in the course. This camp has made our family's life and work more manageable during the winter and summer vacations. I am very proud of TSMC.

> Shou-Hau Tsai TSMC employee

Focus Areas

Company growth, success and contribution to the society

An inclusive, diversified and friendly talents' potential

working environment that can unleash

More ESG activities and social participation opportunities for employees

Work-life balance and individual growth

Latest regulatory updates and compliance guideline, i.e., zero tolerance of corruptions, avoiding conflict of interest, etc.

→ Responses from TSMC

- Strengthen internal communication channel. Communicate with employees through 73 Silicon Garden Meetings, and 4,218 times exchange of opinions to let colleagues understand the Company's prospects
- Organized a training program on TSMC's Human Rights Policy: Say No to Sexual Harassment and Build up a Friendly Workplace to enhance awareness of respect and communion with completion rate of 97%
- Held Inclusive Leadership Workshop to support senior executives in understanding the connotation of diversity and inclusion, and strengthen the awareness of unconscious bias
- The Research and Development organization established the Diversity and Inclusion Committee
- Leveraged TSMC ESG AWARD as a platform to promote sustainable thinking and action, and the event was expanded to overseas subsidiaries. A total of 1,880 sustainable innovation proposals were collected
- Fabs organized community engagement activities such as sending warmth to the disadvantaged, elderly care, and teaching in rural areas from time to time • TSMC Child Care Benefit Program supported employees' work-life balance. In 2022, TSMC had 2,368 newborns, accounting for 1.7% of
- Taiwan's total infant population • Established employee resource group Women@tsmc to encourage female colleagues to pursue career goals and self-growth
- Provided an Annual Ethics and Compliance Training Course covering various important regulatory compliance topics and a total of 67,922 employees (including employees in subsidiaries) completed this training course, reaching 99.9% completion rate



Shareholders/Investors

2022 Sustainability Report

Issues

- Financial performance
- Risk management
- Innovation management
- Climate and energy

Engagement

- General shareholders' meeting/annually
- Investor conference/quarterly
- Domestic and overseas brokerage conferences/as needed
- Face-to-face meetings, video conference calls, and telephone conference calls/as needed
- Annual Report, Sustainability Report, and Form 20-F with the U.S. Securities and Exchange Commission/annually
- Major announcements on the Market Observation Post System/as needed





2022 TSMC Annual General Meeting



From governance and employee engagement to climate change strategy, TSMC has always exceeded our expectations in terms of promptness, level of disclosure and receptiveness to suggestions. Overall we feel very satisfied with the discussions we have had over the years with TSMC.

Guido Giammattei

Portfolio Manager RBC Global Asset Management (UK) Limited A Responsible Purchaser A Practitioner of Green Power

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Customers

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100

Issues

- Innovation management
- Product quality and safety
- Customer relations

Engagement

- Business and technology assessment/quarterly
- Customer satisfaction survey/ annually
- Customer meetings/as needed





TSMC adheres to the values of Integrity, Innovation, Commitment, and Customer Trust, focusing on improving the core capabilities



A long standing partner, trusted. They are someone we can count on to keep a commitment once the commitment is made. They are extremely professional.

NVIDIA Corporation



Suppliers/Contractors

2022 Sustainability Report

Issues

- Sustainable supply chain
- Ethics/regulatory compliance
- Product quality and safety
- Occupational health and safety
- Information management
- Climate and energy

Engagement

- Supply Chain ESH Training/annually
- Supply Online 360 Global Responsible Supply Chain Platform/as needed
- On-site support and audit/as needed
- Supplier meetings/as needed
- Supplier Information Security Association Meeting/monthly



TSMC issues Certificate of Appreciation for the Energy Saving and Carbon Reduction Counseling Project to suppliers



In the face of drastic changes in the global climate and limited resources, we uphold the values of "innovation, responsibility, commitment, and customer partnership" and work together with TSMC to develop green hydrofluoric acid for sustainable circular resources and sustainable development.

> Jian-Wei Lin General Manager SUNLIT FLUO & CHEMICAL CO., LTD

Sustainable development is the foundation of our work, the core mission of improving productivity, and the key to creating value for TSMC and society.

> **Ihong-Ming Bao** General Manager United Industrial Gases Co., Ltd.



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Government/Industry Associations

Issues

- Innovation management
- Ethics/regulatory compliance

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- Climate and energy
- Circular resources
- Water stewardship
- Sustainable supply chain

Engagement

- Official correspondences and visits/as needed
- Offer industry experience and advice/as needed
- Conferences (e.g., briefings, public hearings, symposia, seminars, meetups)/as needed
- Industry association communication platforms/monthly



Focus Areas

Industry specification formulation/ Intellectual property/Trade secret protection

→ Responses from TSMC

- Introduce the semiconductor development trend of advanced process technology and TSMC's technologies to the US Patent Office
- Participated in Taiwan Association for Trade Secret Protection, providing regulatory revision and implementation suggestions

Corporate governance, regulatory compliances and risk management

- Participated in explanatory meetings on the latest regulations of export control, and conduct practice exchanges
- Formulate TSMC's Risk Management Policy and corporate risk management framework with reference to relevant quidelines of risk management stipulated by the Taiwan Stock Exchange Corporation

Carbon credits transactions/Circular resources/Sustainable water stewardship

- Established a carbon credits working group to plan long-term purchases of carbon credits, and cooperated with industry associations to propose the establishment of carbon rights transactions to the government
- Cooperated with Environmental Protection Agency's Resource Recycling Waste Cleanup Plan Program to submit an application for circular resource demonstration cases, assisting the government to promote the program
- TSMC sites in Southern Taiwan Science Park began to use recycled water, and set a 2030 target of 60% of the Company's water resources came from recycled water

Response, suggestion and promotion of environmental protection related regulations

• Represented Taiwan Semiconductor Industry Association to communicate with Environmental Protection Agency to assist the revision a more reasonable and feasible Semiconductor Industry Air Pollutant Emission Standard and Stationary Pollution Sources that Should Be Regularly Tested and Reported in Public and Private Occasions to promote the industry's positive development

Supply chain sustainability and environmental safety and health management improvement

• In addition to Supplier Environment, Safety and Health Forum, practical operation of fire protection equipment, observation of emergency response drills, on-site diagnosis and guidance of energy saving and carbon reduction, Environmental Safety and Health, Fire Response, Fire Protection Self-training, Greenhouse Gas Inventory, Product Carbon Footprint Inventory Workshops, etc. were added in 2022

TSMC, as a member of Taiwan Carbon Capture Storage and Utilization Association (TCCSUA) changes experiences with the Japanese carbon capture and reuse demonstration plant



In addition to actively reducing carbon emissions, TSMC also exerts its influence and drives the value chain to work hard to mitigate climate change. The Company is indeed a model.

> Iames C. Liao President Academia Sinica



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Social impact

Engagement

- Volunteer services/at least once per week
- TSMC LinkedIn/as needed
- TSMC Education and Culture Foundation and TSMC Charity Foundation websites/as needed
- Sending Love charity platform/as needed
- Project cooperation and visits/as needed
- TSMC ESG Newsletter/monthly

New Generation Talent Cultivation Forum



TSMC Education and Culture Foundation inspires everyone's ideals, enthusiasm and curiosity about science, so that everyone can find a stage.

Chuan-Chin Chiao

Director

National Museum of Natural Science

Thanks to TSMC Charity Foundation for coorganizing Technical and Vocational Talent Development Forum, and initiate the job matching program for vocational high school students. This endeavor garnered industry resources to initiate new thinking on talent development.

Terry Tsao

Global Chief Marketing Officer & President of Taiwan SEMI

Focus Areas

→ Responses from TSMC

Young Generation Cultivation, Educational Collaboration, Arts and Culture Promotion • In 2022, TSMC Education and Culture Foundation invested NT\$100.2 million to expand supports for diverse education and the promotion of art and culture with three major axes: Young Generation Cultivation, Educational Collaboration, Arts and Culture Promotion. The seventh TSMC Udreamer Project themed Young and Sustainable Island encouraged young people to care about sustainability and put it into action. A total of 161 groups of students participated with an increase of 32% compared to 2021. The Foundation also held TSMC Journeys of Female Scientists Lectures to encourage high school girls to explore STEM. As of 2022, 3,225 people have attended the event.

Local community services, the needs of the underprivileged and education

Responses to major incidents (e.g., Hualien and Taitung Earthquake), volunteer services, and dedications in environmental education

• In 2022, TSMC Charity Foundation continued to committed itself to championing social causes of Care for the Elderly, Promote Filial Piety, and Protect the Environment, and renamed the focus Care for the Disadvantaged as Empower the Rural Community to strengthen their education and employment. In addition, the Foundation linked industry, government and academia resources to provide stable life and operational support for disadvantaged groups and institutions. It repaired 285 houses for Hualien and Taitung earthquake-stricken residents, and cared for 62 vulnerable households of seniors living alone. A total of 7,607 volunteers devoted in 2022, and the service hours accumulated reached 31,760 hours, with a total investment of NT\$223.07 million

Sustainability Impact

The long-term value of a company hinges on positive impacts generated and negative impacts mitigated for stakeholders, which includes driving output value from the semiconductor industry chain, helping customers leverage the competitive edge of products, protecting natural ecosystems and biodiversity, creating direct and indirect job opportunities, and preventing health or safety hazards. The Triple Bottom Line (TBL) is a sustainable impact management framework developed by TSMC. TBL is grounded in the

Company's six major capitals, four core elements, six sustainable management competencies, and an Environmental Profit and Loss (EP&L) valuation model. It aims to, from an Outside-In perspective, measure changes and contributions to the well-being of humans from the Company's overall value chain and facilitate communication with stakeholders in the hopes of driving economic growth, reducing resource depletion, and further bettering the well-being of society as a whole.

Six Major Capitals

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Finance

Generate economic value and returns through the effective management of financial resources



Manufacturing

Provide services that customers need and carefully maintain manufacturing resources for equipment and buildings



Intelligence

Strengthen TSMC's knowledge capital through continued investment into innovative R&D and patents



Human Resources

Recruit like-minded talent and strengthen talent cultivation so employees may grow with the Company



Environment

Reduce consumption of natural resources and maintain optimal usage efficiency through source management



Give back to society and obtain its trust through

Senior Management Support

Chairman Dr. Mark Liu is personally engaged in ESG efforts and has invited senior executives to lead their functional organizations in proposing sustainable solutions based on core competencies in order to expand positive influence

Four Core

ESG Governance

The ESG Steering Committee and ESG Committee meet regularly to formulate longterm strategies, engage in interdepartmental communication and cooperation, as well as supervise program progress and performance to maintain momentum for sustainability within the organization

Mid-level Management Participation

Mid-level management is the backbone of the Company's pursuit of sustainability, cooperating across organizations and departments in the face of complex sustainability issues to bring about real change

Organization Culture

Foster an organizational culture that doesn't make commitments casually, but is fully devoted to the commitment when it does. Set long-term goals for sustainability issues, strive for change, review progress regularly, and continue to commit to doing better

Process and Methods

Innovation R&D -

- Innovation Management
- Product Ouality and Safety

Human Resource

- Management Diversity and Inclusion
- Talent Retention and Cultivation
- Talent Development
- Human Rights
- Occupational Safety and Health

Customer Service

 Customer Relations

• Circular Resources Air Pollution Control

Stakeholder

Supply Chain

Management

Environmental

Management

Climate and Energy

Water Stewardship

Chain

Sustainable Supply

Engagement Social Impact



Competencies















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Sustainability Impact Strategy Map Note

TSMC has established a Sustainability Impact Strategy Map derived from causal relationships by converting all positive impacts (values) and negative impact (costs) into monetary values, beginning from the direct and indirect impacts of upstream procurement, TSMC operations, and customer use.

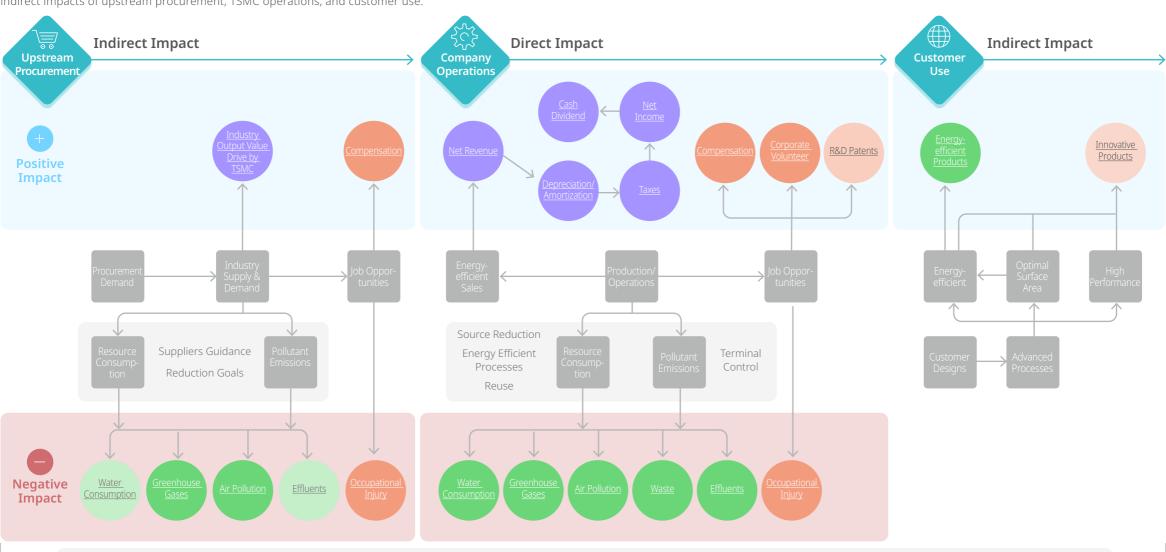
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Operational Input/ Output

Economic Impacts

Environmental Impacts

■ Measures to mitigate negative impacts→ Causal Relationship





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Sustainable Value

Indicators	Impact Attributions	ESG Dimensions	Impact Level	Impact Trend	Impacted Stakeholders
Supply Chain Output Value Driven by TSMC	•		•••••	7	
Supply Chain Employee Compensation ^{Note 4}	•	•	•••••	7	
GHG from the Supply Chain ^{Note 2}	•	•	•••••	7	
Air Pollution from the Supply Chain ^{Note 2}	•	•	•••••	a	
Effluents from the Supply Chain	•		The methodology is developing		自品級
Water Consumption from the Supply Chain	•		The methodology is developing		自急機
Contractor Employee Occupational Injury ^{Note 3}			• • • • • • •	a	
Cash Dividend			•••••	2	\sim
Net Income			•••••	2	₽
Net Revenue			•••••	2	5
Depreciation & Amortization	•	•	•••••	7	
Taxes			•••••	\bigcirc	
Employee Compensation			•••••	a	A
Occupational Injury ^{Note 3}		•	• • • • • • • •		
Corporate Volunteers ^{Note 5}	•	•	•••••	2	44A
GHG ^{Note 1}	•	•	•••••	2	
Air Pollution ^{Note 1}		•	•••••		
Waste ^{Note 1}			•••••	a	<u> </u>
Effluents ^{Note 1}			•••••		<u> </u>
Water Consumption ^{Note 1}			• • • • • • •	2	
R&D Patents			The methodology is developing		~
Energy-efficient Products ^{Note 6}	•	•	•••••	7	
Innovative Products	•		The methodology is developing		\$

+ Positive Imp	pact	Negative Im	pact Unit: NT\$ Million
Monetary Value	Impact Level	Monetary Value	Impact Level
>1,000,000	•••••	<-1,000,000	•••••
500,000 to 1,000,000	•••••	-500,000 to -1,000,000	••••••
100,000 to 500,000	•••••	-100,000 to -500,000	••••••
50,000 to 100,000	•••••	-50,000 to -100,000	•••••
10,000 to 50,000	•••••	-10,000 to -50,000	•••••
1,000 to 10,000	•••••	-1,000 to -10,000	•••••
100 to 1,000	•••••	-100 to -1,000	•••••
0 to 100	•••••	0 to -100	• • • • • • •

Note 1: Environmental Profit and Loss (EP&L) presented in this section is the monetary assessment of possible external impacts from TSMC's purchasing and production. For the costs and economic benefits arising from the implementation of environmental protection projects, please refer to <u>Environmental Cost</u> in TSMC's 2022 annual report. For the <u>EP&L</u> methodology, please refer to the <u>TSMC 2022 Environmental Profit and Loss (EP&L) Report</u>

Note 2: EP&L of the supply chain includes only Tier 1 suppliers which had more than three transactions with TSMC per year and with amounts exceeding NT\$10 million. A total of 1,050 suppliers meet the criteria. Their environmental impact is then calculated through Environmentally Extended Input Output (EEIO) analysis

Note 3: Value of Occupational Injury = Cost of Occupational Injury + Medical Expenses + Amount TSMC is Willing to Pay to Prevent Occupational Disasters

Note 4: Supply Chain Employee Compensation = Procurement amount is input into the EXIOBASE 2 database and calculated using relevant compensation coefficients based on the suppliers' industry and location

Note 5: Corporate Volunteer Value = Volunteer Service Hours * Average TSMC Employee Hourly Income

Note 6: Product energy saving data is calculated based on the research model proposed by Industry, Science and Technology International Strategy Center, ITRI in 2020. Since the model predicts future scenarios using global power usage conditions up until 2020, the estimated calculation of product energy saving is calculated since

History Data (2018~2022)

Procure



Environmental

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In the upstream procurement stage, TSMC leverages its leadership position in the global semiconductor industry to improve the technology and capability of local suppliers. TSMC employs an input-output model to assess output value, job opportunities, and income created from TSMC's procurement demands as well as the resulting economic growth and improvements in living conditions. To address supply chain sustainability issues, TSMC is actively promoting a responsible supply chain, using environmentally extended input-output (EEIO) analysis to identify environmental hot spots in the supply chain, and evaluating raw material suppliers with Life Cycle Assessment (LCA) to identify the environmental impact from production and service processes. TSMC aims to collaborate with suppliers to uncover opportunities for change and growth to help drive sustainable transformation. In 2022, TSMC created an output value of NT\$2,070.8 billion in the supply chain through procurement, generated 309,000 job opportunities and NT\$238.52 billion in payroll through the supply chain. Contractors' occupational injuries resulted in NT\$1.72 million in social costs. The environmental footprints and resource consumption generated from raw material supply resulted in an environmental cost of NT\$16.5 billion environmental cost. Through consultation and goal setting, TSMC will cooperate with suppliers to uncover the opportunities for process optimization and environment footprint minimization. For details, please refer to the TSMC 2022 Environmental Profit and Loss (EP&L) Report.

2022 Sustainability Report

In the operation stage, TSMC uses a Gross Value Added (GVA) approach to assess the positive impact generated for stakeholders by operations. Such positive impact may include equal employment opportunities, competitive compensation and benefits, cash dividends, taxes, depreciation and amortization, and others. TSMC also applies Willingness to Pay (WTP) and Value Transfer to evaluate the social cost and benefits of occupational injury and volunteer activities. Meanwhile, the Company continues to employ environmental profit and loss (EP&L) to measure the negative impacts generated from energy/resource consumption and pollution from the production process. In 2022, TSMC generated NT\$2,263.9 billion in operating revenue, booked NT\$437.3 billion in depreciation and amortization, and issued NT\$285.2 billion in cash dividends. TSMC not only helped customers succeed, but also offered good returns to its investors. In the social dimension, TSMC paid NT\$340.9 billion in taxes and payroll, supported the government in expanding infrastructure and social welfare, improved quality of life, and drove economic growth. Volunteer services from TSMC also created NT\$52.86 million in social benefits, while occupational injuries resulted in NT\$9.3 million in social costs. In the environmental dimension, environmental footprints and resource consumption generated from production process or when delivering services resulted in an environmental cost of NT\$17.89 billion. To mitigate the environmental impact,

TSMC proactively drives green manufacturing by working on creating positive impact through source reduction, energy conservation in manufacturing process, circular economy, and terminal control. For details, please refer to the TSMC 2022 Environmental Profit and Loss (EP&L) Report.

In the customer use stage, TSMC continues to develop world-leading energy-efficient semiconductor technologies to help customers produce advanced, energy-efficient products and facilitate the evolution of energy-saving ICT technologies and product applications to fulfill the commitment to green manufacturing from the inside out. The Industry, Science and Technology International Strategy Center (ISTI) conducted a model analysis based on global energy consumption, GDP, and the number of electronic products, and found that the products TSMC produces for customers will conserve 217,100 GWh in 2030. representing four times the energy consumed during production and a positive impact of NT\$174.2 billion generated. TSMC effectively facilitates global energy conservation by continuing to innovate semiconductor technologies to realize smart applications for a wide range of electronic products. TSMC deployed 288 distinct process technologies, and manufactured 12,698 products for 532 customers in 2022 to continue to bring significant contributions to the advancement of modern society. For details, please refer to Innovation Management in this Report.



TSMC continues to innovate in green technology and strives to reduce the environmental impact from its operations

A Practitioner of Green Power

An Admired Employer

Power to Change Society

TSMC is dedicated to reducing environmental and social impacts and introduced EP&L in 2018 to evaluate environmental externalities and resulting social costs created from the production process. In 2019, TSMC further applied EP&L to the upstream supply chain, converting the environmental impact generated from product life cycles into external social costs, identifying significant environmental impact factors to formulate improvement measures and reduce the environmental externalities and social costs generated from TSMC procurement.

2022 Sustainability Report

In terms of TSMC operations, in 2022, environmental externalities were mainly derived from GHG emissions (>96.5%), followed by air pollution (1.2%) and waste (1%). TSMC's overall and unit environmental externalities increased from 2021 by

10.6% and 1.3%, respectively, but unit environmental externalities decreased by 12.5% compared with 2018. To reduce GHG emissions, TSMC continues to promote low-carbon manufacturing, increase energy efficiency, and expand use of renewable energy. In 2022, overseas production locations achieved net zero emissions in Scope 1 and Scope 2 for the first time. To mitigate air pollution, TSMC adopts Best Available Technologies (CAT) to reduce emissions of two major pollutants - acid & alkali gases and volatile organic gases – and further develops new technologies to reduce PM_{2.5} and nitrous oxide emissions. To prevent and control water pollution, TSMC continues to focus on introducing new treatment technologies to lower chemical oxygen demand (COD) in wastewater and reduce the water pollution composite indicator.

In terms of the supply chain, environmental hot spot analysis of the supply chain reveals the most significant externalities as particle pollutants' impact on human health, followed by the social cost of carbon from GHG emissions. To reduce impacts from air pollution emitted by the supply chain, TSMC helps suppliers mitigate pollutant emissions from the source through environmental protection audit programs. For example, TSMC helps suppliers convert oil burners to natural gas burners, effectively reducing PM_{2.5} and GHG emissions, and this successful case study was shared with other suppliers at the TSMC Supplier Sustainability Forum. In addition, TSMC found that chemical materials account for 43.2% of environmental externalities produced by the supply chain, as such, the Company conducted audits on critical raw material suppliers.

As of 2022, TSMC has audited 95 raw materials and discovered that OSAT and Substrate the largest number of environmental externalities out of all raw materials.

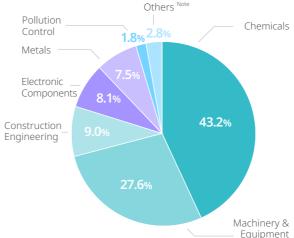
TSMC continues to roll out a variety of green and innovative practices to reduce environmental impacts from production processes at TSMC facilities. TSMC is also asking suppliers to establish management systems as well as energy saving, water conservation, GHG emissions, and waste reduction goals. The company hopes to work with suppliers to create a green, low-carbon supply chain, reduce environmental impacts from operating activities, and create positive influence on society together. For more details, please refer to <u>TSMC</u> 2022 Environmental Profit & Loss (EP&L) Report.

Environmental Externalities Trends





Environmental Hotspot Analysis of the Supply Chain



Note: Others include: Textile products, paper products, printing and reproduction of recorded media, plastic products, computers, electronics, and optical products, electrical equipment, retail, land transport, transport auxiliaries & storage, food & beverage, communication services, telecommunication services, information services, professional, scientific, and technical services, rental, support services, medical care & healthcare, and other services



Decrease in environmental externalities per unit product (compared with 2018)

Tier 1 suppliers analyzed for environment

Accumulated critical raw material audited (22 items increased in 2022)



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Supply Chain Energy Conservation and Carbon Reduction Initiatives

In 2022, TSMC leveraged EP&L analysis to compare chemical and gas suppliers against peers producing the same products and using the same raw materials to conduct variance analysis. TSMC discovered that suppliers with ISO 50001 Energy Management System certificates have significantly better energy use efficiency than those without. Given such findings, TSMC has formulated three major initiatives to help the supply chain conserve energy and reduce carbon emissions.

TSMC hopes to help suppliers evaluate environmental risks and opportunities, reducing resource consumption through a series of initiatives targeting energy conservation and carbon reduction. This can further strengthen the supply chain's green performance and resilience, striving towards a low-carbon economy.

Three MajorInitiatives to Help the Supply Chain Conserve Energy and Reduce Carbon Emissions



2022 Sustainability Report

Require <u>critical energy-intensive</u> suppliers to obtain ISO 50001 Energy Management System certificates and include ISO 50001 as a requirement in TSMC Supplier Sustainability Standards

Continue to work with Industrial Development Bureau of Ministry of Economic Affairs (MOEA) to roll out energy conservation and carbon reduction support programs targeting critical suppliers and share TSMC's energy conservation experiences



Help critical suppliers introduce energy conservation and lowcarbon concepts when designing new facilities. Main programs include adopting low-carbon raw materials and energyefficient equipment, as well as complying with green building standards and ISO 50001 Energy Management System



TSMC shares experiences on energy conservation with suppliers to strengthen sustainability actions

Carry Out the UN Sustainable Development Goals

To support the United Nations' Sustainable Development Goals (UN SDGs) and trends in corporate disclosure, TSMC has complied with Integrating the Sustainable Development Goals into Corporate Reporting: A Practical Guide jointly published by the Global Reporting Initiative (GRI) and The United Nations Global Compact to identify SDGs relevant to the Company, and has published CSR Reports since 2017. In 2022, TSMC further adopted five disclosure categories - Plans, Commitments, Actions, Progress, and Suppliers - defined by GRI and Support the Goals to disclose TSMC's practices and progress toward SDGs. The Company also decided to expand the single stakeholder from supplier to also cover employees, shareholders/investors, customers, contractors, governments/industry associations, and the society to connect more resources and extend the scope of influence. Achievements in related actions have been published in TSMC's first UN SDGs Action Report.

2022 Sustainability Report

Aggregate resources to deploy

educational, cultural and social

programs that reduces inequality

and uphold the common good

In 2023, TSMC will issue the second UN SDGs Action Report to demonstrate our support for The 2030 Agenda for Sustainable Development.

Under the leadership of ESG Steering Committee Chairman Mark Liu, TSMC continued to spotlight nine SDGs: SDG 3 (Good Health and Wellbeing), SDG 4 (Quality Education), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 17 (Partnership for the Goals). TSMC has initiated 23 ESG actions and set 52 measurable long-term goals for 2030 to effect change through tangible actions.

ESG Directions **Process and Reporting Drive Green Manufacturing** TSMC identifies the link between SDGs, the five sustainability roles, and value chain stages through Implement green production, the following three steps: Understand & Prioritize SDGs, Goals & Integration, and Disclosure and innovate high-efficiency Communication. Long-term goals and action plans are then formulated accordingly. semiconductor technologies to mitigate climate change, and pursue sustainable development **Understand Build a Responsible Supply** Cooperation Plan Integration Chain Declare support Cooperate with Collaborate with suppliers stakeholders . for SDGs and contractors to promote sustainable operations and manufacturing standards Create a Diverse and SDGs Long-term **Inclusive Workplace** Goals Establish a safe and healthy workplace that respects human rights and unleashes employees' TSMC full potential TSMC purchases TSMC offers TSMC provides **Develop Talent Progress** Commitmen wafer fabrication Support career development Track Set equipment, and and packaging/ and collaborate with academia measurable progress related services testing services to develop STEAM (Science, goals Technology, Engineering, Art and Mathematics) programs that cultivate talent Disclosure and Care for the Disadvantaged

Action

Take actions

Sustainable

Actions

An Innovation Pioneer

As the world's largest dedicated IC foundry, TSMC works with customers to accelerate and unleash innovation through its its pioneering business model and robust R&D capabilities to drive infinite possibilities in technological progress and sustainable developments through the ubiquitous semiconductor

TSMC Sustainability Roles

A Responsible Purchaser

TSMC is committed to responsible purchasing and works closely with supply chain partners on technology, quality, delivery, human rights, and environmental protection. In the face of serious climate change challenges, the Company will further strengthen green innovation and climate resilience and strive to create a low-carbon semiconductor supply chain

A Practitioner of Green Power

TSMC aspires to be a world-leading benchmark organization in environmental protection and actively integrates green management into daily operations. The Company applies innovative technologies to climate and energy, water management, circular resources, and air pollution control, promoting a comprehensive range of sustainable actions to strengthen environmental protection and act on our firm belief in prospering with the earth's ecosystem

An Admired Employer

TSMC values its commitment to employees and works to foster a humanistic workplace culture with open communications. The Company is dedicated to promoting a diverse, inclusive, safe, and fun workplace where employees can continue to learn. TSMC also provides competitive compensation and welfare, striving to be a company that employees can be proud of

Power to Change Society

Committed to uplifting society, the TSMC Education and Culture Foundation and TSMC Charity Foundation spotlight the changing social landscape and its needs. The two foundations integrate and invest internal and external resources to empower young students of all ages, care for remote areas and the disadvantaged, elderly people living alone, and foster art and cultural literacy to lay the foundation for a society with common good, beauty, and kindness





















>8,500 / >40,000

2022 Sustainability Report

technology and quality

944 / 129

advanced packaging technologies

Innovation Management

Product Quality and Safety



Innovation Management

2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Maintain Technology Leadership Continuous investment in advanced technology development to maintain TSMC's technology leadership in the semiconductor industry	Maintain TSMC's technology leadership and invest 8.5% of revenue into R&D expenses annually	Maintain TSMC's technology leadership and invest 8.5% of revenue into R&D expenses annually Begin volume production of enhanced 3nm process (N3E)	Invested 7.2% of revenue into R&D Target: 8.5% 3nm process technology in volume production Target: 3nm process technology in volume production	Note1
		process (NSE)	rarget. Stiff process technology in volume production	
Protect Intellectual Property Patent protection: Strengthen quality and quantity driven patent management, apply early for patents on next-generation process technologies, and expand the patent protection network to maintain TSMC's technology leadership Trade secret protection: Strengthen business operations and intellectual property innovation by recording, consolidating, and utilizing trade secrets with competitive corporate advantages through trade secret registration and management	Over 80,000 global patent applications	Exceed 7,500 global patent applications	Submitted over 8,500 global patent applications Target: >6,600	↑
	Over 200,000 trade secret registrations	Exceed 40,000 trade secret registrations	Registered over 40,000 trade secrets Target: >25,000	↑
		Share TSMC's trade secret registration mechanism with eight companies	Shared TSMC's trade secret registration mechanism with 17 companies Target: 6	↑
		Assist six companies to successfully build a trade secret registration and management system	Assisted 12 companies to successfully build a trade secret registration and management system Target: 2	↑
		Exceed 500 green trade secret registrations		
Enhance Industry-Academia Collaboration Link academic institutions in Taiwan and overseas by investing resources in university programs based on a long-term mechanism for interaction to cultivate the next-generation semiconductor talent	Cultivate more than 8,000 undergraduate and graduate students globally through university programs that deepen industry-academia collaboration Note 2	Cultivate more than 8,000 undergraduate and graduate students globally through university programs to enhance industry-academia collaboration	Launched a variety of industry-academia collaboration projects, reaching >6,800 undergraduate and graduate students globally Target: 5,500	~
	Cultivate more than 35,000 undergraduate and graduate students globally through university programs that deepen industry-academia collaboration between 2021 and 2030	Cultivate more than 10,000 undergraduate and graduate students globally through university programs that deepen industry-academia collaboration between 2021 and 2023 NEW		
	and R&D expense records every year. The decline in R&D expenses to revenue per		↑ Exceeded ✓ Achieved — Missed Target	

attributed to revenue growth outpacing growth in R&D expenses. In 2022, R&D expenses amounted to US\$5,472 million, 3.4 times more than ten years ago. For historical data on revenue and R&D expenses, please see Continuous Investment in R&D

A Responsible Purchaser A Practitioner of Green Power

An Admired Employer

Power to Change Society

Originating from Dr. Morris Chang's groundbreaking idea of "being everyone's foundry", TSMC became the world's first dedicated IC foundry in 1987 and has since given rise to a thriving fabless IC design industry. TSMC continues to drive innovation and improve people's lives and societies with technology. Innovation remains, to this day, a proud corporate value and integral cornerstone for technology leadership. Within the Company, TSMC encourages employees to innovate by launching innovation-sharing platforms, contests, and other incentives for different organizations. Outside of the Company, TSMC explores product innovation with customers, fosters new talent with schools and research institutes, and advocates for a green supply chain with upstream and downstream suppliers. TSMC remains consistently devoted to innovation both internally and externally.

2022 Sustainability Report

Innovation Management Framework

- Technology Leadership
- Intellectual Property Protection
- Comprehensive Patent Management Mechanism
- Trade Secret Protection
- Intelligent Precision Manufacturing
- Innovation Cases
- TSMC Enables More Than 1,500 Startup Customers Worldwide to Plant Seeds of Innovation
- Strengthen Yield Monitoring System with AI; Effectiveness of Auxiliary Recognition Model Reaches 98%
- Consistent Efforts to Optimize Energy Efficiency in EUV Tools Save 60 GWh Electricity per Year
- Green Energy Cycle: 2.2 kWh of Green Energy from 1 Metric Ton of Organic Sludge
- Improve Corona Technologies in Air Pollution Control Equipment to Reduce Alkaline Gases and PM2.5 by over 90%
- Artificial Intelligence (AI) Job Hazard Analysis Technology Enhances Workplace Safety



Energy





Innovate through **Cross-Sector** Collaboration

- Idea Forums with participation from organizations including
- Operations
- R&D
- Quality and Reliability
- Corporate Planning
- Finance

- Total Quality Excellence and Innovation Conference (TQE)
- ESG AWARD
- Technology Board Conference
- Corporate Research Seminar

- Collaboration with world-class
- R&D Institutes
- Industry-Academia Collaboration

Open Innovation Platform[®] (OIP)

- <u>University Research Center</u>
- Industry-Academia Joint Development Project
- University Shuttle Program
- National Academy for Key Fields of Research

- Course Collaboration
- Semiconductor Programs
- FinFET Academic Design Foster Package (ADFP)
- Career Guidance
- TSMC Ph.D. Scholarship
- TSMC High School Semiconductor Mini Courses
- TSMC Girls in STEM Program for High School



Maintain Technology Leadership

In 2022, TSMC continued to increase R&D investments, with annual R&D expenses accounted for 7.2% of total revenue, a 22.5% growth from last year. The Company has expanded R&D organization which now has 8,558 employees, a 9.6% growth from last year. TSMC's R&D investments paralleled those of world-leading tech companies.

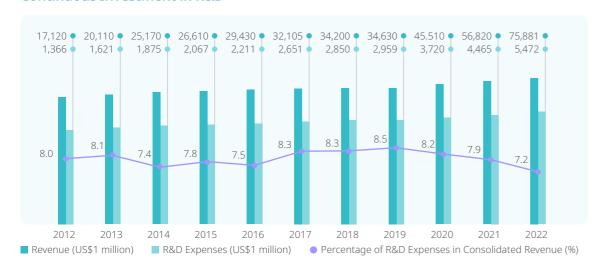
2022 Sustainability Report

To address the challenge with Moore's Law, TSMC's R&D organization provides customers with advanced technologies and design solutions to help them achieve product success. In 2022, N3E, the enhanced 3nm process technology, entered risk production. In the same year, TSMC also pioneered 2nm technology development by successfully entering the stage of baseline setup and yield learning. TSMC will continue to conduct exploratory research into technology innovation beyond 2nm.

In addition to CMOS logic technology, TSMC is also developing a wide range of semiconductor technologies to meet customer demands on SoCs for mobile and other applications. The existing scope of application includes integrated interconnect and packaging solution, microcontrollers, virtual reality, edge-computing, etc.

In 2022, TSMC continued to work closely with world-class research institutes and world-leading universities such as the Semiconductor Research Corporation (U.S.), Interuniversity Microelectronics Centre (Belgium), etc., to develop semiconductor materials and design transistor structures. We aim to uphold Moore's Law and cultivate talent to usher in a new angstrom era for the semiconductor industry.

Continuous Investment in R&D



R&D and Revenue Growth Ratio over the Years



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Technology Leadership and Innovation

2022 Sustainability Report



Pioneered the industry's first 5nm process technology in volume production

- Pioneered the industry's first 3nm technology in risk production
- Pioneered the industry's first 3nm process technology in high volume production
- N3E, the enhanced 3nm technology, successfully entered risk production





Specialty Technologies/ Interconnect and Packaging **Technologies**

- 2020
- Accomplished process validation of TSMC-SoIC® for both chipon-wafer (CoW) and wafer-on-wafer (WoW) stacking using micron-level bonding-pitch processes with promising electrical yield and reliability results
- Entered high-volume manufacturing of InFO-PoP Gen-5 packaging for mobile application processors and successfully qualified InFO-PoP Gen-6 for mobile applications with enhanced thermal performance
- Developed InFO-oS Gen-3, which provides more chip partition integration with larger package size and higher bandwidth
- Expanded the 12-inch Bipolar-CMOS-DMOS (BCD) technology portfolio on 90nm, 55nm, and 22nm processes, targeting a variety of fast-growing applications for mobile power management ICs with various levels of integration
- Achieved technical qualification of 28nm eFlash to support automobile electronics and MCU applications
- CMOS image sensors technology entered volume production, with shrunk sub-micron pixel size and sensors meeting automotive grade reliability compliance
- Began production of 28nm RRAM technology as a low-cost solution to support the price-sensitive IoT market
- Achieved technical qualification of 22nm magnetic random access memory (MRAM) technology to successfully volume produced MRAM and received the Flash Memory Summit 2020's Best of Show award for the most innovative AI application

2021

- Qualified the fifth-generation chip on wafer on substrate (CoWoS®) with record-breaking Si interposer area up to 2,500 mm2, which can accommodate at least two SoC logic and eight high bandwidth memory (HBM) chiplet stacks
- Successfully qualified InFO-PoP Gen-7 for mobile applications with enhanced thermal performance
- Initiated high-volume manufacturing of InFO-oS Gen-3, which provides more chip partition integration with larger package size and higher bandwidth
- Expanded the 12-inch BCD technology portfolio on 90nm, 55nm, 40nm, and 22nm processes, targeting diverse mobile power management ICs applications with different integration levels
- Maintained stable high yield and achieved technical qualification of 28nm eFlash for consumer electronics grade and automobile electronics grade-1 applications
- Achieved 13% pixel size scaling down on Quad Phase Detection (QPD) CMOS image sensors structure for the mobile imaging market
- 28nm and 40nm RRAM entered volume production as a lowcost solution for the price-sensitive IoT market

2022

- Received CoWoS®-S certification for Gen-3 HBM, silicon interposer now contains sub-micron routing layers and integrated capacitors (iCap) so that various chiplets such as SoC, HBM can be placed on it
- Successfully qualified InFO-PoP Gen-8 for mobile applications with enhanced thermal performance; launched R&D for next generation InFO PoP, which will introduce backside redistribution layer
- Successfully qualified InFO-oS Gen-4, which provides more chip partition integration with larger package size and higher bandwidth
- Optimized quality factors of 5V components on 55nm BCD targeting power switches for portable devices; continued to expand 40nm, 22nm, and 0.13 micron BDC technologies to meet automotive market demands
- 28nm eFlash entered volume production, which can support mobile HPC and high-performance low-leakage platforms
- Successfully risk-produced the world's smallest voltage domain global shutter CMOS image sensor chip with 3-wafer stack technology for near infrared and security cameras market
- Prepared 22nm RRAM for volume production as a low-cost embedded non-volatile memories solution for price-sensitive IoT markets

An Innovation Pioneer A Responsible Purchaser A Practitioner of Green Power An Admired Employer

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Foundry Technology Leadership and Innovation in 2022

2022 Sustainability Report

Process Technologies	Product Applications	Innovation / Breakthrough	Customer Success
3nm Fin Field-Effect Transistor (FinFET) (N3) technology	5G 😂	Customer products in high volume production with the industry-leading yield	Led the industry by introducing the most advanced products
4nm Fin Field-Effect Transistor (FinFET) (N4) technology	5G 😸	Led the industry to start volume production for customer products	Introduced products with the industry-leading performance and energy efficiency
The performance-enhanced 5nm FinFET technology N5P	5G ⊗	Entered its second year of volume production for various customers' products	Introduced products with the industry-leading performance and energy efficiency
6nm FinFET (N6) technology	5G 📚 ₩	Widely adopted in mobile, high performance computing, and consumer electronics products	Introduced products with the industry-leading performance and energy efficiency
N6 radio frequency (N6 RF) technology	5G IIIII	Received multiple customer product tape-outs	Introduce products with the industry-leading RF performance and cost-effectiveness
16nm FinFET Compact(N16FFC) MRAM (Magnetoresistive Random Access Memory) Technology		Completed reliability qualification, with one million cycles endurance and reflow capability	Introduced the industry-leading high performance microcontroller unit (MCU) for automotive and industrial applications
CMOS Image Sensor (CIS) technology		Continued to help customers gain market leadership by introducing the world's smallest pixel size products	Led the industry by introducing the most advanced products
TSMC-SoIC [®] (System on Integrated Chip) Chip-on-Wafer (CoW) technology		Led the industry to start volume production for customer products, with significant power and performance improvements	Introduced products with the industry-leading performance and energy efficiency
Integrated Fan-Out with local silicon interconnect (InFO_ LSI) technology		Successfully integrated 5nm SoCs with ultra-high density die-to-die interconnects and entered volume production in 2022	Led the industry by introducing advanced products
5G 5G mobile communications Consumer electronics	₩iFi		tive zonal control used new electrical/electronic
High performance computing True wireless stereo (TWS)	Digital TV/Set-Top Box (STB)	darchitec	ture (EEA) for software defined vehicle

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TSMC Continues to Advance Technology to **Unleash Customer Innovation**

2022 Sustainability Report

Semiconductors have been playing a vital role in the development of human economic civilization, lifestyle and social evolution with greater computing power and better energy efficiency through innovations and breakthroughs. As the trusted dedicated semiconductor foundry service provider, TSMC continues to deliver the industry-leading, next-generation semiconductor technologies, with higher chip density and lower power consumption. The Company also offers comprehensive specialty technologies and leading 3D chip stacking and packaging services to help customers unleash different types of innovation and deliver more advanced, more capable, more energy-efficient, and more affordable electronic products.

Collaborate with Customer to Push the Envelope in **High-Performance Computing**

One noteworthy example is our collaboration with AMD on building its leadership high-performance and adaptive computing products to help address the fast-growing compute demand from increasing adoption of cloud computing services, digital transformation, transition to exascale supercomputing, and the growing deployment of AI and high-speed 5G networks.

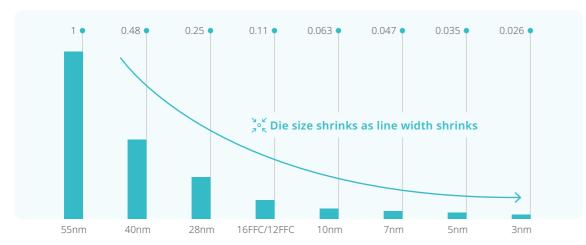
In 2022, combining AMD design innovation and TSMC's industry-leading 5nm technology process, AMD brought its 4th Gen EPYC[™] processors to market. With up to 96 cores in a single processor,

the 4th Gen EPYC processors power the most energy efficient x86 servers. They offer leadership performance, energy efficiency and nextgeneration architecture, to accelerate data center modernization for high application throughput and more actionable insights. The 4th Gen EPYC processors can also help companies advance sustainability goals by deploying efficient, powerful servers to meet workload demands and help reduce power, energy costs, and server footprint.

In addition, in the November 2022 Top500 list, Frontier supercomputer at Oak Ridge National

Laboratory (ORNL) in the US, powered by AMD optimized 3rd Gen EPYC™ processors and AMD Instinct™ MI250X accelerators using TSMC's 7nm process technology, topped the list with 1.1 exaflops for the second consecutive time. Frontier is the world's first supercomputer that breaks the exascale barrier, and it is more than twice as powerful as the next system on the list and more powerful than the next four systems combined.

Comparison of Chip Die Size on Different Technologies



Note: The logic chip/SRAM/IO (input/output) ratio, which affects die size and power consumption, was re-aligned

Comparison of Chip Total Power Consumption on Different Technologies



Note: The logic chip/SRAM/IO (input/output) ratio, which affects die size and power consumption, was re-aligned

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On the energy efficiency front, the Frontier Test & Development System at ORNL, also powered by AMD optimized 3rd Gen EPYC™ processors and Instinct™ MI250X accelerators using TSMC's 7nm process technology, achieved an efficiency score of 62.68 GFlops/Watts, which was at the top of the June 2022 Green500 list and at the No. 2 spot of the November 2022 list. According to the Green500 November

2022 Sustainability Report

2022 list, AMD powers 75 percent of the top 20 most energy efficient super computers.

In addition, using TSMC's process technology leadership, AMD received a 2022 SEAL Sustainable Product Award for innovative and impactful products "purpose-built" for a sustainable future in data centers and was honored in the Best Sustainability

Innovation in HPC category in the annual HPCwire Readers' and Editors' Choice Awards.

With the close collaboration with AMD, TSMC is glad to take part in contributing to the innovation and advancement in supercomputing to ensure scientists and researchers working on solving the world's toughest and most complex challenges, such as climate change, health care, and transportation, have the most cutting-edge tools for their research.

In total, TSMC deployed 288 distinct process technologies, and manufactured 12,698 products for 532 customers in 2022, making continuous contribution to the advancement of modern society.



Customer **Product**

 AMD 4th Gen EPYC[™] (codename Genoa) processor



Product Innovation and Breakthrough

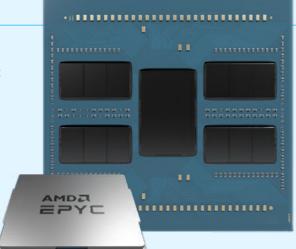
• With up to 96 cores in a single processor, the 4th Gen EPYC™ processors power the most energy efficient x86 servers



Impact on Society

- Enable datacenters to deploy more efficient and powerful servers to meet workload demands
- Help lower power, energy costs, and server footprint to advance corporate sustainability goals

AMD collaborates with TSMC to deliver breakthrough 4th Gen EPYC™ (Genoa) 5nm processor to power the most energy efficient x86 servers (Photo courtesy of AMD)



TSMC's Role

- Provide industry-leading 5nm process technology with best performance and power advantages
- Establish a dedicated team to enable deep technology and design co-optimization (DTCO) to speed up product design and volume production



Case Study

TSMC Enables More Than 1,500 Startup Customers Worldwide to Plant Seeds of Innovation

TSMC is the world's first dedicated semiconductor foundry, and this innovative business model has changed the landscape of the global semiconductor industry and enabled the global fabless IC companies to flourish. Today's heavyweight technology companies, including Broadcom, Marvell, and NVIDIA, have been collaborating with TSMC since their early days to continue to unleash innovation around the worldwide.

2022 Sustainability Report

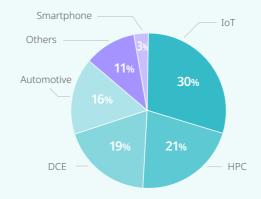
In 2000, TSMC formed a dedicated Emerging Accounts team to support startup companies to accelerate their product innovation. To date, TSMC has worked with more than 1,500 startup companies to advance applications in communication, computing, healthcare, transportation, clean energy and many other new applications. Currently, over 85% of startup companies in the semiconductor industry are engaging with TSMC to develop their prototype products.

TSMC strives to be a long-term important partner that customers can trust and rely on for their success. Driven by the passion to enable startup customers' success, TSMC hosted a dedicated Innovation Zone for the first time at the 2021 TSMC Online Technology Symposium. In the Innovation Zone of the 2022 in-person/ online Technology Symposium, a total of 37 startup customers showcased a wide range of disruptive innovations that aim to make people's lives better and more sustainable, including cashier-less retail, high-performance computing interconnect, cloud and edge AI, power electronics, augmented reality, satellite-mobile communication, battery-free devices, in-vehicle networks, software-defined touch sensing, 5G private networks, and more. Through the interactive demonstration of products, startup customers vividly showcased the splendid future of next-generation semiconductor innovations.

Turning the spotlight to Kinara, which was awarded the first Innovation Zone Demo of the Year Award elected by Symposium attendees, showcased a cashier-less retail solution enabled by its edge AI platform. The platform uses a camera and AI system to identify consumers'

actions and their purchases in real-time with better energy efficiency. The cashier-less retail solution not only brings a convenient shopping experience to consumers but also creates meaningful work for retail cashiers, transforming them into sales consultants who provide value-added advice or retail system administrators. This inspiring story exemplifies how technology drives amazing changes.

2022 Innovation Zone Customer Demo By Application





TSMC hosted the first in-person Innovation Zone at the 2022 Technology Symposium



U.S. company Kinara received the first Innovation Zone Award for its cashier-less retail solution

Protect Intellectual Property

2022 Sustainability Report

IP-based development strategies are increasingly important under trends of globalized economic and trade competition. To fulfill TSMC's vision of sustainable operations, the Company seeks to strengthen its three competitive advantages— Technology Leadership, Manufacturing Excellence, and Customer Trust—by protecting technological innovations and proprietary information through two approaches: patents and trade secrets. For technology leadership, TSMC's IP and R&D teams work closely throughout each step from the beginning of technology planning to risk production and volume production. Such teamwork enables TSMC to build an IP portfolio for each generation's critical innovative technology ahead of schedule, including the latest 3nm and 2nm process technologies, to ensure the Company's technology leadership in the semiconductor industry. In manufacturing excellence, TSMC uses rigorous protection measures to secure critical information

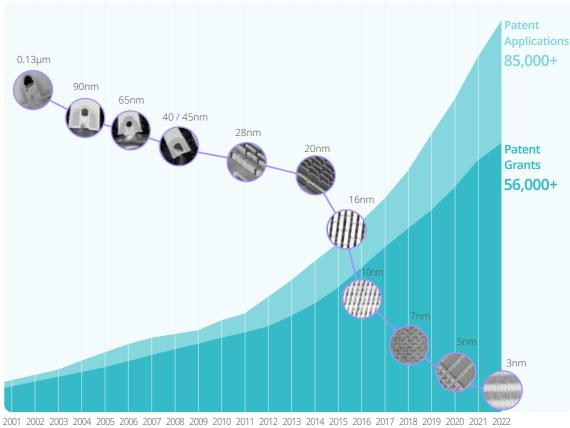
such as capacity planning, manufacturing process management, and information related to intelligent operations in the form of trade secrets, while also actively applying for patents for manufacturing technology with strategic value to secure the Company's competitive advantage obtained through manufacturing excellence and quality assurance. In maintaining customer trust, TSMC protects confidential information concerning the Company and its customers while maintaining strategic leadership in the global patent ranking. These efforts translate into business success, ensuring the freedom of TSMC's operations around the world and strengthening partnerships with customers.

TSMC Patent History

The history of TSMC's robust patent portfolio can be divided into three eras. In 1987, the Company applied for its first patent and has since increased patent applications every year. In 1998, TSMC filed

500 invention patent applications, thus concluding the Groundwork Era. In 1999, the Company entered the Growth Era and filed 1,000 patent applications in 2011. Starting in 2012, the IP team began setting patent application goals based on annual R&D investments, bringing TSMC into the Exponential Growth Era. As of 2022, TSMC has filed over 85,000 global patent applications and consistently reached record highs again and again. Using FinFET technology as an example, TSMC introduced 16nm FinFET process technologies in 2013 and became the first to fabricate both 7nm and 5nm FinFET products. In the early stages of FinFET development, TSMC had already filed patent applications. Over the course of 20 years, TSMC has accumulated over 14,000 FinFET patents as it systematically built up patent protection coverage to ensure technology leadership.

Exploratory R&D Patent Applications



Patent Achievements with Quality and Quantity in 2022



Place among U.S. Patent Applicants and remained the only Taiwanese company in the top 100





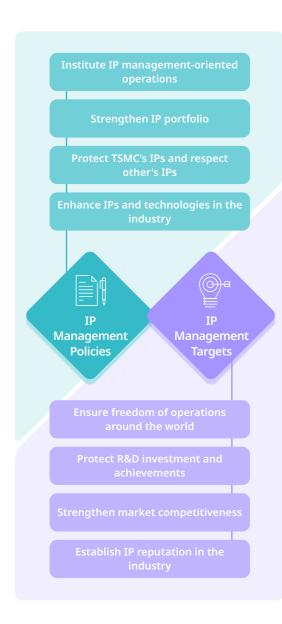


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Comprehensive Patent Management Mechanism

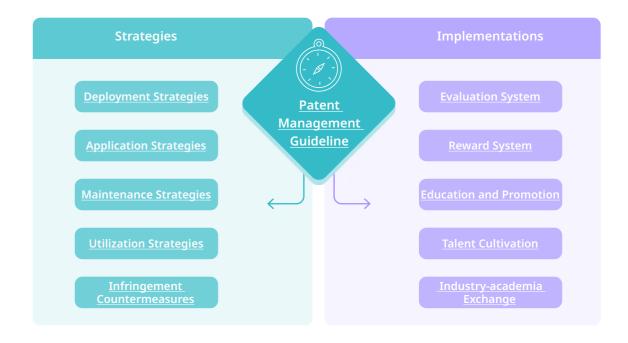
TSMC's patent performance stems from its robust patent management institutions and patent management systems. The Company maps out short-, mid-, and long-term patent blueprints using innovative patent strategies and diverse risk control; monitors and evaluates competitive information by patent map navigation; hosts advanced invention workshops to uncover innovations in core technologies; expands the patent family by targeting key technological indicators; and manages patent prosecutions by invention tiers. Through managing the quality of patent applications and expanding patent protection coverage, TSMC has been able to consistently construct a global strategic patent portfolio with equal attention to quality and quantity. In 2022, TSMC was the only Taiwanese company ranked in the top 100 for U.S. patent applications and grants.

The patent team has also designed a range of incentive systems including awards for patent invention submission and a big annual IP award ceremony. The Prolific Inventor Award recognizes employees that have received over 100 U.S. patents during their employment at TSMC. As of 2022, there have been 141 Prolific Inventor Award recipients, one of whom holds over 1,000 U.S. patents. A total of 360 patents have been issued from 384 employee inventors that received the New Inventor Award in 2022. In 2022, the patent team also launched a series of patent campaigns, including the Annual Patent Competition, which

received 1,663 invention submissions; 16 on-site education and training sessions to help employees ideate valuable patents; and the Online Patent Quiz, which saw the participation of around 2,000 employees.

Widespread Recognition of Patent Success and Industry IP Upgrades

TSMC's patent performance has been recognized by many international IP institutes. The Company ranked first in the semiconductor manufacturing category for IEEE's Patent Power Scorecard, became the first and only company to receive the highest Taiwan Intellectual Property Management System (TIPS) certification (AAA), and ranked in the Clarivate Global Top 100 Innovators and LexisNexis Global Top 100 Innovation Momentum for two consecutive years by index of patent portfolio size and citation strength. In addition, TSMC continues promoting technology and IP upgrades in the industry by communicating with various IP authorities and legal courts, collaborating with academic institutes to develop technology and IP indicators, and spearheading IP strategy alliances for the industry's supply chain. TSMC also helps formulate and amend IP laws and provide suggestions on industry policies to help create a robust patent protection landscape.





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Trade Secret Protection

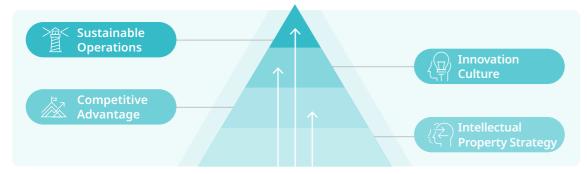
Driven by its four visions—IP Strategy, Competitive Advantage, Innovative Culture, and Sustainable Operation, —TSMC has implemented three measures to drive comprehensive trade secret management: Trade Secret Registration (TSR) System, Golden Trade Secret Award, and Green Trade Secrets. With registration and incentive systems, TSMC aims to execute IP strategies and strengthen competitive advantages by instilling vigor into the Company's innovative culture and fulfill the mission of sustainable corporate governance. In pursuit of excellence, TSMC actively uses intelligent automation and AI technologies to optimize the TSR system. On top of introducing an AI chatbot to raise employee awareness of trade secret management, TSMC also developed numerous capabilities for the TSR system, such as an innovation talent pool, systematic technology clusters, and technical keyword analysis. Not only has TSMC acquired the capability to identify real-time insights into the development trends of leading technologies, the Company has also integrated the HR system and contract management system to consolidate employees' innovation prowess and contributions

2022 Sustainability Report

to strengthen TSMC's evolving competitiveness, maximizing the impact of registered trade secret contents on sustainable technology innovation. In 2022, more than 40,000 trade secrets were registered at TSMC, far exceeding the annual target, bolstering company operations and IP innovation.

In addition to improving trade secret protection and management internally, TSMC is also expanding externally to extend positive spillovers for the industry. Based on the <u>Supply Chain Trade Secret</u> Management Sharing public service project, TSMC established the <u>Trade Secret Registration System</u> Alumni Association in 2022 to share the Company's experience and help the supply chain develop robust trade secret management capabilities without disclosing any proprietary information. In 2022, TSMC successfully aided 12 companies in developing and implementing their own trade secret registration systems and shared TSMC's TSR system with 17 companies, exceeding the annual target as material contributions are continuously made to trade secret protection and management.

TSMC's Vision of Trade Secret Management Innovation



An Intelligent Automation (IA) and Artificial Intelligence (AI) Powered Intelligent Trade **Secret Management System**

Integrated with Human Resources System

TSMC's trade secret registration system is integrated with the Company's human resources system and automatically updates employees' registration information in their personnel file. This serves to highlight employees' contributions to TSMC's technological innovations and is an important indicator for supervisors to consider for performance evaluation and promotion.

Intelligent Reminder Function

The trade secret system automatically compares employees' trade secret registration records and reminds them to complete the registration process in a timely manner.

Keyword Analysis

Analyze technology keywords from previous trade secret registration data to compile and uncover technology development trends.

Technology Cluster

Systematically categorize and annotate registered cases with technology family relation to identify technology clusters.

Real Time Data Visualization Analysis

The use of advanced information analysis software in TSMC's system to visualize trade secret registration data provides employees with realtime updates and precise data on the quantity of registrations, allowing them to understand their registration status and adjust their registration strategies more efficiently and effectively.

Innovation Talent Pool

Analyze Golden Trade Secret award winners' backgrounds to generate an "innovation talent pool" for TSMC's talent development planning and strategic management.

Connected to Contract Management System

TSMC's trade secret registration system is connected to its contract management system, reminding employees involved in technology development and transfer to register the relevant trade secrets in a timely fashion.

AI Chatbot Support

TSMC's trade secret AI chatbot works 24/7 to provide instant replies to support employee trade secret registration and protection queries, thereby enhancing employee trade secret competency.



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Inspire Innovation with New Projects to **Reach Record-High Registrations**

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TSMC utilizes the TSR system to maintain comprehensive records of important inventions for its employees and targets technical innovations of interest with tailored projects. For example, TSMC launched the 100% TSR Coverage in Advance Process Volume Production Fabs Project to encourage engineers with more than one year of experience in 3nm, 5nm, and 7nm processes to come up with innovations. The project's goal of achieving a 100% registration rate was reached in 2021. In 2022, TSMC launched the Manufacturing Excellence TSR Project to focus on developing technical trade secrets for two competitive advantages: Technology Leadership and Manufacturing Excellence. As of 2022, over 31,528 employees have participated in registering a cumulative total of 241,740 technical or commercial trade secrets. In addition, Golden Trade Secret Awards are presented every year to trade secrets with strong impacts on competitive advantages to recognize employee contributions and drive innovation. As of 2022, 2,279 Golden Trade Secret Awards have been given to 5,946 recipients.



The TSR system grants exposure to and records engineers' innovative ideas while maintaining the Company's competitiveness.

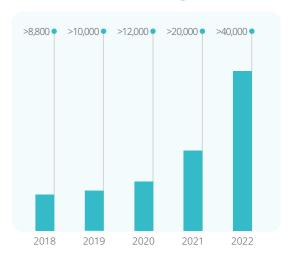
> Tsai Yu-hsuan TSMC Employee

Protect Green IPs and Deepen Co-Prosperity with the Industry and the Environment

In terms of green trade secrets, TSMC launched the Green Trade Secret Award and Green Trade Secret Registration Section to establish a robust foundation for environmental protection trade secrets and strategies and to recognize seven major contributions, encouraging employees to develop more trade secrets advancing environmental protection technologies related to Climate and Energy, Water Stewardship, Circular Resources, and Air Pollution Control. In 2022, 579 innovations were recorded, and the registrants were employees from not only facility organizations responsible for energy and water conservation, but also from R&D, manufacturing, testing, quality control, etc., indicating that a green innovative culture is now deeply rooted in TSMC's daily operations.

To extend the reach of green influence, TSMC further established the Incentive Guidelines to Encourage Green Trade Secret Registration and Sharing as a Public Service to encourage employees to publicly share their experience on energy conservation, carbon emissions reduction, energy management, environmental conservation, and more. Employees may first register undisclosed, sustainability-related innovations as green trade secrets before seeking approval from the system for public disclosure, which also qualifies the innovations to become candidates for recognition as distinguished charitable cases by the Company. Without compromising proprietary information protection policies (PIP), TSMC hopes to proliferate a green manufacturing culture and actual practices and work with the industry to promote environmental sustainability.

Historical Trade Secret Registration



Trade Secret Milestones





Establishment of the Trade Secret Registration System Alumni Association to Extend Sustainability Influence across Industries

TSMC's Strategic Supply Chain Partners Trade Secret Management Sharing public service project strengthens trade secret management (TSM) in the supply chain and provides easy-to-understand trade secret registration (TSR) principles and practices to suppliers. In June 2022, TSMC founded the Trade Secret Registration System Alumni Association to share the Company's TSR execution experience, standard registration templates, and reference evaluation metrics

to help suppliers quickly pick up TSR. Members of the association also discussed challenges in TSR execution and exchanged respective solutions, which further inspired new TSR and TSM services. In 2022, TSMC successfully assisted Solar Applied Materials Tech, eChem Solutions Corp., and ten other companies in establishing and implementing their own TSR systems. In 2023, TSMC plans to do the same for five more companies. TSMC envisions itself as the advocate for TSR and intelligent management, consistently instilling the drive to innovate and elevating the industry's competitiveness.

2022 Sustainability Report



Dr. Fortune F.Y. Shieh, Associate General Counsel of TSMC, shares his experience with the TSR system and intelligent management at the Technology Industry Integrity Governance and Trade Secret Protection Summit Forum

Intelligent Precision Manufacturing

Volume production of advanced processes and precision manufacturing are at the core of intelligent manufacturing at TSMC and the drivers of manufacturing excellence. To keep up with the complex manufacturing model of globalized production and ensure consistent manufacturing efficiency and product quality across fabs, TSMC established and deployed the Global Manufacturing and Management Platform at all its domestic and oversea fabs. The Company also continued to promote digital transformation and digitized fabs through five major strategies: Agile Manufacturing, Precise Process Control, Maximum Tool Productivity, Optimize People Efficiency, and Consistent Management.

For Agile Manufacturing, TSMC utilizes a modularized Intelligent Scheduling and Dispatching system to calculate optimal dispatch orders in combination with the Intelligent Automated Material Handling System to ensure wafers are delivered to the right machine on time. Meanwhile, the Automatic and Intelligent Manufacturing System, developed inhouse, supports production and ensures consistent productivity and cycle times across fabs.

For Precise Process Control, TSMC adopts its self-developed AI technologies to ensure process control consistently across fabs to reduce process variance, and also compiles big data on production from TSMC wafer fabs around the world on a universal quality control platform, using AI technology to simultaneously compare over thirty quality defense

systems, set the same specification control, and optimize global wafer production quality by benchmarking against equipment with the best wafer process performance. For Maximum Tool Productivity, TSMC utilizes an intelligent operation platform to process abnormal activities from millions of process control charts, allowing engineers to detect abnormal activities at the same time. They can then use TSMC's intelligent diagnostics platform to quickly find the root cause and promptly repair tools. For Optimizing People Efficiency, TSMC rolled out relevant measures in 2022 to all TSMC fabs around the world, continuing to digitalize knowledge from internal experts and utilizing intelligent workflows to establish 20 systems, allowing employees to focus on high-added-value tasks and effectively increasing productivity by 30 to 50%.

TSMC's goal is to enable the simultaneous deployment of manufacturing improvement activities and productivity enhancement projects to all TSMC fabs around the world with the Global Manufacturing and Management Platform and achieve consistent manufacturing practices and parameters across all fabs. This can accelerate the delivery of products with optimal yield and performance to customers. Furthermore, TSMC seeks to support cross-fab manufacturing or remote expert instructions with remote operations coupled with augmented reality and mixed reality to achieve an agile and efficient ONE Fab model for collaboration and operations. This empowers TSMC as a trusted, reliable and consistent capacity provider in the global logic IC industry for years to come.

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Development History of Intelligent Precision Manufacturing



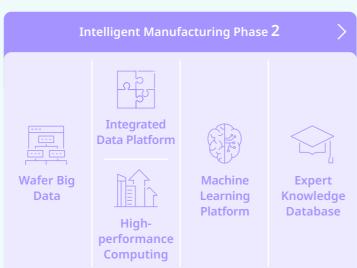
Establish big data platform **Automation**

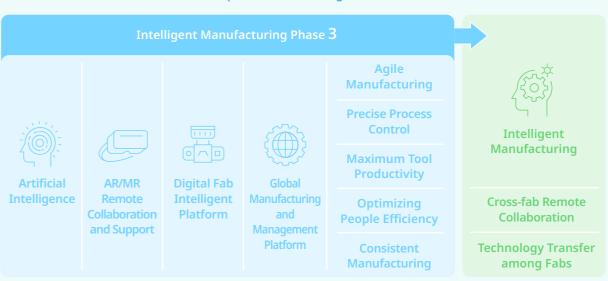
Initiate the plan of Adopt machine learning intelligent fab for manufacturing systems

Digital transformation Intelligent platform

Global Manufacturing and Management Platform

Intelligent Manufacturing Phase 1 **Equipment Automation** Material Handling **Automation** Wafer Dispatch **Automation**







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Open Innovation Platform®

The acceleration in digital transformation has made semiconductors more pervasive and essential in people's lives. TSMC's Open Innovation Platform® (OIP) focuses on innovation and collaboration. solidifying in Electronic Design Automation (EDA) and Intellectual Property (IP) development to achieve Design and Technology Co-Optimization (DTCO), enable IC design in the cloud, and offer design services for backend packaging and testing partners.

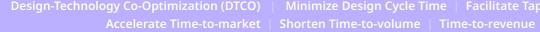
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In addition to the existing EDA, IP, DCA and VCA, and Cloud Alliances, TSMC announced the new 3DFabric Alliance in 2022 as the sixth OIP alliance with 19 inaugural members that have 3D IC expertise covering aspects from EDA, IP, and DCAVCA to Memory, Outsourced Semiconductor Assembly and Test (OSAT), Substrate and Testing. The new 3DFabric Alliance contains a full spectrum of best-in-class solutions and services for semiconductor design, memory modules,

substrate technology, testing, manufacturing, and packaging, aiming to help customers achieve speedy implementation of silicon and system-level innovations and enable next-generation HPC and mobile applications using TSMC's 3DFabric[™] technologies, a comprehensive family of 3D silicon stacking and advanced packaging technologies.

TSMC hosted the 11th OIP Ecosystem Forum in 2022, Where TSMC and its OIP partners have shared the

collaborative ecosystem solutions through DTCO to support the optimization of power, performance and area (PPA) in customer products. TSMC has worked closely with these ecosystem partners ever since the Company was established and continues to expand its libraries and silicon IP portfolio to more than 55,000 IP titles and provides more than 43,000 technology files and over 2,900 process design kits, from 0.5-micron to 3-nanometer, to customers. The latest set of comprehensive ecosystem design solutions support customer designs using TSMC's industry-leading process technology for highperformance computing, mobile, automotive, and IoT applications. These combined efforts have helped customers accelerate innovation for their differentiated products to drive continuous technology development around the world.





EDA Alliance

Provide the certification of Electronic Design Automation (EDA) tools that are required for IC design stages, as well as the readiness of design reference flows to timely address the latest requirements by customer designs and process technologies



Cloud Alliance

Deliver OIP Virtual Design Environment (VDE) and Cloud solutions required at various design stages for customer's adoption that help expedite product design cycle time by fully utilizing the high-performance computing resources available in the Cloud



Value Chain Alliance

← Integrate design enablement building blocks and provides specific services that bring customer's innovation to IC value chain, including IP development, front-end and back-end designs, and wafer manufacturing, assembly, and testing



IP Alliance

Offer silicon-proven IP portfolios that fulfill TSMC's quality requirements and meet a wide variety of design needs in the semiconductor industry



Design Center Alliance

Offer design services ranging from systemlevel front-end design to back-end physical implementation/verification that assist customer's designs in TSMC technologies



3DFabric Alliance

Comprise a full spectrum of 3D IC design solutions and services, memory modules, substrate technology, testing, manufacturing, and packaging, to help customers implement silicon and systemlevel innovations with TSMC 3DFabric stacking and advanced packaging technologies



Through the collective leadership of TSMC and our ecosystem partners, our 3DFabric Alliance offers customers an easy and flexible way to unleash the power of 3D IC in their designs, and we can't wait to see the innovations they can create with our 3DFabric[™] technologies.

Dr. L.C. Lu

TSMC fellow and vice president of the design and technology platform





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Comprehensive Ecosystem Design Solutions

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During the 2022 OIP Ecosystem Forum, a complete set of design solutions was unveiled jointly with OIP alliance partners, to address the market demands for specific platforms for mobile, high-performance computing (HPC), automotive and IoT applications.

To recognize the outstanding support and collaborative achievements of TSMC's OIP ecosystem partners, the Company announced the 2022 OIP Partner of the Year awards for their excellence in accelerating semiconductor innovation.



Advanced Technology

- TSMC FINFLEX™ innovation combines process and design co-optimization for 3nm technology
- Continues full node scaling in N3E that achieves best-in-class PPA results
- Major EDA tools have undergone optimization and certification, and relevant foundation IPs can be provided to customers to start design



Analog Cell

- Boosts analog IP yield
- Enables the automation of EDA tools and overall design flow
- Design solutions are ready in N5, N4 and N3, and will extend to N2 and N6; corresponding analog design migration EDA flows are also ready for customer adoption



Automotive Technology Platform

- Automotive Service Package is available in 0.5um to 12nm
- For technologies of 16nm, 7nm and 5nm, the respective enhanced Automotive Design Enablement Platform (ADEP) is ready for customer adoption
- The platform includes aging and thermal-aware design flows, and is AEC-Q100 and IP9000A compliant



3Dblox™ Standard for 3DFabric™ Technologies

- The comprehensive 3DFabric[™] technology offerings enable the required performance, power, form factor and flexibility for system-level designs
- TSMC 3Dblox™ standard reduces design complexity by modularizing 3DFabric™ structures and standardizing EDA tools for interoperability
- TSMC 3Dblox™ is ready for 3DFabric™ integration in CoWoS®, InFO and TSMC-SoIC® technologies with validated



TSMC joins hands with alliance partners to accelerate semiconductor innovation through OIP

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Enhance Industry-Academia Collaboration

2022 Sustainability Report

TSMC maintains long-term partnerships with universities in Taiwan and abroad in three areas—Industry-Academia Collaboration, Course Collaboration, and Career Guidance—to encourage professors to conduct cutting-edge semiconductor research and develop advanced semiconductor components, process and material technologies, engineering sciences, and special process technologies relating to the electronics industry. TSMC aims to develop long-term and interactive systems for collaboration programs with universities, jointly pushing for advanced research and development and cultivating talent for the semiconductor industry.

In 2022, TSMC invested NT\$660 million in industryacademia research collaboration and worked with 26 universities in Taiwan and abroad to continue numerous research projects and industryacademia projects. With the TSMC University Shuttle Program, the Company is also helping university professors and students to validate designs, applications, and terminal performances. In 2022, TSMC took on a greater role in supporting six universities in Taiwan to establish their own National Academy for Key Fields of Research and continued to provide funding to support cuttingedge research and talent cultivation for the semiconductor industry.

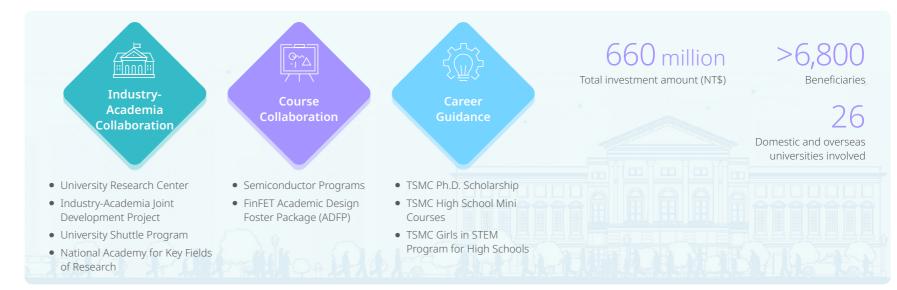
TSMC also launched Semiconductor Programs at universities in Taiwan, with over 4,000 students having enrolled and learned through the programs since 2019. To close job-education discrepancy, TSMC reached out to partners in the industry, company executives, and professors to co-design and lecture programs. In 2022, TSMC launched two courses, Semiconductor Technology - Process & Equipment and Semiconductor Intelligent Manufacturing Systems, which benefitted over 810 students. In 2022, TSMC launched the Academic

Design Foster Package (ADFP) for its own 16nm FinFET technology to help universities overcome education and research bottlenecks in cuttingedge chip design, ushering in the FinFET era and strengthening R&D capabilities.

For career guidance, TSMC organized a wide range of events to give students further insight into the semiconductor industry and lay the foundations for future talent. In 2022, a total of 1,700 students attended TSMC's career guidance events. In

addition, a mini course Semiconductor Devices Physics was launched for high schools with a simplified but comprehensive course design and hands-on practice sessions to inspire passion and interest in semiconductors, thus cultivating tech talent for the future. In 2022, TSMC also continued to organize the Girls in STEM program for high schools, sharing experience of working in tech with high school girls and reaching over 2,900 students.

TSMC University Collaboration Programs





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Industry-Academia Collaboration

2022 Sustainability Report

• University Research Center

TSMC worked with National Yang Ming Chiao Tung University, National Taiwan University, National Cheng Kung University, and National Tsing Hua University to establish graduate institutes and provided research funding to encourage university professors and students to come up with innovative semiconductor research projects, develop cutting-edge technologies in semiconductor components, materials, processes, and chip design, and foster semiconductor researchers. TSMC has been establishing university research centers since 2013; as of 2022, a total of 245 professors and over 3,600 top students in the fields of electronics, physics, chemistry, chemical engineering, and mechanical engineering have joined the graduate institutes in the four universities mentioned above. In addition, TSMC provided funding and collaborated with eight world-leading universities abroad, launching international research projects through graduate institutes.

• Industry-Academia Joint **Development Project**

TSMC encourages university professors to explore cutting-edge semiconductor technologies through industry-academia joint development projects that allow interested students to join and learn from hands-on experience. TSMC hopes this will encourage students to consider a career in the semiconductor industry. In 2022, 147 industryacademia joint development projects were launched, with 134 professors from nine universities in Taiwan and 17 universities abroad participated. Since 2013, these industry-academia joint development projects have resulted in 228 patent applications in the U.S.

University Shuttle Program

Semiconductor innovations continue to drive progress in the world; it is therefore pertinent and pressing to cultivate talent for the future. In 2022, TSMC worked with professors and students from 12 world-leading universities through the University Shuttle Program to realize IC circuit designs and validate terminal performances. As a result, a total of 92 papers were published on 5G and wireless



Innovation is a never-ending journey in the field of chip designs. I'd like to thank TSMC University Shuttle Program for their support and efforts in research innovation and talent cultivation

Wei-Zen Chen

Professor at the Department of Electronics and Electrical Engineering, and Institute of Electronics, National Yang-Ming Chiao Tung University

TSMC University Shuttle Program provides us stronger foundations and the opportunity to validate and realize our designs. I'd like to thank TSMC for providing such invaluable resources.

Yuan-Bang Huang

Student at the Institute of Electrical Engineering, National Taiwan University communication, high-speed wireline communication, memory applications, safety, biotechnology, image sensor applications, and robotics applications. And 22 of those papers were published in esteemed journals or at renowned conferences such as the IEEE Journal of Solid-State Circuits and the International Solid-State Circuits Conference (ISSCC), often touted as the "IC Design Olympics."

National Academy for Key Fields of Research

To support the Ministry of Education's National Key Fikelds Industry-University Cooperation and Skilled

Personnel Training, TSMC is committed to helping National Yang Ming Chiao Tung University, National Taiwan University, National Cheng Kung University, and National Tsing Hua University to establish graduate institutes. In 2022, TSMC extended its collaboration with two more universities —National Sun Yat-sen University and National Chung Hsing University—to integrate TSMC's R&D resources with their R&D capabilities. In the future, TSMC will invest at least NT\$100 million in funding to support cutting-edge semiconductor research, help schools offer merit-based scholarships, and cultivate top R&D talent.

Key Academic Collaborators and Research Topics in 2022



Note: Universities are listed in alphabetical order

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Course Collaboration

• Semiconductor Programs

To increase the quantity and quality of domestic semiconductor talent and attract more outstanding students to the semiconductor industry, TSMC offers Semiconductor Programs at top universities in Taiwan. Six majors are offered, including components/integration, processes/modules, equipment engineering, advanced packaging, intelligent manufacturing, and advanced circuit design. In 2022, National Chung Hsing University joined the program too. In total, over 4,000 students have enrolled.

2022 Sustainability Report

In addition to the Semiconductor Programs, TSMC invites employees to serve as industry lecturers to co-lecture two courses, Semiconductor Technology -Process and Equipment and Semiconductor Intelligent Manufacturing Systems, at several universities to give students insight into the latest knowledge and practices from the industry and mitigate any job-education discrepancy. In 2022, a total of 810 students enrolled in these courses. Since April 2022, TSMC has made internal training resources available to students enrolled at TSMC Semiconductor Programs at various universities. Students can visit the TSMC Newcomer Training Center for free courses such as Semiconductor Component Fundamentals and Semiconductor Tool Fundamentals. Professional insights from corporate trainers at the Newcomer Training Center and the opportunity for hands-on practice with real tools

enable students to integrate theory into practice and learn about the latest semiconductor processes and tools. In 2022, five sessions were offered at the Newcomer Training Center, holding 209 lectures and benefitting 271 students.

FinFET Academic Design Foster Package (ADFP)

To strengthen the cultivation of forward-looking design talent and reduce education-job discrepancy, TSMC launched the 16nm FinFET Academic Design Foster Package (ADFP) and leveraged government cloud platforms to help universities upgrade verylarge-scale integration (VLSI) chips. In addition, TSMC organized lessons and contests related to circuit design. As of 2022, ADFP has been successfully deployed at 11 universities in Taiwan for professors to use in related courses. It is estimated that over 2,000 people will benefit annually starting from 2023. ADFPs are also planned expand to universities abroad in the future to create a global FinFET design education platform and cultivate semiconductor talent for the future.

Career Guidance

• TSMC Ph.D. Scholarship

Fostering Ph.D.-level scientific research talent is key to the sustained advancement of the semiconductor industry. TSMC launched a Ph.D. Scholarship in 2020

as an incentive for elite students to pursue doctoral degrees in scientific specialties related to the field of semiconductors. The program consists of three pillars: scholarship, mentorship, and internship. An annual subsidy of NT\$500,000 is issued for a maximum of five years to offer Ph.D. students financial support. After attaining the degree, the scholarship recipients can directly join the semiconductor industry or become an educator to cultivate more talent. As of 2022, a total of 74 Ph.D. students have benefited from the scholarship.

• TSMC High School Semiconductor Mini Courses

TSMC co-developed the mini course Physics of Semiconductor Devices and animated learning resources with college professors to introduce the fundamental principles of semiconductors to high school students, guiding high school students with simple and easy-to-understand semiconductorrelated knowledge and hands-on practice. This course aims to inspire their passion for science and further drive learning motivation. In 2022, TSMC offered courses at Taipei Municipal Jianguo High School, Taipei Municipal Zhongshan Girls High School, and Taichung First Senior High School to a total of 88 students. In 2023, TSMC plans to promote courses to more schools through Train the Trainer workshops to help science education take root and invest in cultivating future tech talent.

• TSMC Girls in STEM Program for High Schools

To encourage high school girls to pursue science, technology, engineering, and mathematics, the TSMC Education and Culture Foundation hosted the TSMC Journeys of Female Scientist Lectures for two consecutive years in 2020 and 2021. In 2021, TSMC held career lectures titled Lean in and Achieve a Better Version of Yourself aimed at inspiring students' interests in STEM as they learned about the unique strengths and capabilities of women as well as in-depth information on TSMC and the semiconductor industry. In 2022, TSMC continued to promote career lectures to 12 schools and reached out to over 2,900 students, encouraging high school girls to pursue tech careers and foster more female talent for the technology sectors.



The lecture was practical and informative, and our alumni provided us plenty of helpful advice. It was the first time that I can truly learn about TSMC and the semiconductor industry.

Tang-Hsin Liu

Student at Taipei First Girls High School and Lecture Attendee An Innovation Pioneer A Responsible Purchaser A Practitioner of Green Power An Admired Employer

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Product Quality and Safety

Note 2: Due to the impact of the COVID-19 pandemic, some suppliers were unable to join the competition

Note 3: Starting from 2021

2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Enhance Quality Culture Promote continuous improvement programs to enhance the internal quality culture Encourage local suppliers to participate in Taiwan Continuous Improvement Award (TCIA) to strengthen quality culture and competitiveness within local supply chain	Generate up to NT\$20 billion in value from improvement projects and involve outstanding projects in Taiwan Continuous Improvement Award (TCIA) Encourage 100% of major local raw materials suppliers Note 1 and 75% of backend packaging materials suppliers to participate in TCIA with 60% of them advancing to the finals	Generate NT\$14 billion in value from improvement projects and involve at least six outstanding projects in TCIA Encourage 100% of major local raw materials suppliers and 60% of backend packaging materials suppliers to participate in TCIA, with 20% of them advancing to the finals	Generated more than NT\$13 billion in value from improvement projects Target: NT\$13 billion Involved 10 outstanding projects in TCIA Target: 6 projects 74% of major local raw materials suppliers participated in TCIA Target: 100% 60% of backend packaging materials suppliers participated in TCIA Target: 60% 17% of raw materials and backend packaging material suppliers advanced to the finals of TCIA Target: 20%	✓
Improve Quality Capability Develop innovative testing methods to enhance product, technology and production quality	Develop a cumulative total of 3,000 innovative testing methods for quality and reliability Note 3	Develop 278 innovative testing methods for quality and reliability	Developed 272 innovative testing methods for quality and reliability Target: 265 projects	↑
ongoing orders in each quarter	ose that meet at least one of the following conditions: 1. accounted for 85% of purchasing	ng expenses; 2. single-source supplier; 3.	↑ Exceeded ✓ Achieved — Missed Target	

the Company's technology

roadmap

Overview Sustainable Business Practices

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↑ Exceeded ✓ Achieved — Missed Target

Operations and Governance

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Appendix



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Note 4: To highlight the importance of product safety at TSMC, the Company will introduce a new strategy, Sustainable Chemicals Management, which will cover three existing KPIs relating to chemical management

Note 5: In response to developments in process technologies, all materials with potential risks supplied by new suppliers must pass CMR testing Note 6: The target for 2023 has been changed to 36% as testing results failed to meet expectations in 2022

TSMC is committed to providing outstanding semiconductor foundry services. The Company spotlights the quality standards of all operational aspects and advance quality management system from supply chain management, technology

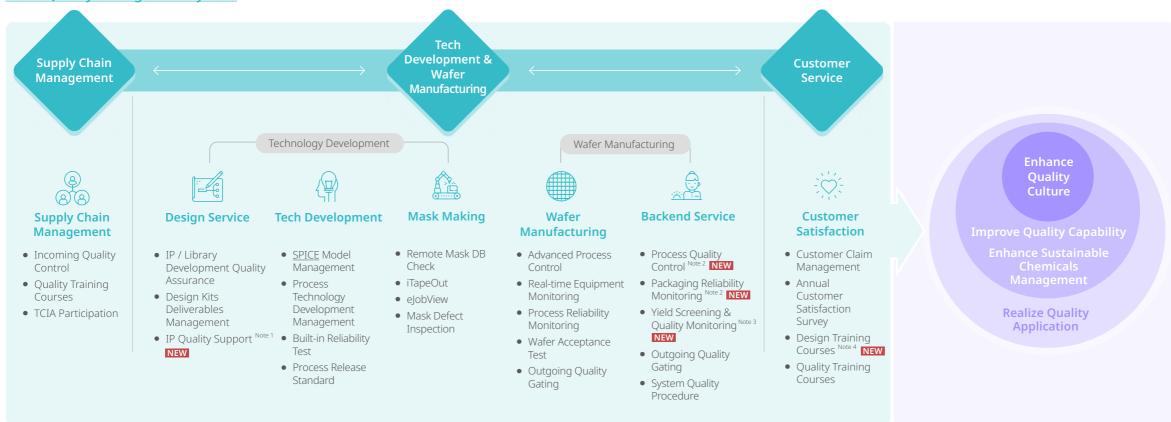
2022 Sustainability Report

development, wafer manufacturing, and customer service. The Company also roots quality culture firmly in daily operations from six aspects: Defining, Integrating, Encouraging, Sharing, Coaching, and Driving. In 2022, TSMC organized the first Quality

Forum to encourage employees to commit to quality innovation and also added a quality culture course to the new employee orientation to strengthen quality awareness in daily operations. In 2022, TSMC's Quality and Reliability Laboratories introduced a

total of 272 innovative testing methods to facilitate technology development through an energysaving approach and the application of AI in yield monitoring for operational efficiency and quality enhancement.

TSMC Quality Management System



Note 1: Provided IP training courses to OIP partners to help create high-quality and certified IP solutions for customers

Note 2: Launched industry-academia cooperative research programs with Harvard University and National Cheng Kung University to exchange knowledge on mechanics and work together to overcome problems with product failure and reliability Note 3: Developed an intelligent testing framework to drastically increase testing capacities and applied AI to yield monitoring to enhance operational quality and efficiency

Note 4: Launched standardized training courses on new processes to quickly familiarize customers with the design and process flow. The courses help reduce design cycle time and accelerate volume production of new products

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Enhance Quality Culture

Quality is the cornerstone of sustainable development at TSMC. To cultivate a quality culture that engages all employees, TSMC hosts companywide conferences, training programs, and quality improvement projects to drive cross-organizational learning and collaboration and enhance employees' problem-solving skills. In 2022, TSMC organized two Quality Forums with executives giving keynote speeches and panel discussions to drive quality innovation, attracting nearly 6,000 attendees. Moreover, TSMC has added a quality culture course to the new employee orientation since 2022 to

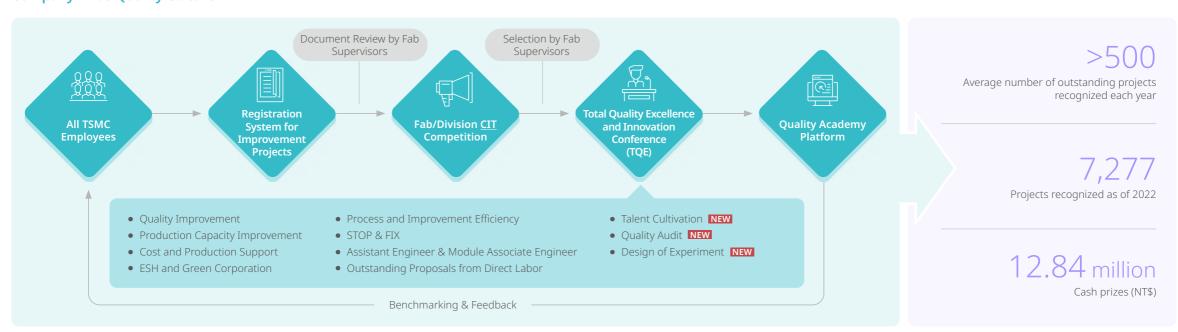
2022 Sustainability Report

help new employees build awareness of quality and TSMC's core values, accelerating integration and adaptation to their duties. A total of 11,493 new employees have been trained to commit to the goal of quality excellence.

TSMC has been hosting the Total Quality Excellence and Innovation Conference (TQE) for 30 consecutive years to improve the quality system and methodology. In 2022, TSMC integrated existing activities related to continuous improvement into TQE, adding the Design of Experiment and

Quality Audit categories to boost quality innovation synergy and the Talent Cultivation category to motivate internal organizations to enhance talent cultivation and management for employee capability improvement. In pursuit of perfection, TSMC launched the Quality Academy platform which integrates quality cases, tools, publications and mentoring resources to facilitate employees to learn from each other and inspire more innovative ideas. In 2022, TSMC employees submitted 9,316 improvement projects and generated over NT\$13 billion in value. To encourage employees to take the initiative in preventing abnormal quality or outdated operations, TSMC launched a new theme, STOP & FIX, in 2019 to collect and share improvement projects every year. As of 2022, the number of STOP & FIX projects has reached 9,439. Additionally, TSMC launched the CIT Outstanding Engineer program in 2000 to incentivize employees and provided training courses to build a talent pool of improvement experts. Up to now, TSMC has awarded a total of 1,394 CIT Outstanding Engineer Awards.

Company-Wide Quality Culture



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2022 TQE-Winning Cases



Quality Improvement High-quality IoT chips

2022 Sustainability Report

- Improve IC design for chips
- Optimize parameters of lithographic and etching processes
- Adjust wafer surface polarity and improve developing speed

10.6% Yield loss/damage reduced

66%

GHG emissions reduced



Design of Experiment Resolve flaws in integrated voltage controller

• Collaborate across organizations to introduce thick copper and magnetic material processes

97%

Voltage conversion efficiency

15.3% Aluminum pad defects resolved



Production Capacity Improvement

Improve etching processes

- Optimize etching programs and adjust photoresist thickness
- Adjust use and pairing of wet etching chemicals
- Establish oxidation layer thickness monitor procedure

35%

Production cycle time improved

1% Total productivity increased



Process and Efficiency Improvement

Develop prepayment mechanism

- Develop mechanism to reflect demand and supply changes in a timely manner
- Develop offset algorithm
- Build report platform

32.1 million

Estimated benefit generated (NT\$)

66%

Operating time reduced



Cost and Production Support

Optimize statistical process control

 Develop cross-system modularized management mechanism



Operational efficiency improved



Talent Cultivation

Cultivate assistant engineers

 Develop skill training and evaluation/ certification system for assistant engineers

82%

Job satisfaction

39% Manpower reduced



ESH and Green Corporation

Develop carbon credit verification procedure

• Launch big data computing and AI recognition system to track carbon reduction performance

> Completed carbon credit verification for TSMC



STOP & FIX

Protection against masks aging

 Develop automatic mask-scanning system to detect all anomalies

92%

Inspection time reduced

87%

Number of risk impacted wafers reduced





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Quality Audit Strengthen outgoing quality control

 Develop automatic system to regularly track abnormal products and equipment

2022 Sustainability Report

• Filter non-conforming products automatically before shipping

96%

Audit time reduced

10 minutes

Disposal time per abnormal wafer reduced



Outstanding Proposals from Direct Labor

Automatic recognition process for wafer cassette information

- Develop automatic recognition equipment to replace manual operations and judgement
- Integrate software systems to increase operational accuracy and efficiency

100%

Correctness of information interpretation >95%

Inspection rate

88%

Reduced manual handling



Assistant Engineer and Module Associate Engineer Improve equipment

 Standardize equipment quality control to reduce idle time and increase productivity

20 million

Estimated benefit generated (NT\$)



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In addition to cross-functional exchanges within the Company, TSMC is also a long-term participant of TCIA. By participating in the competition, TSMC exchanges practical knowledge on quality improvement with peers from other industries and accelerates the advancement of all local industries. In 2022, TSMC received six Gold Awards, four Silver Awards, and three Best Innovation Awards at TCIA, setting a new record for TSMC.

2022 Sustainability Report

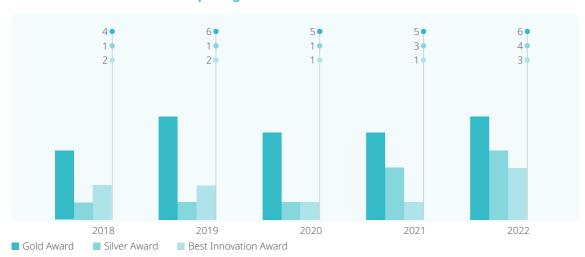
To strengthen the supply chain, TSMC also encourages suppliers to participate in TCIA. In 2022, some suppliers were restricted by the

COVID-19 prevention measures, but TSMC still ensured that 74% of major local raw materials suppliers and 60% of backend packaging materials suppliers were able to participate in the competition. A total of 17% of TSMC suppliers advanced to the finals and won four Gold Awards. three Silver Awards, four Bronze Awards, and one Best Innovation Award. TSMC announced the list of winners on its <u>corporate website</u> to encourage suppliers to continue to improve.

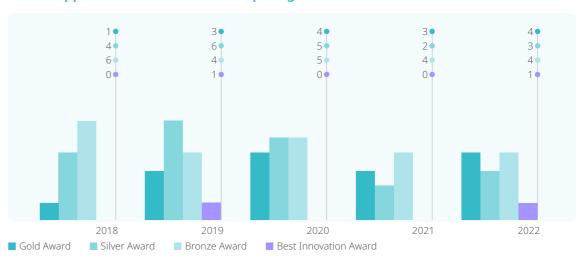
Percentage of Major Local Raw Materials Suppliers Participating in TCIA



TSMC Track Record of Participating in TCIA



TSMC Supplier Track Record of Participating in TCIA



2022 TCIA-TSMC Winning Cases



Gold Award Increase yield of image sensors

2022 Sustainability Report

>70% yield loss/damage reduced

NT\$3 billion estimated benefit generated





Gold Award and Best Innovation Award Optimize specialty chemical processes

>90% process defects resolved

>50% costs reduced





Gold Award Increase productivity in the photolithography area

6% productivity increased

85% number of manual operations reduced





Gold Award Improve gas leakage in the production area

Reduced gas leakage events from an average of 3 per quarter to 0





Gold Award and Best Innovation Award Develop smart testing framework

99.6% testing efficiency increased

30% total testing productivity increased





Gold Award and Best Innovation Award Digital transformation of old equipment

15.5% equipment productivity increased

NT\$150 million estimated benefit generated





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Improve Quality Capability

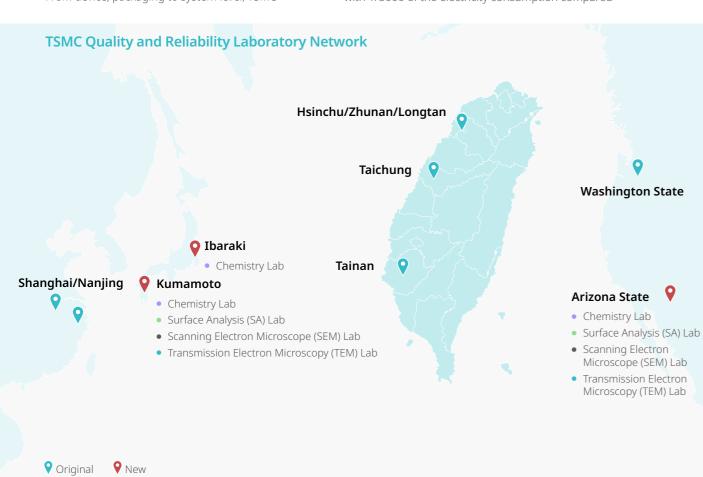
Quality capability plays a key role in ensuring technology leadership. TSMC's Quality and Reliability Laboratories have been dedicated to perfecting, researching, and developing testing methods. In 2022, the laboratories introduced 272 innovative testing methods while ensuring that device characteristics, process yield, and product reliability all comply with customer demands and standards. From device, packaging to system level, TSMC

2022 Sustainability Report

continues to minimize quality risks in customer products and maintains strict monitoring of raw material stability and safety acquired from the upstream or through recycling, aiming to realize the Company's vision of being a green, safe, and healthy workplace. As EUV is critical to advanced processes, a new aging test method for EUV mask was developed to accelerate validation and technology development with 1/5000 of the electricity consumption compared to the original method, fulfilling the Company's commitment to sustainable operation.

In addition to strengthening quality capabilities and management throughout the supply chain, TSMC is also dedicated to talent cultivation and local industry support. In 2022, TSMC launched industry-academia cooperative research programs with Harvard University and National Cheng Kung

University to stabilize production line quality by exchanging knowledge on mechanics and working together to overcome problems with product failure and reliability. Meanwhile, TSMC collaborated with the Semiconductor Equipment and Materials International (SEMI) to organize the fourth Strategic Materials Conference in Taiwan, sharing the win-win strategy for technology and sustainable development to elevate the competitiveness of the local supply chain.



Sustainable Strategies from the Quality and Reliability Laboratories Accelerate the replacement of hazardous substances and help new TSMC facilities with designs for discharging Substances of Very High Concern (SVHCs) • Chemistry Lab

- Verify the quality of materials recycled and reused at TSMC to ensure that they meet
- requirements for advanced processes and promote green manufacturing **NEW** Develop the ability to analyze 100% of CMR substances and facilitate source
- management in suppliers Advanced Materials Evaluate and select technologies and materials for advanced processes Analytic Center
 - Provide an analysis and technology exchange platform to strengthen suppliers' analytical capabilities **NEW**
- Develop low-power consumption and high-capacity processes to increase the EUV Surface Analysis (SA) Select eco-friendly materials and replace in processes
- Lab Develop equipment consumables, reducing costs and extending consumable life by three times **NEW**
- Complete reliability certification for the latest advanced processes, special processes, and Reliability Analysis wafer-level packaging processes (RA) Lab

reduction learning curve (reliability point of view)

- Advanced Failure Analysis (AFA) Lab
- Process Failure Analysis (PEFA) Lab

(AMAC)

- Package & Assembly
- Failure Analysis (PAFA) Lab
- Product Failure Analysis (PFA) Lab
- Scanning Electron Microscope (SEM) Lab
- Transmission Electron Microscopy (TEM) Lab
- Continue to promote industry-academia cooperation programs

operate and maintain equipment to cultivate tech talent

Apply digital transformation and automatic data processing to increase efficiency **NEW**

Accelerate advanced process development, yield improvement, and product DPPM

Donate equipment to universities and elementary schools and provide training on how to

Apply for domestic and foreign patents through innovation and invention

64



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Enhance Sustainable Chemicals Management

2022 Sustainability Report

TSMC cares about the safety of its employees and supply chain. To continue tracking where materials with potential risks end up, TSMC's Advanced Materials Analytical Center (AMAC) has established mechanisms for screening CMR materials and expands its screening scope based on the Company's technology roadmap. In 2022, the AMAC completed the screening of new 16 semiconductor materials, developing the ability to analyze 100% of CMR substances. Furthermore, TSMC assisted VisEra in strengthening protection for high-risk materials by sharing measures such as substitutes for high-risk chemicals, protection gear, and regular workplace assessments. Meanwhile, TSMC incorporated hazardous substance management regulations in the TSMC Supplier Sustainability Standards, and provided training, auditing, and guidance to suppliers. In 2022, TSMC continued to help all suppliers supplying materials with potential risks to develop capabilities to detect CMR substances.

In compliance with the TSMC Environmental Policy and TSMC Safety and Health Policy, TSMC is committed to becoming a world-class company in environmental protection, health, and safety. Sustainable chemicals management at TSMC includes compliance with international regulations and customer requirements. In addition, the Company has always aimed to avoid or minimize the use of hazardous substances. The Corporate Environment, Safety and Health (ESH) Division and the Industrial Safety and Environmental Protection Departments of the fabs are responsible for ensuring that the storage, transport, use, and disposal of any irreplaceable hazardous materials are compliant with regulations as well as TSMC's own ESH requirements to guarantee the health and safety of all workers and prevent pollution to the environment.

Such materials can only be used with consent from VP-level executives of related divisions or departments.

NMPs are commonly used in industrial and semiconductor processes. However, due to their reproductive toxicity, TSMC launched an industry-first replacement program in 2016. In 2022, TSMC was able to achieve the goal of reducing NMP usage at all Taiwan facilities by 95%. The Company expects to replace all NMP use at overseas locations by the end of 2023. NMP replacement is an innovative practice and, therefore, subject to rigorous internal review. After years of hard work across multiple facilities, TSMC is able to confirm that NMP replacement not only meets product quality demands but is also more friendly to the environment.

In addition, TSMC uses green procurement procedures to control chemical sources and ensure new materials are free from hazardous substances. New materials or changes to existing materials both require confirmation through the green procurement process to avoid any hazardous substances prohibited or restricted by regulations or customers. In 2022, to strengthen PFAS management, TSMC amended green procurement procedures, expanding the list of prohibited substances from PFASs with eight or more carbons to PFASs with more than four carbons, taking control from the source

Sustainable chemicals management at TSMC is based on the QC 080000 Hazardous Substance Process Management System Requirements and strives for continuous improvements by utilizing the plan-do-checkact (PDCA) management model. All the TSMC fabs, upon official launch, acquire third-party certification.



TSMC Quality and Reliability Laboratories strive to innovate in testing methods to support technology development

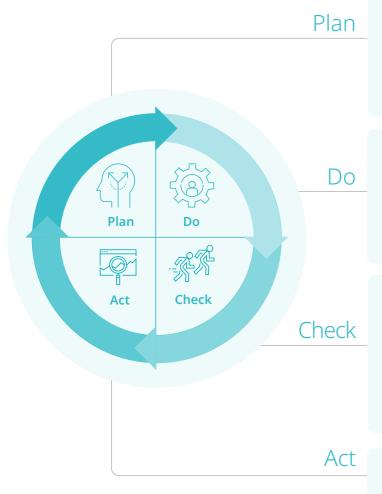
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PDCA Cycle for Sustainable Chemicals Management

2022 Sustainability Report



Work Items

Identify and register in compliance with regulations and customer requirements

Each month, the Corporate ESH Division identifies regulations on hazardous substances management in Taiwan and beyond as well as customer requirements to inform related units to take the necessary measures and track progress through the internal electronic notification system

List of banned or restricted substances

Compile according to regulations, customer requirements, or TSMC requirements

Hazardous substance replacement programs

Formulate related plans in compliance with regulations, customer requirements, or TSMC requirements

Key Tasks in 2022

- The EU added **nine** SVHCs to REACH and customers have amended management measures for hazardous substances; TSMC complied with all new requirements
- ✓ The Restricted Substance List now includes PFASs with more than **four** carbons

New material review

All new chemical materials or changes to existing materials are subject to review by the Corporate ESH Division and Industrial Safety and Environmental Protection Departments of the fabs to confirm the new chemical complies with ESH regulations before R&D evaluation

Carry out hazardous substance replacement programs

- Reviewed a total of 215 new chemicals, of which 127 were approved; of the 88 new chemicals that failed to pass reviews, **five** were rejected for containing substances highly hazardous to human health, one was rejected because TSMC was unable to treat the resulting wastewater, one was rejected because the proper waste handling could not be guaranteed, and 81 were rejected because suppliers were unable to provide necessary information or there were no requirements for an assessment
- ▼ TSMC continued to reduce the use of NMP in wet etching processes; in 2022, NMP usage decreased by 97.2% from 2016

Raw material hazardous substance test

Suppliers are required to provide proof of compliance with hazardous substance specification test report issued by ISO 17025-certified labs. TSMC may take random samples to ensure the compliance of raw materials

In 2022, the Chemical Lab acquired an X-ray fluorescence spectrometer, brought in operators, and helped operators obtain the relevant licenses. The spectrometer is expected to be officially put into commission in 2023, which will increase hazardous substance screening speeds and safety **NEW**

Product hazardous substance test

Sample and send main products to external ISO 17025-certified labs for testing every year

Environment assessment

Developed ability to screen PFAS levels in water by referring to US EPA 537.1, enabling the regularly monitoring of effluents from various fabs **NEW**

- Completed random sampling tests for 132 raw materials; all test results were in line with TSMC specifications
- Completed hazardous substance tests for main products; results showed compliance with relevant regulations and customers' and TSMC's specifications

Management review

Each quarter, management from the Quality and Reliability Organization shall organize an interdepartmental meeting to review measures on hazardous substance management and progress toward annual targets

✓ Met the targets for NMP reduction, supplier audit and follow-up, new material reviews, and compliance with incoming material inspection

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Realize Quality Application

TSMC shows its commitment to quality in technology, manufacturing, and services. For quality in technology, TSMC helps customers design products with superior reliability. In 2022, TSMC completed quality and reliability certification for 3nm process technology, 22nm embedded RRAM IP, the first TSMC-SoIC® and Wafer-on-Wafer (WoW) technologies. For more details, please refer to 5.3.6 Quality and Reliability of the TSMC 2022 Annual Report.

2022 Sustainability Report

Demands from the automotive chip market have made automotive chips with HPC capabilities very critical in advanced processes. TSMC has cuttingedge technologies and has been able to provide design rules specific to automotive chips during the early stages of volume production using 5nm process technologies. The Company has helped customers design and plan automotive chips with HPC capabilities beforehand and will be updating design principles as more experience with the volume production of 5nm technologies is acquired. In 2022, TSMC completed verification of automotive IPs for TSMC's 5nm technology, perfectly addressing customer design requirement for auto chips.

For quality in manufacturing, TSMC has been able to strengthen the application of design principles for automotive products by timely physical failure analysis for process improvement. In 2022, TSMC completed reliability verification for 5nm automotive processes and met

customers' requirements for the defective parts per million (DPPM) of new designs. This helps improve and facilitate volume production for subsequent designs, testing, and processes. To realize intelligent precision manufacturing, TSMC leveraged machine learning to create an automatic yield monitoring system and deployed the system to all facilities in 2022. The system has been able to stabilize product yield and return problems immediately. Moreover, the Quality and Reliability Organization completed several digital transformation projects in the areas of raw materials management, statistical process control (SPC), metrology and laboratory analysis, which has enabled smart quality defense and remote management of manufacturing, making seamless quality control across all TSMC fabs around the world a reality.

For quality in services, as advanced processes become more complex, TSMC introduced innovative Design-Technology Co-Optimization (DTCO) to enhance the speed, power and density of TSMC's new process technologies. TSMC has also launched new process standardization training programs to familiarize customers with new process design processes, which can help accelerate new product design timelines and volume production. For example, the most advanced training program is currently on N3E, which was launched in November 2022. As of December 2022, a total of 10 clients with 11 training sessions and a total of 1,200 individuals have participated in the N3E course for the next generation of semiconductor innovation. In addition, to reduce product defects and risks of product returns, TSMC offers diverse courses to customers, sharing technical knowledges on highvoltage stress, burn-in, and screening. In 2022, TSMC shared quality-related information with 29 customers and worked closely on quality and reliability testing to ensure stable production lines and strengthen partnerships.

Thanks to qualification in technology development, real-time defense systems and innovative applications in semiconductor manufacturing services, as well as its continuous quality improvement culture, TSMC had no major product recalls in 2022. Meanwhile, a third-party audit verified the effectiveness of the Company's quality management systems in compliance with IATF 16949:2016 and IECQ QC 080000:2017 requirements. In 2022, TSMC's four backend fabs also continued to pass the certification of the American National Standards Institute ANSI/ESD (Electrostatic Discharge) S20.20 standard.

Development Focus of Quality Value Chain



- Provide quality training courses and encourage suppliers to participate in TCIA to improve supply chain's sustainability
- Conduct training, auditing, and consultations to develop CMR substance inspection capabilities
- Share technological knowledge to help suppliers transform into semiconductor supply chain



- Develop technologies and help customers design with superior product reliability to accelerate time to market
- Develop real-time defense systems to reduce product defects and prevent quality events
- Launch new process standardization training programs to accelerate new product design timelines
- Offer diverse courses to develop comprehensive knowledge in quality management and work together on quality and reliability

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Strengthen Yield Monitoring System with AI; Effectiveness of Auxiliary Recognition Model Reaches 98%

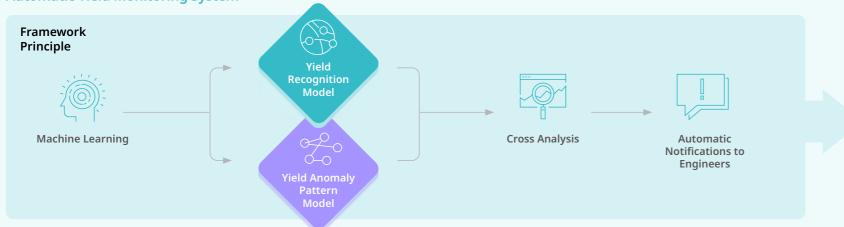
Stable product yield and immediate response to manufacturing challenges are critical in the volume production of semiconductor chips, where time is of the essence. In recent years, TSMC has been actively introducing digital transformation to increase the operational efficiency of yield testing and quality monitoring. In 2020, the Company developed a highly accurate yield recognition model. In 2021, a highly accurate yield anomaly pattern model was launched by introducing automatic cross-check analysis. In 2022, the

Company continued to advance the system, developing and deploying automatic yield monitoring systems at all TSMC fabs. The systems continuously improve the efficiency of yield monitoring and effectiveness of auxiliary recognition model reaches 98%. This can help reduce redundant work for engineers, enabling them to focus on real-time response and professional analysis for yield monitoring to prevent yield losses and strengthen product quality.



Automatic Yield Monitoring System

2022 Sustainability Report



Effectiveness of Auxiliary Recognition Model

Execution rate achieved 100% deployment rate to all fabs

Reduced confirmation time required by workers, saving labor costs An Innovation Pioneer A Responsible Purchaser A Practitioner of Green Power An Admired Employer

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2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements	
React with Precise Response				
Provide excellent customer service through close collaboration with	Maintain a customer satisfaction rating of over 90%	Maintain a customer satisfaction rating of over 90%	Customer satisfaction rating of 88% Note 2 Target: >90%	_
customers and regular customer meetings/ surveys to understand their requirements and respond to their feedback	Reduce cases of problematic engineering quality to 20% of the level in 2019 for every one million 12-inch wafers shipped Note 1	Reduce cases of problematic engineering quality to 30% of the level in 2019 for every one million 12-inch wafers shipped	Reduced cases of problematic engineering quality to 36% of the level in 2019 for every one million 12-inch wafers shipped Target: 55% of the level in 2019	↑
Establish Virtual Fab Service Provide comprehensive information promptly to ensure the success of customer's products;	Provide >1,200 wafer manufacturing and process technologies and >170 advanced packaging technologies in line with the TSMC technology roadmap	Provide >994 wafer manufacturing and process technologies and >147 advanced packaging technologies in line with the TSMC technology roadmap	Provided >944 wafer manufacturing and process technologies and >129 advanced packaging technologies in line with the TSMC technology roadmap Target: 932 wafer manufacturing and process technologies and 107 advanced packaging technologies	↑
strengthen processes and systems to ensure that customer product information receives protection of the highest standard	Pass customer product information security audits with no major flaws	Pass customer product information security audits with no major flaws	Passed <u>customer product information security audits</u> with no major flaws Target: No major flaws	~
Note 1: In 2022, cases of problematic engineering quality have been reduced to meet the 2030 Goal. As such, the 2030 Goal for reducing cases of problematic engineering quality or poor reliability has been adjusted from 50% to 20% Note 2: Please refer to the Precise Response section for the reasons that the goal was not achieved			↑ Exceeded ✓ Achieved — Missed Target	



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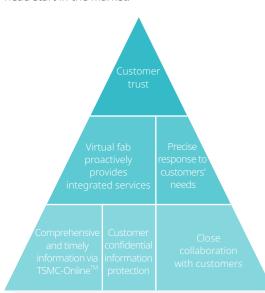
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Customer trust is a core value integral to TSMC. The Company believes that gaining customer's trust is critical to consistent innovation in technologies, and the Company is committed to providing products and services of the highest quality. TSMC's vision is to become "the largest and most advanced dedicated IC design and manufacturing service provider in the world." Service teams dedicated to customers have been assembled that strive to provide world-class services in areas such as product design, mask fabrication, wafer manufacturing, and backend packaging. Digital transformation is also being introduced as part of the commitment to providing excellent services to make customers more competitive, build deeper and stronger relationships with customers, and collaborate with them to get a head start in the market.

2022 Sustainability Report



Precise Response

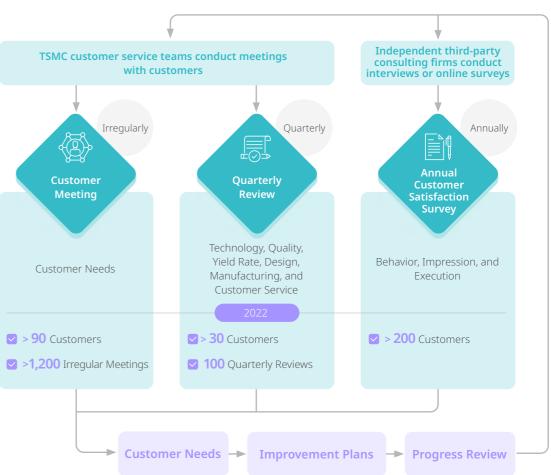
Customer feedback and satisfaction ratings are opportunities for TSMC to improve. The customer service team learns and analyzes customers' commercial and technological demands through annual satisfaction surveys, quarterly evaluation meetings, and need-based meetings to provide optimal solutions to strengthen partnerships. In 2022, TSMC conducted the annual satisfaction survey with more than 200 customers and held over 100 quarterly evaluation meetings with more than 30 customers, hosting more than 1,200 online and offline meetings for the managerial level.

In 2022, the global semiconductor market experienced extreme changes: from strong demands in the first half of the year to decelerated growth in the second half. With uncertainties looming over the industry, TSMC decided to double down on collaboration and communication with customers. In 2022, customer satisfaction levels have rebounded from 84% in 2021 to 88%. In the future, TSMC will continue to work on long-term capacity planning, tech support, and other areas. The Company hopes that the newly added capacity and the distribution of existing capacity can satisfy customer demands, provide greater supply chain resilience, and ultimately, help TSMC achieve its long-term goal of 90% customer satisfaction. Meanwhile, TSMC is proud to announce that customer trust, an indicator from the annual customer satisfaction survey, has already increased to 95%. TSMC is also advancing manufacturing technologies to achieve better quality and yield. In 2022, cases of problematic engineering

quality or poor reliability for every one million 12-inch wafers shipped were reduced to 36% of the level in

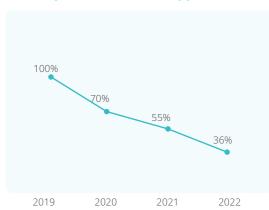
2019, exceeding the annual goal of 55%. As such, the Company decided to ramp up the 2030 Goal to 20%.

Various Communication Channels for Customers

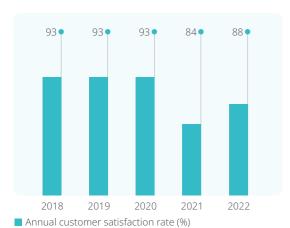


Cases of Problematic Engineering Quality for Every Million Wafers Shipped

2022 Sustainability Report



Annual Customer Satisfaction



Note: Figures for customer satisfaction ratings include TSMC fabs in Taiwan and overseas subsidiaries

Virtual Fab

Real-time interaction and information exchange are the main reasons customers consider TSMC as their own wafer fabs. TSMC-Online[™] is a customer self-service portal that provides comprehensive information on in-house technologies and manufacturing, allowing customers to feel at home but also protected with robust proprietary information protection services. In 2022, TSMC-Online[™] was upgraded by reorganizing system

functions and frameworks, importing customer workflows and personalized concepts to meet customer demands. The upgraded system allows for intuitive operation and easy self-service that can increase operational efficiency for customers. As of December 2022, TSMC-Online[™] has processed an average of more than 3,000 log-ins each day.

In 2022, to accommodate the development of the

technology roadmap and support diverse product demands from customers, TSMC provided over 944 wafer manufacturing technologies and over 129 advanced packaging technologies for customers. In terms of proprietary information protection for customers, TSMC complies with international regulations and standards and has obtained ISO 27001 certification, the international standard for information security management. TSMC has also

TSMC's customer service team provides world-class services in areas including wafer production, testing, etc.



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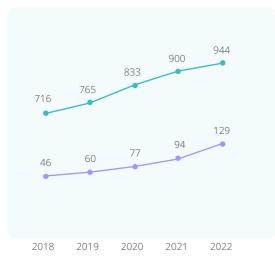
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established an Information Protection Policy and SOP to ensure, under the virtual fab, the highest level of security that customers enjoy with their own foundries to protect customers' interests.

2022 Sustainability Report

TSMC is committed to delivering products of the highest quality and pursuing innovative collaborative models based on the core value. of Customer Trust. As a trusted technology and capacity provider in the global logic IC industry, TSMC works with customers to support their success and sustainable operations. Customers' success is TSMC's success, and the Company will continue to work closely with customers to provide customer-oriented services.

Types of Technology for Customers



- Types of wafer manufacturing technology
- Types of advanced packaging technology

Note: Figures for types of technology are from TSMC fabs in Taiwan and overseas subsidiaries

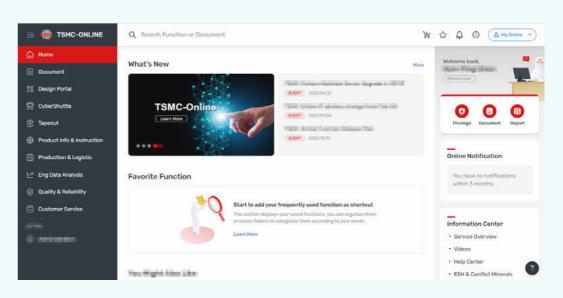
Case Study

The Upgraded TSMC-Online[™] Delivers a Brand-New Customer Experience

TSMC is employing innovative digital collaboration to help customers succeed. In 2022, TSMC-OnlineTM was upgraded not only by changing the user interface but, more importantly, by optimizing service flows. The system framework was restructured to deliver a new and improved customer experience with TSMC-Online™.

The Personalized Workspace is one of the highlights of the upgraded TSMC-OnlineTM system, as it makes the customer's workflow more convenient. In the Personalized Workplace, two system functions for One-Stop File Download and Subscription Management have also been added to enable customers to

access and filter technical documents and download multiple files from their Carts with a single click. Customers can also schedule to send production reports at designated times and subscribe to technical documents for the latest updates to access the latest technical documents and production reports. My Favorite Functions allows customers to add frequently-used functions to their workplace to accommodate their job requirements and habits. The function makes it easy for users to manage and personalize information, which increases their operational efficiency. For more details, please refer to TSMC Optimizes Customer Experience by Upgrading Its Online Service System.



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TSMC Delivers Unrivalled Manufacturing Flexibility

2022 Sustainability Report









1.2 Million

2022 Sustainability Report

100%

530 GWh

Sustainable Supply Chain



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Sustaina	ole Supply Chain
Strategies	2030 Goals
Improve Sustainability Risk Management	Ensure 100% of Tier 1 suppliers ^{Note1} complete the Sustainability Management Self-Assessment

TSMC requires all suppliers to adhere to the TSMC Supplier Code of Conduct, taking actions to improve labor rights, safety and health, environmental protection, business ethics, and the efficiency of the management system; the Company has also taken the initiative to help suppliers continue to improve their core capabilities to reduce risks of disruption to business operations

the Sustainability Management Sell-Assessment Questionnaire

Ensure 100% critical suppliers Note2 receive Code of Conduct audits by RBA-certified agencies every three years

Ensure 980 sessions of S.H.A.R.P. audits toward critical high-risk suppliers at a pace of 100 sessions a year

Supplier due diligence on responsible mineral sourcing: 100% of the minerals used are sourced responsibly

Audit a cumulative total of 30 suppliers (≥ 3 suppliers per year) for due diligence on responsible mineral sourcing

Continue to diversify production plant sites and assess new suppliers; develop 185 multi-source supply solutions Note3 (Base year: 2018)

Ensure a cumulative total of 145 local raw materials suppliers receive consultation on process advancement and quality improvement (Base year: 2016)

Ensure a cumulative total of 300 raw materials suppliers Note4 participate in the annual emergency response drill (Base year: 2016)

Ensure a cumulative total of 1,500 suppliers^{Note4} participate in the Environmental Safety and Health (ESH) training programs (Base year: 2016)

Ensure 100% critical high-risk suppliers complete Safety and Health consultation

Ensure 100% of Tier 1 suppliers complete the Sustainability Management Self-Assessment Questionnaire

Ensure 70 critical suppliers receive third-party audits

Ensure 100 sessions of S.H.A.R.P. audits toward critical high-risk suppliers

Supplier due diligence on responsible mineral sourcing: 100% of the minerals used are sourced responsibly

Complete audits on ≥ 3 suppliers for due diligence on responsible mineral sourcing

Complete the development of 145 multi-source supply programs

Ensure a cumulative total of 75 local suppliers receive consultation on process advancement and quality improvement

Ensure a cumulative total of 190 raw materials suppliers participate in the annual emergency response drill

Ensure a cumulative total of 1,050 suppliers participate in the ESH training programs

Ensure 100% critical high-risk suppliers complete Safety and Health consultation

Ensure 100% of Tier 1 suppliers complete the Sustainability Management Self-Assessment Questionnaire Target: 100%

A total of 60 critical suppliers completed third-party supplier audits with an annual completion rate of 100% Target: 60 critical suppliers

Completed 100 sessions of S.H.A.R.P. audits toward critical highrisk suppliers

Target: 100 sessions

100% responsible mineral sourcing Target: 100%

Completed audits on 5 suppliers for due diligence on responsible mineral sourcing

Target: ≥ 3 suppliers

Completed the development of 135 multi-source supply programs Target: 130 programs

Ten suppliers received consultation on process advancement and quality improvement, bringing the cumulative total to 65 Target: 10; cumulative total 65

29 raw materials suppliers participated in the annual emergency response drill, bringing the cumulative total to 161

201 suppliers participated in the ESH training programs, bringing the cumulative total to 960

Target: Cumulative total 900

Target: Cumulative total 150

100% Note5 of critical high-risk suppliers completed Safety and Health consultation

Target: 100%

↑ Exceeded ✓ Achieved — Missed Target

with order amounts exceeding NT\$5 million. In 2022, 1,230 suppliers met the criteria

Note1: Tier 1 suppliers: Suppliers trading directly with TSMC with more than three orders per year, Note3: Since risk evaluation has also been incorporated into new processes in recent years, the target was increased from 145 in 2030 to 185

Note4: Mainly involving suppliers in Taiwan

 $Note 5: \ In \ 2021, TSMC \ audited \ 70 \ critical \ high-risk \ suppliers, among \ which \ five \ suppliers \ scored \ below \ 70 \ for \ suppliers \ scored \ below \ 70 \ for \ suppliers \ scored \ below \ 70 \ for \ suppliers \ scored \ suppliers \ scored \ below \ 70 \ for \ suppliers \ scored \ sc$ Safety and Health and had received consultation; guidance has been completed (one of the shortcomings in the audit has not yet obtained ISO 14064 verification, so TSMC will continue to follow up)



Strategies			2023 Targets	2022 Achievements	
Promote Green and	Increase local sourcing Note6				
Low-carbon Supply Chains	- 64% for indirect raw materials		Source 62.5% of indirect raw materials locally	Sourced 62.1% of indirect raw materials locally Target: 60.5%	↑
TSMC continues to reduce environmental impact and its external	- 60% for spare parts		Source 44.5% of spare parts locally	Sourced 43% of spare parts locally Target: 50%	Note7
cost and minimize the effects of climate change and resource depletion	Provide consultation on power reduct suppliers Note4 and reduce energy cons total Note8 of 1,500 GWh (Base year: 20	sumption by a	Reduce supplier energy consumption by a cumulative total of 550 GWh	Reduced supplier energy consumption by a cumulative total of 530 GWh Target: 430 GWh	↑
targets on power and substance water consumption, waste	Provide consultation on water reduce suppliers Note 4 and reduce water con a cumulative total of 35 million met year: 2020)	sumption by	Reduce supplier water consumption by a cumulative total of 30 million metric tons	Reduced supplier water consumption by a cumulative total of 29.08 million metric tons Target: 20 million metric tons	↑
emissions, propelling the sustainable development of supply chains	Suppliers invited to participate in Cl year should achieve an average sco response rate of 95% NEW		Suppliers invited to participate in CDP in the year should achieve an average score of C and a response rate of 85%	Suppliers Note9 invited to participate in CDP in the year achieved an average score of C and a response rate of 81% NEW	tive total of ve total of ar achieved an
	Ensure 100% of high energy consum suppliers receive ISO 14064 GHG Em verification (Base year: 2021)		Ensure 70% of high energy consumption suppliers receive ISO 14064 GHG Emission verification	65% of high energy consumption suppliers received ISO 14064 GHG Emission verification Target: 55%	↑
	Reduce waste production among loca suppliers ^{Note11} by 42% ^{Note12} (Base year:		Reduce waste production among local major suppliers by 35%	Reduced waste production per unit among local major suppliers by 34% Target: 32%	↑
Note 7: For spare parts, since the proportion requirements became stricter. Curror TSMC requirements, and since TSM of supply chain capacity and shipme Note 8: The cumulative total of power reduct the newly achieved reduction results Note 9: Suppliers invited to participate in CE	in Taiwan, which is the main operation region of TSMC in of advanced processing increased, the quality ently, suppliers in Taiwan have not been able to meet C had to increase inventory levels due to the uncertainty ents, it missed the annual local sourcing target and included the existing achievement of past efforts and so DP in 2022: A total of 137 suppliers of raw materials and curement categories and expenditures	consumption Note 11: Mainly focusir Calculation fo B: waste prod Note 12: In the most re waste reducti 35% to 42%. T sludge that cc	high energy consumption suppliers: Suppliers in Taiwan whose energy at a single site exceeds 5 GWh per year ag on suppliers in Taiwan producing 80% of the waste in raw materials. rmula: A/(A+B)(%); A: waste reduced by the factory in that month (metric tons); uced by the factory in that month (metric tons) cent two years, the main waste-producing suppliers have vigorously promoted on and improvement plans, thus the target for 2030 has been increased from the key improvements were: (1) Recycling of heavy metal sludge, converting build only be solidified and treated into renewable raw materials; (2) Installing on and treatment equipment to decrease sludge output	↑ Exceeded ✓ Achieved — Missed Target	



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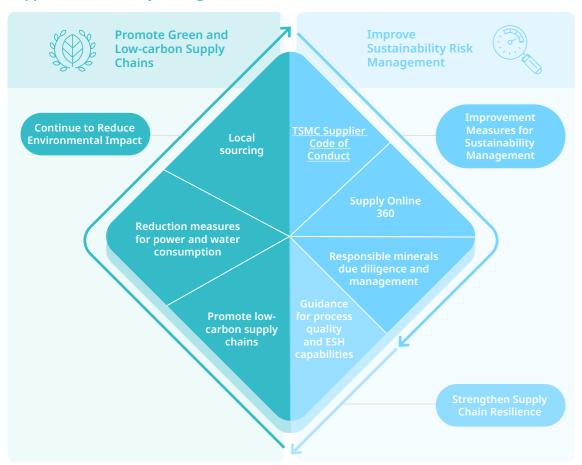
TSMC is dedicated to building an environmentally and socially responsible operating model, exerting influence towards sustainability as the global leader of the semiconductor industry. In 2022, TSMC continued to uphold two main strategies as its supply chain sustainability management guideline: Improving Sustainability Risk Management and

2022 Sustainability Report

Promoting Green and Low-carbon Supply Chains. The Company continued to require suppliers to adhere to the TSMC Supplier Code of Conduct in operations, taking actions to improve safety in the workplace, dignity for labor, ethical operations, and comprehensive protection of the environment, and continued to reduce risks of disruption to business

operations. Additionally, to answer the calls for green manufacturing, TSMC has taken the initiative to reduce the environmental impact of supply chains, prompting suppliers to set reduction targets for power and water consumption, waste generation, and carbon emissions. TSMC aims to mitigate the impact of climate change on society and lay the foundation for the sustainable development of supply chains.

Supplier Sustainability Management Framework



Four Guiding Principles of Sustainable Supply Chain Management



Compliance Guidance

Suppliers comply with the TSMC Supplier Code of Conduct and extend the scope of management to their upstream suppliers



Risk **Assessment** Suppliers determine the level of Code compliance via the Sustainability Self-Assessment Questionnaire or Sustainability Risk Assessment by the TSMC Team



Audit Participation Critical Suppliers are audited by RBA-certified third-party institutions or audited on-site by the TSMC Supplier Healthiness Assessment Rectification Program (S.H.A.R.P.) Team



Continuous **Improvement**

Suppliers implement improvement measures according to the audit results and receive relevant consultation or follow-up evaluation



TSMC joins hands with suppliers to lay the foundation for sustainable development

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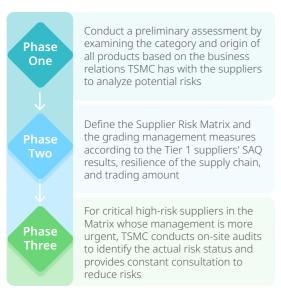
Improve Sustainability Risk Management

Improvement Measures for Sustainability Management

TSMC worked closely with supplier partners through the four guiding principles of Compliance Guidance, Risk Assessment, Audit Participation, and Continuous Improvement to urge suppliers to improve their sustainability performance and take the initiative to promote sustainable practices to their upstream suppliers. To prompt common growth among supplier partners worldwide, TSMC established the global responsible supply chain management platform Supply Online 360. The platform serves as an integrated communication channel with all suppliers, propelling tangible change with virtual data analysis and bringing sustainable semiconductor supply chain practices into reality.

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Supply Chain Three-phase Risk Assessment



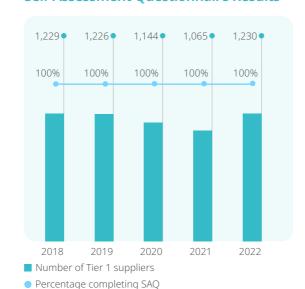
• Compliance Guidance

As a member of the Responsible Business Alliance (RBA), TSMC has established its Supplier Code of Conduct according to RBA's Code of Conduct. TSMC requires Tier 1 suppliers to comply with the Code of Conduct while encouraging them to ask their upstream suppliers, contractors, and service providers to adopt the same Code in their practices and management. New suppliers must sign the TSMC Supplier Code of Conduct to be eligible for partnership.

Risk Assessment

To gain an in-depth understanding of the current status of supply chain development and potential risks, TSMC conducts a three-phase risk assessment in supplier management, identifying

Self-Assessment Questionnaire Results



the improvement measures required for suppliers according to supplier classification.

First, TSMC investigates and analyzes all suppliers it conducts business with and requires Tier 1 suppliers to conduct the Self-Assessment Questionnaire (SAQ) to evaluate their performance in sustainability. In 2022, Tier 1 suppliers in Taiwan completed 1,230 SAQs. According to the survey results, for the Dangerous Workplace category, the most common problem among 4% of the suppliers was failure to stipulate operating procedures for dangerous machines; in terms of Personnel Operation Safety, 3% of suppliers did not have adequately equipped emergency response personnel, and they did not formulate effective first aid procedures; regarding Fire Protection Equipment Design and Maintenance, 16% of the suppliers had not established

a monthly fire protection equipment inspection and maintenance plan. TSMC determines the level of risk based on the SAQ results and priority accident records, and it defines supplier grades according to indicators such as procurement expenses, product criticality, and business relations with TSMC. Using the two dimensions of Risk and Criticality, TSMC establishes a Supplier Risk Matrix to define supplier grades and formulate exclusive management measures accordingly. In 2022, suppliers with physical production lines were targeted for management. Besides the existing SAQ items, two assessment items, Supply Chain Risk Management and Process Reliability, were added, while climate change response measures, fire protection system integrity, and green manufacturing were also considered. Suppliers scoring less than 70 points were included as the priority inspection targets of on-site audits.

Critical High-risk Supplier Assessment Process

Tier 1 Suppliers Suppliers trading directly with TSMC with more than three orders per Critical year, with order High-risk Suppliers accounting for the top Determined according **Suppliers** amounts exceeding 85% of the purchasing expenses or of a single-source purchase, or incident records, and NT\$5 million business items suppliers recognized as critical by TSMC after assessing multiple risk indicators, including the suppliers' market shares, inventory levels, and other characteristics



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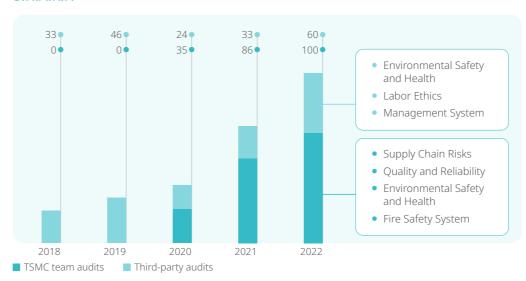
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• Audit Implementation and Continuous **Improvement**

2022 Sustainability Report

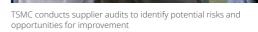
After identifying risks using the Supplier Risk Matrix, TSMC conducts on-site or remote audits focusing on the six major categories of Supply Chain Risk, Quality and Reliability, Environmental Safety and Health, Fire Protection System, Labor Ethics, and Management System to determine potential risks and opportunities. TSMC requires suppliers to propose improvement plans and schedules and assigns the TSMC S.H.A.R.P. Team to offer guidance and followup on improvements regularly. The Company has further extended audit projects such as key guidance and new factory design guidance, and constantly strengthens suppliers' self-management awareness and improvement ability. In 2022, TSMC conducted 160 on-site audits of critical high-risk suppliers to properly track the risk status of the suppliers and improve their operational sustainability. By doing so, TSMC can ensure stable materials supply and services, provide a safe and healthy workplace, and minimize environmental and social impact.

S.H.A.R.P.



Supplier Risk Matrix, Classification and Management Measures















Priority Violations Note 1

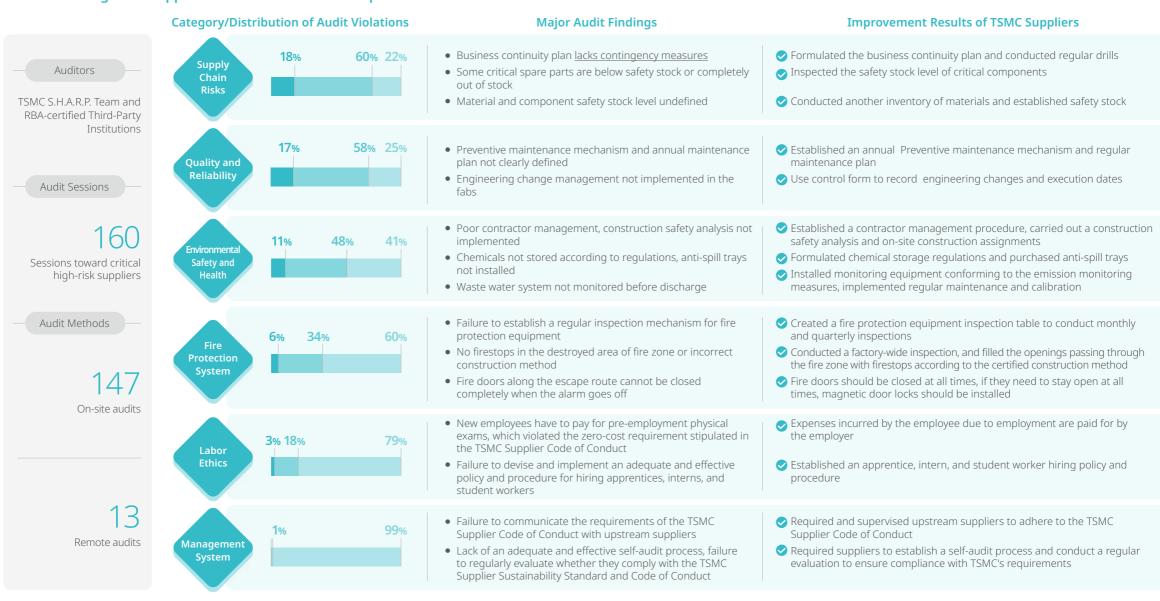
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2022 Critical High-risk Suppliers Audits and Areas for Improvement



Minor Violations Note 3

Major Violations Note 2





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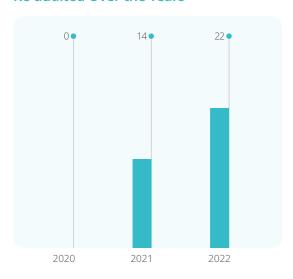
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Re-audit and Key items improved Projects

2022 Sustainability Report

To ensure suppliers' improvement results, the TSMC S.H.A.R.P. Team focused on four major dimensions of the six major categories, Supply Chain Risks, Quality and Reliability, Environmental Safety and Health, and Fire Protection System, to launch short, medium, and long-term improvement plans to solve the problems from previous audits. Furthermore, a key items improved project was implemented and suppliers were required to formulate a business Continuity Plan (BCP) and conduct regular drills, and formulate contingency measures to minimize the potential risks of

Cumulative Number of Suppliers Re-audited Over the Years



emergencies. 22 re-audits were completed in 2022. Through multiple rectification, suppliers are able to perform self- review to effectively improve audited findings, decrease the occurrence of abnormal

events, increase process stability, operational safety, and reliability, maintain supply quality, and avoid the risk of material supply interruptions.

Supplier Re-audit Process and Results



Summarize Findings from the Previous Audit

• Evaluate suppliers' production line maintenance conditions and mechanisms, as well as the occurrence of abnormal events after the first audit



Arrange for Re-audit

- Improvements of the findings from the previous audit were not as expected, so an improvement consensus was reached with the suppliers and the key items direction was explained on-site to make sure all levels of suppliers understand the target in order to implement improvement measures
- Implement a regular tracking mechanism to set up and review operating procedures, provide consultation, and ensure the operational standards comply with suppliers' needs



Design Key Items for **Improvement**

- Define replacement standards for obsolete equipment in the fabs
- Real-time monitoring of important processes or equipment parameters in the production lines
- Ensure regular maintenance of production line equipment
- Install relevant equipment in various areas of the fabs in accordance with environmental and fire protection regulations



Improvement Results of 2022

- Replaced obsolete industrial sulfuric acid production lines
- Use IE3 motors
- Created an EPA monitoring system and implemented certification
- Horizontally expanded the maintenance form to various equipment



The re-audit serves to confirm that the supplier has completed the improvement of the previous findings to design key items improvement projects





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Procurement Arrangement of Main Raw Materials

2022 Sustainability Report

TSMC has formulated comprehensive procurement management actions for main materials, and it continues to collaborate with suppliers in five major areas: supplier distribution, diverse sources of materials, quality control, local procurement, and sustainable operations. By adjusting the global market deployment, developing diverse sources of materials, and increasing localized procurement, potential supply chain risks such as insufficient production capacity, quality defects, delivery delays, inflation, and major natural disasters can be proactively resolved. Furthermore, suppliers are required to incorporate sustainability into their operational considerations in accordance with the TSMC Supplier Sustainability Standard. At the same

time, TSMC also collaborates with suppliers to facilitate advanced material R&D, process innovation, and quality improvement, thereby continuously improving supply chain resilience and generating the values of a circular economy. For more information, please refer to 5.3.5 Raw Material and Supply Chain Management in the annual report.

Suppliers' Reporting Procedure

TSMC values people above all else and has established a Supply Chain Employee Reporting Channel on <u>Supply</u> Online 360. This reporting channel offers protection for the employees of suppliers, extends and deepens TSMC's management practices, and builds a more inclusive workplace for the supply chain. In 2022, there were five reported cases, of which two were erroneous claims; one was a remuneration-related dispute and

one involved ambiguous overtime hours without overtime pay, for which the suppliers were immediately required to make improvements according to the TSMC Supplier Code of Conduct and compensate employees' due salaries and overtime pay; the final dispute was related to the protection of confidential information, and TSMC has reinforced information asset management.

Reporting Procedure



Supplier Employees

• Supply chain employee complaint channel

Key Management Actions for Main Raw Materials

Main Raw Materials Management Dimension	Silicon Wafers	Process Chemicals	Photolithography Materials	Gases	Grinding Fluid, Grinding Pad, Diamond Discs
Key Suppliers	6 suppliers	12 suppliers	7 suppliers	9 suppliers	7 suppliers
Diverse Sources of Materials	~			~	
Quality Control	~	~			
Local Procurement		~	~		~
Sustainable Operations	~	~	~	~	~



TSMC Grievance Handling Committee

- Investigation and supervision
- Penalty
- Report to TSMC's top supervisor of supply chain management for a penalty



Suppliers

- Examine problems and make improvements
- Implement improvement measures



Through comprehensive management actions, TSMC requires suppliers to incorporate sustainability into their operations



TSMC Supplier Sustainability Academy Reaches 1.2 Million Users—Fostering Common Good in the Industry Through Digitalization

2022 Sustainability Report

To bolster the capabilities of suppliers, the TSMC Supplier Sustainability Academy has planned seven major programs with 44 courses, transforming TSMC's operating and manufacturing experience into online animated teaching materials and sharing them with the supply chain free of charge. As of 2022, 1.2 million people have completed training, and 284 Tier 1 suppliers have used the platform to train their suppliers and connect to the internal contractor construction management system, requiring those engaging in highrisk operations to complete the necessary courses before they can be qualified for construction to minimize potential industrial safety risks. The Enterprise GHG Inventory course is expected to be included in the compulsory courses for Tier 1 suppliers in 2023 to enhance the supply chain's green impact.

Responsible Minerals Sourcing

TSMC ensures that human rights, health, and the environment in mineral production areas are not violated by purchasing conflict-free raw materials from dependable sources. In light of this, the Company has adopted a series of legal compliance measures including the establishment of a due diligence framework following the Model Supply Chain Policy for a Responsible Global Supply Chain of Mineral from Conflict-Affected and High-Risk Areas published by the Organization for Economic Cooperation and Development (OECD). At the same time, TSMC is one of the staunchest supporters of

the Responsible Minerals Initiative (RMI) and Global e-Sustainability Initiative (GeSI). The Company adheres to the Responsible Minerals Assurance Process (RMAP), requiring suppliers to procure conflict-free raw materials.

TSMC requires suppliers to comply with the responsible minerals sourcing policy and sign the statement of responsible minerals for products containing tantalum, tin, tungsten, and gold. Since 2017. TSMC has also disclosed the source smelters.

for the cobalt used in TSMC products to clients. In 2022, the Company completed the inventory of mica usage in the supply chain. Since 2021, TSMC has audited at least three suppliers of tantalum, tin, tungsten, and gold annually, ensuring that these suppliers formulate and implement conflictfree minerals management processes and conduct due diligence on upstream suppliers. For the latest TSMC disclosure documents, please visit TSMC's official website or the US Securities and Exchange Commission website.

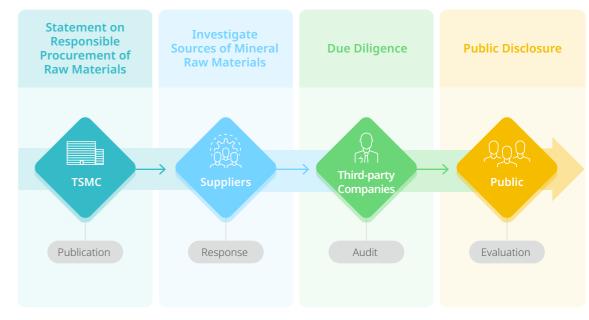
Conflict-free Minerals Due Diligence



Percentage of conflict-free minerals

Note: Figures from Tier 1 Suppliers of TSMC fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Responsible Minerals Management Process



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Strengthen Supply Chain Resilience

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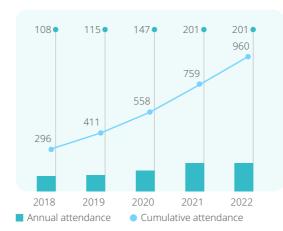
TSMC ensures ESH sustainability management in the supply chain with four separate steps: Establishing Standards and Systems, Audit and Violations Tracking, Consultation and Training, and Focus Consultation. To constantly improve the sustainability of suppliers, besides regularly organizing the Sustainable Supply Environment, Safety, and Health Forum, practical fire protection equipment training, emergency response drills and observation, and on-site energy conservation and carbon reduction diagnosis and guidance, the Company also launched a series of courses

and training including ESH and Fire Response Workshop, Supplier Fire Protection Autonomous Training, Supplier Carbon Inventory Workshop, and Supplier Product Carbon Footprint Inventory Workshop in 2022. Through handson teaching, group discussion, and practice by professional lecturers, the learning performance and self-management capabilities of suppliers are optimized, thereby enhancing suppliers' environmental safety, health, and loss prevention capabilities, and forming an uninterrupted supply chain.

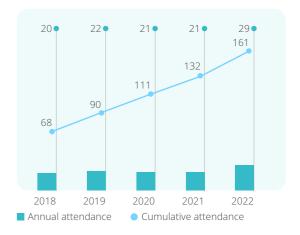
Follow-up

evaluation

Number of Suppliers Participating in ESH Training



Number of Suppliers Observing TSMC Annual Emergency Response Drills



Sustainable Management of the Supply Chain on Environmental Safety and Health



Supplier Follow-up Consultation

- Critical supplier focus consultation
- Follow-up evaluations for high-fire-risk suppliers

Standards and System Establishment

- Constantly update the Supplier Code of Conduct and Sustainability Standards
- Supplier leadership commitment to the Code of Conduct and Sustainability Standards
- Introduce fire protection and ESH design to new factories
- Establish designated fire protection management personnel



Consultation and Training

- ESH and Fire Response Workshop **NEW**
- Fire Protection Autonomous training **NEW**
- Supplier Carbon Inventory Workshop **NEW**
- Supplier Product Carbon Footprint
 Energy Saving and Carbon Inventory Workshop **NEW**
- Sustainable Supply Chain Environment, Safety and Health Forum
- Fire Protection Practice and Operational Training
- Emergency Response Observation
 - Reduction Guidance



Audit and Violations Tracking

- Supplier ESH/fire protection audit
- Violations mitigation and follow-up
- Refine audit techniques and strengthen audit methods





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Achievement of ESH and Loss Prevention Capability Guidance in 2022





Supplier EHS

Workshop

2022 Sustainability Report



Supplier Fire

Response

Workshop



Fire Protection

Practice and

Operational

Training



Fire Protection

Autonomous

training

Target



Emergency

Response

Observation



Supplier

Inventory

Workshop



Supplier Product Carbon Footprint Inventory Workshop

Energy and Carbon Reduction Consultation



suppliers' operational resilience and promote sustainable measures such as a supply chain net zero campaign

Help suppliers to understand the TSMC Supplier Sustainability Standard and emergency response capability through interactive discussions and practice

Elevate suppliers' capabilities in fire protection, first aid, and emergency response

Guide suppliers to accurately identify the sources and data of carbon emissions from fabs and products, and devise improvement measures to attain reduction goals Determine energy conservation opportunities and provide them to suppliers to improve energy conservation

116

354

Raw materials suppliers

50

Suppliers

requiring priority

improvement

management

shortcomings

due to ESH

audit

S 56

Bulk and specialty gas manufacturers and high-firerisk suppliers

50

S 58

40

A 48

12 (A) 112

Raw materials suppliers

29 34

A 47

Suppliers who have yet to obtain the ISO 14064 GHG verification certificate

<a>29

<a>20 24

Suppliers who consume more than 5 million kWh of electricity annually

6

Raw materials suppliers







Case Study

2022 Sustainability Report

Supplier Fire Protection Personnel Project 2.0—Further Improvement of Self-management Capability

TSMC implemented the Supplier Sustainable Fire Protection Management Mechanism in 2020 and established a Supplier Protection Personnel System in 2021 to allocate training resources to executive personnel in order to achieve optimal training performance. In 2022, to lower the risk of material supply interruptions caused by fires, TSMC launched the Supplier Fire Protection Personnel Project 2.0 in addition to introducing fire protection requirements that are superior to RBA specifications; the Company also conducted on-site measurements and random inspections of supplier production

lines. Based on the principle of the Supplier Sustainability Standards, TSMC collaborated with external experts to open small classes for practical fire protection-related operational training and implemented the Supplier Fire Protection Autonomous Training Program. Meanwhile, online interactive courses will be planned and made available in the TSMC Supplier Sustainability Academy in 2023, so that suppliers' fire protection training will not be subject to time and venue constraints, thereby refining fire protection management and equipment reliability on an ongoing basis.



Supplier Fire Protection Practice and Operational Training

Commissioned WuFeng University to organize the Practical Operational Training for Supplier Fire Protection Personnel, using MR equipment to conduct on-site drills in a bid to improve suppliers' professional fire protection capabilities. A total of 40 supplier representatives participated in two training sessions.



Supplier Fire Protection Autonomous Training Program

Fire protection technicians hired by suppliers were asked to conduct on-site training on employee fire protection equipment. Moreover, TSMC's fire protection experts conducted on-site guidance and observation to verify training quality. A total of 12 suppliers have completed the training.



TSMC Supplier Sustainability Academy Interactive Fire **Protection Course**

Apart from physical courses, TSMC expects to launch the Deficiencies in Suppliers' Fire Protection Audits and Improvement Measures online course in Chinese and English on Supply Online 360, allowing domestic and foreign suppliers to participate in interactive fire protection training online.

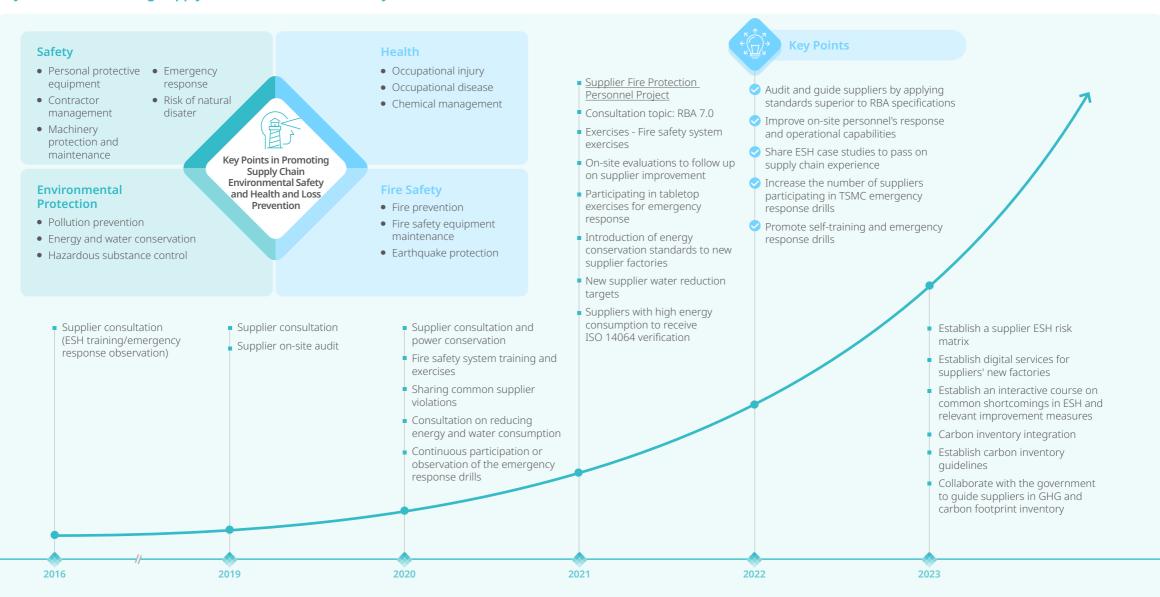
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Key Points in Promoting Supply Chain Environmental Safety and Health and Loss Prevention

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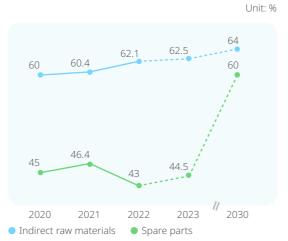
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Promote Constant Upgrade of Local Supply Chains

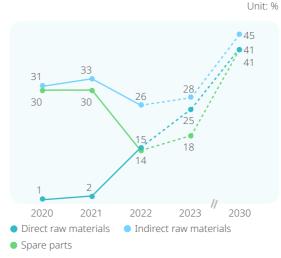
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TSMC's main production site is located in Taiwan. Its procurement can be divided into six categories: equipment, spare parts, raw materials, facility services, IT, and goods. Besides promoting local sourcing in Taiwan, TSMC has also set up independent procurement organizations for TSMC subsidiaries, including TSMC (China), TSMC (Nanjing), and WaferTech. We also assist local suppliers to improve technology and quality and reduce costs and carbon emissions to build a highly effective and competitive semiconductor industry chain.

Percentage of Local Sourcing in Taiwan

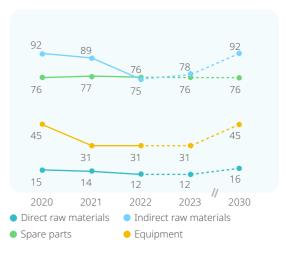


Percentage of Local Sourcing in China



Percentage of Local Sourcing in the US

Unit: %



Challenges and Solutions of Supply Chain Management Activities from Taiwan Fabs in 2022

Number of **Problems/Challenges Consultation Measures from TSMC** 2022 Performance **Suppliers Technology and Part** Assemble a team of experts to provide consultation • Percentage of imported high-level spare parts for several for local suppliers, offer technical support, and assist advanced processes is still too high, as local suppliers lack critical 9 Developed parts for 156 advanced processes in certification, ensuring that supplier technology technologies developments are consistent with TSMC's business • Parts of specific advanced machinery have to be sent abroad for needs repair and maintenance, which affects production schedules New factories supplied a sufficient amount of raw materials upon Capacity volume production, meeting TSMC quality requirements 10 Production line expansion and process advancement Assisted new suppliers to establish the Best Known Method (BKM) • Capacity insufficient to meet advanced process requirements for inferior quality improvement **Measurement Technology** Zero returns of goods Add analytical instruments 9 Assisted new suppliers to increase detection thresholds • Measurement technology insufficient to meet advanced process Introduce advanced instruments requirements Assisted new suppliers to acquire capabilities for IC material analysis

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Promote Green and Low-carbon **Supply Chains**

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Continue to Reduce Environmental **Impact**

In response to the Net Zero by 2050 target, TSMC formed the Green Supply Chain Management Team and proposed specific action guidelines based on the five major dimensions proposed by World Economic Forum's (WEF) Net-Zero Challenge: The Supply Chain Opportunity guideline: Create Transparency, Optimize for CO2, Engage Suppliers, Push Ecosystems, and Enable Your Organization. Through this, TSMC continues to bolster the operational capability of a low-carbon supply chain.

• Create Transparency

In 2022, TSMC required 137 raw material and equipment suppliers to participate in the CDP Supply Chain Program and carried out an organizational GHG inventory training and CDP disclosure questionnaire briefing to improve data quality. A total of 322 people participated in the training and 111 suppliers completed the questionnaire. According to the survey results, 84% of the manufacturers have put their Board of Directors in charge of supervising climate change topics, 93% have conducted GHG inventory or estimation, 71% have set emission reduction targets, and approximately 51% of suppliers have provided Scope 3 emissions data. Also, to improve carbon emission data quality, TSMC has required suppliers with annual GHG emissions exceeding 2,500 tons to obtain third-party certification for ISO 14064 GHG inventory since 2021. The Supplier Sustainability Standard is expected to be revised in 2023, adding Scope 3 inventory request for suppliers, and requiring designated suppliers to obtain third-party ISO 14067 product carbon

footprint and ISO 50001 energy management certification.

In 2022, to manage the raw materials supply chain and identify carbon emission hotspots, a life cycle assessment of raw materials' carbon footprint was conducted. The results indicated that chemicals. bulk gases, and silicon wafers were the main emission sources. Thus, TSMC required relevant suppliers to stipulate rigorous short, medium, and long-term energy conservation, carbon reduction, and green energy consumption targets, as well as continue to track implementation performance. The Company also required suppliers to obtain the carbon footprint of their upstream materials

and communicate their carbon reduction claims. In 2023, TSMC will consolidate supplier carbon information-related inventories as the basis for subsequent Net Zero actions.

• Optimize for CO₂

TSMC continues to bolster green manufacturing. By improving raw materials usage efficiency and decreasing the amount of raw materials required for wafer production, it is able to reduce the carbon emissions in the supply chain. In 2022, TSMC lowered the consumption of bulk chemicals with a significant proportion of carbon emissions to save roughly 178.000 tons of carbon emissions at the raw materials manufacturing end via approaches such as reducing time span, extending use, replacing, and skipping stations. Meanwhile, the Company continues to promote the Electronic-grade Chemicals Recycling Program, indirectly decreasing carbon emissions and environmental impact during the upstream natural resource extraction process by using recycled chemicals in factories. Furthermore, the Company continues to optimize procurement strategies to minimize transport carbon emissions in the supply chain.

• Engage Suppliers

In 2021, TSMC stipulated the Supplier Sustainability Standard, requiring suppliers to formulate their GHG

Five Approaches to Promote Low-carbon Supply Chains



Collaborate with suppliers to improve the quality and transparency of carbon emissions data in the supply chain

- Suppliers are required to participate in the CDP Supply Chain Program
- Review production data with suppliers to ascertain carbon emissions hotspots and carbon reduction opportunities



Focus on lowering carbon emissions and continue to optimize the Company's manufacturing and procurement strategies

- Improve the usage efficiency of chemicals with a significant proportion of carbon emissions to decrease consumption and facilitate the reduction of carbon emissions in the supply chain
- Promote local sourcing to lower transport emissions



Include carbon emissions in audits and collaborate with suppliers to minimize carbon emissions

- Demand and guide suppliers to elevate their green performance through the Supplier Sustainability Standard
- Promote green innovation projects for the supply chain



Participate in industry collaborations and initiatives on low-carbon topics

- Continue to promote the Energy Conservation Action Project for Next-generation Fab Tools
- Invite high-carbon emissions suppliers to join the Renewable Energy Joint Procurement Project



Establish an internal carbon reduction mechanism in the Company and increase carbon reduction incentives

- Form a green supply chain management team responsible for supply chain carbon reduction-related affairs
- Create a systematic reward mechanism



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Cumulative Total of Water

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reduction targets and reduce, track, document, and disclose their Scope 1 and Scope 2 emissions. In 2022, TSMC continued to require and assist suppliers to improve their performance in making the supply chain greener. The annual total energy reduction reached 190 GWh, and the accumulative total reached 530 GWh. The annual total water reduction reached 9.37 million metric tons, and the cumulative total reached 29.08 million metric tons. Additionally, 65% of the high energy consumption suppliers received ISO 14064 verification. TSMC also required suppliers to introduce energy conservation assessments when building new factories. The waste production per unit among major waste-producing suppliers was reduced by 34%, exceeding the annual target of 32%.

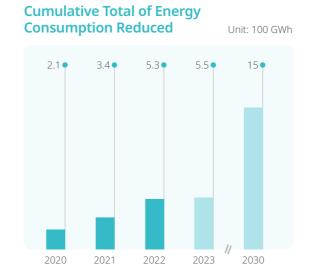
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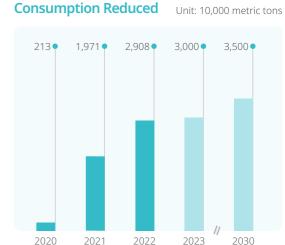
Additionally, TSMC also actively promotes green innovation projects in the supply chain. In 2022, suppliers were engaged to launch the Supplier Carbon Capture Program to help them build carbon capture equipment for rectification columns, and reintroduce the residual gas from the rectification process of industrial-grade liquid CO² into the process for secondary purification. This is reproduced into electronic-grade liquid CO₂ that conforms to TSMC's tons of CO₂ have been captured successfully.

Push Low-carbon Ecosystems and **Establish Internal Carbon Reduction** Mechanisms

TSMC is dedicated to creating a green semiconductor supply chain. Besides working with suppliers to advance the Energy Conservation Action Project for Next-generation Fab Tools, suppliers with high carbon emissions were invited to join the renewable energy joint procurement project in 2022 to assist suppliers to expand the source of green power procurement and consolidate the upstream to form a low-carbon supply chain. In 2022, TSMC established a green supply chain management team to track and require suppliers to implement carbon reduction actions. The team is also responsible for integrating TSMC's internal and external resources to help suppliers achieve their targets. Moreover, in response to TSMC's internal application of ESG AWARD to motivate employees to constantly review carbon reduction opportunities and inspire green innovation, the Materials Management invited suppliers to submit proposals together for the first time in 2022, such as collaborating with suppliers to recycle packaging materials or recycling and transforming calcium fluoride sludge into recycled products, as well as enhancing carbon reduction awareness among TSMC personnel and the supply chain through a reward mechanism.

Targets and Achievements of Suppliers' Efforts to Reduce Energy and Water Consumption, Waste, and Carbon Emission





quality standards. Up until December 2022, 800 metric

Supply Chain Carbon Emission Management Process 2021 2022 2023 2050





Percentage of ISO 14064 Verification Unit: %



Supplier Material Packaging White Paper Regulations Launched to Form Optimal Packaging Supply Chain

To alleviate the environmental problems caused by excessive packaging of raw materials, TSMC and suppliers joined forces to compile the first <u>Supplier Material Packaging</u> <u>White Paper Regulations</u> to promote reduction circulation in the three major dimensions of Health and Safety, Environmental Protection, and Packaging and Labeling Standardization to establish a Handling-friendly, Environment-friendly, and Automation-friendly packaging culture. More than 1,200 domestic and foreign raw materials suppliers were encouraged to improve packaging operations, striving towards the goal of optimal packaging in the supply chain.

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In 2022, TSMC took the initiative to provide packaging samples for suppliers of similar materials through inventory checks, offering improvement suggestions to elevate packaging quality. Additionally, active promotion was conducted through the Supply Online 360 platform to encourage suppliers to implement packaging optimization from the manufacturing end to the logistics process. Please refer to Supplier Material Packaging White Paper Regulations for further details.

Implementation Results in 2022

Improvement

Cases

Benefits

Health and Safety Transportfriendly Choose an appropriate packaging method according to the total weight of raw materials and place a warning label on the box to protect box handling personnel

- ✓ Mark the weight with a warning sign on the boxes
- Provide lifting aid
- Use chemical hazard labels and signs

Add holes and role handles for oversized or overweight boxes to make it easy for personnel to move safely

100,000 times

Improved comfort for 100,000 times handling

Environmental Protection Environmentfriendly Reduce the use of composite materials and excessive packaging with the 3R principle (reduce, reuse, and recycle)

- ✓ Volume minimization and optimization
- Reduce auxiliary materials or unnecessary labels
- Avoid packaging materials that contain heavy metals
- Provide recyclable packaging material recommendations

Minimize the excessive use of film for stacked materials without compromising the protective performance

4.8 metric tons
Reduced waste generation by

4.8 metric tons

Packaging and Labeling Standardization Automationfriendly Standardize packaging size, label, and content to improve work efficiency, reduce workload, and accelerate the development of automated packaging

- ✓ List the packaging size of various materials
- Develop radio frequency identification (RFID) systems
- Define label format and placement
- Standardize wafer packaging and packing methods

Replace disposable shipping boxes with Hybox to facilitate the transport and putting-away of silicon wafers with factory automation robots to optimize work efficiency 13,000 times
Reduced manual handling

117 metric tons
Reduced weight handled



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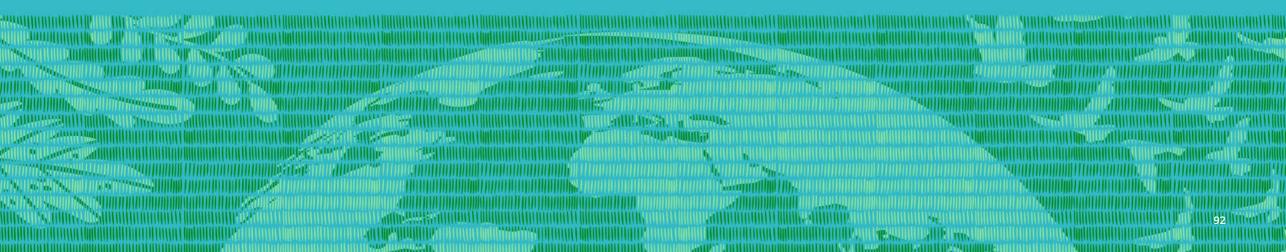
TSMC aspires to be a world-leading benchmark organization in environmental protection and actively integrates green management into daily operations. comprehensive range of sustainable actions to strengthen environmental protection and act on the firm belief in prospering with the earth's ecosystem.

Climate and Energy

Water Stewardship

Circular Resources

Air Pollution Control



Overview

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Strategies	2030 Goals	2023 Targets	2022 Achievements		
Strengthen Climate Resilience Develop climate change response and measure to reduce the impact of climate risks	0 day of production interruption due to climate disasters	0 day of production interruption due to climate disasters	0 day of production interruption due to climate disasters Target: 0 days	~	
Drive Low-carbon Manufacturing Continue to use best available technology to reduce emissions of greenhouse gases (GHG) and become an industry leader in low-carbon manufacturing	Reduce unit GHG emissions by 30% compared to the base year (metric ton of carbon dioxide equivalent (MTCO ₂ e)/12-inch equivalent wafer mask layer) by 30%, and restore GHG emissions to the 2020 level (Base year: 2020)	Reduce unit GHG emissions (metric ton of carbon dioxide equivalent (MTCO ₂ e)/12-inch equivalent wafer mask layer) by 9% (Base year: 2020)	Reduce unit GHG emissions (metric ton of carbon dioxide equivalent (MTCO ₂ e)/12-inch equivalent wafer mask layer) by 6% Target: 6% (Base year: 2020)	~	
Use Renewable Energy Continue to purchase renewable energy and install solar-energy power systems to achieve target of 100% renewable energy use	Starting from 3nm new fabs, renewable energy accounts for more than 20% of energy consumption and the purchasing of renewable energy increases annually to achieve 40% renewable energy company-wide	Continue to use renewable energy to achieve 12% of renewable energy in TSMC and overseas sites use 100% renewable energy	Used 2,190 GWh of renewable energy ^{Note1} and Renewable Energy Certificates (RECs); TSMC overseas sites used 100% renewable energy; accounting for 10.4% of TSMC's power consumption Target: TSMC overseas sites used 100% renewable energy; accounting for 10% of TSMC's power consumption	~	
Increase Energy Efficiency Plan and implement new energy- saving measures each year to increase energy efficiency	Cumulative energy-saving rate reached 18% between 2016 and 2030 through new energy-saving measures ^{Note 2}	14% cumulative energy-saving rate	700 GWh energy saved, and cumulatively saved 3,100 GWh; cumulative energy-saving rate reached 13% Target: 700 GWh; 3,100 GWh	~	
	Double energy efficiency after five years of volume production for each process technology ^{Note 3}	Increase energy efficiency of 5nm process technology 0.7 times higher in the 4 th year of volume production	Increase 5nm process technology energy efficiency 0.6 times higher in the 3 rd year of volume production Target: increase 5nm process technology energy efficiency 0.4 times higher in the 3rd year of volume production	↑	

Note 1: Definition of renewable energy use: Purchased, self-generated renewable energy, and renewable energy certificates and carbon credits produced by renewable energy

Note 2: Absolute value of energy efficiency improvement targets are replaced with energy-saving rate to avoid value differences incurred by market fluctuation and changes in power use. The rate is the cumulative energy-saving results since the base year 2016





↑ Exceeded ✓ Achieved — Missed Target

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Responding to climate change is the responsibility for sustainable business operation. As the world's largest provider of semiconductor technologies and capacity, TSMC is committed to reaching Net Zero emissions by 2050 and has drawn Roadmap to Net Zero Emissions, targets include zero-growth and gradual reduction in carbon emissions starting 2025, reducing 2020 carbon emission to 2010 levels, and reaching net zero emissions (with value chain included) by 2050. Among these, using 100% renewable energy is one of the key strategies in realizing net zero emissions. Other than the continuing improvements

2022 Sustainability Report

of various carbon reduction actions, TSMC is also working on expanding the use of renewable energy and establishing a diverse supply. Since the Company included a small-scale hydroelectric station as one of the sources of power supply in 2022, its yearly use of renewable energy reached 2,190 GWh, and TSMC overseas sites reached net zero emissions in Scope 1 and 2. TSMC established carbon credits quality procurement standards for the first time in 2022 and chose four carbon credits offset programs for carbon reduction, and referenced the UN's Convention on Biological Diversity and SDGs as

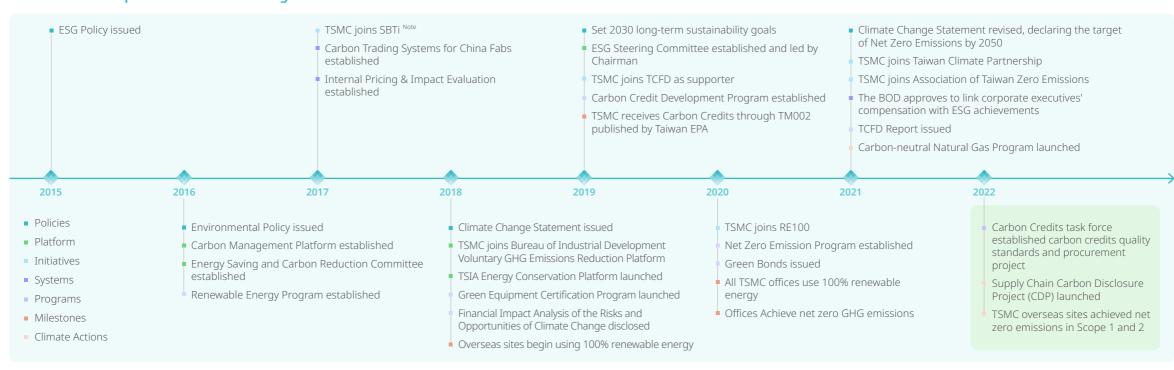
quidelines to formulate its Biodiversity Statement. Officially launched in 2023, the Statement strives to reach a balance between technology and the ecosystem to allow never-ending momentum for sustainability to realize GHG reduction targets.

Strengthen Climate Resilience

Global Risks Report 2023 published by the World Economic Forum (WEF) pointed out that climaterelated environmental issues are the most significant four risks of the top ten global risks over the next decade, including failure to mitigate climate

change, failure of climate-change adaptation, natural disasters and extreme weather events, and biodiversity loss and ecosystem collapse; it is clear that constantly improving climate risk response measures and enhancing corporate operational resilience are pressing important tasks. TSMC successfully achieved uninterrupted production target in 2022 by identifying potential risks and opportunities through regular systematic risk assessment identification and following the Company's Climate Risk Adaptation Standards to reduce potential climate disaster.

Milestones of Responses to Climate Change



Note: Science Based Targets Initiative (SBTi) is an international initiative organization that encourages companies to set an absolute GHG emission reduction target that is in line with the Paris Agreement goals with a yearly reduction of 4.2 %. TSMC is committed to develop SBT reduction targets in 2017, and as the global demand for chips drastically increased in recent years, the CAGR of TSMC's capacity exceeds 10%. However, as the supply from the renewable energy market in the Company's main manufacturing site was insufficient, reaching SBT requirements poses as a challenge in the short term. Taking operational growth and development trends in carbon reduction into account, TSMC will put zero growth in emissions as the main target, and assess to fulfill SBT requirements in mid and long-term targets



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TSMC Climate Change Management Framework^{Note}

13IVIC CIIIIIate Ciiai	nge Management Framework	
Category	Corporate Management Strategies and Actions	2022 Execution Summary
Governance	 The Board will regularly review risks and opportunities related to climate change ESG Steering Committee: TSMC's top organization in climate change management. Chaired by the Chairman of TSMC with the chairperson of the ESG Committee serving as executive secretary. The Committee reviews TSMC's climate change strategies and goals every quarter and reports to the Board of Directors Energy Saving and Carbon Reduction Committee: The Energy Saving and Carbon Reduction Committee is the Company's management organization for taking action on climate change risk and opportunity. It is chaired by the Vice President of Fab Operations. Every quarter, this Committee formulates management plans, reviews implementation status, and discusses future plans Risk Management Steering Council: The Risk Management Steering Council briefs the audit committee each year on the ever-changing risk environment facing TSMC, the focus of the Company's enterprise risk management, and risk assessment and mitigation efforts, including climate change issues 	 ✓ The ESG Steering Committee is comprised of senior executives from various TSMC organizations and formulates long-term 2030 goals and development strategies for climate change and renewable energy. See ESG Management Platform for more information ✓ The executive secretary of the ESG Steering Committee delivered quarterly reports to the Board on sustainable development strategies and achievements, including green manufacturing performance, renewable energy procurement, and net zero emission targets and strategies ✓ The Energy Saving and Carbon Reduction Committee defined five major energy conservation teams based on different process technologies to conserve more energy from production equipment and fab facilities. As an incentive for the energy conservation teams, the Committee rewards them based on the achievement on energy conservation targets and innovative ideas ✓ The Chairperson of the RM Steering Committee gave an annual report to the Audit and Risk Committee on water resources, energy risks, natural disasters, regulations, and other topics related to climate change; TSMC Risk Management Policy was published in 2022 to establish and strengthen the risk management corporate culture
	Organize interdepartmental discussions and identify short, mid, and long-term climate risks and opportunities	 Planned and carried out 684 energy saving measures across eight major categories, saving an additional 700 GWh See Increase Energy Efficiency for more information See Climate Change Risk and Opportunity Matrix for more information on how response measures were formulated and enforced according to the climate risks and opportunities identified in the interdepartmental Climate Change Risk and Opportunity Workshop
Strategies	 Assess the potential financial and operational impact on TSMC from major climate risks and opportunities 	See <u>TSMC TCFD Report</u> for more information on how TSMC completed a <u>qualitative assessment on the financial impact of major climate risk and opportunities</u> and implemented quantitative assessment on the financial impact of major climate risk and opportunities
	 Conduct scenario analysis and assess SBT(Science-Based Target) and net zero emission targets and actions 	Based on the SSP1-1.9 scenario set forth by the Intergovernmental Panel on Climate Change (IPCC) AR6, TSMC analyzed climate risks in production and formulated climate change strategies and mitigation measures while also striving toward net zero emission targets
	 Use the TCFD framework to develop a process for identifying climate risks 	Evaluated the qualitative and quantitative financial impact of major climate-related risks/opportunities discussed in the TCFD workshop by related departments
Risk	Formulate response measures based on the risks/opportunities identified and prioritized	Reported assessment results of the climate risks/opportunities and response plans to the ESG Committee Chairperson
Management	Integrate climate risk identification and assessment in the Enterprise Risk Management (ERM) process	See <u>6.3 Risk Management</u> in 2022 TSMC Annual Report for more information
	Set management metrics related to climate change	Established the following as climate change performance indicators: GHG emissions per unit product, amount of renewable energy purchased, total electricity saved, improved production efficiency, and days of production interruption due to climate disasters. See <u>Climate and Energy Strategies</u> , <u>Goals</u> , <u>and Outcomes</u> for more information
Metrics and	Through ISO 14064 annual inventory and disclosure of greenhouse gas emissions, review the impact on the company's operations, and assess the risks of Scope 1, 2 and 3 and their mitigation strategies	Based on carbon inventory and evaluation results, the consistent carbon reduction actions have effectively reduced risks of Scope 1 emissions, the risks of Scope 2 indirect GHG emissions due to electricity consumption and the risks of Scope 3 due to the continual increase of supplier indirect emissions. See more on <u>Drive Low-carbon Manufacturing</u>
Targets	Set climate change management targets and review progress and performance	Set climate change and energy management goals for 2030 in accordance with climate change performance indicators for senior executives to regularly review implementation performance. See <u>Climate and Energy Strategies</u> , <u>Goals</u> , and <u>Outcomes</u> and <u>GHG Reduction Best Practices</u> for more information



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Identify Climate Risks and Opportunities

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TSMC holds the Climate Change Risk and Opportunity Workshop once every two years to identify and update climate risks and opportunities based on the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) framework. In 2022, the Workshop identified 11 transition and physical climate risks and eight opportunities. The top three climate risks were net zero emissions, impact on company reputation, and uncertainties in the development of new energy saving/carbon reduction technologies, and the top three opportunities were: develop low-carbon products and services and increase energy efficiency in customer products, drive low carbon manufacturing, and boost company reputation. Apart from continuous improvements on carbon reduction practices, TSMC also set up carbon credit procurement strategies and started implementations in 2022 to further enhance corporate climate resilience. See TSMC TCFD Report for qualitative assessment methods and results on the financial impacts of each risk and opportunity.

Climate and Energy Strategies, Goals, and Outcomes

Category

Transitiona

Risk

Key Response Measures



- Participate in renewable energy programs
- Set ambitious carbon reduction targets: commit to zero carbon emissions from global operations by 2050 Assemble a renewable energy task force to work with related associations and government agencies to
- Participate in carbon trading markets
- accelerate the development of renewable energy and actively seek to purchase green energy Work with associations to propose suggestions to the government about building a carbon credit market

- Net zero emission
- Map out the company's net zero emissions roadmap, formulate net zero emission strategies, and enforce
- Receive rewards from the public sector for offsetting carbon reductions
- Ocontinue carrying out GHG reduction actions and participate in government carbon offset programs for carbon reduction to earn carbon credits
- Develop low-carbon products and services; Increase energy efficiency in customer products
- Implement long-term plans for purchasing carbon credits
- Continue investing in R&D resources to develop energy-saving products

- ♠ EIA commitment
- Diversify water sources and start using reclaimed water
- Promote water efficiency and diversification
- Strengthen water resource management and apply for AWS (Alliance for Water Stewardship) certification
- Uncertainty in new energy saving/carbon reduction technologies
- Promote energy saving and carbon reduction actions and track facility outcomes every quarter through the Energy Saving and Carbon Emission Reduction Committee
- Improve plant energy efficiency
- Build green factories, obtain green building licenses, and share experiences with external parties
- Impact on Company reputation/ image.
- Enhance company reputation
- Stick to green manufacturing and green innovation. Enhance the company's green reputation through transparent disclosure





- Floods (TSMC operations)
- Floods (Supply chain)
- Droughts (TSMC operations)
- Droughts (Supply chain)
- Increase resilience against natural disasters
- Assess flood and drought risks at fabs and formulate and carry out risk mitigation measures
- Ask suppliers to evaluate the flood and drought risks of their operational facilities and implement risk
- Establish a comprehensive water monitoring system and emergency response processes and hold regular drills

- /! Rising temperature
- Drive low carbon manufacturing
- Establish the Energy Conservation and Carbon Reduction Committee, led by senior executives to reduce greenhouse gas emissions

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Drive Low-carbon Manufacturing

The annual GHG inventory result is TSMC's first step to strengthening carbon reduction by reviewing overall carbon reduction efforts and revising the emission reduction strategies on a rolling basis. In 2022, the Company's total GHG emission was 18 million MT CO₂ equivalent; direct emissions from Scope 1 processes such as F-GHGs and nitrous oxide processes accounted for 11%; indirect GHG emissions in Scope 2 from electricity use, which was still the major emission source, accounted for 50%; and indirect GHG emissions from the value chain in Scope 3 accounted for 39%, which were primarily from producing raw materials, energy related activities in the upstream, and transportation. Overall GHG emissions increased

14% compared to the previous year because of the continuous expansion of advanced process capacities, however, in terms of the capacity growth ratio, per unit product emissions saw a slight decrease compared to the previous year, indicating TSMC's non-stop efforts in improving low-carbon manufacturing actions that effectively delivered GHG emissions reduction per unit product.

TSMC continues to enforce industry-leading best practices for GHG reduction, including ramping up replacements and installing local scrubbers on the manufacturing end, using carbon-neutral natural gases, constructing green factories with green building

certificates, implementing energy-saving projects for process tools and facility equipment, and increasing the use of renewable energy. In response to an increase in carbon cost brought about by a global trend in lowcarbon transition, starting from 2022, TSMC widely uses internal carbon pricing mechanism to reflect carbon cost in efficacy estimation for daily reduction measures, and include this into decision-making evaluation for new fab investments. As for emissions reduction actions in Scope 3, TSMC continues to focus on increasing material use efficiency and implement electronic grade chemical reuse. Starting from 2022, TSMC invites suppliers to participate in the CDP Supply Chain Program to learn more about the global trend

on low-carbon transition and their own carbon hot spots, and helps them develop strategy and target on carbon reduction. TSMC also shares with suppliers its Best Known Method to support them to implement green actions together.

TSMC Carbon Pricing Mechanism



Internal Factors for Carbon Pricing

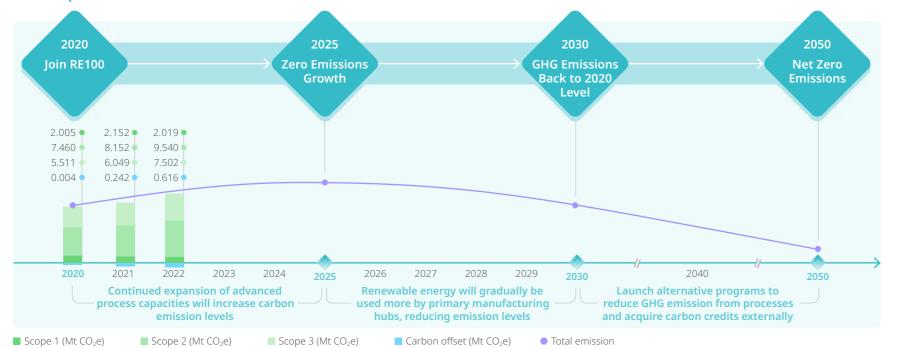
- Carbon tax/fee
- Regulation penalties
- Carbon reduction and green electricity costs
- Carbon market prices





Drive Low-carbon Manufacturing; **Develop Green Products**

Roadmap to Net Zero Emissions



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GHG Reduction Standard Practices



Scope I

Direct GHG Emissions

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Processes that use F-GHGs and nitrous oxide

- Optimize gas quantity used in production
- Substitute high global warming potential (GWP) fabrication gases
- ✓ Install Point-of-Use abatement equipment for F-GHG and nitrous oxide
- Use carbon-neutral natural gas

100%

Introduce optimized process parameters in accordance with the manufacturing specifications by the Intelligent Engineering Center

100%

Apply optimized carbon reduction technology – remote plasma dissociation of nitrogen trifluoride (NF₃) to all 12-inch fabs

100%

Apply nitrogen trifluoride (NF₃)/octafluorobutane (C₄F₈) to 6-inch and 8-inch fabs

3,900

Install equipment with new F-GHG and nitrous oxide reduction technologies

95%

Replace 91 existing tools with fluorinated gas processes; installation rate: 95%

First in Taiwan to use carbon-neutral natural gas. The facilities in Taiwan have had zero carbon footprints and TSMC has been able to reduce emissions by 0.28 million metric tons CO₂e



Scope II

Indirect GHG Emissions (From Purchased Energy)

Energy usage

- Build green buildings
- ✓ Increase energy efficiency
- Use energy-saving & low-carbon emission designs in next-generation process tools
- Purchase renewable energy

TSMC led the global semiconductor industry with the largest LEED-certified building area; three buildings received green building certification in 2022, bringing TSMC's total to 40 LEED-certified buildings and 28 EEWH certified buildings

Energy efficiency of advanced technologies led industry peers Note 1; carried out 684 energy-saving measures over 8 major categories and saved 700 GWh, equivalent of nearly 360,000 metric tons CO₂e

The world's only semiconductor company to launch energy-saving programs for next-generation semiconductor fab tools; completed 195 energysaving programs with an accumulation of 500 GWh electricity saved

In addition to using 100% renewable energy for global offices, TSMC also purchased 2,190 GWh of renewable energy around the whole world, accounting for 10.4% total power consumption



Scope III

Indirect GHG Emissions (Value Chain)

Raw material production, energy-related activities upstream, and transportation

- Supplier required to obtain external verification
- Reduce carbon footprint from raw materials
- ✓ Participate in CDP Supply Chain Program NEW
- Optimize delivery schedules

65%

High Energy Consumption Suppliers Note 2 must pass GHG emissions inventory and third-party verification; 65% of suppliers have been verified.

High Energy Consumption Suppliers were asked to set annual targets and implement real energy-saving actions; in 2022, TSMC suppliers conserved 190 GWh and reduced 97,000 metric tons CO₂e

81%

Invite material and equipment critical suppliers^{Note3} to disclose carbon reduction targets and progress with a response rate of 81%

Improved the delivery schedule for process tools and replaced air freight with ocean freight, reducing 28,000 metric tons CO₂e

Note 1: Figures from Joint Steering Committee (JSTC) report of the World Semiconductor Council

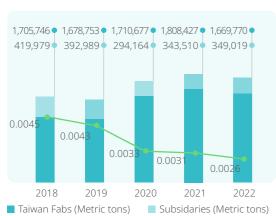
Note 2: High Energy Consumption Suppliers are suppliers that use >5 GWh/year in a single facility

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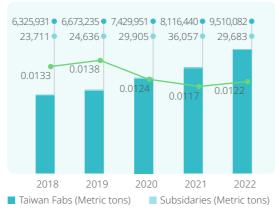
Scope 1 GHG Emissions



2022 Sustainability Report

■ Emission Intensity tCO₂e/12" wfr-layer

Scope 2 GHG Emissions



Emission Intensity tCO₂e/12" wfr-layer

Scope 3 GHG Emissions

Unit: Metric Tons



Note 1: GHG emissions data for Scope 1 and Scope 2 include TSMC fabs in Taiwan, TSMC (China), TSMC (Nanjing), WaferTech, and VisEra

Note 2: In order to maintain the data consistency of the 2020 follow-up greenhouse gas inventory and reduction targets, the Scope 1 inventory data has been changed to 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gases Inventories since 2020

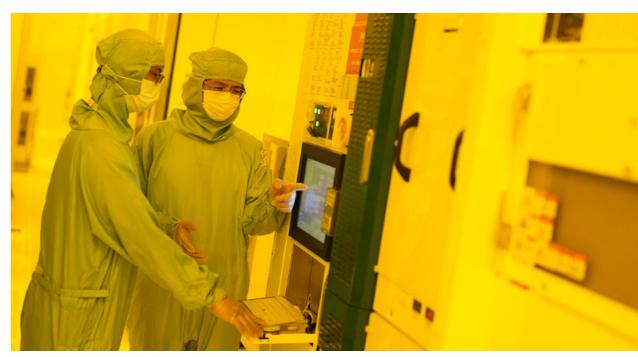
Note 3: Scope 3 GHG emissions only includes TSMC fabs in Taiwan

Note 4: Emission factor based on data released in 2022 by the Bureau of Energy stating that 0.509 kg of CO2e/kWh, where 1 kg of CO2e equals 6,805 kJ.

Product Carbon Footprint

TSMC is committed to reducing carbon footprints in raw material manufacturing and transportation to product manufacturing, testing, and assembling phases. In 2022, the Company obtained ISO 14067 third party certification, and conduct Product Carbon Footprint Assessment every three years. Other than actively reducing greenhouse gas emissions in manufacturing processes and improving resource efficiency, the Company also offers guidance for suppliers to join its consistent endeavors in realizing environmental sustainability. In addition, although

the life cycle of TSMC's product carbon footprint covers from raw material excavation to shipment, through providing highly energy-efficient process technology, TSMC supported clients in increasing the life span and function innovation of terminal smart devices applied in various fields, including developing smart home, smart city, smart health care, smart industry. This further helps save energy for the world, as every kWh of power used in production can help save four kWh of power for other industries worldwide and households.



TSMC is committed to optimizing the efficiency of energy and reducing greenhouse gas emissions





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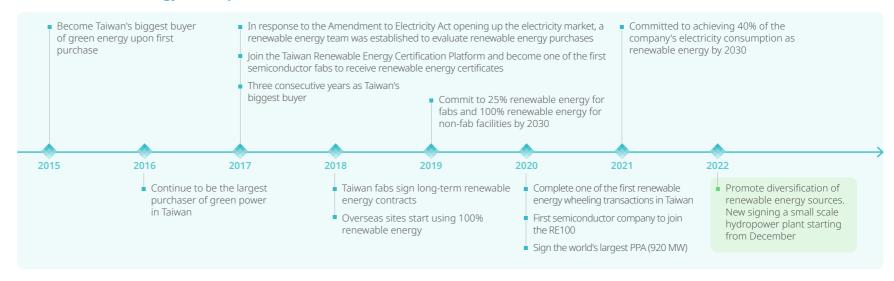
Use Renewable Energy

Increasing the use of renewable energy is critical to achieving the Company's goal of Net Zero Emissions by 2050. In 2022, with support from the board and management team, TSMC introduced renewable energy from small hydroelectric stations, continued to increase power supply from onshore wind farms, increased renewable energy usage by 47% to 970 GWh, and maintained 100% use of renewable energy in global offices. TSMC also signed a power purchase agreement (PPA) for 1.3 GW of renewable energy with the option to increase around 3,900 GWh of green energy each year. By the end of 2022, the Company has signed on 2.9 GW of renewable energy through PPAs, which can reduce around 4.6 million metric tons of carbon emissions each year.

2022 Sustainability Report

In addition, TSMC has been purchasing renewable energy, Renewable Energy Certificates (RECs), and carbon credits in countries with comprehensive regulations and ample supply to offset 100% of carbon emissions from power used in overseas locations, including the United States, Canada, Europe, China, Japan, and Korea. 2022 marks the fifth consecutive year that TSMC has achieved zero carbon emissions from power consumption in overseas subsidiaries.

TSMC Renewable Energy Development Timeline



Renewable Energy Consumption and Ratio



Renewable energy used by all TSMC operation sites by 2030

5 Consecutive Years

Zero carbon emissions from power consumption in overseas subsidiaries

Renewable energy used in global offices

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Renewable Energy Systems

In addition to purchasing renewable energy, TSMC has also installed solar panels in TSMC facilities to produce carbon-free renewable energy for its own fabs. In 2022, TSMC had an installed capacity of 5,340 kWp in solar panels, which provided 4.56 GWh in electricity and reduced carbon emissions by 2,322 metric tons. In 2023, an additional 900 kW of solar panel capacity will be installed, which can generate up to 4.6 GWh of electricity. While strengthening its own climate resilience, the Company is also

2022 Sustainability Report

expanding the scope of efforts toward sustainability and common good through TSMC Charity Foundation's Public Welfare Green Energy Project to install photovoltaic (PV) systems and give back all earnings from power rebates to organizations serving disadvantaged communities. As of 2022, the Company has provided an installed capacity of 464 kWp across seven locations and generated 574,000 kWh in electricity. In 2022, it also gave back NT\$2.75 million from rebates generated by the project.

TSMC Renewable Energy Installed Capacity and Power Generation for In-house Use





TSMC introduces power supply from Tainan Xikou Hydroelectric Power Plant to diversify renewable energy







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Increase Energy Efficiency

Semiconductor technologies are evolving rapidly and increasing energy consumption. In 2022, TSMC consumed a total of 22,400 GWh in energy; with purchased electricity accounting for around 94%, natural gases for 5.8%, and diesel for 0.2%. TSMC is dedicated to optimizing energy use efficiency. The Energy Saving and Carbon Reduction Committee has defined five major energy conservation teams for different process technologies to explore opportunities to save energy and maximize energy conservation in tools. In addition to the full rollout of various energy conservation measures

2022 Sustainability Report

for manufacturing tools and facility equipment, TSMC also encourages employees to actively dedicate themselves to green innovation, awarding Energy Conservation Model Awards and Energy Conservation Innovation Awards to incentivize employees to come up with and realize outstanding ideas. In 2022, TSMC was able to conserve 700 GWh in electricity and successfully increase process energy efficiency for 5nm volume production to 60% in the third year, exceeding the annual target.

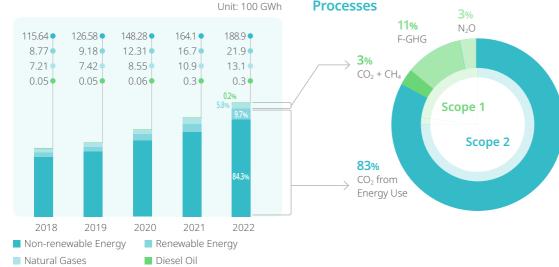
Energy Efficiency of Process Technologies



Note 1: Standardized baseline for energy efficiency is the values taken from the first year of volume production

Note 2: Figures from TSMC fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

Total Energy Consumption GHG Emissions from Manufacturing



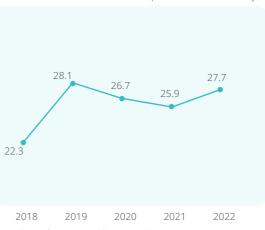
Note 1:1 cubic meter of natural gas=10.5 kWh of electricity; 1 liter Diesel Fuel = 8,400(kcal) = 35.16(MJ); 1 kWh= 3,600 kilojoules Note 2: Figures from TSMC fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Note 3: GHG emissions from fabrication processes include only direct emissions (Scope 1) and indirect emissions from using electricity (Scope 2)

Note 4: The total amount of renewable energy include solar energy, wind energy, thermal energy, and hydroelectric energy

Unit Product Energy Consumption

Unit: kWh/12-inch equivalent wafer mask layer



Unit Product Energy Consumption

Note1: Figures from TSMC fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

Note2: Diesel and natural gas aren't used for production and excluded from calculations here



TSMC retrofits the hot DI water circulation system of wafer cleaning tools to expand energy saving benefits

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Expand Energy-saving Measures

2022 Sustainability Report

In 2022, the five major energy conservation teams continued to innovate various energy conservation programs, including the Hot Water Recycling System, Intelligent Compressed Dry Air (CDA) Flow Control System, and Optimized AI-powered Water Chiller System. In addition, TSMC is deploying a variety of green action plans to improve energy and resource efficiency. To strengthen energy conservation and carbon emissions, TSMC founded the Engineering Center for Green Manufacturing in 2022 to comprehensively assess, plan, and manage net zero emission strategies, energy conservation in modules and tools, energy conservation in facility equipment, and low-carbon technology R&D. Additionally, TSMC integrated energy-saving measures across facilities for horizontal roll out, which will become standard designs for new facilities. In 2022, overseas facilities -TSMC (China) and TSMC (Nanjing) - also joined

Taiwan facilities in energy conservation to generate more green benefits.

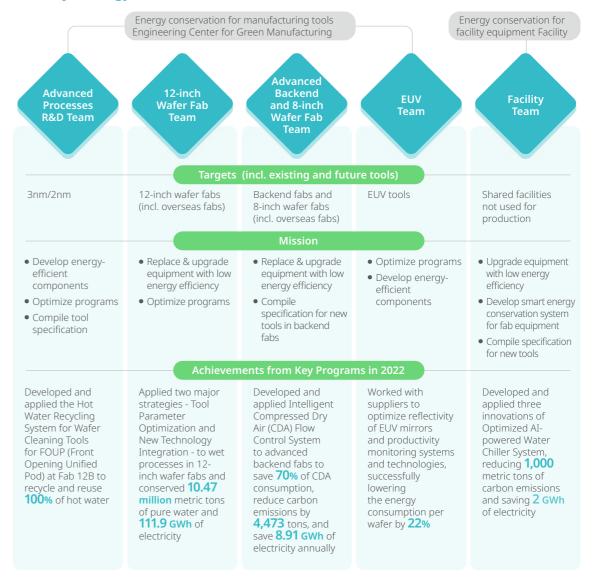
In 2022, TSMC implemented 684 energy conservation measures across eight categories, achieving a 13% energy saving rate and conserving 700 GWh in electricity. Energy conserved in 2022 is the equivalent of reducing 360,000 metric tons in carbon emissions and saving NT\$1.75 billion in energy costs. The reduced carbon emissions also decreased the potential social cost of carbon by NT\$530 million. As of 2022, the Energy Conservation Action Project for Next-generation Fab Tools launched in 2018 has validated and applied 195 energy-conservation programs to hundreds types of advanced process tools and conserved 500 GWh in energy through cross-fab roll out of energy conservation measures.

TSMC Cumulative Energy-saving Targets



Note: 1kWh= 3,600 kilojoules

Five Major Energy Conservation Teams Continue to Innovate



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Energy Conservation Measures



23 Measures

38.7 GWh Energy Saved

2022 Sustainability Report

19,000

Metric Tons CO₂e Reduced

Lighting Energy Savings

Energy Usage Management

49 Measures **24** GWh

• Reduce PCW and exhaust emissions from manufacturing processes

• Optimize temperature settings for heating equipment

Energy Saved

12,000

Metric Tons CO₂e Reduced

- AI Powered Chilled Water Energy Saving System
- Replace cold water with PCW for cooling air compressors throughout first- and second-stage compression

Measures

41.58 GWh

21,000

Energy Saved

Metric Tons CO₂e Reduced

A.C. Energy Savings

> **Facility Equipment**

Manfacturing

Total 684 measures

4444

191 Measures

and chillers

95 GWh

• Replace with new high-efficiency, energy-saving pumps

48.300

Energy Saved

Metric Tons CO₂e Reduced

- Modify wet film plate for makeup air handling unit (MAU)
- Energy-efficient fan blades for PCW towers

63 Measures **127** GWh

64,000

Energy Saved

Metric Tons CO2e Reduced

Increased Performance

Standby Energy

Savings

• Use high-efficiency, energy-saving auxiliary equipment and components for new equipment

• Optimize water usage and exhaust settings

173 Measures 172 GWh

87,000

Energy Saved

Metric Tons CO₂e Reduced

• Energy-saving mode for Uninterrupted Power Supply System

• Cooling fan for battery cabinet to conserve energy

Energy Saved

• Use standby mode for Local Scrubbers

17 Measures

33 GWh

16,000 Metric Tons CO₂e Reduced

New Units Specs

Adjustments

164

170 GWh Energy Saved

86,000 Metric Tons CO₂e Reduced

Measures

• Replace tool components with energy-saving components

Note: CO₂e factor is 0.509 kg/kWh; 1kWh= 3,600 kilojoules

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Strengthen Biodiversity Protection

2022 Sustainability Report

TSMC cares about environmental sustainability and actively works to strike a balance between technology and ecology. To ensure sustainable ecosystems and maintain biodiversity, TSMC regularly assesses changes in ecosystems surrounding TSMC fabs, cultivates indigenous species, created firefly habitats within TSMC locations, and launched the TSMC Plant a Tree Program to facilitate stable population growth and reproduction for species. In addition to implementing eco-friendly practices, TSMC is also an avid supporter of the UN Convention on Biological Diversity and SDGs. The Company formulated its own

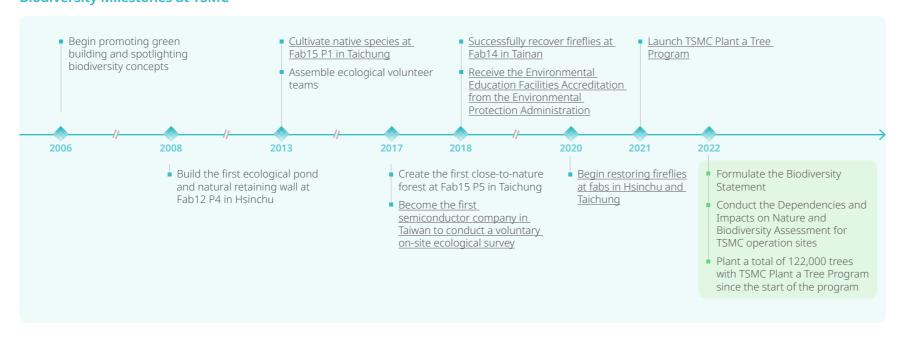
Biodiversity Statement in 2022, which will be formally declared in 2023. TSMC's Biodiversity Statement will commit to working with stakeholders to protect and deepen the integrity of biodiversity and working with supply chain partners to raise awareness and comply with related regulations within business locations, fulfilling its mission of strengthening environmental protection.

In 2022 Q4, TSMC conducted a Dependencies & Impacts on Nature and Biodiversity Assessment for deeper insights into interactions between operations and local environments, analyzing three areas location of facilities, emission of pollutants, and dependency on ecosystem services. For location of facilities, TSMC overlapped the Company's locations in Taiwan with the Forestry's Bureau National Ecological Network GIS database and included resources consumed and emissions discharged throughout operations as assessment factors to identify mitigation and restoration. Results showed that there are no wildlife refuges or nature reserves within two kilometers of TSMC locations in Taiwan, TSMC continues to maintain green ecosystems

around fabs and enforce environmental education. In addition, TSMC is working with stakeholders such as the Forestry Bureau, county and city governments, research and education institutes, and conservation groups to promote conservation programs based on conservation corridor assessment results and deepen the diverse values of biodiversity.

For pollutant emissions, TSMC used qualitative analysis of Life Cycle Impact and identified GHG emissions as the main cause of impact on biodiversity, followed by water consumption. TSMC is driving low-carbon manufacturing and enforcing GHG reduction standard practices to effectively reduce GHG emissions per unit of production. The Company also complies with AWS Standards to enforce sustainable water management at all TSMC fabs and improves surrounding ecosystems and soil and water conservation to foster biodiversity. For dependency on ecosystem services, which was explored for the first time in 2022, TSMC established a dedicated internal unit and invited outside experts to join in meetings and discussions and also compiled a survey on supplier enforcement. Results showed that TSMC and its supply chain are more dependent on three types of ecosystem services - water provision, climate regulation, and flood prevention. TSMC will continue to strengthen the climate resilience, promote green and lowcarbon supply chains, and strengthen management in compliance with the Climate Risk Adaptation Standards to reduce dependency on ecosystem services and mitigate impact on operations from loss of ecosystem services.

Biodiversity Milestones at TSMC



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2022 Sustainability Report

Consistent Efforts to Optimize Energy Efficiency in EUV Tools Save 60 GWh Electricity per Year

TSMC has successfully applied EUV technologies for 3nm volume production, but energy consumption rises with the growing number of EUV tools. To ensure developments in process technologies do not compromise environmental sustainability, the Company continues to optimize EUV tool parameters and reduce energy consumption per unit of wafer production through big data analysis. Additionally, TSMC engages suppliers for research to dive deep and uncover opportunities to conserve more energy.

Research has shown that EUV light is transmitted with the help of unique reflective mirrors, which, after bouncing off several mirrors, result in severe energy attenuation. The multilayer mirror's flatness and smoothness determines EUV light reflectivity, so, to increase energy efficiency, TSMC has engaged suppliers to finetune mirror fabrication processes and optical structures to optimize flatness and smoothness and effectively improve reflectivity. EUV light is produced from laser pulses

firing 50,000 times per second at a drop of tin. Vaporized tin often deposits on mirrors to cause fog, which impacts productivity. The Company then needs to inject hydrogen and tin to produce tin hydride before pulling the multilayer mirror out of the chamber. After repeated testing with suppliers, TSMC was able to pinpoint the optimal parameters for the number of pumps required for tin vapor removal, effectively reducing energy consumed by tin vapor pumps. In 2022, TSMC was able to successfully reduce energy consumption per wafer from EUV tools by 22%, the equivalent of 60 GWh.



TSMC works with suppliers to optimize energy efficiency in EUV tools

Three Innovations of AI-powered Water Chiller System Improve Energyefficiency

TSMC is committed to driving green manufacturing and actively implements energy-efficiency innovations. The Company continues to optimize the energy-saving model of water chiller systems through machine learning methods and successfully develops three functions including Single Chiller Compressor Abnormal Energy Consumption Detection, Multi-chiller Compressor Operating Load Precision Forecast, and Water Chiller System Pressure Control Optimization to strengthen operational reliability. TSMC introduced the three functions to Fab 15A in 2022, saving 2 GWh of electricity and reducing 1,000 metric tons of carbon emissions. In 2023, all TSMC 12-inch wafer fabs in Taiwan will begin to adopt the three functions, which are also listed as standard designs for new plants. Those initiatives are expected to save 100 GWh of electricity per year and reduce carbon emissions by 50,000 metric tons, bringing TSMC closer to its 2050 sustainability goal of Net Zero Emissions.



TSMC optimizes energy efficiency of water chiller systems through machine learning methods

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Item

Issued by any of

the right-side of organizations or

standards

Note

Mandatory

Mandatory

Priority



Case Study

Establish Carbon Credits Quality Procurement Standards to Achieve Carbon Reduction and Sustainable Development

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TSMC is committed to creating an environmentally and socially responsible business model. To fulfill the Company's commitment of Net Zero Emissions by 2050, the Corporate Environment Safety Health Division, Finance, Accounting, Legal, Information Technology and Materials Management, and Supply Chain Management Units formed the Carbon Credit Task Force and formulated the Carbon Credits Quality Standards for Voluntary Emissions Reductions in compliance with international guidelines and industry practices to serve as purchasing guidelines. TSMC assessed carbon credit verification standards, year issued, additionality, permanence, and risk management. Additionally, the Company prioritizes programs that comply with UN SDGs such as Climate, Community & Biodiversity (CCB) and the criteria that the source of carbon credits should align with emissions for rigorous quality assurance to extend the scope of TSMC's sustainability impact.

TSMC's overseas locations currently use 100% renewable

energy and exhaust gas reduction facilities to maximize emissions reduction. The remaining carbon emissions are offset, in principle, with carbon credits. In 2022, TSMC selected four carbon credit programs located in the U.S. and China that comply with the Company's Carbon Credits Quality Standards for Voluntary improve forest management to uphold local biodiversity education through earnings from carbon credits. Through carbon credit trading, TSMC has been able to not only offset carbon emissions but also fulfill several

Emissions Reductions. The programs are mainly naturebased carbon credits from projects that establish natural forests and improve forest management. Two of the natural forest establishment programs create jobs for local residents and foster skillsets in maintaining the forest; 50% of the jobs created are offered to women to facilitate gender equality. The remaining two programs and help local conservation groups and indigenous communities preserve traditional cultures and outdoor

SDGs to create diverse sustainability benefits.

The Verified Carbon Standard, VCS The Gold Standard, GS International Verification • American Carbon Registry, ACR **Standards** • Climate Action Reserve, CAR

Taiwan Offset Project, TOP

• China Certificate Emission Reduction, CCER

TSMC Carbon Credits Quality Standards for Voluntary Emissions Reductions

• J-Credits

Year Issued Past five years (≦ 3 years preferred), starting from date the carbon credit is issued Mandatory

 Program is not required by regulation Additionality

 Financial benefits are not innate, but created from carbon credit earnings • Technological programs unrelated to common technologies or related to

Mandatory technologies with barriers in local areas

Permanence Measurable project durability

Details

Regional

Mandatory

Risk Management

of credits Carbon leakage

prevention

- No double issuance
 Sound project management No negative media
- Political stability of project location Transparent reporting of
- project details

Community **Impact**

Protect/Improve ecosystem, increase biodiversity, respect rights of locals/ indigenous peoples, and create social value (e.g., increase employment & local health)

Priority

Project Location

Credits are generated from the same region where emission occurs

Four Nature-based Carbon Credit Programs

Accreditation		Location	Year	Sustainability Co-benefits
• VCS 2405(CCB)	Afforestation	nina	2018-2020	Conserve biodiversity locally (SDG 15)Create jobs locally (SDG 1)
• VCS 1855(CCB)	C	CHIHIA	2016-2020	• Offer >50% of created jobs to women (SDG 5)
• ACR 592	Improved	ıc	2019-2021	Conserve biodiversity locally (SDG 15) Preserve traditional cultures and outdoor
• ACR 398	Forest Manage- ment	U.S.	2019-2021	education (SDG 4 & SDG 11)

Overview Sustainable Business Practices Operations and Governance

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Strategies	2030 Goals	2023 Targets	2022 Achievements	
Manage Water Resource Risks Enforce climate change mitigation policies; implement water conservation and water shortage adaptation measures	Reduce unit water consumption by 30% (L/12-inch equivalent wafer mask layer) (Base year: 2010)	Reduce unit water consumption by 2.7% (L/12-inch equivalent wafer mask layer) (Base year: 2010)	Reduced unit water consumption by 2.6% (Base year: 2010) Target: 16%	— Note 1
Develop Diverse Water Sources				
Develop water reclamation technologies; continue to practice water conservation and use reclaimed water during manufacturing	>60% replacement of water resources with reclaimed water	5% replacement of water resources with reclaimed water ^{Note 2}	TSMC Tainan Science Park Reclaimed Water Plant started supplying water on September 19, 2022 Target: TSMC Tainan Science Park Reclaimed Water Plant start of operations	\
		Continue to collaborate with the government to complete the second water reclamation plant located in Anping, Tainan		
Develop Preventive Measures				
Improve the efficiency of water pollution control and removal of water pollutants	Water pollution composite indicator reduction rate of >60% $^{\text{Note 3}}$	Water pollution composite indicator reduction rate of 56%	Water pollution composite indicator reduction rate of 54.3% Target: 45%	↑
water consumption. Excluding the new facilities, the unit Note 2: (1) The source of reclaimed water include municipal draitap water)	not yet in operation (volume production level), the new facilities still consume wate: water consumption was 15.6% in 2022. In the future, facilities below a certain eco nage and industrial discharge (2) Replacement rate of reclaimed water = consump	nomic scale will be excluded from the calculation of unit water consumption tion volume of reclaimed water/(consumption volume of reclaimed water +	↑ Exceeded ✓ Achieved — Missed Target	

Water Signal

from the Water

Resource Agency

(WRA)

Blue

Normal

water levels

Fairly

severe

Second

stage

Third

stage

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Drought Contingency Measures

Government

Response

Measures

Stable supply

and demand

Farmers

farming

encouraged

to suspend

Reduce water

pressure at

Suspended

Reduce water

industrial users

Water rationing

by district

supply to

by 5-20%

specific times

irrigation water

in certain areas

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TSMC Response

Measures

reservoirs supply for

• Host drills regularly

Drought Emergency

Response Team in

Check water resources

Spontaneously save

consumption by 7%

Activate water trucks

Activate water trucks

• Reduce water

consumption by 7-20%

• Reduce water

7-20%

consumption by

and water truck capacity

Monitor WRA

TSMC fabs

operation

water by 5%

Reduce water

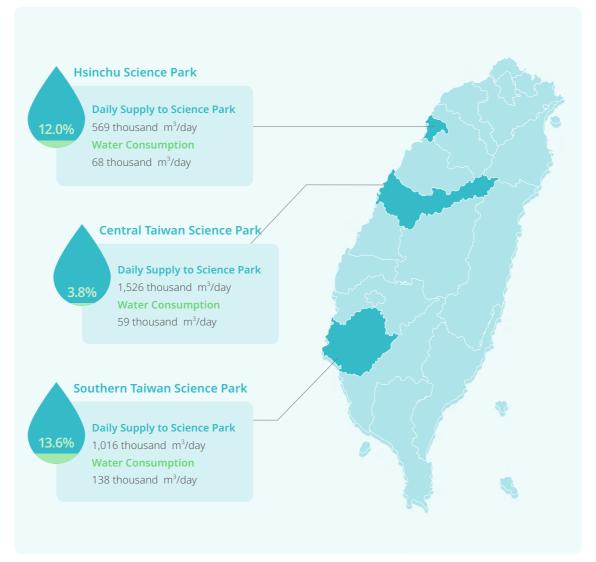
Water truck drills

In 2022, Taiwan experienced zero typhoons while weather fronts carrying moisture failed to cover reservoirs in Taiwan, resulting in little rainfall in Southern Taiwan. Based on the drought monitoring signals issued by the Water Resources Agency, TSMC adopted response measures in compliance with the TSMC Internal Control Procedures for Low Water Supply Crisis Management to take stock of areas where more water could be conserved and to strengthen the water use efficiency of recycling systems. In 2022, the Company conserved 3.35 million m³ of water and recycled a cumulative total of 215 million m³ of water throughout the year.

2022 Sustainability Report

While working to increase water reclamation efficiency, TSMC also cares about getting the most use out of every drop of water. As such, TSMC is actively developing water reclamation technologies. On September 19, 2022, the TSMC Tainan Science Park Reclaimed Water Plant—Taiwan's first privately-operated water reclamation plant—became operational and started recycling industrial wastewater produced in the Southern Taiwan Science Park into reclaimed water for advanced semiconductor processes, a first for the global semiconductor industry. TSMC also continues to work with the government and is planning to complete the Tainan Anping Reclaimed Water Plant in 2023, which is estimated to reclaim 35,000 m³ of water per day for TSMC facilities in the Southern Taiwan Science Park (STSP). TSMC's goal is to increase the supply of reclaimed water to gradually reduce city water consumption each year. The Company is also exploring the concept of being water positive in the hope of restoring water resources in the future and upholding sustainable water practices.

TSMC Water Consumption in Three Science Parks



Resource: Water Resources Agency, Ministry of Economic Affairs

Manage Water Resource Risks

2022 Sustainability Report

Every year, TSMC evaluates the water risk levels of all TSMC facilities using the Water Risk Atlas from the World Resources Institute (WRI). Results from 2022 were identical to those of 2021: WaferTech was rated as low risk; TSMC facilities in Taiwan and VisEra were rated as medium-to-low risk; and TSMC (China) and TSMC (Nanjing) were rated as high and medium-to-high risk, respectively, due to regional water quality differences. In 2022, TSMC added Fab 18B into the water risk evaluation. While building Fab 18B, TSMC preemptively elevated foundations, installed floodgates, and applied existing recycling systems and wastewater treatment measures to the facility. By the time Fab 18B became operational, it already possessed outstanding flood protection and process water recycling rate, which enabled it to maximize water resources and mitigate environmental impact.

Effective Water Management with AWS

In 2022, Fab 12A, Fab 12B, and Fab 5 at Hsinchu Science Park and Advanced Backend Fab 3 at Lungtan Science Park obtained Alliance for Water Stewardship (AWS) Platinum certification. All advanced TSMC fabs in Taiwan's three science parks have obtained AWS Platinum certification (the highest level available) for three consecutive years, a first for the global semiconductor industry.

Sustainable water stewardship at TSMC complies with AWS standards. In 2022, the Company introduced water reclaimed from industrial wastewater to facilities at the STSP for the first

time. The reclaimed water was gradually supplied to Fab 6, Fab 14, and Fab 18 to reduce city water consumption and achieve the preliminary target toward sustainable water balance. TSMC's efforts toward good water quality include a new tetramethylammonium hydroxide (TMAH) treatment system in Fab 3 to effectively reduce effluent concentration by 90%; 70% copper concentration reduction from effluents discharged by Advanced Backend Fab 3 to improve local

creek water quality. After improving the cooling equipment of the reaction tank and reducing the batch reaction time, in June 2022, the hyfrofluoric (HF) acid waste regeneration system in Fab 15B achieved zero treatment outsourcing of the HF acid waste liquid. The hydrofluoric acid waste regeneration system processed a cumulative total of 4,193 metric tons of HF acid waste and produced 1,025 metric tons of cryolite in 2022. In addition, ecological restoration and soil and water conservation in areas surrounding TSMC facilities are AWS implementation priorities. TSMC compiled the TSMC Firefly Habitat Management Process to bring back fireflies and launched afforestation initiatives. In 2022, over 1,900 adult fireflies appeared across TSMC's three major factories. The Company also planted 108,000 trees and 320,000 shrubs, expanding afforested areas to 10.1 hectares to create a healthier water environment.

TSMC WRI Risk Identification

TSMC Overall WRI Risk Index TSMC Assessment Results TSMC Response Measures Assessment Water risk Decreasing 1 Facility underground water Flood Risk Elevate facility levels Frequency **Facility Design** Interannual variation Install flood gates Seasonal variation Drought 16 Facility Flood risks Tsunami risks Coastal erosion Quality Mid-to-high Establish emergency 1 Facility Untreated water Control response procedures bodies • Develop diverse water Water sources Management Drinking water quality Regulation **Water Quality** Recycle and reuse water Sanitary conditions 1 Facility Set water pollution Sustainable Reputation composite indicator investment index

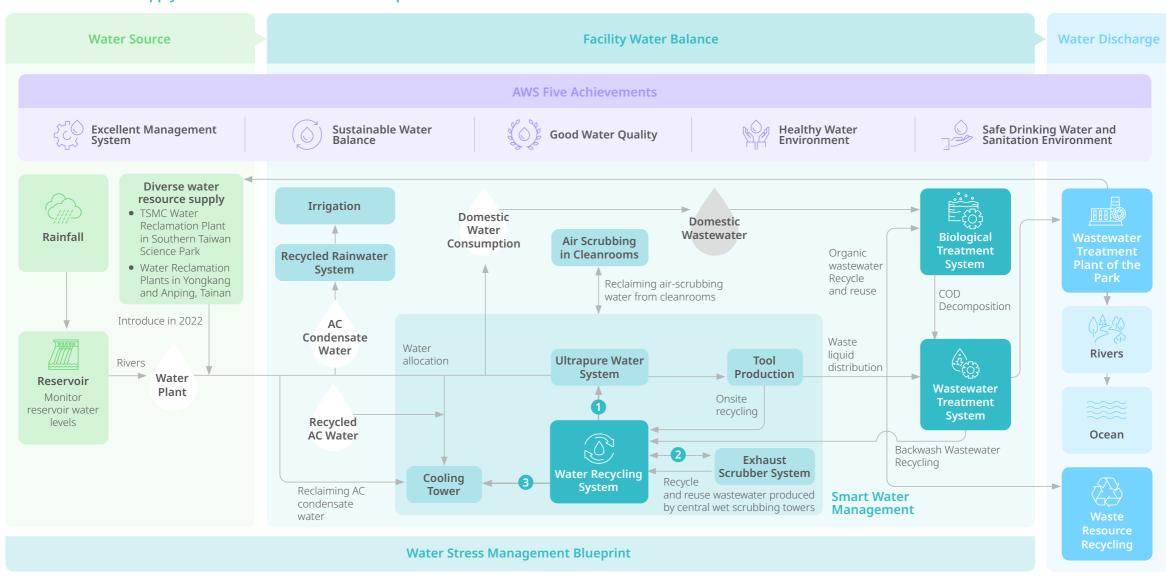
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Water Balance and Supply Chain Environmental Relationship







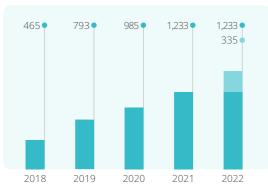
Strengthen In-house Water Reclamation and Water Use Efficiency

TSMC has created an internal Water Map platform to effectively manage and gain insights into water used in TSMC facilities. The Company also continues to track reservoir water levels and install in-house water quality and water level monitoring points to monitor water usage, recycled water, wastewater, and domestic water consumption in processes according to the water balance chart. This forms the basis for integrating water consumption and recycle and reuse mechanisms to calculate recycling/discharge rates and allocate water to units that use water. In 2022, TSMC continued to implement four major water saving measures: reducing facility system water consumption, increasing the wastewater recycling of facilities, improving the water production rate of the system, and decreasing water discharge loss from the system. The Company conserved 3.35 million m³ of water and yielded a wafer unit water

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consumption of 137.3 liter per 12-inch equivalent wafer mask layer, a 2.6% reduction from the 140.9 liter per 12-inch equivalent wafer mask layer in 2010, the base year. Nevertheless, TSMC failed to reach the 2022 target because new facilities built in 2022 were still in risk production stages. Though the new facilities have not yet reached economic scale, there was still a fixed amount of water consumption, which led to a lower water saving rate. Wastewater discharge was 93.0 liter per 12-inch equivalent wafer mask layer, an 18% increase from last year. The increase was also caused by the water consumption for risk production in new facilities. Before the new facilities reach economic scale in production, TSMC will continue to optimize operating parameters for water recycling systems, increase water use efficiency, and reduce wastewater discharge.

Annual Water Conservation



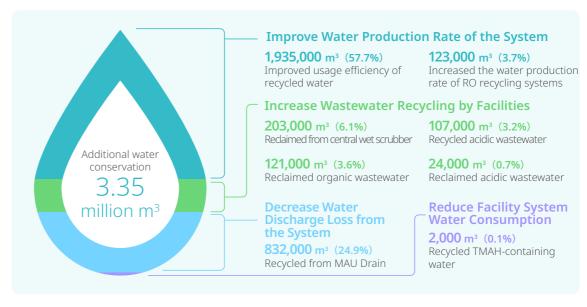
- Annual cumulative water conserved (10,000 m³)
- Additional water conserved in 2022 (10,000 m³)

Water Recycling and Usage Efficiency



- Total amount of water recycling (million m³)
- Average process water recycling rate (%)

Water Saving Measures and Achievements in 2022



City Water Consumption and Water Consumption per Wafer-layer



- Total city water consumption of Taiwan fabs (million m³)
- City water consumption of subsidiary (million m³)
- Water consumption per wafer-layer (Liter/12-inch equivalent wafer mask layer)

Note: Figures from TSMC fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

Wastewater Discharge per Unit



- TSMC wastewater (million m³)
- Subsidiary wastewater (million m³)
- Wafer mask unit wastewater (Liter/12-inch equivalent wafer mask layer)

Note: Figures from TSMC facilities in Taiwan, WaferTech, TSMC(China), TSMC(Nanjing) and VisEra

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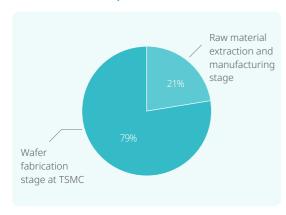
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Product Water Footprint

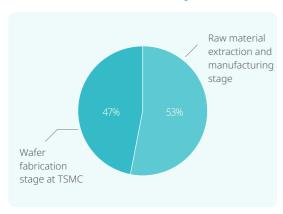
TSMC is committed to reducing product water footprint in various stages, including raw material manufacturing and transportation, product manufacturing, testing, and packaging, etc. The water footprint of products is assessed every three years. In 2022, the Company obtained third-party ISO 14046 certification. According to the Company's

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TSMC Product Water Footprint Distribution - Water Consumption Indicator

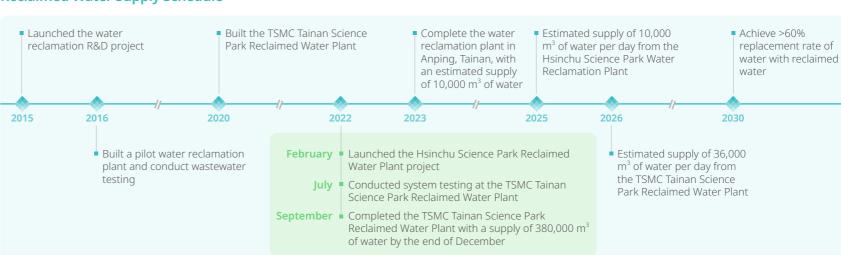


TSMC Product Water Footprint Distribution - Water Quality Indicator



2021 product water footprint survey, TSMC facilities consume 79% of water (mainly from direct water consumption by facilities) and raw material suppliers consume the remaining 21% of water (mainly chemical, silicon wafer, and bulk gas suppliers). In terms of water quality indicators, TSMC and raw material suppliers account for 47% and 53%, respectively. Water pollutants are mainly suspended solids, metals, and chemical oxygen demand (COD). In addition to actively <u>reducing water consumption</u> from production processes and discharge of water pollutants, TSMC also helps suppliers to set water conservation targets with the Sustainability Management Self-Assessment Questionnaire. All suppliers are required to adhere to the TSMC Supplier Code of Conduct to manage water use and discharge, while identifying opportunities for water saving and implementing measures. For more details, please refer to Sustainable Supply Chain in this report.

Reclaimed Water Supply Schedule



Develop Diverse Water Sources

The year 2022 marked the start of water reclamation at TSMC. To get the most out of every drop of water, TSMC is actively conserving water from production processes while also developing water reclamation technologies. To ensure water quality complies with advanced process specifications and their demands for cleanliness, TSMC works with the government, industry, and academia to develop low-energy consumption biological treatment, low-energy consumption sludge treatment, high-efficiency urea removal process, and other innovative technologies. The Company also establishes multi-layered, realtime, and automatic monitoring systems to ensure the quality of reclaimed water supplies. In September 2022, the TSMC Tainan Science Park Reclaimed Water Plant entered into operation as a center for processing, monitoring, and supplying TSMC facilities in the STSP. As of December 2022, the Reclaimed Water Plant has supplied 380,000 m³ of water reclaimed from industrial wastewater. To develop diverse water resources, the Water Reclamation Plant in Anping, Tainan, will be

completed and enter into operation in 2023. In 2026, the water supply capacity of the Tainan Science Park Reclaimed Water Plant will reach up to 36,000 m³ per day, reducing city water consumption and contributing positively to the surrounding environment. TSMC is also designing innovative systems to reclaim concentrated wastewater and make waste sludge reusable through waste heat, thereby reducing the discharge of highconcentration wastewater.

In 2022, TSMC completed the TSMC Tainan Science Park Reclaimed Water Plant and also launched the Hsinchu Science Park Reclaimed Water Plant project to expand the use of reclaimed water. The Hsinchu Science Park Reclaimed Water Plant is expected to supply 10,000 m³ of water per day in 2025. With the Hsinchu Science Park Reclaimed Water Plant and reclaimed water provided by the city government, new fabs in the Hsinchu Science Park will use 100% reclaimed water, strengthening TSMC's operational resiliency and fulfilling the commitment to achieve sustainable water cycle management.

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Develop Preventive Measures

TSMC continues to advance the performance of water pollution control and treatment processes. As advanced processes have evolved and increased the use of organic chemicals, TSMC has introduced a membrane bioreactor system to strengthen water pollutant removal. In 2022, average **COD** and TMAH concentration levels were reduced to 151.5 ppm and 3.75 ppm, respectively. Fab 15B introduced rotating packed bed technology in 2022 to further reduce COD levels. Lab test results showed that 70% of COD levels in water can be reduced. TSMC plans to officially roll

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Water Pollution Composite Indicator Reduction Rates Unit: %



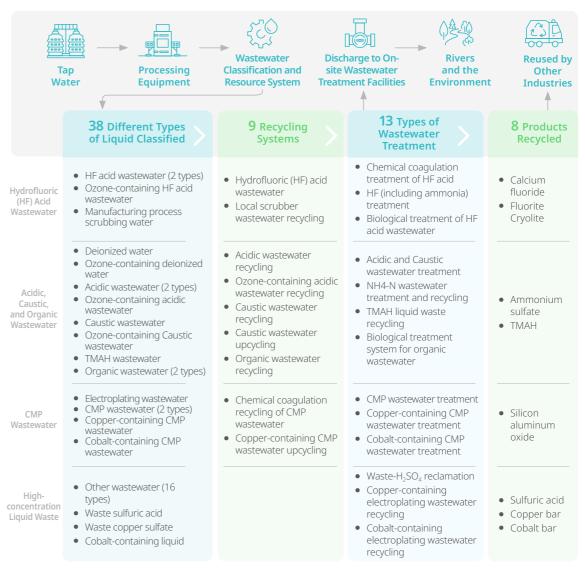
Note: Figures from TSMC fabs in Taiwan

out this technology in 2023. Due to the increased use of cobalt sulfate, cobalt sulfate treatment systems have also been expanded, which have helped to achieve a 54.3% water pollution composite indicator reduction rate, far exceeding the 2022 target of 45% and 2030 goal of 50%. As such, the reduction rate goal for 2030 has been raised to over 60% to achieve environmental sustainability.

Wastewater Classification and Resource **System**

To classify and treat wastewater, TSMC has developed 38 separation systems based on the composition and concentration of wastewater for treatment, recycling, and reuse. In the third guarter of 2022, Fab 15B successfully eliminated HF acid waste outsourcing by optimizing the hydrofluoric acid waste regeneration system, further perfecting the renewable technologies of local circular economy industries. TSMC also performed sludge tests, a byproduct of the chemical mechanical polishing process, at the Zero Waste Manufacturing Center, turning sludge into aluminum silicon oxide through dehydration, grinding, and surface modification. The aluminum silicon oxide can then be used as plastic fillers for factory use.

Wastewater Classification and Resource System







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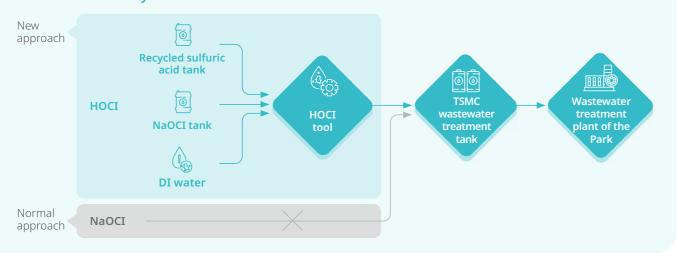
Innovative HOCI Conversion System Reduces Chemical Consumption and Carbon Emissions

As semiconductor technologies continue to evolve, the consumption of sodium hypochlorite (NaOCI) increases to treat pollutants in wastewater. To practice green manufacturing, reduce environmental impacts, and improve the water quality of effluents, TSMC launched the NaOCI reduction project in 2022. Between pH 5.5 and 6.5, NaOCl turns into hypochlorous acid (HOCl), a strong oxidizing agent approximately 80 times stronger than NaOCI. TSMC capitalized on HOCI's strong oxidizing properties by adding recycled sulfuric acid to NaOCl with deionized water (DI water). After optimizing the mixing

ratio, it became possible to convert NaOCI to HOCI stably, reducing NaOCI consumption without compromising disinfection and ammonia nitrogen removal. In 2022, the HOCI conversion system was introduced to Fab 15B for pilot run. It is estimated that annual NaOCI consumption and carbon emissions can be reduced by 80 metric tons and 10 metric tons, respectively. The Company will continue to roll out the system in other facilities as it is friendlier for the environment and can increase the reuse value of waste liquids, promoting environmental sustainability through green innovation.

HOCI Conversion System

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TSMC innovates HOCI Conversion System to reduce chemical consumption



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Circular Resources

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Strategies	2030 Goals	2023 Targets	2022 Achievements	
Promote Source Reduction Promote waste reduction by source separation and require vendors to provide low chemical consumption equipment	Outsourced unit waste disposal per wafer ≦ 0.50 (kg/12-inch equivalent wafer mask layer)	Outsourced unit waste disposal per wafer ≦ 0.98 (kg/12-inch equivalent wafer mask layer)	Outsourced unit waste disposal per wafer \leq 0.99 (kg/12-inch equivalent wafer mask layer) Target: \leq 0.99	~
Enhance Circular Economy Collaborate with vendors to develop new waste recycling technology to increase the amount of waste recycled and reused	Develop multiple types of electronic-grade chemicals for resource recycling within TSMC Reduce CO ₂ emissions from waste treatment to 2020 emission levels Note1	In-house resource recycling rate ≥ 28% Promote 3 projects to reuse instead of incinerate	In-house resource recycling rate: 28% Target: ≥ 23% Reused instead of incinerating 125 metric tons of organic sludge and reduced carbon emissions by 92 metric tons Note2	↑
Strengthen Audit and Guidance				
Enhance vendor capabilities in self-management and implementing resource recycling through audits, guidance, and tracking with applied technologies	All waste treatment vendors shall acquire ISO 14001 or other international EHS Management certification Note 3	86% of waste treatment vendors shall acquire ISO 14001 or other international EHS Management certifications	84% of waste treatment vendors have acquired ISO 14001 or other international EHS Management certifications Target: 84%	~
	All waste treatment vendors shall finish building the System of Waste Intelligent Fast Track (S.W.I.F.T.) Note 4	20% of waste treatment vendors shall finish building the System of Waste Intelligent Fast Track (S.W.I.F.T.)	9% of waste treatment vendors have finished building the System of Waste Intelligent Fast Track (S.W.I.F.T.)	
	Increase percentage of Excellent & Good waste treatment vendor evaluation results to 90% NEW	Increase percentage of Excellent & Good waste treatment vendor evaluation results to 82% NEW		
Note 1: Carbon emission figures from TSMC fa	ahs in Taiwan		↑ Exceeded ✓ Achieved — Missed Target	

Note 1: Carbon emission figures from TSMC fabs in Taiwan

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Note 2: Derived from the general waste (incineration) coefficient (0.737 kg of CO₂e/ kg). Source: DATA.GOV.TW (STSP Recycling Center)

Note 3: TSMC requires waste treatment vendors to at least acquire ISO 14001 or ISO 45001 certifications as the basis for standardized management. Waste treatment vendors include waste treatment and recycling vendors. Government-owned enterprises, public-to-private enterprises, items exempted from online reporting, and timber waste and lubricant waste vendors not included in the aforementioned vendors

Note 4: Only includes TSMC-certified waste treatment vendors that have been working with TSMC for three years



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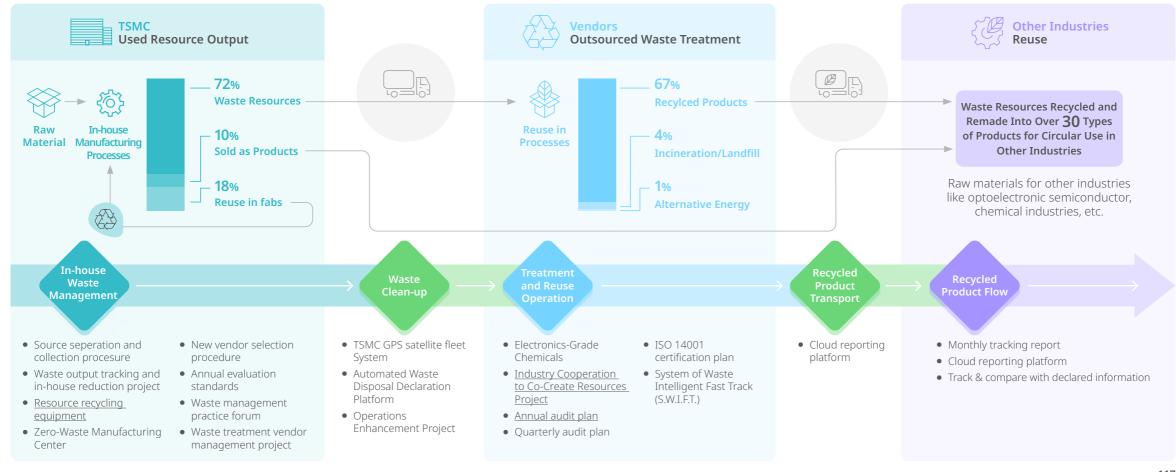
TSMC is a committed advocate of the circular economy and upholds the management principles of "minimizing waste, maximizing resource recycling, and optimizing vendor management" in its efforts to develop a comprehensive waste management system. As the Company continues to develop advanced processes, more raw materials are

2022 Sustainability Report

consumed and more waste is produced. As such, TSMC strives to achieve resource sustainability through three major strategies: source reduction, circular economy, and audit and guidance. In 2022, the Company's waste recycling rate reached 96%, and the landfill rate was less than 1% for 13 consecutive years. TSMC is also working with

vendors to deploy renewable technologies that can successfully produce green energy from organic sludge and reuse activated carbon waste in-house to create a circular system. In addition, to strengthen sustainable practices in our vendors, TSMC is actively promoting the System of Waste Intelligent Fast Track (S.W.I.F.T.) to help transform and upgrade vendors. In 2022, TSMC also organized communication sessions for 55 vendors and updated the Company's five critical checkpoints. By 2030, S.W.I.F.T. is expected to be deployed at all waste treatment vendors as everyone joins hands to create a better environment.

TSMC Waste Life Cycle Management Procedure 2.0

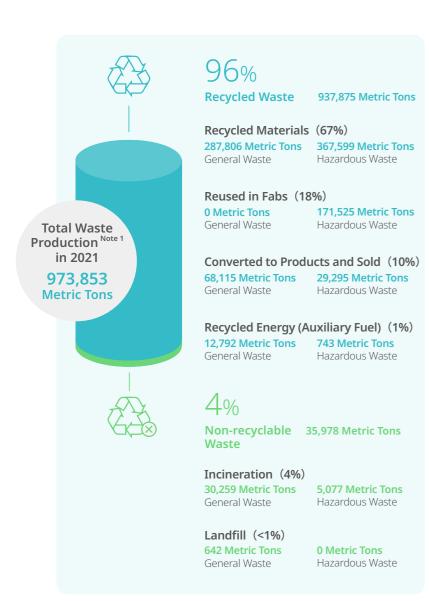


Outsourced General Waste Note 2

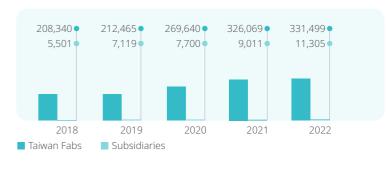
Unit: Metric tons/year

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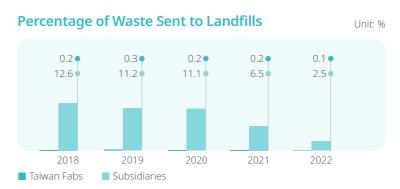












Note 1: Figures from TSMC fabs in Taiwan and the data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling equipment

Note 2: Outsourced recycling total solid waste in Taiwan facilities are 114,492 metric tons/year, and subsidiaries are 6,195 metric tons/year. Outsourced non-recyclable total solid waste in Taiwan facilities are 14,247 metric tons/year, and subsidiaries are 2,782 metric tons/year.

Promote Source Reduction

TSMC is actively practicing green manufacturing and implementing source reduction strategies to minimize waste. The interdepartmental Waste Management Task Force utilizes the Plan-Do-Check-Act (PDCA) management cycle to set waste reduction goals and improvement plans at the beginning of each year. The Task Force also leverages the Unit Waste Production Management System to directly manage and control waste production and reduction. Waste management units convene monthly to track the progress and

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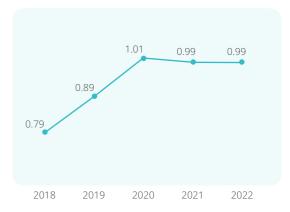
outcomes of waste reduction measures. In 2022, TSMC was able to reduce waste by over 20,000 metric tons through 129 projects that reduced chemical use time and quantity, adopted new chemicals, and extended use cycles.

Wafer cleaning processes and their cleanliness levels are important factors impacting yield. The higher yield demands of advanced processes have increased the use of sulfuric acids (cleaning solvent). Process, equipment, and facility

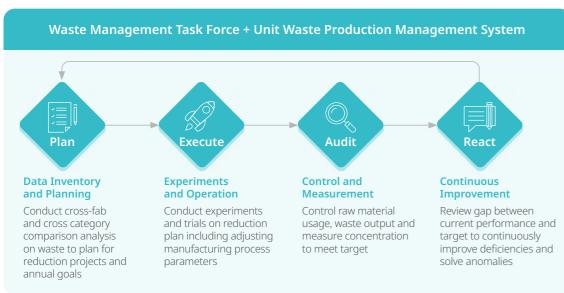
organizations worked together to improve postwet-etching cleaning steps by increasing acid valve speeds for sulfuric peroxide mixture (SPM) cleaning processes by 54%. In 2022, sulfuric acid waste produced from cleaning each 12" wafer was successfully reduced by 20% without compromising quality. In 2023, this process will be deployed to all facilities, which is expected to help reduce sulfuric acid waste liquid by 30,000 metric tons in 2024.

Outsourced Unit Waste Disposal per Wafer Trend

Unit: Kg/12-inch equivalent wafer mask layer



TSMC Waste Reduction Management Mechanism



Waste Reduction Measures and Results in 2022





Case Study

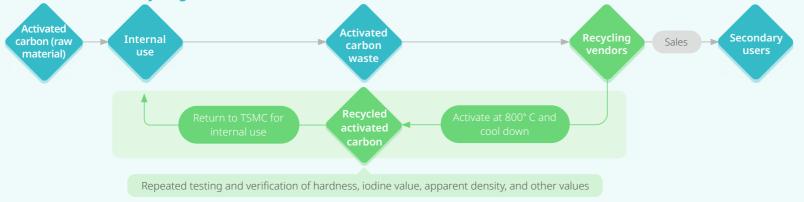
Activated Carbon Waste Reactivation: Creating NT\$30 Million of Green Benefits

TSMC is committed to carrying out source reduction strategies. By developing a closedloop cycle to recycle waste for in-house use, the Company has been able to reduce resource consumption and minimize environmental impacts. Activated carbon is used to recycle wastewater at TSMC. The resulting waste was previously outsourced to waste treatment vendors for treatment. To increase the waste's value, TSMC worked with vendors to research

ways to recycle activated carbon and was able to produce recycled carbon by subjected activated carbon waste to temperatures of 800° C and then cooling it. To ensure the quality of recycled carbon complies with TSMC standards, several parameters were repeatedly tested and verified: hardness (loss from abrasions), iodine value (adsorption capabilities), and apparent density (activation levels). In 2022, TSMC was able to produce recycled activated

carbon with adsorption capabilities and use cycles consistent with new activated carbon. The recycling process will be deployed to all Taiwan fabs in 2023, which will allow the reuse of activated carbon to reduce outsourcing by 6,000 metric tons and generate NT\$30 million in green benefits each year, effectively growing the Company's circular economy and supporting environmental sustainability.

Activated Carbon Recycling Process



Enhance Circular Economy

In addition to source reduction, TSMC is also carrying out circular economy practices to fulfill long-term goals for 2030 of outsourcing less than 0.5kg of waste per wafer unit. Through the Action Plan to Turn Waste into High-Value Products, resource recycling equipment were deployed in the Taiwan fabs that were able to increase the recycling of six types of waste liquids into highvalue products for internal use or sale. Over 260,000 metric tons of resources were recycled with an in-house resource recycling rate of 28%, which was 6% higher than in 2021 and generated NT\$1 billion in benefits. The central utility plant structure of the Zero Waste Manufacturing Center was completed, which is slated to enter into operation in 2023. As for the Electronics-grade Chemicals Recycling Program, TSMC continues to conduct evaluations and expects to purify waste into electronic-grade chemicals for internal use. The closed-loop cycle can reduce operating risks and maximize the value of recycled products.

The Industry Cooperation to Co-create Resources Project involves working with vendors from other industries to reduce incineration and landfill rates. In 2022, TSMC increased recycling rates from 95% to 96% and reduced landfill rates from 0.2% to 0.1%. To achieve the 2050 goal of net zero emissions and zero waste, TSMC worked with vendors and introduced anaerobic digestion to treat organic sludge, which can then be used to generate green energy. The Company was also

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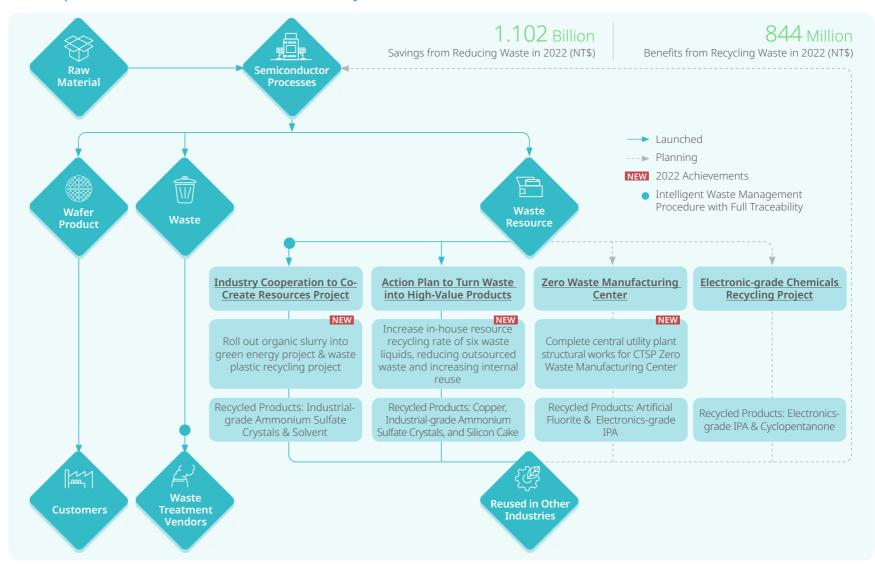
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able to reuse instead of incinerating plastic waste through four principles: source management, internal and external sorting, innovative technologies, and high-value products. In 2022, TSMC successfully developed garbage bags from 100% recycled materials for internal use. Other plastic waste was converted into solid fuel and supplied to combined heat and power (CHP) cogeneration plants to reduce coal consumption. The technology will go live in the fourth quarter of 2022 and be deployed to all facilities in 2023.

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Phase 1 and 2 of Fab 12 previously obtained the highest platinum rating for zero waste to landfills (UL 2799), and all Taiwan facilities and subsidiaries will seek to obtain UL 2799 certification in 2023 and 2025, respectively, as well. In addition, as most of TSMC's waste treatment vendors use diesel trucks, TSMC launched the Electric Waste Removal Truck Program in 2022 and started conducting assessments. It was discovered that electric trucks produce 45% fewer carbon emissions per kilometer than diesel trucks. The Program is part of the Company's efforts to uphold the TSMC Environmental Policy.

TSMC Aspires to be a Practitioner of Circular Economy



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Green Energy Cycle: 2.2 kWh of Green Energy from 1 Metric Ton of Organic Sludge

To promote green innovation, TSMC worked with vendors to launch the Anaerobic Digestion of Organic Sludge R&D Project, using anaerobic digestion (AD) to treat organic sludge and produce marsh gas, a form of bio-energy, for the first time. In 2022, the Company filed an application to the Hsinchu Science Park Administration and received approval in September to test out AD for organic sludge treatment at Fab 12 Phases 6 and 7. As of the end of December, the incineration of organic sludge was successfully reduced by 125 metric tons.

Using anaerobic bacteria, it is possible to break down organic sludge through four stages—hydrolysis, acidogenesis, acetogenesis, and methanogenesis—and produce marsh gas, which is primarily comprised of methane, for power generation. Each metric ton of organic sludge can generate approximately 2.2 kWh of energy through AD. The goal is to recycle instead of incinerate 100% of organic sludge in 2024, which reduces outsourced incineration by 6,500 metric tons, increases recycling rates at Taiwan facilities by 1%, and creates a circular system that can help usher in the future of green energy.

Anaerobic Digestion of Organic Sludge

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TSMC works with suppliers to convert organic sludge into green energy

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Strengthen Audit and Guidance

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To ensure a safe waste clean-up system, TSMC established the Supplier Transportation Management White Paper, requiring waste clean-up vendors to strengthen systems for waste-removal trucks, drivers, processes before/during/after clean-up, and education and training and obtain ISO 45001 certification before 2023. Waste clean-up vendors are asked to protect employee health and reduce environmental risks by creating safe workplaces. As of the end of 2022, 80% of waste clean-up vendors have obtained ISO 45001

certification. In the same year, TSMC conducted onsite audits of 41 waste clean-up vendors, inspected 100% of tank trucks and sludge clean-up trucks, and mitigated ten deficiencies.

TSMC believes that corporate growth and environmental protection go hand in hand. To such end, waste treatment vendors are asked to improve environmental protection practices and prevent any possibility of illegal waste disposal through TSMC's Waste Treatment Vendor Sustainability

Enhancement Project. In the first stage, new vendor selection, an interdisciplinary team of experts conducts document reviews and on-site inspections across <u>six dimensions</u> to ensure compliance in waste treatment, facilities, and on-site operations. Approved vendors then enter the second stage, which includes quarterly on-site audits to confirm the flow of waste. In 2022, new assessment items were added on <u>environmental sustainability</u> to two of the <u>eight dimensions</u> evaluated during annual audits, operations management and waste

management. The items added drive vendors to work with TSMC toward a sustainable environment by obtaining ISO certifications, reducing and taking stock of GHG emissions, committing to carbon neutrality, recycling resources, and implementing smart management. Lastly, vendors that perform poorly in three dimensions assessed during annual audits are replaced to enforce green practices throughout the supply chain.

Waste Treatment Vendor Sustainability Enhancement Project





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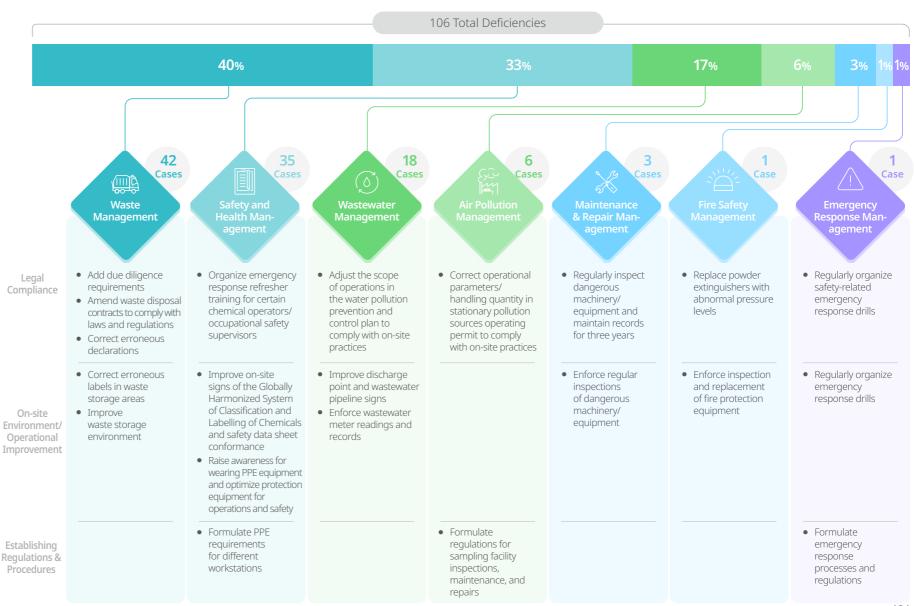
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In 2022, TSMC conducted on-site audits of 58 waste treatment vendors, reaching an audit ratio of 100% and mitigating 106 deficiencies. The number of deficiencies was reduced by 17% from 2021, and the percentage of Excellent and Good vendors has increased from 36% in 2015 to 80%. In 2022, another long-term KPI was added under the Circular Resource section increase the percentage of Excellent & Good waste treatment vendors to 90% by 2030—to enhance vendor quality and generate greater impacts on sustainability from the supply chain. Additionally, 84% of waste treatment vendors have obtained ISO 14001 certification. All waste treatment vendors are expected to obtain the certification by the end of 2030.

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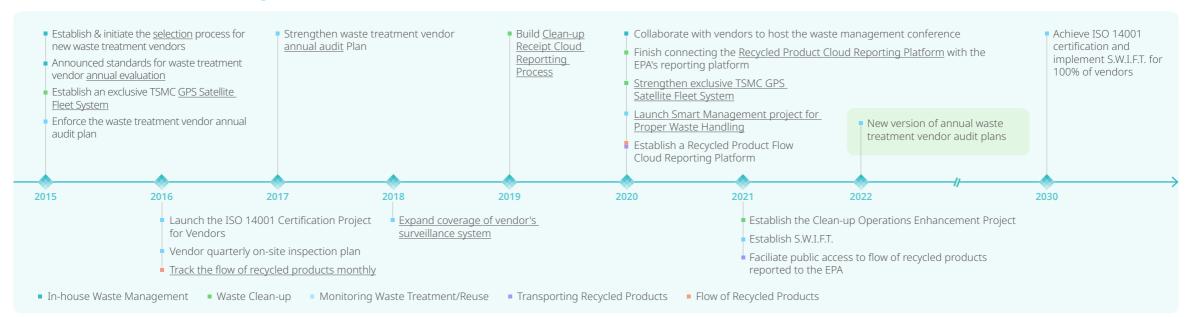
TSMC continues to leverage digital tools to improve the Intelligent Waste Management Procedure with Full Traceability. In 2022, the EPA invited the Company to the Environmental Regulation Enforcement & Corporate Integrity Forum and National Environmental Regulation Enforcement Conference to share how it was able to strengthen management, recycle resources, and reduce risks of illegal disposal by vendors. By sharing its experiences, TSMC hopes to lead the industry into a sustainable future through digital transformation.

Waste Treatment Vendor Audit and Guidance Results in 2022

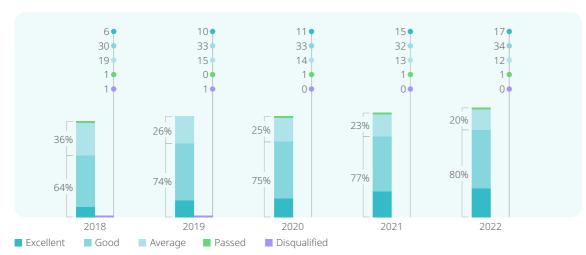


TSMC Waste Treatment Vendor Management Milestones

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2022 Waste Treatment Vendor Evaluation Results



Note: The total score is 100 points: greater than 90 points are Excellent; 80-89 points are Good; 70-79 points are Average; 60-69 points are Passed; less than 60 points are Disqualified

ISO-certified Waste Treatment Vendors



Overview

Sustainable Business Practices

Operations and Governance

Appendix

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Air Pollution Control

2030 Goals **Adopt Best Available Technology** Adopt the Best Available Technology Reduce the unit air pollutant emissions by 65% Note Reduce the unit air pollutant emissions by 58% Reduced the unit air pollutant emissions by 59% to control the pollutants emitted (Base year: 2015) Target: 56% from TSMC operations and minimize environmental impact Reduction rate of volatile organic gases: >99% Reduction rate of volatile organic gases: >98.6% Reduction rate of volatile organic gases: >98.9% Target: >98.6% **Strengthen Monitoring for Air Pollution Control Equipment** Leverage backup systems and dual-Report <1 abnormal occurrence in air pollution Report <1 abnormal occurrence in air pollution Reported 0 abnormal occurrences in air pollution track management, along with control equipment control equipment control equipment pollutant monitors, to ensure that the Target: <1 equipment works as intended and to prevent abnormal occurrences Note: TSMC actively invests resources to lower environmental impacts. In 2030, air pollutant emissions unit per product was adjusted from 60% to 65% ↑ Exceeded ✓ Achieved — Missed Target





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TSMC is committed to air pollution control and has adopted the Emission Source Classification method and multi-phase Best Available Technology (BAT) to enhance the performance of pollution control. In 2022, Wet Electrostatic Precipitator Scrubber was applied in TSMC process for the first time, which used hightemperature sulfuric acid for cleaning, reducing alkaline gases and particulate matter (PM_{2.5}) by 90% and 91%, respectively. The Company also actively monitoring and managing air pollution emissions from control equipment, expanding the Environmental Lab's responsibilities to include the following three

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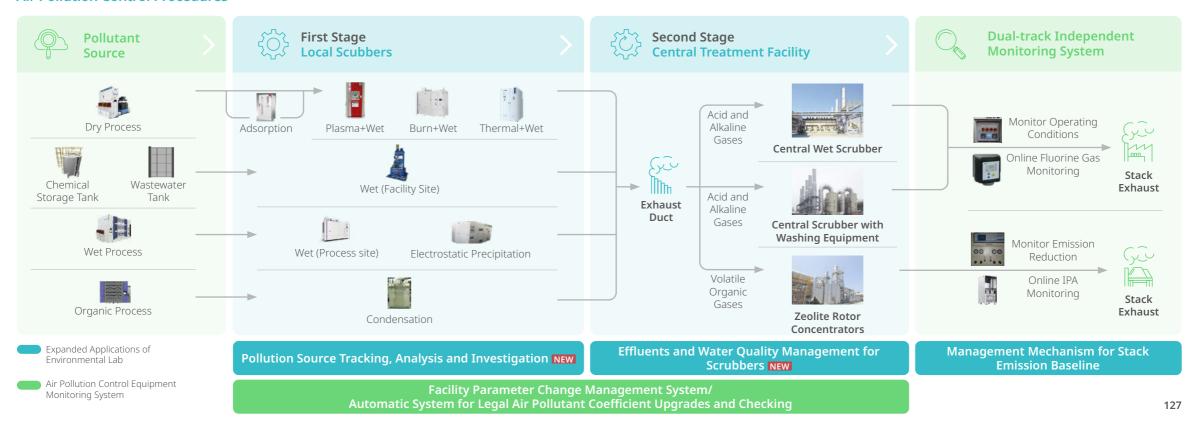
areas: air pollution monitoring, water quality analysis, and environmental protection in surrounding areas. In addition, TSMC is conducting verifications to help facilities quickly identify target pollutants, apply BAT, and introducing Effluents and Water Quality Management for Scrubbers to regularly inspect water quality to ensure air pollution control equipment is operating at optimum levels. In 2022, TSMC was able to meet the annual target for air pollutant emissions per unit of production as well as the annual target for volatile organic gases reduction, continuing to move toward sustainability goals.

Adopt Best Available Technology

Acid, alkaline, and volatile organic gases comprise the majority of air pollutants produced by the semiconductor industry. TSMC employs two approaches - Classification and Reduction of Emission from Sources and Strengthened Management of Terminal Prevention Facilities to achieve BAT with this multi-phase system and effectively control air pollutant emissions. Exhaust gases are separated in the first stage based on their properties - toxic, corrosive, flammable, perfluorocarbon greenhouse gases, and acidic/alkaline. The gases are first introduced

to high-efficiency local scrubbers that will process highly concentrated pollutants. The gases with low concentrations will then be sent to central scrubbers. which are terminal prevention facilities, for the second stage of rinsing and neutralization. Depending on their boiling points, volatile organic gases may be sent to condensation type scrubbers first and then to zeolite rotor concentrators for adsorption, reducing emissions and improving decontamination results.

Air Pollution Control Procedures



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Different Types of Local Scrubbers

2022 Sustainability Report

Proc	cess S	Semiconductor Fabrication	Target Pollutant	Control Technologies	Equipment	Reduction Rate	Real-time Parameter Monitoring
	Epitaxial Dry Etching	Corrosive Gases (Burn-Wet PM _{2.5} reduction equipment testing NEW	()	. 000/	Natural gas flow Oxygen flow	
		Perfluorocarbons	Burn-Wet (Large-capacity)		>99%	Circulating water flowInlet pressure	
			Corrosive Gases		180	>95%	Current amperageCirculating water flowInlet pressure
		Dry Etching	Perfluorocarbons	Plasma-Wet	:		
			Flammable Gases				
		Thin Film	Corrosive Gases			>95%	Reactor temperature
Dr.	ry	Diffusion	Perfluorocarbons	Thermal-Wet with Chemical Dosing			
Pro	ocess		Flammable Gases		Ŧ.,*		Circulating water flowpH value
		Sputtering —	Hydrochloric Acids	Thermal-Wet with Chemical Dosing		Hydrochloric Acids >87%	• Inlet pressure
		_	Particulate Matters	(Add High-efficiency Spray Device)		Particulate Matters >86%	
	Ion Implantation Sputtering Epitaxy	Toxic Gases	Adsorption	1	>95%	Pressure difference of local scrubberInlet pressure	
	Thin Film	Nitrous Oxide (N₂O) (PN	High-Temperature Thermal+Wet 1 _{2.5} Reduction Equipment Testing NEW		>90%	Reactor temperatureCirculating water flowInlet pressure	
		Wet etching	Corrosive Gases	Wet +		>95%	Differential pressure of local scrubberCirculating water flow
- / \ -	et		Organic Gases	Chemical Dosage ganic Gases (Process Site)			Inlet pressurepH value
Process		Alkaline Gases PM _{2.5} NEW	Wet Electrostatic Precipitation		>90%	Inlet pressureCorona voltageCorona current	
	rganic rocess	PR Stripping	High Boiling Point Organics	Condensation		Specific High Boiling Point Organics >95%	Differential pressure of local scrubberCondensation temperature
Storage Tanks	age Storage lank	Corrosive Gases	Wet +		>95%	Differential pressure of local scrubberpH value	
		Acid and Alkaline Gases	Chemical Dosage (Facility Site)			Circulating water flowInlet pressure	

Source Reduction and Management – High Efficiency Local Scrubbers

As TSMC accelerates the development of advanced process technologies, the New Tool & New Chemical Review Committee evaluates the hazard of new processes and chemicals on ESH to prevent added risks of air pollution. In 2022, the Committee conducted 430 reviews for 198 new tools and 232 new chemicals. The two-stage review enables the Committee to carefully identify optimal separation methods and local scrubbers for new tools and chemicals. Depending on exhaust gas properties, they are sent to different types of local scrubbers - thermal, burn, plasma, wet with chemical dosage, adsorption, condensation, and wet - for pre-treatment. As TSMC continues to bring in new types of high efficiency local scrubbers, the Company is also working with suppliers to optimize the performances of existing local scrubbers. In 2022, TSMC applied the wet electrostatic precipitator scrubber in the process which used high-temperature sulfuric acid for cleaning in Fab 12B, using corona technologies and wet scrubber method to remove pollutants alkaline gases and $PM_{2.5}$ - at the same time.

Launched in 2021, the three-year <u>High-efficiency</u> <u>Spray Equipment Upgrade Program</u> to upgrade existing thermal-wet scrubber has upgraded 508 scrubbers, with a finish rate of 68% by the end of 2022. To further enhance PM_{2.5} reduction rates of existing local scrubbers, TSMC expanded the PM_{2.5} Reduction Equipment Upgrade Program to

develop devices that can improve decontamination for different types of local scrubbers, including eddy gas/water separators, centrifugal washers, or cyclone particle collectors to strengthen exhaust gas treatments.

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Strengthen Management of Terminal Prevention Facilities — Central Scrubbers

After first-stage treatment, the exhaust gases undergo second-stage treatment: acid/alkaline

gases are channeled to central treatment facilities for scrubbing and acid/alkali neutralization to remove pollutants. Exhaust gases from certain wet processes that emit large amounts of acid/ alkaline gases are sent to a two-step scrubbing - central scrubber connecting washing tower to increase pollutant adsorption. To enhance the effectiveness of central scrubbers, existing facilities installed hydro membranes, changed filters, and added Raschig rings to optimize tower structures and decontamination. TSMC will continue to install

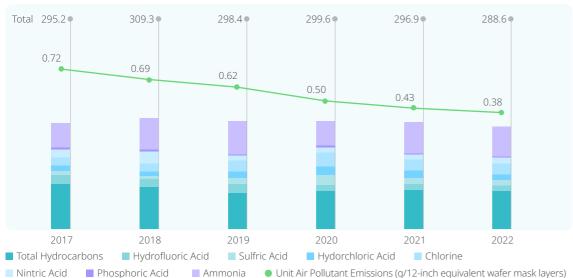
High-efficiency Central Scrubbers in new facilities to enhance the overall performance of terminal prevention facilities.

As for volatile organic gas treatment, TSMC continues to carry out the Low-efficiency Single Zeolite Rotor Concentrators renew Initiative in existing facilities and install Dual Zeolite Rotor Concentrators in new facilities. In 2022, all facilities reduced volatile organic gases by 98.9%. Due to enhanced prevention and control measures, total air pollutant emissions have

not increased with the addition of new facilities. When concentrated gases adsorbed by zeolite rotors enter thermal oxidizers, pyrolysis can remove volatile organic gas pollutants but may also produce the byproduct of nitrous oxide (NO_x) pollutants. In 2022, Fab 18 Phase 7 applied low nitrous oxide burner (low-NO_x burner) in the volatile organic gas treatment facilities, using Moderate or Intense Low Oxygen Dilution (MILD) thermal oxidizers and combustion flow field control technologies to reduce NOx emissions by 65% each year.

Historical Emissions and Emissions Per Unit of Production

Unit: ton/year

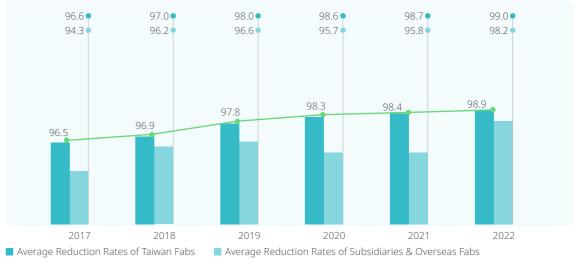


Note 1: TSMC air pollutant emissions are reported in accordance with local laws and regulations

Note 2: Air pollutant emissions include the total emissions of eight gases: hydrocarbons (THC), sulfuric acid (H₂SO₄), hydrochloric acid (HCl), nitric acid (HNO₃), hydrofluoric acid (HF), phosphoric acid (H₃PO₄), chlorine (Cl₂), and ammonia (NH₃)

Historical Volatile Organic Gas Reduction Rates

Unit: %



Average Reduction Rates of TSMC (including subsidiaries)

Note: Figures from TSMC fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra. Data excludes WaferTech as local regulations required individual hydrocarbon monitoring instead of total hydrocarbon monitoring

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Appendix



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Central Scrubbers

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Zeolite Rotor Concentrators

Timeline of Air Pollution Prevention Systems

- Add chemical dosing system to thermal wet scrubbers
- Introduce high-temp electric heating and wet scrubber
- Add chemical dosing system to scrubbers to wastewater tank scrubbers
- Introduce wet Add high-efficiency electrostatic spray equipment to thermal wet precipators scrubbers
 - Introduce large-capacity burning equipment
- PM_{2.5} Reduction Equipment Upgrade Plan
- Apply local wet electrostatic precipitation scrubbers to high-temperature sulfuric acid cleaning process
 - ✓ Alkaline gas removal: 90%
 - ✓ PM_{2.5} removal: **91%**

- 2018
- Add hydromembrane to scrubber
- Add chemical Independent Central Scrubber connected

2019

 Introduce Clean-Gas-Desorbing Zeolite Rotor Concentrators to existing facilities

with washing

equipment

- dosing system to wastewater tank scrubbers
- Introduce Dual Zeolite Rotor Concentrators to new facilities

- Introduce the Lowefficiency Single Zeolite Rotor Concentrators Upgrade Initiative to existing facilities
- Introduce Parameter Optimization for Single Zeolite Rotor Concentrators to existing facilities

2020

- 2021
- Introduce the Improvement Program for Inefficient Thermal Oxidizer of Zeolite **Rotor Concentrators**
- Introduce Smart Control Parameters for Single Zeolite Rotor Concentrators to existing facilities

2022

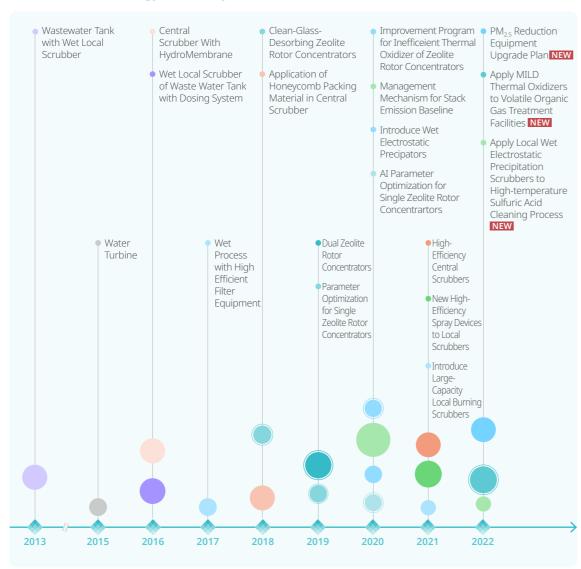
Local Scrubber

- Introduce High-Efficiency Central Scrubbers to new facilities
- Apply MILD thermal oxiders to volatile organic gas treatment facilities
- ✓ Annual NOx reduction: 65%



Prevention Technology Feasibility and Reduction Effectiveness Evaluation

2022 Sustainability Report



Empower Environmental Lab for Comprehensive Air Pollution Control

In compliance with TSMC Environmental Policy, the Company is dedicated to reducing air pollution emissions. The Environmental Lab has strengthened pollutant monitoring and management for stacks, using baseline management to control the concentration of air pollutants, achieve source reduction and enhance the performance of prevention facilities. In 2022, 104 stacks exceeding baseline concentration standards have been mitigated by the decontamination method, including replacing terminal prevention facilities that have reached the end of their life cycles, upgrading existing facilities, or introducing new high-efficiency facilities. The outcome shows 88 stacks have been mitigated.

For air pollution sampling, the Environmental Lab introduced various sampling and analysis technologies according to the demands and regulatory requirements. In 2022, the Lab developed ways to analyze inorganic acids, ammonia, heavy metals, NMHCs, etc., to increase the facilities' abilities for different pollutants identification, provide sampling data more rapidly, and shorten mitigation period. The Lab further traced air pollution sources by sampling central scrubber exhaust ducts to confirm the source of abnormal exhaust gas emissions. Then, TSMC can investigate upstream process tools to clarify special gases and emission properties for ensuring the coverage rate of local scrubber installation is sufficient. The Lab also verifies the performance of upgraded local scrubber, filler variance, and optimal parameters. This allows facilities to rapidly develop optimal treatment for target pollutants. In 2022, 2,282 exhaust ducts, sub-ducts, and equipment units were sampled

and tested; 16 cases of mixed acid and alkaline gas emissions were found and resolved, and improved performances in 15 treatment facilities were verified.

For water quality testing, the Environmental Lab provided the <u>analyzation for 29 items</u> of pollutants in scrubber water. The result showed that water containing acid-base ions could be turned into gaseous pollutants at <u>certain pH levels</u>. In 2022, the Environmental Lab established Effluents and Water Quality Management for Scrubbers to regularly inspect water status to ensure air pollution control equipment operates at the optimal levels.

Three Applications of Environmental Lab to Strive for Zero Emission

Develop comprehensive sampling and testing technologies to monitor emissions and verify upgrades of control equipment



- Manage emission stacks
- Increase variety of pollutants sampled **NEW**
- Investigate emission sources **NEW**



- Manage effluents and water quality for scrubbers **NEW**
- 29 items for watere quality test **NEW**



- Monitor surrounding areas with air quality vehicles
- Build stationary monitoring stations around Zhunan, Taichung and Tainan Science Parks

Note 1: Size of the bubble indicates the technology's reduction efficiency

Note 2: Single circle indicates local/central scrubbers; double circles indicate zeolite rotor concentrators

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TSMC is strengthening the reliability of air pollution control equipment operating systems and air pollution monitoring to ensure compliance with Taiwan and overseas regulations. The Company also deployed automatic monitoring systems - total hydrocarbon monitors, online IPA monitors, and online fluorine gas monitors - to rigorously control monitoring data and actual emission levels. In addition, the Facility Division, Industrial Safety and Environmental Protection Division, and Instrument Control System Division used Automatic System for Legal Air Pollutant Coefficient Upgrades and Inspection, Facility Parameter Change Management System, and Facility Monitoring and Data Collection System to monitor facility parameters. The systems automatically compare and inspect data to prevent flaws or losses from human error. This effectively increases the accuracy and reliability of TSMC reports to government agencies.

In addition, to ensure air pollution treatment facilities remain at optimal efficiency for operations all year round, all control equipment is equipped with a Dual-track Independent Monitoring System that allows the Facility Division and Industrial Safety and Environmental Protection Division to perform emergency repairs or initiate backup systems to minimize damages and losses. TSMC also adopts the N+1 rule where all equipment must have at least one backup system and uses Uninterrupted Power Supply Systems to help fulfill the management target of zero failure in control equipment. With dedicated efforts from various divisions, TSMC is proud to report zero abnormal occurrences in air pollution control equipment in 2022.

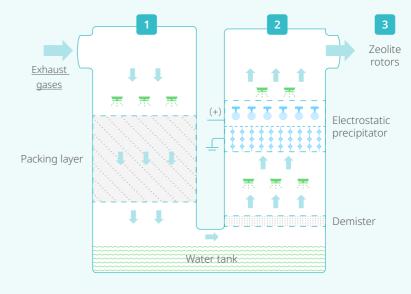
Case Study

Improve Corona Technologies in Air Pollution Control Equipment to Reduce Alkaline Gases and PM_{2.5} by over 90%

With the evolution of advanced processes, TSMC continues to work with suppliers to optimize the performance of air pollution prevention equipment and has applied Wet Electrostatic Precipitator (wet-EP) Scrubbers in the process which used high-temperature sulfuric acid for cleaning. As this process simultaneously uses acids, alkaline, and organic chemicals, it produces large amounts of acid/alkaline gases and high-concentration PM_{2.5}. TSMC improved on wet-EP corona technologies to ensure safety and enhance the effectiveness of air pollution treatment, changing electricity discharge mode and installing protective mechanisms. The improved technology has obtained SEMI S2 safety certification and, after repeated testing, can be used for three-stage pollutant treatment. The first stage is a washer that transmits gaseous acid/alkaline liquid phases for decontamination. The second stage is a particle collector that accumulates and removes particulate matter with corona discharge. Finally, the gases which have been treated by wet-EP would enter to the zeolite rotors for organic pollutant removing. The three-stage process can effectively minimize acid/alkaline gases, organic gases, and PM_{2.5} emissions simultaneously.

In 2022, TSMC introduced wet-EP into Fab 12B. Results showed that the three stage process was able to remove 90% of alkaline gases, and 91% of PM_{2.5} which is the form of acid gases after reaction. In the future, TSMC will continue to evaluate the feasibility and efficacy of wet-EP applications to other exhaust gases to reduce air pollution emissions and strive toward zero emissions.

Wet-EP Scrubbers: Three Stages of Decontamination



Three Stages of **Decontamination**

- Washer: Remove acid/alkaline gases
- Particle Collector: Remove Particles
- Zeolite Rotors: Remove VOCs

Case Study

2022 Sustainability Report

Optimize Thermal Oxidizer Structures and Treatment Process to Reduce Nitrogen Oxide (NO_x) Emissions by 65%

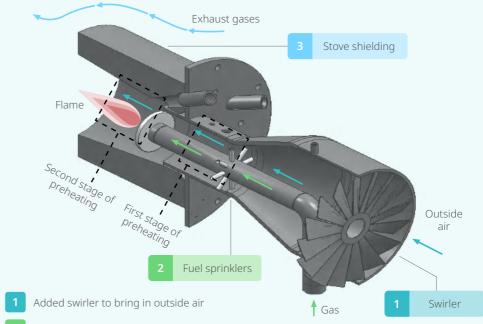
Volatile organic compounds (VOCs) and perfluorinated compounds (PFCs) are byproducts of wafer manufacturing. Air pollution control equipment mainly uses pyrolysis to remove VOCs and PFCs. However, this process also causes dinitrogen (N₂) to react with oxygen (O₂) in the air and produce nitrogen oxides (NO and NO₂) pollutants.

Develop Low-NOx Burner to Reduce NO_x Production

TSMC has launched a NOx reduction project in all facilities around the world to comply with assessment requirements for the new U.S. facility. First, TSMC conducted survey and analysis for comprehensive stacks in the facilities. Results showed that NO_x is mainly produced by pyrolysis in local scrubbers and VOC control equipment. To reduce NO_x emissions, TSMC adapted the structure and treatment processes of thermal oxidizers in control equipment, adding swirler to introduce outside air into oxidizers to facilitate combustion. Fuel sprinklers are also added for pre-heating in stages. In the first stage, the oxygen concentration is be lower in the low-temperature reaction. In the second stage, the air with low oxygen concentration is introduced into the combustion. Under the low-oxygen combustion, flame temperature dip from 1,600° C to 1,300° C and result in lower NO_x production. At the same time, combustion flow field control technologies are used to change where exhaust gases enter into thermal oxidizers so that the gases can circumvent hightemperature zones, which reduces the production of thermal NO_v.

In 2022, TSMC tested the new process on VOC control equipment in the Fab 18 Phase 7 and was able to minimize target pollutants and NO_x byproducts by simply adapting thermal oxidizers and using optimal temperatures. The process does not compromise the performance of exhaust gas treatment and can reduce NO_x emissions by 65% each year. TSMC will continue to evaluate ways to improve local scrubbers to further reduce NO_x production and strive for environmental-friendly goals.

Low-NO_x Burner Reduces Nitrogen Oxides Emissions



- Added fuel sprinklers for pre-heating
- Stove shielding is installed to allow exhaust gas to flow in from outside to avoid direct contact with high-temperature flame

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Diversity and Inclusion

Talent Attraction and Retention

Talent Development

Human Rights

Occupational Safety and Health

Attraction and Retention

Overview

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Power to Change Society

Diversity and Inclusion

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Establish an Open-style Management System Fulfill Core Values and Business Philosophy and continue to shape an inclusive culture	Rank in the 75 th percentile for Diversity and Inclusion; the rank is determined by comparing results from the Engagement Survey ^{Note 1} against the WTW Global High Performance Norm	Rank in the 50 th percentile for Diversity and Inclusion; the rank is determined by comparing results from the Engagement Survey against the WTW Global High Performance Norm		
Unleash the Potential of Diverse Talent Note 2				
Provide resources to support diverse talent to grow and flourish	Women in management: ≧ 20%	Women in management: ≧ 14%	Women in management: 13.3% Target: 14%	Note 3
	Women account for 30% of all newly-hired technical professionals	Women account for 25% of all newly-hired technical professionals	Women accounted for 23.7% of all newly-hired technical professionals Target: 25%	Note 4
Note 2: TSMC respects difference, hence the hiring or pr current social situation, thus the strategy of Unle Note 3: Although the proportion of women in managers	o years and will be issued next in 2023. For the 2021 Engagement Survey, please refer omotion of colleagues is not affected by gender, religion, race, nationality, or political a ashing the Potential of Female Employees was changed to Unleashing the Potential in 2022 has not been achieved, it was still 0.3% higher than that in 2021. For details o n the proportion of women in newly-hired technical professionals has not been achiev	affiliation. The Company proposes that the employee mix should reflect the of Diverse Talent to build a diverse and inclusive workplace on talent retention, please refer to <u>Talent Attraction and Retention</u>	↑ Exceeded ✓ Achieved — Missed Target	



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TSMC respects difference and sees talent as the most important asset for driving industry upgrades and social development, hence the hiring or promotion of colleagues is not affected by gender, religion, race, nationality, or political affiliation. Furthermore, diverse management and employee mix are applied to bolster the Company's competitive edge and sustainable

2022 Sustainability Report

development. By implementing the Diversity and Inclusion Statement, TSMC vigorously creates an open-style management system and inclusive workplace that integrates people from different backgrounds. By strengthening collaboration through mutual understanding, acceptance, and respect, the Company will maximize the benefits of diverse talent resources.

Establish an Open-style Management System

TSMC strives to create an open-style management system inspired by the **Business Philosophy** written and published by TSMC Founder Dr. Morris Chang, and continues to work on the four areas of Diverse Communication Channels, Learning Resources, Advance Employee Welfare, and Unleash the Potential of Diverse Talent. It is hoped to prove the Company's commitment and actions to fostering,

cultivating, and retaining talent, thereby realizing a diverse and inclusive workplace where everyone respects each other and is willing to communicate. TSMC aims to enable global employees to fully utilize their strengths in suitable positions, growing together with the Company and creating win-win situations.

The Four Areas of Diversity and Inclusion

- Communication meetings at all levels / across levels
- A global Engagement Survey to regularly and systematically compile employee opinions
- Establish multiple channels for employees
- CEO on Quarterly Outlook NEW
- Expand Silicon Garden Meeting Feedback Channel NEW
- Provide diverse learning resources and tools to strengthen the professional know-how and selfefficacy of employees
- Diverse learning methods to help employees understand the significance of Diversity and Inclusion



- Launch the TSMC Child Care Benefit Program to support employees in balancing family life and work
- Free <u>advanced health check-ups</u> & leave for TSMC employees with five-year seniority and longer
- Upgrade the Service Award to recognize employees' service and contributions to the Company

- Organize Inclusive Leadership Workshop
- Found the Employee Resource Group Women@tsmc
- Form the R&D Organization Diversity and Inclusion Committee **NEW**

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Unleash the Potential of Diverse Talent

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In 2022, TSMC organized 15 Inclusive Leadership Workshops to support senior executives in understanding diversity and inclusion, as well as reinforce the awareness of unconscious bias, learn how it is formed, and appreciate the value of diversity and inclusion in their work through case studies. Furthermore, they also learned how to create a diverse and inclusive workplace. The training completion rate was 81%.

In the same year, the R&D Organization Diversity and Inclusion Committee was formed to focus on female employees' issues, actively recruit female interns, and hold a series of lectures. The aim was not only to promote knowledge sharing from the perspective

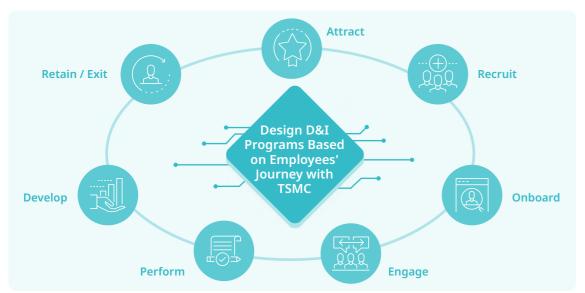
of career planning and building a workplace mentality, but also to facilitate exchanges among female colleagues, encourage dialogue between different generations, and provide all-round support for female employees, so as to promote innovative values of diversity and inclusion.

Additionally, TSMC officially established the employee resource group Women@tsmc in 2022 to provide female employees with a platform to support each other. Activities such as female colleagues forums and mentoring programs serve to enhance female employees' interpersonal networks within the Company and encourage them to pursue their careers and self-growth. Women@tsmc also supports

the <u>TSMC Journeys of Female Scientist Lectures</u> by inviting lecturers to communicate with students, helping the Company to expand talent cultivation and create a talent pool for the semiconductor industry.

In 2023, TSMC will design projects according to different stages of employees' careers. These include experience camps for people with disabilities and job content design, forming diverse employee resource groups, hosting training courses to raise awareness of diversity and inclusion, implementing flexible work hours, as well as support programs for expatriates and their families in a bid to create a diverse and inclusive experience for employees. The purpose is also to implement a friendly workplace and unleash the potential of diverse talent.

Diverse and Inclusive Employee Experience





The company holds a "Tech Your STEM Genes" women in science and technology symposium



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Unleash Employee Potential and Create a Role Model for Female Semiconductor Talent

TSMC prides itself on its people-oriented corporate culture. To support the career development of female talent in the semiconductor industry, TSMC is committed to realizing the value of diversity and inclusion and creating a challenging, fun, and sustainable learning workplace. Through teamwork, experience sharing, and quidance programs, the Company can assist female colleagues to tap into their potential and develop their strengths, as well as support colleagues in looking after their families and work development with a robust employee welfare system. Moreover,

TSMC recognizes the significant contributions of outstanding female colleagues by recommending them to participate in external award selections. In turn, the Company can create a role model for female talent, encouraging women in science and technology to facilitate the development of the semiconductor industry and advance technological innovation. In 2022, TSMC recommended numerous outstanding female colleagues to win national and global accolades.





Defending TSMC's industry leadership and operation freedom is the most honorable mission in my career. Thanks to the R&D team's innovation achievements and the legal team's joint efforts that made the new patent record.

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My first impression of TSMC was that it is a company with an exceptional ability to get things done and an emphasis on teamwork.





TSMC's abundant resources and innovations enable novel ideas to be turned into actions in a short time. Thanks to the guidance of senior colleagues and mentors, I can complete tasks with minimal effort and explore the infinite possibilities of semiconductor applications.



Associate General Counsel National Manager Excellence Award Chinese Professional Management Association



Constructed strategic patent portfolio with internationally-recognized quality; led patent litigations to establish victory results for Accolade TSMC's freedom of operation.



TSMC Academician National Industrial Innovation Award -**Woman Group** Ministry of Economic Affairs



Pushed through the nm process limit, developed photoresist technology of Extreme Ultraviolet Light (EUV), and collaborated with Accolade suppliers to lower process costs and risks, as well as maintain TSMC's technological leadership.



TSMC Technical Assistant Manager of the **Product Component Engineering Department** Female Up and Comer Award Global Semiconductor Alliance



Improved chip computing speed significantly in a short time, controlled costs effectively, increased customer product performance, Accolade and fostered innovation in the semiconductor

ecosystem.

Promotion Rate by Gender

2022 Sustainability Report



Percentage of Female Employees



Females in STEM Positions Note 2

• Females in Management Position in Revenue-Generating Functions^{Note 5} Note 1: The percentage of female employees declined in 2022 because new hires were mainly engineers and there was a significantly lower number

Females in Top Management Note 4
 Females in Junior Management Note 4

Females in All Employees

of female engineers than male engineers in the labor market Note 2: STEM positions include R&D, operations, Q&R, information technology, and information security employees, and other units

Note 3: Newly-hired technical professionals include all newly-hired technical professionals with less than one year of recognized experience

 Females in TSMC Academy Note6 Note 4: Junior management positions include first-line managers while top management positions include Vice Presidents and higher.

• Females in Newly-Hired Technical Professionals Note 3

Note 5: Management positions in revenue-generating functions include managers of R&D, operations, Q&R, sales, and other units

Females in Management

Note 6: TSMC Academy members with outstanding achievements, insights, or breakthroughs in specific fields or experts with outstanding contributions to TSMC

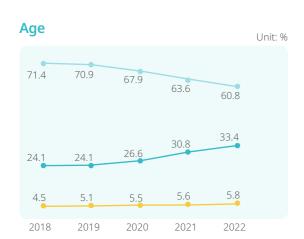
Compensation Ratio by Gender

Region/ Subsidiary	Position	2018	2019	2020	2021	2022
Taiwan	Managers	0.99:1	0.95:1	0.97:1	0.97:1	0.97:1
	Professionals	0.93:1	0.93:1	0.93:1	0.93:1	0.93:1
	Assistants	0.98:1	0.97:1	0.97:1	0.93:1	0.91:1
	Technicians	1.14:1	1.13:1	1.13:1	1.14:1	1.15:1
	Managers	0.96:1	0.94:1	0.96:1	1:1	0.96:1
China	Professionals	0.89:1	0.89:1	0.88:1	1:1	0.99:1
Cillia	Assistants	0.93:1	0.88:1	0.91:1	1.14:1	1.19:1
	Technicians	1.07:1	1.05:1	1.11:1	1.16:1	1.13:1
North	Managers	0.88:1	0.95:1	0.94:1	0.97:1	0.93:1
America, Europe,	Professionals	0.78:1	0.79:1	0.78:1	0.82:1	1.03:1
Japan, Korea	Assistants	-	-	-	-	0.97:1
	Technicians	-	-	-	-	0.96:1
	Managers	0.79:1	0.72:1	0.71:1	0.69:1	0.69:1
VisEra	Professionals	0.87:1	0.86:1	0.86:1	0.85:1	0.91:1
VISETA	Assistants	1:1	1.03:1	1.06:1	1.18:1	1.18:1
	Technicians	1.04:1	1.13:1	1.03:1	1.04:1	1.05:1
WaferTech	Managers	0.79:1	0.84:1	0.75:1	0.79:1	0.80:1
	Professionals	0.83:1	0.91:1	0.83:1	0.87:1	0.82:1
vvaler recir	Assistants	0.87:1	0.91:1	0.91:1	0.93:1	0.95:1
	Technicians	1:1	0.99:1	1:1	1.02:1	1.02:1

Note: From 2018, statistics for Japan, North America, and Europe have been changed from individual statistics to consolidated statistics

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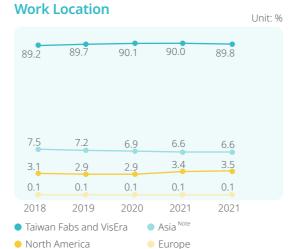


51+

18~30

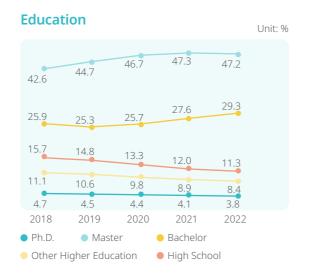
31~50

2022 Sustainability Report



Note: Asia includes Shanghai, Nanjing, Japan, and South Korea

Position Unit: % 47.6 45.7 35.0 33.5 32.3 30.7 30.0 10.9 10.2 10.2 10.0 2020 2021 2022 2018 Managers Professionals Technicians Assistants





TSMC implements a diverse and inclusive workplace, creating an environment of mutual respect and communication

Talent Attraction and Retention

Note 2: The Engagement Survey is issued once every two years and will be issued next in 2023. For results from the 2021 Engagement Survey, please refer to the Employee Commitment section

2022 Sustainability Report

Strategies	2030 Goals 2023 Targets		2022 Achievements	
Fulfill the "Commitment" Core Values				
Offer employees quality jobs and strengthen employee commitment	Conduct an Employee Engagement Survey every two years to reinforce core values			
	- Ensure that over 95% of employees are fully committed to their work		Over 93% of employees were fully committed to their work Target: 95%	Note
	- Ensure that over 95% of employees are willing to continue working for TSMC in the next five years		Over 90% of employees were willing to continue working for TSMC in the next five years Target: 95%	Note
	Conduct an Engagement Survey every two years to reinforce core values; rank in the top 25% for Sustainably Engaged; rank is determined by comparing results from the Engagement Survey against the WTW Global High-Performance Norm ^{Note 2}	Rank in the top 75% for Sustainably Engaged; rank is determined by comparing results from the Engagement Survey Note 2 against the WTW Global High-Performance Norm		
	Maintain position above 75 th percentile among industry peers in total compensation	Maintain position above 75 th percentile among industry peers in total compensation	Maintained position above 75 th percentile among industry peers in total compensation Target: 75 th percentile	~
	Maintain total turnover rate between 5-10%	Maintain total turnover rate between 5-10%	Total turnover rate: 6.7% Target: 5-10%	~
	Less than 10% new hire (<1 year) turnover rate	Less than 14.5% new hire (<1 year) turnover rate	New hire turnover rate (<1 year): 15% Target: ≦ 15%	~
Note 1: Expected to launch the TSMC Culture Re	finement Plan in 2023	↑ Exceeded ✓ Achieved — Missed Target		

A Responsible Purchaser

Power to Change Society

In 2022, the semiconductor industry continued to flourish. To cater to the needs of global customers, TSMC expanded investment in Taiwan, the U.S., China, Japan, etc. The Company also invested in advanced technology R&D and expanded production capacity. In addition to bolstering the recruitment and cultivation of local talent, TSMC advanced to Japan, Southeast Asia, and Europe to expand global talent recruitment. In 2022, TSMC recruited 12,442 new employees worldwide, creating 7,817 premium new job opportunities, providing employees with competitive compensation and welfare systems better than statutory requirements, as well as a

2022 Sustainability Report

growth, in turn obtaining a sense of belonging and accomplishment. Furthermore, the Company strives to respond to their needs through new employee care measures in order to successfully lower the new employee turnover rate.

An Innovation Pioneer

Fulfill the "Commitment" Core Values

Fulfill Core Values

TSMC's core values of Integrity, Commitment, Innovation, and Customer Trust were defined by TSMC Founder Dr. Morris Chang. Chairman Mark Liu and CEO Dr. C.C. Wei expect all TSMC employees to uphold these core values, reinforcing the Company's business philosophy and vision through internal websites, meetings, lectures,

publications, and various communication channels. In the fourth quarter of 2022, a core value survey was conducted to listen to employees' feedback on the implementation of the Company's core values and relevant strengthening measures that will be launched in 2023. Through seminars and case studies, the Company aims to enhance employees' understanding and experience of the core values, thereby ensuring that employees can grow together with TSMC.

When it comes to talent attraction and retention. TSMC has always believed in "putting the right people with the shared vision and values in the right positions". "Shared vision" means that all employees share the same vision and mission; "shared values"

means that all employees abide by the same core values and code of conduct; and the "right people in the right positions" means that the Company is dedicated to helping employees unleash their full potential in the right positions.

Strong Talent Pool

TSMC has remained true to its core values and has always strived to be a company that employees can be proud of. In 2022, the total number of global employees was 73,677, consisting of 73,090 permanent and 587 temporary employees based on employment contract type. In terms of employment type, 73,310 were full-time employees and 367 part-time employees.

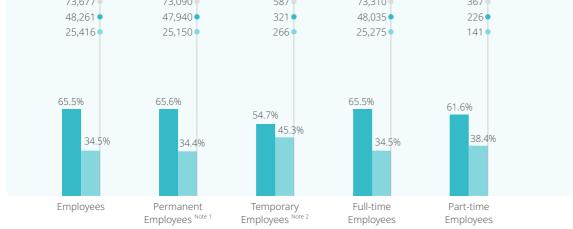
Workforce Type Distribution - by Gender

Female

safe and healthy workplace, so that colleagues are

willing to devote themselves to work, learning, and

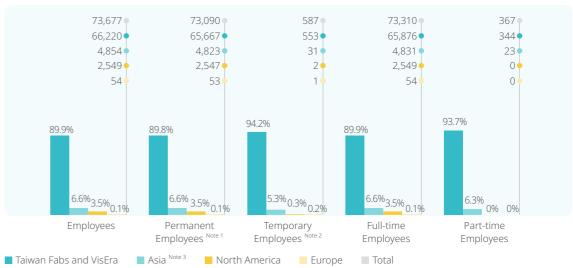




Note 1: Permanent employees refer to those who have signed contracts with no fixed term, as defined according to the GRI Standards Note 2: Temporary employees are those who have signed fixed-term contracts

Workforce Type Distribution - by Work Location

Unit: Number of People



Note 1: Permanent employees refer to those who have signed contracts with no fixed term, as defined according to the GRI Standards

Note 2: Temporary employees are those who have signed fixed-term contracts

Note 3: Asia includes Shanghai, Nanjing, Japan, and South Korea

An Innovation Pioneer

A Responsible Purchaser

A Practitioner of Green Power

An Admired Employer

Power to Change Society

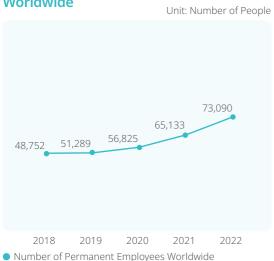
• Reinforce the Recruitment of Female and Foreign Science and Engineering **Talent**

2022 Sustainability Report

To encourage more outstanding female science and engineering talent to join the Company, TSMC continues to provide female colleagues with a friendly and supportive workplace. In 2022, two female career-sharing and interview sessions were held, inviting female executives to share their work and workplace experience to help participants better understand the semiconductor industry and TSMC.

Additionally, TSMC continues to expand its diverse talent pool. The total number of foreign employees in 2022 was 1,147, accounting for 1.6% of global employees; 2.3% of new employees in 2022 were foreign employees, higher than the proportion of foreign employees among all employees; the

Number of Permanent Employees Worldwide



proportion of women in new managers reached 16.3%.

Recruitment Criteria

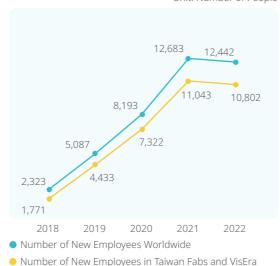
Abiding by the guidelines of shared vision and values, and the basis of diversity and inclusion, TSMC does not discriminate against candidates because of their gender, religion, race, nationality, or political affiliation. TSMC prioritizes character and capability over professional skills when assessing candidates. All candidates must pass rigorous selection criteria and interviews for a comprehensive evaluation before they are welcomed on board.

Talent Recruitment in Taiwan Fabs and VisEra

TSMC's global recruitment stresses local hiring. However, in the principal place of business, Taiwan

Number of New Employees

Unit: Number of People



fabs and VisEra, the Company must consider technological development and diversity. Therefore, in addition to the recruitment of professionals and recent graduates, overseas special professionals are listed as a recruitment focus as well.

» Strengthen Internship Program

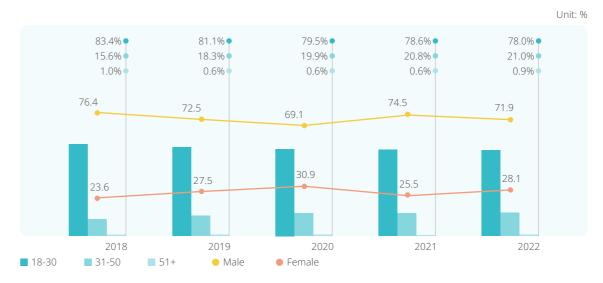
In 2022, TSMC continued the 2021 DNA Internship Program, which revolves around the theme of Development, Navigation, and Advance Offer to provide diverse learning activities and practical project involvement such as lectures, courses, and workshops to give interns the opportunity for selfdiscovery and learning about the semiconductor industry and technologies. Outstanding interns were given advance offers to TSMC upon graduation, contributing to the success of both the students and the Company.

Interns Receiving Advance Offers in Taiwan Fabs and VisEra





Ratio of New Employees - by Gender and Age



١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤٥٤ | ١٤

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In 2022, TSMC welcomed 639 interns through the DNA Internship Program, of which 31% (195 interns) were female students. After the internship, 226 interns were evaluated as outstanding and received advance offers, accounting for 35% of total interns. Of them, 29% were female students.

2022 Sustainability Report

» Disabled Employees

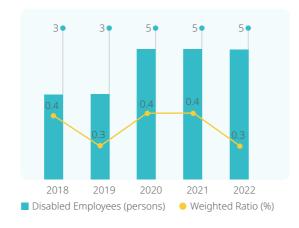
In compliance with local regulations, TSMC hired a total of 443 employees with mild or moderate disabilities, and 109 employees with severe disabilities. In light of the rapid growth of the number of employees, TSMC has also vigorously recruited disabled personnel. In 2022, the Company organized two recruitment briefing sessions for disabled personnel and added

Disabled Employees - Taiwan



job vacancy announcement channels to reach more potential talents. In 2023, TSMC expects to join forces with school resource centers and government employment service centers to increase the recruitment of disabled talents. The Company also plans to launch a workplace experience camp for disabled interns, helping TSMC in restructuring specific job positions for the disabled. Furthermore, disabled interns with outstanding performances will be hired as permanent employees. VisEra also provided vacancies for disabled candidates. However, due to the nature of job vacancies, VisEra received a dearth of suitable applicants, leading to its failure to meet minimum requirement of 1% and has paid subsidies according to legal regulation.

Disabled Employees - VisEra



Case Study

TSMC Holds Inaugural Female Career Sharing and Interview Session

World-changing innovation relies on diverse perspectives and ideas. To foster ongoing innovations in the semiconductor industry, TSMC has invested resources to proactively attract female technological talents to join the industry. In 2022, the inaugural female career sharing and interview session was held, inviting female senior executives and engineers from fields related to technology to interact with female engineering college students and graduate students through the lecture titled Explore Your Boundless Potential in the Nanometer World. Through career experience sharing, the students could understand the work and life of female employees at TSMC, as well as gain insights into their career development paths. The lecture was combined with Q&As and one-on-one interviews to help female students explore suitable jobs, as well as increase TSMC's female employment rates.

The event saw the participation of 107 students, of which 67 received one-onone interviews. Eventually, 32 people were hired, who will certainly demonstrate their expertise and confidence in the professional field of semiconductors in the future.



TSMC helps female students explore career development

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Overseas Recruitment for Special **Experts**

2022 Sustainability Report

To sustain the Company's diversified talent pool and recruit talent in special fields, TSMC continues to recruit overseas talent around the world. In terms of industry-academia cooperation, TSMC has closely maintained long-term connections with MIT, Stanford University, UC Berkeley, Tokyo University, and other prestigious universities around the world to incubate top research talents and ensure early engagement with global talents for future recruitment. In addition to recruiting semiconductor professionals in major cities in the U.S., Singapore, and Malaysia, TSMC has also expanded its scope to include European IT talents, attracting new talents via online briefings and physical recruitment activities.

Overseas Hires in Taiwan



» Assimilate Foreign Employees

To help foreign employees quickly adapt to the new environment, TSMC offers assistance for relocation and settlement including exclusive newcomer orientation, subsidies for learning Chinese, and rewards for receiving Chinese certificates, so as to encourage foreign employees to assimilate into the workplace and environment of Taiwan. In addition, TSMC also invites foreign employees and their families to join exclusive groups such as the Formosa Cultural Society and Indian Culture Research Society. The Company also holds cultural festivals such as Thanksgiving and Indian Diwali etc., to increase mutual communication. In 2022, 21 people applied for a Chinese training subsidy, and the total subsidy amount was NT\$303,737.

Overseas Hires in Taiwan - VisEra



Case Study

Advance to Southeast Asia - Expand Global Talent Recruitment

To expand global talent recruitment, TSMC visited Singapore and Malaysia in 2022 to communicate with diverse engineering talent in the local area. Three recruitment sessions and four face-to-face interviews were held to let local talent gain more insight into the semiconductor industry and TSMC. In total, 56 people participated in the interviews, and 12 accepted TSMC's offer for internships or permanent employment.

Besides recruitment activities, TSMC also visited the National University of Singapore, Nanyang Technological University, University of Malaya, and Universiti Tunku Abdul Rahman to meet with engineering professors, hoping to promote TSMC's internship program and industry-academia collaboration by strengthening campus relations, thereby establishing long-term partnerships, cultivating future talent, and introducing innovative energy into the semiconductor industry.



TSMC expands hiring of global talents to inject more innovation into semiconductor industry

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Employee Commitment

In 2021, TSMC introduced the Engagement Survey, created using WTW's High Performing Employee Experience Model as a blueprint, to systematically learn about employees' experiences at work and analyze the Company's advantages and opportunities to formulate improvement measures. In 2022, three improvement measures were completed.

2022 Sustainability Report

Engagement Survey Improvement Measures

Improvement Measures

Establish an openstyle management system and foster a workplace of mutual respect. Encourage employees to speak up and encourage management to be open to suggestions and make appropriate responses.

Unleash employees' potential, allowing them to enjoy work and learn and grow continuously to garner a tremendous sense of belonging and achievement.

In addition to cash rewards, nonmonetary incentives are also used to motivate and retain talent.

2022 Improvement Measures

Held CEO's communication meetings in Hsinchu. Taichung, and Tainan, and expanded the scope of labormanagement meetings by adding Silicon Garden Meeting to each organization. Representatives were selected through peer voting, while suggestions and ideas could be submitted anonymously through representatives.

Launched physical and online courses complemented by diverse learning resources such as internal/external learning platforms to let colleagues enjoy learning at work.

Launched WeCare Survey and regular questionnaire surveys to care about new hires. Retention interviews were also carried out for groups at risk of resignation in a bid to improve problems promptly.

Competitive Compensation Packages

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TSMC provides competitive compensation packages to attract and retain the best talent, as well as reward employee performance and encourage long-term contribution. Besides referring to market information of selected benchmark companies and compensation survey reports, the Company also reviews market information on compensation data of the whole industry for competitiveness analysis to develop the most effective compensation strategies.

TSMC's compensation package includes a base salary, allowances, cash bonuses, and profit-sharing schemes. In 2022, the average annual compensation of a newly graduated TSMC engineer with a master's degree at Taiwan fabs and VisEra was higher than NT\$2 million. The average compensation of direct laborers was higher than NT\$1 million, which is four times the minimum monthly wages in Taiwan. Compared with the previous year, Taiwan fabs experienced year-onyear growth in 2022 in terms of the number of full-time employees, average salary, and median salary.

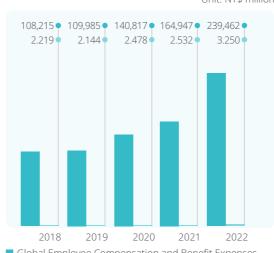
In addition to cash basis compensation, starting from 2022, regular employees of TSMC and its 100%-owned subsidiaries may participate in the Global Employee Stock Purchase Program. TSMC offers a 15% stock purchase subsidy to encourage colleagues to purchase company stocks and participate in the Company's longterm success. A total of 70% of colleagues worldwide participate in the program.

In recent years, TSMC has continued to grow in revenue and profit. The Company has increased total compensation and benefits for employees from around NT\$108.2 billion to NT\$239.5 billion between 2018 and 2022, and average compensation and benefits for every

employee from NT\$2.21 million to NT\$3.25 million during the same period. According to the Engagement Survey conducted in 2021, 81% of colleagues believe that the Company provides reasonable overall rewards and compensation. This result is better than that of global high-performance companies (67%) and hightech companies (66%) participating in WTW Global's survey, indicating that besides offering competitive compensation in the market, TSMC's rewards are also recognized by colleagues as being reasonable.

In 2022, TSMC's revenue and profit reached a new record high yet again. The cash bonuses and profitsharing schemes allocated for Taiwan fabs were valued at NT\$121.4 billion, and the annual salary adjustment for 2022 also took place as planned.

Compensation and Benefit Expenses



■ Global Employee Compensation and Benefit Expenses

Per Capita Global Employee Compensation and Benefit Expenses

Bonus

The incentive program of TSMC facilities in Taiwan is implemented over two years. Cash bonuses are paid quarterly to provide timely incentives and profit-sharing is paid annually in the following year to encourage long-term service and continuous contribution. The incentive programs of overseas regions are designed in consideration of local cultures and markets and are given out through annual cash bonuses or long-term one to three-year schemes. In 2022, the median total compensation of TSMC employees globally (excluding pension and other benefits) was approximately NT\$2.33 million, which was 1/276 of the CEO's total compensation. The median of the CEO's annual total compensation percentage increase and the annual average total compensation percentage increase was around 3.4:1.

Average and Median Compensation



Full-time Employees (persons)

Note: In compliance with the regulations set forth by the Taiwan Stock Exchange, TSMC started, in 2020, to disclose the number of full-time employees in non-executive positions, their average and median compensation, as well as respective differences in compensation from the previous year. The numbers are calculated in accordance with the regulations of the Taiwan Stock Exchange, which excludes executive officers (managers) and employees eligible for exemption. For those not employed by the Company for a full year, the data is prorated, and the profit-sharing amount is on a profit-year basis, therefore part of the compensation data is projected



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Corporate Officer Shareholding Guidelines

TSMC believes that the long-term ownership of company shares by corporate officers helps align their interests with those of all shareholders; therefore, the Company formulated the Corporate Officer Shareholding Guidelines in 2020. The required value for the Chairman, CEO, and other corporate officers' holding of TSMC shares is proportional to their annual base salary. Officers shall achieve the required value within three years of their appointment and maintain the required value for the entire period of their employment.

2022 Sustainability Report

• Executive Officer Compensation Policy

TSMC's policies, systems, standards, and structures pertinent to the compensation of executive officers are stipulated and assessed by the independent Compensation and People Development Committee, including monthly salaries, quarterly

performance bonuses, and compensation paid based on annual profit conditions. If necessary, sign-on bonuses will be offered to attract critical talent. Since 2021, TSMC has offered Employee Restricted Stock Awards for corporate executives and critical talents to link their compensation with shareholders' interests and environmental, social, and governance (ESG) performance. In 2021 and 2022, the Employee Restricted Stock Awards Rules were stipulated; please refer to 4.6.1 Status of Employee Restricted Stock in the Company's 2022 annual report. According to laws and regulations, proposals related to the compensation of the Company and executive officers must be submitted to the Compensation and People Development Committee for deliberation and forwarded to the Board of Directors for resolution. Matters requiring the approval of the shareholders' meeting will take effect after the proposed resolutions has been presented at the shareholders' meeting and a

vote has been conducted in accordance with legal procedures. In addition to the aforementioned compensation policy, TSMC also provides a retirement policy that is better than the statutory requirements of Labor Standards Act to ensure future viability of executive officers' retirement benefits. Furthermore, in response to the regulations of the U.S. Securities and Exchange Commission, TSMC will formulate a claw-back policy for the compensation of executive officers in 2023 to enhance corporate governance and ensure the Company's financial integrity.

Parental Benefits

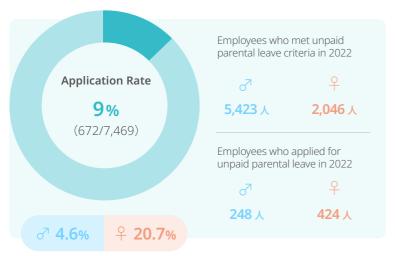
TSMC provides breastfeeding and breast milk collection rooms to support the breast milk collection needs of female employees. Besides, providing parental leave in accordance with local laws and regulations for employees after childbirth, the Company also offers a comprehensive leave

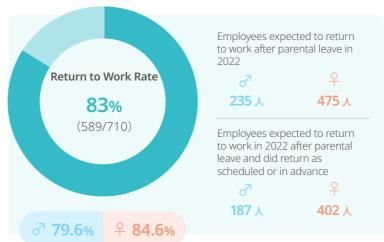
management system so that employees have flexibility in making use of their vacation days to take care of their children. In addition, TSMC launched the TSMC Child Care Benefit Program in 2022 to help employees balance their personal and work needs.

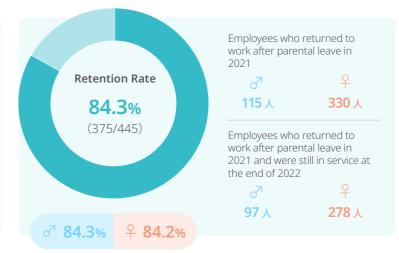
In 2022, a total of 672 employees in TSMC's Taiwan fabs and VisEra applied for unpaid parental leave. The expected number of employees to return from parental leave for the year was 710, of which 589 employees returned on time or ahead of time, achieving an 83% return to work rate. As for the retention rate after returning, of the 445 employees who returned to work in 2021, a total of 375 remained at TSMC as of the end of 2022, achieving an 84.3% retention rate.

In 2022, the number of employees in TSMC's Taiwan fabs and VisEra aged between 20 and 64 accounted for 0.43% of Taiwan's population of the same age group. During the same time, the number of

Unpaid Parental Leave in TSMC's Taiwan Fabs and VisEra - Application, Return to Work, and Retention Rate







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employees' newborns was 2,368, which was 1.7% of the total number of newborns in Taiwan, an example of the Company's outstanding benefits in mitigating the impact of sub-replacement fertility in Taiwan.

2022 Sustainability Report

Solid Pension System

TSMC established its statutory defined benefit plan and supervisory committee of labor retirement reserve according to the Labor Standards Act, and also set up its statutory defined contribution plan according to the Labor Pension Act, which was effective starting July 1, 2005. For each region, TSMC also established pension plans according to local standards and regulations. The previously mentioned supervisory committee not only holds quarterly meetings but also supervises affairs in connection with labor's retirement reserve fund. To meet legal requirements for disclosure of financial reporting and ensure sufficient funding levels, TSMC makes contributions based statutory requirement and also

engages an actuarial consulting firm to assess the valuation of the defined benefit plan. Please refer to Please refer to page 43-46 of the attached financial report in the Company's 2022 annual report for details. Thanks to the Company's sound financial condition, it is able to ensure the future viability employees' retirement benefits and solid pension contributions and payments, which encourages employees to make long-term career plans with and further deepen their commitment to TSMC.

New Employee Orientation and Retention

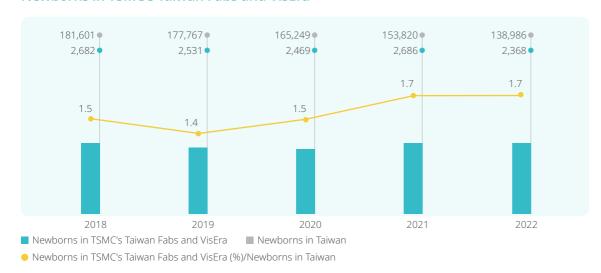
To assist new employees to retain their jobs and quickly fit into the workplace, orientation training was launched in 2022 for newcomers who have worked for at least four months but less than one year. Inspired by the theme of workplace ecology, workplace communication, and stress regulation, the physical course Success for Newcomers in the Workplace and the online broadcast Soft Power in the Workplace were launched. In total, 17 sessions of Success for Newcomers in the Workplace were conducted with 501 participants, achieving a postclass evaluation score of 97 points. For Soft Power in the Workplace, professional psychological counselors were invited to share with new employees how to regulate stress, adopt a growth mindset, as well as coping methods for challenges and setbacks based on their personal experience. Nearly 1,300 people participated in the program, achieving an average post-class evaluation score of 94 points.

In addition to training, the WeCare Survey was launched in August 2022 to help new colleagues adapt to the workplace within one year of joining the Company. The survey includes dimensions such as self-efficacy, role clarity, social interaction, and understanding of the culture. Feedback is collected regularly every month and systematically analyzed to provide necessary assistance on time. After a pilot run of five months, the adaptability assessment score of new employees increased from 7.4 to 7.9 points. Since October of the same year, direct supervisors can use the <u>online dashboard</u> to keep track of the progress of new employees. In 2023, TSMC expects to launch the online robot **Bonnie**, which can quickly answer new colleagues' guestions and help them integrate into company life seamlessly.

Maintain Healthy Turnover Rate

To ensure talent mobility and long-term growth, TSMC believes that a healthy employee turnover rate should be between 5 and 10%. In 2022, the total turnover rate was 6.7%, or 0.1 percentage points lower than that of 2021. The new hire turnover rate (<1 year) was 15.0%, or 2.6% lower than that of 2021, indicating that new employee care measures implemented in 2022, such as the WeCare Survey, new employee orientation training, etc., helped retain employees.

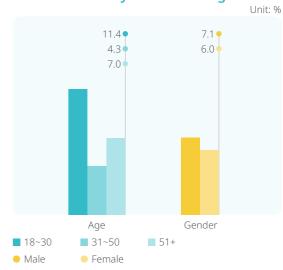
Newborns in TSMC's Taiwan Fabs and VisEra



Historical Turnover Rates



Turnover Rate - by Gender and Age





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2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements
Equip People with Future Capabilities			
Prepare employees with the skills for the future and build a talent pool	Fill over 80% of manager positions through internal promotions	Fill over 80% of manager positions through internal promotions	Filled 88.6% of manager positions through internal promotions Target: $\geq 80\%$
	Fill over 50% of vacancies through internal transfers	Fill over 50% of vacancies through internal transfers	Filled 57.6% of vacancies through internal transfers Target: $\geq 50\%$
	90% completion of the talent pipeline within three years for fab directors/directors	Review 80% of the talent pipeline for fab directors/directors	Reviewed 69% of the talent pipeline for fab directors/ directors Target: 80%
Unleash Employees' Potential and Innovation			
Enable self-learning and create positive impact to the Company and the society	Achieve an annual average of 100 hours of learning in employees	Achieve an annual average of 75 hours of learning in employees	Achieved an annual average of 69.5 hours of learning in employees Target: 50 hours
Note: In 2022, the organizational structure was adjuste	d to meet operational needs, and 88 new organizations were established, lowering the taler	nt pipeline's review rate	↑ Exceeded ✓ Achieved — Missed Target

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Employees are the most important asset of TSMC. Besides encouraging colleagues to learn constantly and unleash their talents, TSMC also emphasizes the cultivation of their skills and ongoing development. Consequently, the Company integrates internal and external resources to provide employees with a world-class workplace as well as challenging, meaningful, and interesting jobs. In addition, the TSMC Employee Training and Education Procedures have been formulated. In 2022, the TSMC Talent

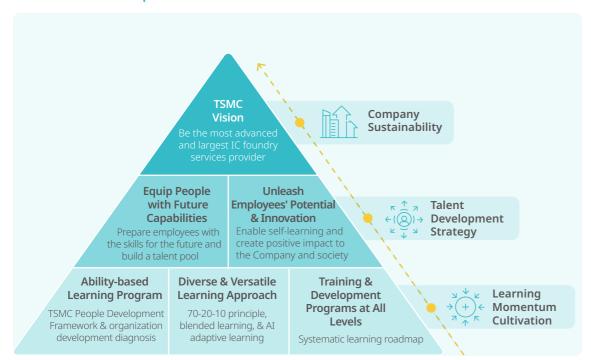
Development Model was formulated to materialize

the two major strategies of Equipping Employees

with Future Capabilities as well as Unleashing Employees' Potential and Innovation based on core attributes, in turn developing an ability-based learning program and a diverse and versatile learning approach. Complemented by various training and development programs at all levels, the Company aims to equip colleagues with capabilities that will be needed in the future in advance, actively implement comprehensive talent pipeline management, and enable employees to engage in lifelong learning with goals, plan and discipline, thereby becoming a force to uplift the society.

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TSMC Talent Development Model



Equip People with Future Capabilities

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To accommodate the needs of operational growth, TSMC values the pre-training of employee capabilities and talent pipeline management. This is to ensure that when there is a mission, positions can be filled with suitable talent immediately to support the Company's rapid development. In 2022, 88 new organizations were added and the review of talent pipeline for fab directors/directors reached 69%. Through the talent pipeline, the Company can systematically formulate a detailed talent development plan, focus on operational needs, and complete the Company's talent pool. To take fab director talent as an example, the oneyear Operations People Development Program (OPDP) emphasizes the four major learning themes of Problem Solving, Strategic Thinking, Systems Thinking, and Change Management. Through group learning, application case studies, experience sharing by vice presidents and senior fab directors, as well as mentoring and other plans, TSMC strives to enhance the knowledge of fab directors and train all-round talent. The participation rate was 100%.

In terms of manager talent pipeline management, the updated New Manager Program was launched in 2022. The program was attended by 1,255 persons, achieving a participation rate of 97% and a cumulative total of 7,300 person-times. The Operation Engineers Training Committee (OETC) also plans training for engineers with different jobs and levels, builds capability stages and learning roadmaps, and provides courses in regulations, technology, management, and personal effectiveness to equip employees with the necessary skills for future development. The program was attended by 48,000 persons, achieving a participation rate of 100% and a cumulative total of 380,000 attendees.

Ability-Based Learning Program

The TSMC Capability Model centers on the Core Attributes to define Functional Capabilities according to the characteristics of each organization. General Capabilities and Leadership Capabilities necessary for employees are also developed. These are divided into two categories, Managing Work and Managing People/Organization, and they are further divided into three levels: basic, intermediate, and advanced. This is complemented by organizational development diagnosis to offer a series of learning and development plans.

TSMC Capability Model





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Diverse and Versatile Learning Approach

2022 Sustainability Report

By applying the 70-20-10 rule, TSMC provides employees with specific development needs in three dimensions: Experience Learning, Feedback and Guidance, and Education and Training. Also, in combination with blended learning, employees are encouraged to apply the learning results to work and life in order to improve their performance and self-efficacy.

70-20-10 Rule



70%

2022 Learning and Development Activities



Feedback and Coaching



Dual track development of management and professional technical competencies

• Employees continue to accrue management and professional technical experience based on organizational needs and personal expertise to learn from work tasks and enhance their competencies

Transfers and Rotations in 2022

	Incoming	Taiwan Fabs and VisEra				
Outbound	Incoming	Hsinchu Site	Taichung Site	Tainan Site	Overseas	Total
	Hsinchu Site	7,090	268	436	36	7,830
Taiwan Fabs and VisFra	Taichung Site	301	1,165	439	69	1,974
	Tainan Site	516	151	4,733	14	5,414
Ove	rseas	20	20	15	1,507	1,562
Total		7,927	1,604	5,623	1,626	16,780

Internal Promotions, Transfers, and Rotations

Passing on organizational knowledge through internal talent mobility

- **88.6**% manager positions filled through internal promotions
- 30.5% and 26% of the transfer and rotation rates for managers and professionals respectively
- **57.6%** vacancies filled through internal transfers
- **16,780** employees transferred to new positions



Buddy System

• 12,442 new employees expedited their understanding of the corporate culture through the buddy system and continued to offer feedback and suggestions during their employment

• Employees are encouraged to learn from outstanding senior employees, who can provide them with work or personal adaptation-related guidance

Feedback and Development on Performance

• Two performance management development tools are provided (Goal Management and Individual Development Plan) to encourage employees to set goals and update progress of implementation on a continuous basis; at the same time, managers can review employee progress as well as give feedback and recognition to help both parties effectively align work and development goals



Training Program

- Provide diverse learning resources on leadership, functional, and general capabilities in accordance with job titles and expertise
- 3,708 face-to-face trainings
- **8,509** online trainings
- **2,518,073** participants
- An average of 69.5 hours of learning per employee



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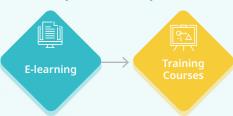


70-20-10 Rule + Blended Learning Helps New Managers Adapt to Their Jobs More Quickly

As the number of employees continues to increase along with the diversification of the workforce structure and composition, the management's responsiveness and functional development must also continue to evolve. TSMC has consolidated the 70-20-10 rule and the blended learning model to design a revised new manager

training course to guide new managers in applying it to their work via three steps. Furthermore, real-time adjustments are implemented in response to feedback to optimize management skills at work on an ongoing basis. Please refer to TSMC's Diverse Learning Models Bolster Talent Development for more details.

Three Steps of New Supervisor Training Course



2022 Sustainability Report

Step 1

10% education and training

Use the online learning platform to learn basic management knowledge before

Step 2

guidance, 10%

Learn and practice case study scenarios in the face-to face-training training and reinforce management skills through feedback from lecturers and peers

Step 2+

learning, 20% feedback and guidance

After the course. receive regular learning resources for self-study and collaborate with online learning groups to apply knowledge to work; moreover, lecturers regularly engage in oneon-one interviews and discussions with trainees

20% feedback and guidance, 10% education and training

Step 3

Practice and discuss practical management issues and adjust management skills through real-time feedback from lecturers and peers in the face-toface workshop



Step 3+

70% experiential learning, 20% feedback and guidance

Apply the acquired management skills to work, and continue to improve in response to feedback from direct supervisors: the lecturers will also continue to provide one-on-one consultation to bolster selfmanagement capability



Thanks to plenty of practical case studies, exercises, and feedback from lecturers and peers in the revised course, I can reflect and make progress. When I encounter problems, I can apply this knowhow quickly to resolve them.

Trainee

TSMC's New Manager Training Program



TSMC New Manager Training Program

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Training and Development Programs at All Levels

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TSMC conducts talent development based on the TSMC Capability Model and designs learning courses based on grade and expertise. In 2022, training and development plans for employees at all levels were completed and launched progressively.



Unleash Employees' Potential and Innovation

TSMC offers a wide range of learning resources to provide colleagues with learning content and approaches that cater to the needs of individuals and organizations, hoping to improve their work performance and self-worth and engender a positive impact on the Company and society. In 2022, faceto-face and online training were launched along with internal and external learning platforms, and employees' average annual learning hours reached 69.5 hours, an increase of 42% compared with the previous year. The total training cost was NT\$968 million, equivalent to NT\$13,000 per employee, an increase of <u>5.6 times</u> relative to the year before.

TSMC measures the outcome using the four levels of evaluation of the Kirkpatrick Model: reaction, learning, behavior, and results. In 2022, TSMC conducted reactive evaluations for all courses hosted by Organization Planning and Development Office. The course design, lecturers, administrative services, and overall satisfaction level were evaluated. Employees gave a score of 96 for their overall recommendations. In terms of course effectiveness, learning and behavior evaluations were completed for the majority of onthe-job training held at the organization level, allowing learners to understand and apply the training to work; the outcome evaluation was based on the staff performance management and development system, demonstrating the training benefits by achieving the performance goals.



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Kirkpatrick Model

Level 1

benefits

Course

recommendation:



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Level 2

 After the class. • The effectiveness of trainees evaluate trainees' learning is the course content assessed via tests, design, lecturers, practices, exercises, administrative homework, action services, and plans, etc. satisfaction with the overall course

Degree of completion of the post-course test for trainees of operational organization certification training: 82.7% Note1

The average score of the post-course test of trainees:

 After the training, the supervisors and colleagues of the trainees observe whether the trainees have applied the newly acquired knowledge to their work

Behavior

Evaluation

Level 3

98.7 points Note2

✓ Learning roadmap training program post-training assessment completion: 100 % (taking the learning blueprint training plan organized by the Operation **Engineers Training** Committee as an

example)

Filled 88.6% of manager positions through internal promotions

Outcome

Evaluation

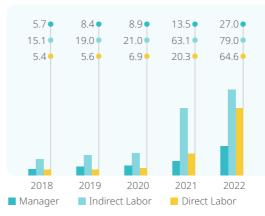
Level 4

benefits of training

Commercial

- Filled **57.6**% of vacancies through internal transfers
- Annual customer satisfaction of 83.9%

Average Training Hours per Person by Job Function



Average Training Hours per Person by Gender



Historical Training Index



Note: Starting in 2022, certified internal instructors who obtained repeated certifications will be counted only once

Note 1: Taking the degree of completion of advanced TSMC fabs and on-duty certification of the operational organization as an example Note 2: Taking the course conducted by the Organizational Planning and Development Office as an example

Diverse Learning Resources and Channels

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TSMC's growth is closely tied to the learning and development of employees. Besides education and training courses that have significant relevance to professional technology and functions, the Company applies skills as the foundation of development in order to cultivate employees' knowledge on an ongoing basis and strengthen the awareness of self-learning. Combined with the internal learning manual and external learning platform, TSMC launched more than 16,000 diverse learning resources including online micro-classes, audio-visual storytelling, reading articles, and special broadcasts for colleagues to choose from at will. In 2022, over 152,279 colleagues partook in the program, accumulating 14,413 learning hours and achieving an overall satisfaction score of 93 points for the internal learning resources.

Cultivate Internal Instructors & Excellent **Instructor Award**

Talent is one of TSMC's key strategies for bolstering its competitiveness, and internal instructors have become an important impetus for facilitating the Company's talent cultivation through the sharing of personal knowledge and experience. Established 16 years ago, the Excellent Instructor Award has recognized excellent internal instructors each year, hosting Trainer Power-Up Camp, inviting external trainers to share knowledge in the training field; at the same time, encouraging other outstanding employees to join the ranks of our instructors and share their knowledge and experience for more efficient training. In 2022, TSMC employees were trained over 300,000 times cumulatively with the help of over 1,680 internal instructors.



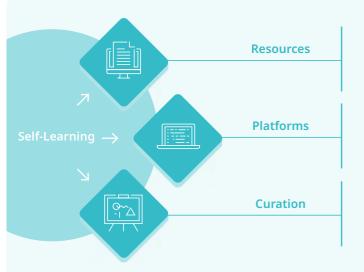
As senior employees of TSMC, we are obligated to pass on the experience and heritage to uphold TSMC's technological leadership.

> T.C. Luo Awardee of the Excellent Instructor Award



For me, being a trainer entails sharing my experience with trainees; the enthusiastic feedback of trainees enables me to examine my work and teaching from diverse angles and perspectives.

> I.W. Chen Awardee of the Excellent Instructor Award



- No. of internal learning platform resources: 600+
- No. of external learning platform resources: 16.000+
- Internal learning platform
- External learning platform
- Resource promotion (online promotion/live broadcast events)
- Extended learning resources after training



2022 TSMC Excellent Instructor Award Ceremony



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Human Rights

Enforce the TSMC Human Rights Policy Comply with the Maintain Human Rights Related Issues in all fabs Maintain Human Rights Related Issues in all fabs Maintained Human Rights Related Issues in all fabs that **United Nations Guiding** that implement the Validated Assessment Program that implement the VAP of the RBA at a zeroimplement the VAP of the RBA at a zero-missing level (VAP) of the Responsible Business Alliance (RBA) at Principles on Business and missing level Target: Zero-missing a zero-missing level Human Rights (UNGPs) to monitor material human rights issues and minimize relevant risks Optimize training and management systems to Organize a training program on TSMC Human Organized a training program on TSMC Human Rights Rights Policy: Say No to Sexual Harassment and support zero sexual harassment, zero workplace Policy: Say No to Sexual Harassment and Build Up a Friendly bullying, work hour management, human rights of Build Up a Friendly Workplace Workplace disabled employees, and proprietary information protection - Completion rate >95% - Completion rate 97% Target: 95% - 100% pass rate in post-class tests - 100% pass rate in post-class tests Target: 100% ↑ Exceeded ✓ Achieved — Missed Target

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TSMC adopts the RBA Code of Conduct and the UNGPs approved by the United Nations Human Rights Council to manage the human rights issues of its operations, suppliers, and business partners, as well as formulate the Human Rights Policy. Furthermore, TSMC abides by the local laws and regulations of the global regions in which it operates and stipulates clear implementation guidelines for various human rights concerns in an effort to minimize human rights risks.

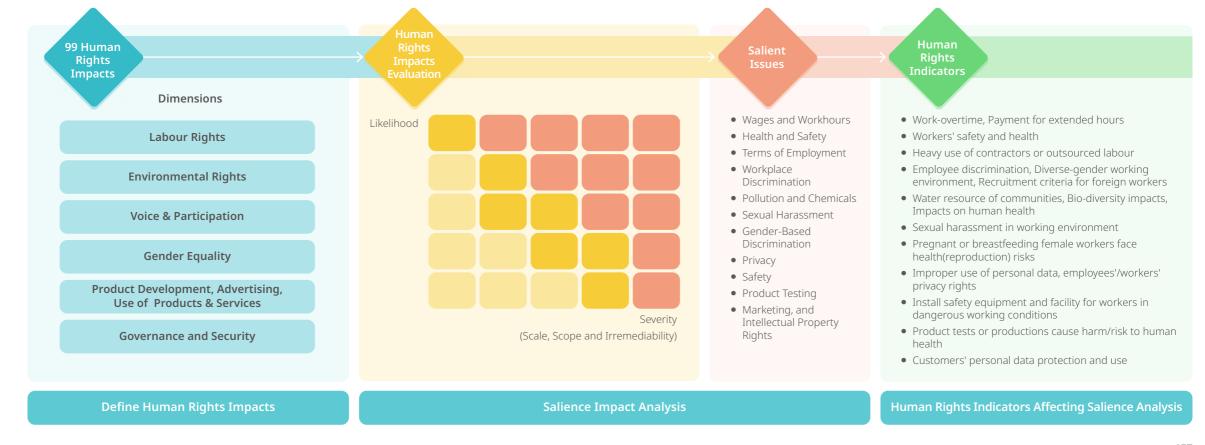
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Enforce the TSMC Human Rights Policy

TSMC regards the Human Rights Policy as the overarching principle of human rights governance and aligns with international sustainability practices. As the scope of human rights-related issues is extensive, the United Nations Development Programme (UNDP) proposed a human rights framework with six major

dimensions—Labor Rights, Environmental Rights, Voice & Participation, Gender Equality, Product Development, Advertising, Use of Products & Services, and Governance & Security—with 99 indicators. This is complemented by a human rights risk matrix to identify salient human rights issues along the two

major axes of Severity and Likelihood, as well as to evaluate the potential impact of the human rights issues on the past, the present, and the future based on the three major factors of Scale, Scope, and Irremediability.



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Overview

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In 2022, TSMC launched the survey of salient human rights issues using the UNDP's human rights framework. A total of 73 managers and colleagues participated in the identification of human rights issues; the members included ESG committee members, the heads of sustainability

2022 Sustainability Report

reports of various organizations, and ESG representatives. The importance and impact of various human rights indicators on TSMC and its value chain were measured from a crossorganizational perspective. Based on the investigation results, 11 salient human rights

issues were identified along with the targets that are impacted by the issues, including TSMC employees, employees of suppliers, employees of contractors, customers, and the community. In 2023, TSMC will use these results to build a crossunit human rights taskforce, which will follow

the UNGPs framework to conduct due diligence, perform risk investigation and assessment, implement mitigation and remedial measures, launch human rights education and training, as well as disclose human rights management progress and goals to stakeholders.

Impacted Targets

Dimensions	Salient Issues	Indicators	TSMC Employees	Suppliers' Employees	Contractors' Employees	Customers Community
QQ Labour Rights	 Wages and Workhours Health and Safety Terms of Employment Workplace Discrimination 	 Work-overtime, Payment for extended hours Workers' safety and health Heavy use of contractors or outsourced labour Employee discrimination, Diverse-gender working environment, Recruitment criteria for foreign workers 	⊘⊘⊘	⊘⊘⊘⊘	⊘⊘⊘⊘	
Environmental Rights	 Pollution and Chemicals 	Water resource of communities, Bio-diversity impacts, Impacts on human health				\odot
Voice & Participation	• Privacy	Improper use of personal data, employees'/ workers' privacy rights	$ $ \odot	\odot	\odot	
Gender Equality	Sexual HarassmentGender-Based Discrimination	Sexual harassment in working environment Pregnant or breastfeeding female workers face health(reproduction) risks		⊘⊘	⊘⊘	
Product Development, Advertising, Use of Products & Services	Product TestingMarketing, and Intellectual Property Rights	 Product tests or productions cause harm/risk to human health Customers' personal data protection and use 	\bigcirc	\odot	\otimes	\odot
Governance and Security	• Safety	Install safety equipment and facility for workers in dangerous working conditions	$ $ \otimes	\odot	\odot	

TSMC Human Rights Management System



TSMC Facilities & Subsidiaries and **Human Rights**

Operations managers on site are jointly responsible with senior executives in HR, Information Technology, Materials Management & Risk Management, and Legal. The senior executive in HR is responsible for reporting major human rights topics in TSMC to the management team.



Employees and

The HR Organization's Human Rights Operation Center is responsible for human rights topics of daily relevance to employees and ensuring the Company meets RBA or higher standards by compiling and carrying out the Measures for Human Resources Management System and the Internal Control Procedures for Human Resource Management System.



Suppliers and **Human Rights**

The IT Supply Chain Management Section of the Information Technology and Materials Management & Risk Management organization are responsible for all human rights issues related to suppliers and for managing the issues by compiling and carrying out TSMC Supplier Code of Conduct.



Overview

Sustainable Business Practices Operations and Governance Appendix

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		Targets and Actions	Risk Assessment	Mitigation Measures	Remedies	porting Channels
Provide a Safe, Healthy, and Harassment- Free Workplace	All employees Please refer to Occupational Safety and Health for more information on special hazards and health management Top 5% of employees with the highest level of	Formulate OSH Management Procedures and establish the Employee Health Management Program Meeting and Occupational Disease Investigation Committee	Investigate whether there are any occupational diseases from chemical exposure Increase voluntary participation rate for non-statutory employee health plans	 Quarterly meetings on occupational health management were held by senior executives to manage and control the <u>five major safety hazards</u> of occupational diseases <u>across departments</u> Advanced medical imaging checks every five years for new employees and non-management employees Follow-up with employees with top 5% stress levels by therapists and counseling services 	Immediate transfer from the original post Provide ample medical support Provide compensatory leave and subsidies according to laws and regulations	Occupational Disease Investigation Committee and Employee Voice Channels
	stress recorded from the employee health survey 14 incidents verified by the Sexual Harassment Investigation Committee	Formulate a Sexual Harassment Prevention Policy and establish the Sexual Harassment Investigation Committee	Case inquiry by the Sexual Harassment Investigation Committee and Ombudsman	Offered classes to prevent harassment and bullying	 Make necessary position or workstation changes depending on the situation For severe cases, the offender will be punished according to the TSMC Employee Reward and Punishment Measures 	Sexual Harassment Investigation Committee
Eliminate Discrimination and Ensure Equal Employment Opportunities	New employees, indigenous peoples, women, migrant workers, contract employees, disabled workers, etc.	Declare principles of <u>non-discrimination</u> in the TSMC Recruitment Interview <u>Internal Control Procedures</u> and offer Recruitment & Selection training courses and suggestions/reminders to hiring supervisors	Eliminate discrimination in the workplace in compliance with internal control procedures starting from recruitment	A total of 839 managers completed the Recruitment & Selection training course in 2022	Violations of the non-discrimination principle by management shall be punished according to internal policies on rewards and punishment The Recruitment Division shall re-invite candidates into the interview process	Irregular Business Conduct Reporting System
Prohibit Forced Labor and Child Labor	New employees	Comply with regulations on freely chosen employment in the RBA Code of Conduct Establish Recruitment & Hiring Measures to declare that TSMC does not employ forced labor and employees under the age of 18; detail employee rights, duties, and benefits in the Offer Letter to maintain fair and transparent employee relations	 Inquire about candidates' willingness to work during the interview Candidates must provide proof of identification for verification 	Oversaw the compliance of various procedures during employment through the prohibition of forced labor management procedures to eliminate child labor and forced labor-related problems	 Risk prevention through the regular VAP and Self-assessment Questionnaire (SAQ) from the RBA Code of Conduct If there is any evidence of forced labor, supervisors will be required to make the necessary improvements and restitute the rights to which employees are entitled 	Irregular Business Conduct Reporting System
Manage Working Time	All employees Please refer to Occupational Safety and Health for more information on the risks of overworking	Formulate Management Measures for Work Hours Procedure and build an Attendance Record System and Overtime System	Understand employee work hours through reporting channels, fablevel communication meetings, and management systems TSMC must first obtain employee consent for overtime requests and provide overtime pay or compensatory leave	 Managed and analyzed employee timesheets and provided early warnings to fab supervisors on work hour management Overall employee compensation is higher than the minimum wage and industry peers 	If there is any evidence of forced labor, supervisors will be required to make the necessary improvements and restitute the rights to which employees are entitled	Employee Voice Channels
F		Provide a <u>variety of activities</u> and clubs to enrich the concept of work-life balance	Examine participation rates	Collaborated with members of the TSMC Employee Welfare Committee and activity organizers to promote activities and encourage participation	Conduct questionnaires to make improvements in the future	Employee Voice Channels
Encourage Work-Life Balance	All employees	Offer childcare services & educational support/services	Increase quota for TSMC childcare facilities	Optimized pay structure and offered an additional seven days of paid leave to attract and retain outstanding kindergarten teachers Strengthened STEAM education at the TSMC kindergarten	 Move up the date to draw lots for the use of childcare facilities. This will allow those who did not draw a slot to have adequate time to find other childcare facilities Offer competitive compensation and benefits to kindergarten teachers 	Employee Voice Channels
Responsible Mineral Sourcing	All suppliers 0	Require suppliers to comply with and sign the <u>TSMC Statement on Responsible</u> <u>Sourcing of Minerals</u> for products containing tantalum, tin, tungsten, and gold	Establish a due diligence framework in compliance with the Model Supply Chain Policy for a Responsible Global Supply Chain of Minerals from Conflict-Affected and High-Risk Areas by the OECD	Suppliers of products containing tantalum, tin, and tungsten, and gold were required to collaborate with more than one compliant smelter	Suppliers will be asked to terminate sourcing if there is evidence of sourcing from non-compliant mines	Reporting Channels for Supply Chain Employees

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Human Rights Protection Training Programs

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In 2022, TSMC launched a wide range of human rights protection training programs on fab ESH, emergency response, first-aid training, and a friendly workplace. TSMC offered a total of 205,342.1 training hours to 70,008 employees, which was 95.7% of all TSMC employees. A total of 190,312 employees attended the human rights protection training programs. Furthermore, TSMC launched the TSMC Human Rights Policy: Say No to Sexual Harassment and Build Up a Friendly Workplace training program, which saw the participation of 63,550 employees and achieved a 100% pass rate for the post-class test.

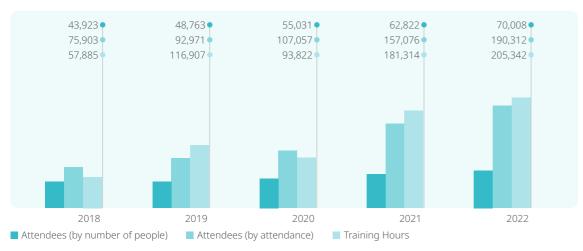
Risk Assessment & Management

As a full member of the RBA, TSMC conducts

due diligence in compliance with the RBA Code of Conduct to ensure that TSMC either meets or exceeds the standard.

TSMC uses the RBA SAQ as a template to identify the practices, risks, and management systems of the four major aspects of labor, health and safety, environment, and ethics in business operations. In 2022, all TSMC fabs in Taiwan scored 88 or more on the SAQ, which qualifies as Low Risk (85 or higher is considered Low Risk). To comply with customer requests, TSMC also commissioned a third-party institute to carry out the RBA VAP for seven TSMC fabs, which all received full marks on the VAP. The complete audit report will be disclosed to customers and related stakeholders on RBA-Online.

Human Rights Protection Training



	SAQ Assessment Scores	VAP Score				
Taiwan	2022	2016-2018	2019	2020	2021	2022
Corporate HQ	97.3 🔘	-	-	-	-	_
Fab 2	92.6 🔘	②	-	-	-	-
Fab 3	91.9 🔘	Ø	⊘	-	-	-
Fab 5	92.1 🔘	O	⊘	-	⊘	-
Fab 6	92.4 💿	②	⊘	-	-	-
Fab 8	92.1 🔘	Ø	-	-	-	-
Fab 12A	92.9 🔘	193.3	⊘	-	Ø	-
Fab 12B	92.1 🔘	⊘	-	Ø	-	②
Fab 14A	92.2 🔘	182.4	-	-	-	⊘
Fab 14B	92.9 🔘	Ø	⊘	-	Ø	-
Fab 15A	92.6 🔘	O	⊘	-	Ø	-
Fab 15B	93.4 🔘	Ø	-	-	Ø	⊘
Fab 18	92.4 🔘	Ø	-	-	Ø	-
Advanced Backend Fab 1	93.5 🔘	Ø	-	-	-	-
Advanced Backend Fab 2	93.6 🔘	Ø	-	-	-	-
Advanced Backend Fab 3	95.5 🔘	Ø	-	-	⊘	
Advanced Backend Fab 5	91.6 🔘	-	-	-	-	-
Subsidaries						
VisEra	93.6 🔘	-	-	-	-	-
TSMC (China)	93.0 🔘	⊘	-	-	-	-
TSMC (Nanjing)	91.5 🔘	-	196.5	-	-	-
WaferTech	88.7 💿	Ø	-	-	-	-

SAQ: O Low Risk (≥85) VAP: VAP: Full marks (200)

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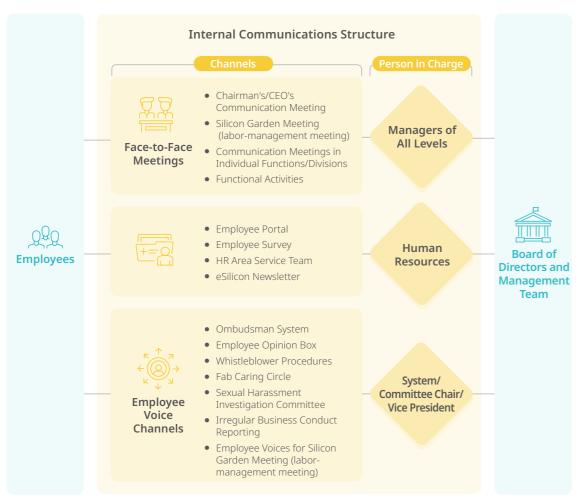
Employee Voice Channels and Case Management

2022 Sustainability Report

TSMC values employee opinions and interests. To protect the human rights of employees, TSMC has constructed a robust system for employee feedback that includes face-to-face communication meetings, employee opinion surveys, Silicon Garden Meeting, and various employee feedback channels such as employee suggestion boxes, the Ombudsman System managed directly by a senior executive appointed by the CEO, the whistleblower procedures, and the Irregular Business Conduct Reporting System available to external parties on the TSMC website. Employees may express

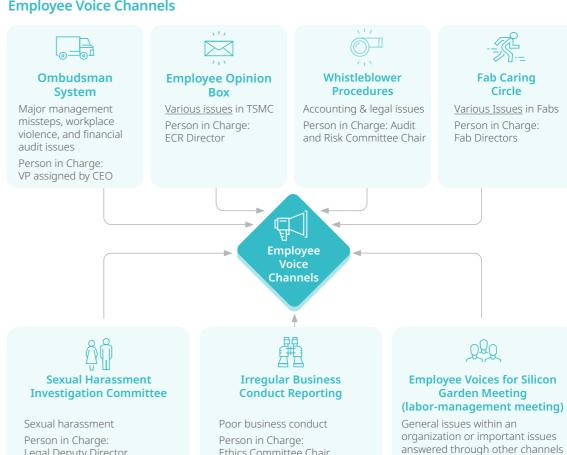
their opinions through any of the aforementioned channels, and the Company can also respond to the opinions collected as well as conduct necessary interviews and investigations.

Internal Communications Structure



Employee Voice Channels

Legal Deputy Director



Ethics Committee Chair

that must be addressed again

Each Silicon Garden Meeting Chair

Person in Charge:

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In 2022, TSMC's internal communication channels handled a total of 4.818 cases of employee opinions and complaints, including 19 through the Sexual Harassment Investigation Committee, 251 through the Ombudsman System, one through the Whistleblower Procedures, and 83 cases through the Irregular Business Conduct Reporting System. All cases reported by employees were processed and addressed immediately and confidentially.

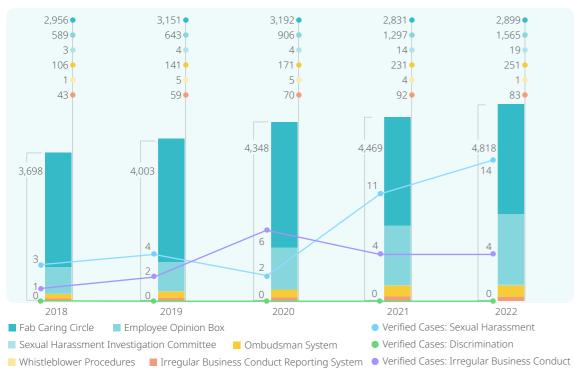
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• The Sexual Harassment Investigation Committee verified 14 cases of sexual harassment; the perpetrating employees were punished according to the severity of the situation, and the informers were offered assistance programs including but not limited to psychological counseling. As the cases involved unwanted attention and verbal/ physical harassment, TSMC has added a section on the different forms of sexual harassment and

what constitutes sexual harassment in the annual sexual harassment prevention courses. Moreover, the Company has reinforced the explanation of the new Stalking and Harassment Prevention Act in 2022, reminding employees that continuous or repeated surveillance, observation, stalking, and other behaviors constitute elements of harassment.

• There were four violations of business ethics and all employees have been punished or dismissed in compliance with the Company's regulations. TSMC continues to advocate important business ethics concepts in relevant training programs. In 2022, 67,922 employees participated in the annual business ethics and regulatory compliance training (including Personal Data Protection Act-related contents), achieving a 99.9% completion rate.

Cases Reported through Employee Voice Channels



Note 1: The figures for Ombudsman System, Sexual Harassment Investigation Committee, Irregular Business Conduct Reporting System, and Employee Opinion Box cover all TSMC facilities, while the figure for Fab Caring Circle covers only TSMC's Taiwan fabs

Note 2: Cases reported through the <u>Irregular Business Conduct Reporting System</u> are from external parties and internal employees

Freedom of Association and Labor-**Management Meetings**

To create a communicative workplace and enforce an open-style management system, offer diverse internal communication channels, and respect employees' freedom of association, TSMC fabs in Taiwan regularly host labor-management meetings for 89.9% of the Company's global employees in compliance with local laws and regulations. TSMC management appoints a representative to explain recent developments in TSMC operations to employee representatives. At the meetings, management and employee representatives discuss topics of concern in an attempt to strengthen communication between management and employees.

In 2022, to promptly listen to the voices of employees, on top of the 13 existing fabs, TSMC went beyond legal requirements and subdivided non-fab colleagues into ten labor-management meetings with Organizations as the unit. Furthermore, the labormanagement meetings were renamed Silicon Garden Meetings to bring the Company and employees closer, and electronic voting was implemented to elect representatives from various organizations. Additionally, a feedback channel for Silicon Garden Meetings has also been created, allowing employees to entrust organization representatives to voice their opinions at labor-management meetings and convey their suggestions 24 hours a day. Such information is sent to the relevant units through the system immediately for them to respond.

Long-term Commitment

To realize the Human Rights Policy, TSMC has implemented the VAP of the RBA in all fabs. The Human Rights Related Issues have reached the faultless level as well as better governance and training on zero sexual harassment, zero workplace bullying, work hour management, human rights of disabled employees, and proprietary information protection. TSMC launched new training programs on Say No to Workplace Harassment, Workplace Bullying, and Proprietary Information Protection in 2022 to educate management and employees about human rights. TSMC will also assemble a task force of experts to inspect processes and advise better practices for a concrete work plan on annual human rights protection plans from 2023 to 2030.

Occupational Safety and Health

2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Promote Safety Culture				
Advocate for a humanistic safety culture, manage	Incident Rate per 1,000 Employees: <0.20	Incident Rate per 1,000 Employees: <0.2	Incident Rate per 1,000 Employees: 0.145 Target: <0.2	↑
safety risks, and establish an intrinsically safe working environment	Disabling Injury Frequency Rate (FR): <0.3	Disabling Injury Frequency Rate (FR): <0.4	Disabling Injury Frequency Rate (FR): 0.27 Target: <0.4	↑
	Disabling Severity Rate (SR): <3	Disabling Severity Rate (SR): <4	Disabling Severity Rate (SR): 3 Target: <4	↑
Provide Comprehensive Health Management				
Prevent occupational diseases and promote comprehensive health	0 case of occupational disorders caused by exposure to chemicals	0 case of occupational disorders caused by exposure to chemicals	0 case of occupational disorders caused by exposure to chemicals Target: 0	~
management for employees	Employees with abnormal blood lipids, blood pressure, and blood sugar: \leq 11%, 13.5% and 2.5%	Employees with abnormal blood lipids, blood pressure, and blood sugar: ≦ 11%, 13.5% and 2.5%	Employees with abnormal blood lipids, blood pressure, and blood sugar: 9.2%, 10.8%, 1.8% Target: <11% \ 13.5% \ 2.5%	↑
	Employees with reported high-stress levels: <9%	Employees with reported high-stress levels: <9%	Employees with reported high-stress levels: 8.1% Target: <9%	↑
Build Internal- External Alliance				
Collaborate with external parties to establish a safer working environment across the supply chain	Assist all high-risk contractors to obtain ISO 45001 certification for occupational safety and health management system ^{Note}	Assisted 75% of high-risk contractors to obtain ISO 45001 certification for occupational safety and health management system	Assist 65% of high-risk contractors to obtain ISO 45001 certification for occupational safety and health management system Target: 65%	✓
Note: The number of contractors engaged	in <u>high-risk operations</u> increases each year, hence TSMC will continue to offer assistance		↑ Exceeded ✓ Achieved — Missed Target	

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TSMC upholds the mission of Safety and Zero Accidents to monitor safety and health topics, develop digital disaster prevention measures, as well as control and monitor safety and health-related risks through artificial intelligence to build the best healthy workplace. Internally, the Corporate ESH Division is responsible for formulating the companylevel occupational safety and health management strategies and targets. Through a clear division of labor between various organizations within the Company, the division is in charge of promoting safety and health at all levels. Furthermore, the Occupational Safety and Health Committee convenes regularly to make sure safety and health management control are implemented in different fabs in a bid to promote

the fab-level environmental

safety and health policy

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the health of workers. Externally, the Company collaborates with industry, government, academia, and supplier/contractor partners to prevent and lower the impact of occupational disasters, as well as to improve the safe and healthy work environment of the industry chain.

TSMC's Fab 12B Phase 8, Fab 18B Phase 1 to 3, and Advanced Backend Fab 6, which were completed in 2021, obtained ISO 45001 certification for occupational safety and health management system and TOSHMS certification in 2022. The remaining fabs and TSMC (China), TSMC (Nanjing), WaferTech, and VisEra have all obtained ISO 45001 certification. At the same time, fabs in Taiwan will apply for

response of leased or

borrowed fabs or offices

separate TOSHMS certifications, where workers are requested to observe the management regulations through the management system. In response to the continuation of the COVID-19 pandemic, pandemic prevention policies including stringent access control, reporting, and rapid case investigation mechanisms were proposed to reduce manpower and case investigation time, as well as to control group activities. Furthermore, benefits such as employee vaccination or family care leave were established, and a group operation model was adopted based on the content and needs of the work involved. During the peak period of the pandemic, the maximum singleday manpower loss was controlled below 2.9% to maintain normal operations.

In 2022, the number of contractors visiting TSMC reached a new record of 49,628 people per day. In light of the improving pandemic situation and to commend outstanding contractors, supervisors, and industrial safety personnel, TSMC hosted a Communication Meeting for ESH Supervisors of Contractors. Moreover, the latest revision of the Blue Book for Contractors' Safety, Health and Environmental Protection was published to help contractors further understand safety and health codes, so as to strive towards the target of "zero incidents and zero occupational accidents."

Internal Control for Safety and Health All Departments Collaboration and Execution Health care Early warning for **Wellness Center** occupational diseases • Employee assistance Advance health promotion Health promotion **Facility Department** • Construction Site Guidelines for Behavior-based Safety Promote health and • Environmental Safety Management on Construction Sites safety measures at • Construction site epidemic prevention & management new facilities Prevent <u>physical</u>, chemical, Convene quarterly fab-level Fab-level Industrial Occupational Safety and Health ergonomic, and work-related Safety and diseases in the fabs Committee meetings **Environmental** Assess and improve safety and Manage contractors **Protection Division** health-related risks Assist subsidiaries in developing Promote safety and • Formulate job hazard analysis, regulations for environmental health-related exposure assessment, and safety and health and set activities control-related measures execution targets Formulate and promote fab- Spearhead fab-level Support the emergency related matters according to

occupational disease

health promotion

prevention investigation and



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Safety and Health Measures

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Safety and Health Mea	isures	SPI	Taiwan	Overseas	VisEra
Measures	Safety and Health Efforts in 2022	Indicator	Fabs	Fabs	
Regulatory Updates	 Kept up to date with the latest regulations, tracked compliance in all fabs, and issued 11 changes to safety and health regulations In response to demands for overseas expansion, new facilities for the U.S. and Japan are currently in the construction stage. A regulatory database of U.S. federal/state laws and Japanese laws is being compiled and overseas legal counsel is hired 	~	~	Note 1	~
Standardized Management Procedures	• Continued to gather opinions from relevant workers every year and reviewed and revised 56 management processes	~	~	~	~
Safety and Health Education	 Continued to promote safety and health training to ensure all employees and contractors have passed related training. Training records are digitalized for record-keeping to comply with safety and health regulations and emergency response needs. Operators of hazardous operations have obtained licenses to operate in compliance with relevant laws Note 2 Digitized 59 safety and health management programs and introduced the training/teaching materials on the cloud platform for management, thereby comprehensively improving the professional skill of dedicated safety and health engineers NEW Three dangerous operations including wall demolition, high-pressure waterjet, and electricity opening were added to the contractor's industrial safety certification training program NEW All of TSMC's workers have completed hazard notification/education Newly added hours of emergency response training and safety and health education for middle-aged and elderly workers to enhance their safety awareness. All training programs are included in the annual compulsory program, and the electronic personal learning blueprint is utilized to track their completion rate NEW 	~	~	~	~
Hazard Identification and Assessment	 Conducted workplace hazard identification, safety and health management plans, workplace analysis, workplace observation and operational safety analysis, and health management analysis for employees and contractors. All identified risks were classified into different risk levels for future management, tracking, and monitoring to control, prevent, or reduce hazards and risks; 32,874 cases of hazard assessment were carried out Note 3 	~	~	~	~
Procurement Management	 Continued to reinforce the fire protection of wet process machines. It is clearly stipulated in the machine procurement specifications that machine cavities must be made of non-flame retardant materials to minimize smoke damage caused by the burning of plastic materials and the risk of fire spreading in the event of a fire NEW. Formulated safety procurement regulations for auxiliary equipment such as step stools 	~	~	~	~
Change Management	Completed 5,069 cases of change management with zero related incidents	~	~	~	~
Chemical Management ^{Note 4}	 All new chemicals underwent safety review processes before entering facilities. In 2022, 231 chemicals were evaluated and introduced with zero related incidents and without introducing any IARC group 1 carcinogens Inventoried and integrated the Chemical Management System, consolidated chemical flow and personnel exposure risk tracking, and developed a chemical safety data sheet review system in Taiwan/China/U.S./Japan that allows for searching chemical labels that comply with local regulations in the electronic system NEW NEW 	~	~	~	~
Tool Management	 Evaluated and introduced 198 new tools with zero related incidents Completed the testing of all ionizing radiation-exempt control machines at TSMC, and established a control process Devised a safety and health management process for machine components to be cleaned, machine auxiliary equipment pipelines, and scrapped components NEW 	~	~	~	~
Contractor Management	• Contractors engaged in a total of 638,655 constructions in the fabs, of which 62,608 were high-risk operations	~	~	~	~
Compliance Audit	Internal audits revealed 2,279 shortcomings, which were corrected within the specified time	~	~	~	~
Emergency Response	 Created a cross-fab CCTV platform in Taiwan and a phone application that utilizes the emergency digital evacuation and roll call system. In the event of an emergency, other fabs can assist in emergency response via the monitor screen Due to the greater difficulty of putting out EV fires, EV parking area safety regulations were stipulated, charging piles were removed from the underground parking area, fire blankets were installed in various fabs, and emergency response procedures were created NEW 	~	~	~	~
Occupational Injury Prevention	Continued to hold investigative meetings to analyze employee occupational injuries and horizontally apply the improvement measures to all fabs in the hope of reducing accidents		~	~	~

Note 1: In response to the construction of the fabs in Arizona and JASM, it is planned for the regulatory updates platform to expand the Japanese regulations, and the plan will be extended to 2023

Note 3: <u>Hazard Identification and Assessment</u>: Foster a safety culture where employees and the Company protect each other and encourage employees to speak up and offer suggestions for occupational safety. <u>Classification management</u> and tracking are used to control, prevent, or reduce hazards to cultivate a friendly and safe workplace

✓ Completed Ongoing

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Promote Safety Culture

Following the TSMC Safety and Health Policy, TSMC has implemented the following health and safety measures and used the Safety Performance Index (SPI) to track performance. TSMC has strengthened

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employees' safety and health awareness through training, hoping to minimize the impact of unsafe environments or conduct. An analysis of employee disabling injury statistics reveals that

most injuries are caused by insufficient safety awareness and failure to implement management regulations. To enhance safety culture, experts were commissioned to conduct a safety culture

investigation in 2022, helping to identify the direction and improvement measures.

Case Study

Discover Opportunities for Continuous Improvement through the Safety Culture Investigation

Safety culture is the consensus among workers on safety awareness, emphasis, and belief in the workplace, and it is also the foundation of a safe and healthy workplace. In 2022, TSMC commissioned a professional international safety culture consulting firm to design a questionnaire based on four aspects: teamwork, safety communication, safety values, and organizational trust. Focusing on plants with "a disabling injury frequency rate and a disabling severity rate that have fallen below the Company average" for three consecutive years, a frontend wafer processing plant and a backend chip packaging plant were chosen via sampling. The survey targets included colleagues of production and non-production units, covering different genders, age groups, seniorities, and grades; a total of 2,568 questionnaires were sent out, and 1,776 valid questionnaires were retrieved, resulting in a response rate of 69.2%.

According to the analysis outcome, TSMC's safety culture was given a score of 4.8 points, indicating the Company is transitioning from being "compliant" to "incorporating safety awareness into our values". The top three topics of concern among the colleagues were "intrinsically safe work environment, comprehensive and transparent safety-related reporting procedures, and a team culture of looking out for each other". The most recognized measures were "feeling the management's high level of safety concern, quick adoption of improvement measures, ongoing work environment optimization, and understanding the importance of employees' physical and mental health" The least satisfied aspects were "the supervisor fails to proactively communicate safety-related topics, the employees believe that they do not have the proper ability to cope with management-related contingencies, the Company is advised to provide more safety awareness training."

To respond to the colleagues' topics of concern, the emphasis in 2023 will be placed on "reinforcing employees' day-to-day safety awareness, safety communication, and developing diverse safety awareness

training." Corporate ESH Division will identify potential risks in the workplace and design bespoke safety and health training programs; design Safety Moment programs to train seed personnel from various units; publish new safety-related knowledge every month to elevate everyone's safety awareness; demand various departments to hold monthly workplace safety and health-related problem discussions, where the seed personnel will report improvement suggestions back to the Corporate ESH Division in a bid to establish a company-wide safety culture.

Five Steps to Launch a Safety Culture Investigation



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Safety Performance Index

TSMC Safety Performance Index (SPI) is classified into four levels, including active and passive indices. The active indices encourage employees to participate in health and safety activities while the passive index shows the number of safetyrelated failures, false alarms, etc. To implement the improvement measures for the prevention of false alarms, if the same false alarm occurs repeatedly in the same year, additional points will be deducted from the SPI. In 2022, bluelight indices (excellent) increased by 10.1% from 2021 to 86%. The main improvement in the passive indices was reflected in the decrease in false alarms from 28 incidents in the previous

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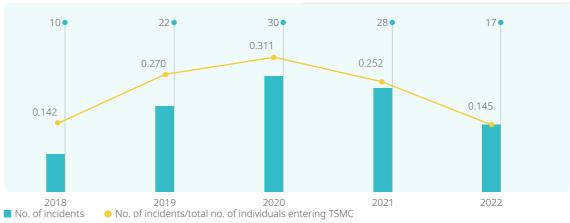
years to 17 incidents this year, and the incident rate per 1,000 employees was reduced to 0.145 from 0.252 in 2021. When a false alarm occurs, in addition to applying the 3L5W (Three-Legged Five Whys) Tool to conduct an investigation, the Company also interviews relevant personnel, analyzes and inspects the equipment, and tests the materials using the false alarm reporting and investigation procedure. Relevant documents and records are checked, or the scene is reconstructed to identify the direct, indirect, and fundamental cause of the incident to actively discover improvement opportunities and prevent similar incidents from occurring again.

Safety Performance Index Chart



Note: Data includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), TSMC Japan 3DIC R&D Center, WaferTech, and VisEra

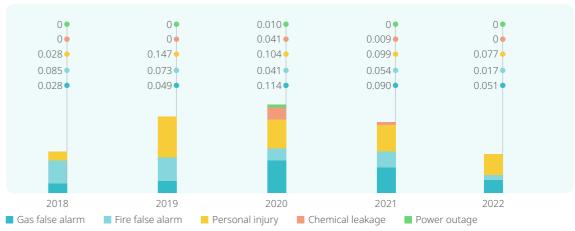
Historical Incidents



Note: Starting from 2020, the incident rate per thousand individuals entering TSMC includes employees and contractors. Employee calculation includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), WaferTech, and VisEra; contractor calculation includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra

Historical Incidents by Type

Unit: Number of Incidents / % Per Thousand Employees



Note: Historical incidents by type per thousand individuals entering TSMC include employees and contractors. Employee calculation includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), WaferTech, and VisEra; contractor calculation includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra



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Reduce Fire Alarms

Two false fire alarms were caused by the activation of a machine's CO₂ warning system; one fire alarm was caused by an aging heating element of the cleaning tank; one incident of a static electricity-induced fire caused by the use of flammable chemicals on the machine

Improvement Measures

- The safety design of the cleaning tank must include low-liquid level detectors and overheat detectors that are not controlled by the process. When the detectors are activated, they should be able to automatically turn off the heater; when the overheat detector circuit is open and faulty, it should be regarded as an alarm, and the heater is automatically turned off. This regulation has been included in the machine procurement and safety inspection standards, and new machines must pass the safety inspection before they can be used
- Static protection for valves using chemicals



Reduce Gas Alarms

Three incidents were caused by damaged gas early warning alarm components, and three incidents were caused by workers who did not observe the gas cylinder replacement procedures. In all **SiX** incidents, the special gas was shut down immediately after the gas early warning alarm was triggered, hence it did not leak into the environment to cause personnel casualties or environmental pollution

- Record gas cylinder changes with 5G cameras, require on-site personnel to conduct steel cylinder replacement training every guarter to strengthen compliance with SOPs and operational proficiency
- To increase the safety of changing gas cylinders containing hazardous gases, in 2023 TSMC will develop VR environments or objects that are combined with visual effects and auditory information to improve the operational proficiency of on-site workers through gesture interaction and understanding intention



Reduce Injuries

Nine injuries were mainly caused by contractors' unsafe conduct such as lack of safety awareness or failure to follow SOPs

- Construction site safety management is conducted through the three strategies of risk identification, management support, and execution review. The digital transformation of occupational safety and health training is implemented, where <u>relevant</u> programs are launched by the TSMC Supplier Sustainability Academy. In particular, high-risk operation contractors must complete 100% of the training before entering the fabs to begin construction. As of December 2022, 21 occupational safety and health programs were completed by more than **200,000** people
- To bolster contractors' safety awareness, the TSMC Contractor ESH Bluebook was converted into an audio book, and the operation safety management regulations for mechanical equipment including threading machines, sheerleg cranes, and suspended cages for window cleaning were added
- Interactive promotional safety awareness animation videos were produced for the cleaning personnel, which include examples of unsafe operations and unsafe environments to improve learning results
- Unsafe environments prone to injuries and falls were improved by installing safety signs on the aisles to minimize the risk of tripping; warnings and warning lines were added on the edges of the dock area to remind people of falling risks



TSMC conducts hazardous gas leakage response drill through Virtual Reality (VR)



TSMC builds VR room for compound disaster simulation training to enhance resilience

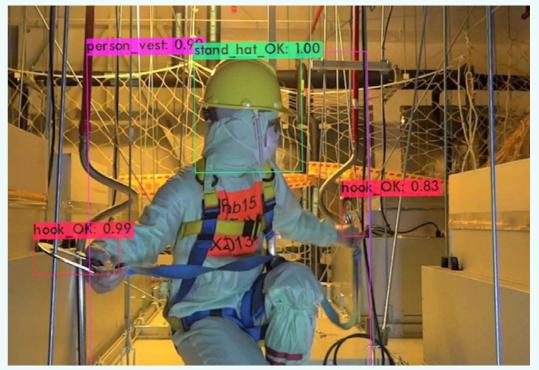


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Artificial Intelligence (AI) Job Hazard Analysis Technology Enhances Workplace Safety

To enhance the implementation of the construction personnel's safety regulations, minimize inattention-related occupational disasters, and improve inspection manpower allocation and timeconsuming problems, TSMC has joined forces with National Chung Hsing University's Department of Management Information Systems in 2021 to develop Artificial Intelligence (AI) Job Hazard Analysis Technology, integrating existing emergency response 4G cameras in the fabs with a wired or wireless network to transmit live images, apply intelligent identification technology to identify environmental and operational risks, as well as integrate big data computing and machine learning to monitor high-risk workplaces. The Emergency Response Center personnel can monitor safety blind spots via live images around the clock. When construction workers operating in highrisk areas exhibit unsafe behaviors or find themselves in an unsafe environment, text messages or the public address system can be used to report the problem to TSMC project managers and Emergency Response Center, demanding the contractor to make immediate improvements. The contractor may only resume construction after it has passed re-inspection.

In 2022, the AI job hazard analysis technology was used in Fab 15A to monitor 1,402 ceiling operations, where three unsafe contractor behaviors were discovered in time during the test process to prevent occupational injuries. Besides the ceiling, AI job hazard analysis technologies will be developed for other high-risk workplaces. The technology will be introduced to various fabs, and it will be standard equipment for new fabs. Considering the diverse applications of AI technology, TSMC formed an internal image recognition development and review platform in 2022 to consolidate all AI image recognition system developments. Units with image recognition needs can search and utilize the application resources that have already been developed on this platform to expand the scope and depth of disaster prevention technology.



Ceiling AI Image Recognition



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Statistical Analysis of Disabling Injuries among Employees

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Disclosure of occupational accidents is based on the Occupational Safety and Health Act and important disabling injury indicators issued by the Global Reporting Initiative (GRI), which uses Disabling Severity Rate (SR) and Disabling Injury Frequency Rate (FR) as primary indicators. In 2022, there were 35 disabling injuries among employees with 385 workdays lost. Of these, 21 cases of disabling injuries among men resulted in the loss of 251 workdays, and 14 cases of disabling injuries among women resulted in the

loss of 134 workdays. The employee injury rate was 0.05%. Men suffered from a higher number of work-related disabling injuries and workdays lost than women. The types of injuries were mostly falls and impact injuries, mainly caused by accidental collisions due to poor route design or failure to pay attention to people in front when using trolleys; or tripping injuries caused by the improper placement of materials when conducting machine maintenance operations.

Improvement Measures

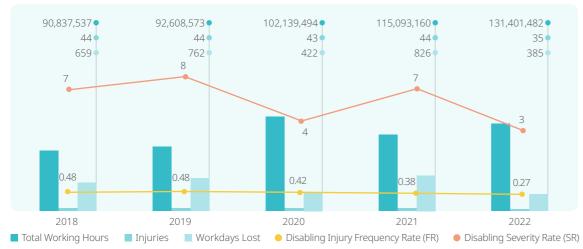


Mostly caused by colleagues using trolleys in the 6" and 8" fabs. Therefore, trolley routes and placement locations continue to be planned according to the operations involved, reflectors are installed in areas prone to collisions, and colleagues who voluntarily report incidents are rewarded. Unsafe environments were improved and quarterly communication meetings were conducted in the manufacturing department to promote preventive safety awareness using different themes. In 2023, trolley operation-related training videos will be recorded to improve learning performance



Mostly caused by missing a step in the clean room or tripping over objects during machine maintenance. Consequently, the <u>6S standard</u> for maintenance processes has been formulated, including guidelines for placing relevant components, materials, and covers during machine maintenance, as well as rules for fixing extension cords and trolleys. In addition, specifications for the steps on the machines in the clean room and the regulations for using them have also been defined

Total Working Hours, Injuries and Working Days Lost



Note 1: According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate (FR)/Disabling Severity Rate (SR) are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dust, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered work injuries

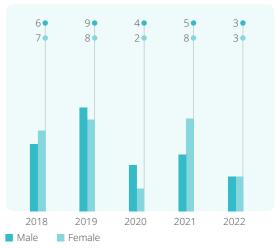
Note 2: Data includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra

Disabling Injury Frequency Rate by Gender

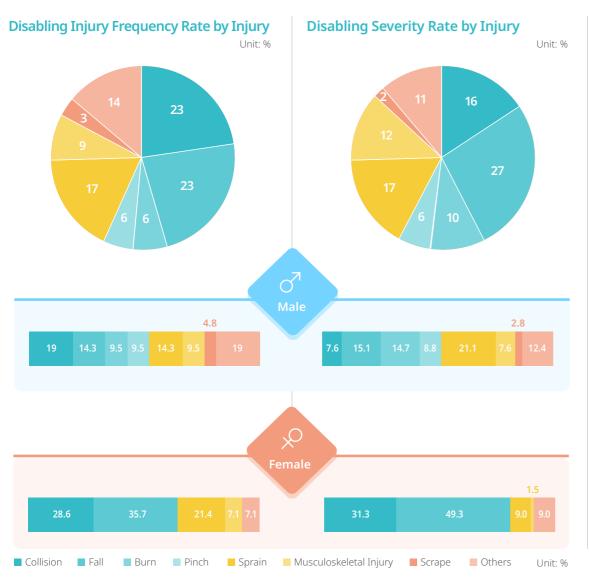


Note: Data includes TSMC fabs in Taiwan, TSMC (China), TSMC (Nanjing) and VisFra

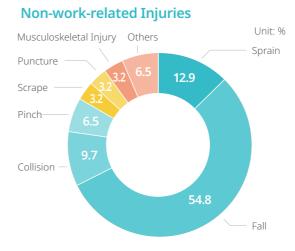
Disabling Severity Rate by Gender



Note: Data includes TSMC fabs in Taiwan, TSMC (China), TSMC (Nanjing) and VisFra



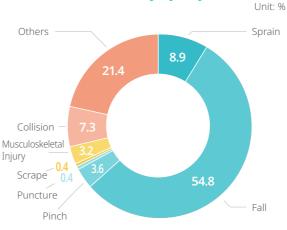
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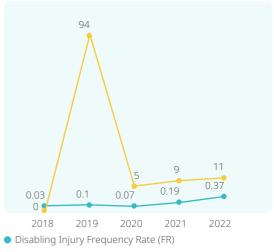
Statistical Analysis of Disabling Injuries **Among Contractors**

In 2022, the contractor disabling injury frequency rate (FR) and disabling severity rate (SR) were higher compared to 2021. This was mostly attributed to unsafe behaviors such as a lack of safety awareness or failure to follow SOPs. Please refer to the Safety Performance Index for relevant improvement measures.





Disabling Injuries in Contractors



Disabling Severity Rate (SR)

Note: Data includes fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra







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Provide Comprehensive Health Management

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TSMC's comprehensive health management encompasses worker health promotion, health check-ups, care, and occupational disease prevention. These measures aim to control the work environment and personnel health risks to attain a work-life balance. To protect the physical and mental health of employees, TSMC has hired professional medical staff including 2 physicians, 122 nurses, and 7 psychologists in the fabs in Taiwan and China. A total of 1,743 services were provided by contracted labor health physicians.



Health Promotion

- Held online health walk challenges and weight control competitions, which saw the participation of 15,260 and 6,693 people, respectively. Healthy diets for nearly 100,000 people per month
- Held health expert lectures to share sports/sleep/nutrition-related topics and provided individual consultation for **32,977** participants
- Provided sports arenas, gyms, aerobics classrooms, ball courts, and diverse courses for 133,391 employees and their families



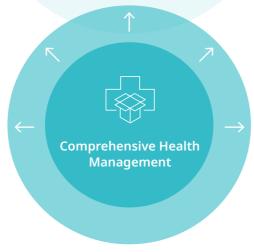
Health Check-up

- Physical examinations for **12,666** new employees
- Annual regular health check-ups for **63,719** people
- Special hazardous operation health check-ups for **6.883** people
- Advanced employee health check-ups Note 1 for **46,672** people
- Manager health check-ups for **3,567** people
- 37,468 people came to the fabs to receive self-paid health check-ups
- Free oral cancer, colorectal cancer, breast cancer, cervical cancer, and hepatitis B/C screening for **2.567** construction site contractors Note 2



Caring and Care

- Nurses cared for **33,209** people diagnosed with COVID-19 by phone
- Provided **2,901** employees with psychological/legal/financial consultation services
- Provided **2,041** employees who came to Taiwan for training with health management and medical care assistance
- 18,705 visits to dental clinics in Taiwan and China
- 24-hour emergency medical treatment and follow-up for 872 people



Note 1: For further details, please refer to Advanced Employee Health Check-up and Follow-up Care

Note 2: For further details, please refer to TSMC Launches Health Check-up Program on New Construction Site, Safeguarding the Health of Contractors



Health Risk Management

- General and special operation health checkup report tracking abnormal conditions for **22,713** people
- Respiratory assessment for **17,258** people
- Maternal health management for 890 people
- Prevention and management of cerebral and cardiovascular diseases for 6,511 people
- Post-injury/illness reinstatement evaluation for 519 people
- Domestic and overseas business trip pandemic prevention for 985 people



Occupational Disease Prevention

- Prevention and management of ergonomic musculoskeletal diseases for 277 people
- Physical/chemical exposure disease prevention and grading management of special hazard operation personnel for **2.699** people
- Social and mental disorder prevention and individual care for 1,438 employees who felt high-stress levels after a health check-up
- Biological disease prevention for 5,507 people



TSMC implements occupational disease prevention and actively promotes employees' health and well-being



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Case Study

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Advanced Employee Health Check-up and Follow-up Care

According to the World Health Organization's statistics on the top ten causes of death, cerebrovascular diseases, heart diseases and cancer are the primary causes of disability and death. To enhance employees' health care, besides implementing health checks that comply with laws and regulations in TSMC fabs in Taiwan and Nanjing, the Company also collaborated with

hospitals in 2022 to provide employees with advanced imaging examinations for cerebrovascular disease, heart disease, cancer (intestine/lung/breast), and other diseases by applying a standard that is superior to regulations, hoping to adopt a more proactive approach to detect abnormalities in advance and assist employees to receive early treatment. Moreover, the

inspection results are combined with personal work hazards and applied to the physical and mental health management plan to actively mitigate employees' health risks. In 2022, 46,672 people received health check-ups, and for those who have abnormal results, all immediate assisted them back to hospitals for recheck and further treatment.

Category	Measures	Subject/Frequency	Detail information	Number of People Who Completed Inspection (Inspection Completion Rate)
	Colorectal cancer: stool occult blood	All employees at TSMC fabs in Taiwan and TSMC (Nanjing) / Annually	The screening service is provided regardless of age to facilitate early detection and treatment	32,184 (47%)
Cancer screening	Breast cancer: Female employees over the age of 40 at TSMC fabs in Taiwan/Annually		The service is provided five years earlier than the one offered by the NHI (age 45 or above)	2,383 (28%)
	Lung cancer: chest CT scan	All employees at TSMC fabs in Taiwan 1. At the time of employment	Facilitate early detection and treatment	6,102 (88%)
	FCG	Every five years for existing employees	racilitate early detection and treatment	4,777 (91%)
Cerebrovascular disease imaging examinations	Cardiac/ carotid echo Cardiac CT for calcium scoring	High-risk group of cerebral and cardiovascular disease	The screening results are incorporated into the cerebral and cardiovascular disease prevention program, where a physician will conduct an overall health risk assessment and follow-up management (please refer to the Prevention Measures Against Occupational Diseases & Achievements - Social/Mental Factors)	1,060 (75%)



TSMC provides advanced imaging examinations for cerebrovascular disease, heart disease, and cancer in a manner superior to regulations

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Comprehensive Health Care Service to Look after the Health of Contractors and Partners

In 2022, TSMC's safety and health management measures were extended to all workers including employees, contractors, suppliers, and construction site contractors. Furthermore, two major measures Environmental Safety Protection and Labor Physical and Mental Care were implemented for work sites. First of all, technological tools were introduced to manage construction site safety and address environmental risks, and prevent personnel from being exposed to unsafe environments. Second, the emphasis is on people, where health and screening services have been extended to construction sites, and a care group has been formed to protect the safety and health of contractors in the fab construction.

Five Major Health Care Actions for Contractors on Construction Sites



Provide Vaccination Service

• Provide contractors in the construction area with influenza vaccination service



Health Management System

• Use the "health management system for high-risk construction groups" to identify personnel with high-health risk. Integrate access control, work order, and health database to monitor personnel work status



Follow-up Care

- TSMC, Safety Management Center resident nurses, and industrial safety personnel of the main contractor form a caring group to offer onsite care
- Evaluate the personnel's type of work and work environment, provide care for middle-aged and elderly workers and disadvantaged workers, measure blood pressure, and promote health education



On-site Physician Service

- On-site health service by "occupational medical physicians"
- Provide professional services for the four major labor health protection plans



Free Health Check-ups in the **Construction Area**

- Provide oral cancer. colorectal cancer. breast cancer, cervical cancer, and hepatitis B/C screening
- If precancerous lesions or cancer are discovered, the on-site medical team will assist contractors and partners to seek medical treatment



On-site health service by occupational physicians



On-site care service by resident nurses

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Prevent Occupational Diseases

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TSMC remains committed to building a safe and healthy workplace where each task is assessed repeatedly through risk identification. Furthermore, the Company collaborates with occupational disease physicians and external experts by following the disk identification method to uncover five major potential risk factors of occupational diseases (chemical, physical, ergonomic, biological, and social/mental) and design preventive measures accordingly.

Prevention Measures Against Occupational Diseases & Achievements



Ergonomic

On-site Visits with occupational physicians

Existing Measures

- Arranged occupational physicians to visit loading sites at TSMC fabs in Taiwan
- Used computerized ergonomic risk assessment systems to identify operations with high ergonomics risks
- Conducted an investigation in 2021 of the departments where many people in the same unit have applied for leave due to muscle ache to determine if the operations involved ergonomic risks
- Conducted health surveys and track employees who applied for pain relief patches, and reached out to and arranged meetings with occupational physicians for employees on leave for musculoskeletal pains

Achievements

- Arranged 19 occupational physician on-site visits, achieving a 100% improvement completion rate
- Employees affected by soreness were cross-checked with the computerized ergonomic risk assessment system; **none** were found to be working in areas with ergonomic or potential ergonomic risks
- A total of **eight** units had more than three people apply for leave within the same unit due to soreness in 2021; they were deemed to be at low risk after on-site visits and evaluations were carried out
- 198 employees were impacted by soreness and participated in the ergonomic risk exposure survey; one employee was assisted with suspected ergonomic risk factors to make work adjustments
- Three people continued to use pain relief patches to treat body aches in the same location; an evaluation by an occupational physician determined that the illness was unlikely to be work-related, and the wellness center provided health education to help mitigate their discomfort



Establish an exposure assessment model to manage the use of chemicals

- Re-evaluated the suitability of all chemical operation-related PPEs
- Evaluated PPEs that meet safety protection and comfort requirements for colleagues to choose
- Collaborated with Distinguished Professor Peng-Jy Tsai from National Cheng Kung University to confirm the justifiability of the work environment monitoring plan implemented by each fab every six months
- Implemented direct-reading instruments (TSI AM520) in conjunction with 4G cameras to monitor dust conditions in chip crushing operations

- Chemical management: Please refer to <u>TSMC's chemical management procedure</u>
- Re-evaluate chemical work stations involving manual labor at 148 laboratories annually to confirm that there are zero risks of chemical exposure
- Based on the analysis of chemical exposure risk and the frequency/nature of the operation, approximately 4% of the contractors may be exposed to high health risk substances (carcinogens, mutagens, and reprotoxic substances); 10 such incidences were observed
- Continued to arrange occupational physicians to assist contractors in the fabs to conduct on-site surveys and identify chemical exposure risks in the workplace
- Requested contractors with abnormal special health check-up results to voluntarily report them to TSMC

- 100% confirmation of the suitability of PPEs for chemical operations
- Completed the assessment of **five** types of PPE, including powered air purifying respirators, eye protection safety glasses, and hearing protection earmuffs
- Established a work environment measurement plan to ensure the effective implementation of the work environment measurement
- The chip casting area was improved according to the monitoring results of chip crushing operations to reduce the risk of dust emission
- 0 case of occupational disorders caused by exposure to chemicals

- Confirmed that all chemical-related tasks in 148 laboratories are performed inside fume cupboards with zero health risks to operators
- Confirmed that 10 work sites where contractors may be exposed to high health risk substances comply with safety and health management regulations; in addition, the sites are equipped with good ventilation, and protective equipment is worn by workers, hence there are no exposure concerns
- Ensured that the personnel working inside TSMC fabs do not have any health concerns about chemical exposure
- Received 0 cases of unusual results for the special health check-up



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Social/Mental

2022 Sustainability Report

Enhance the cerebral and cardiovascular disease prevention and management program

New Measures in 2022

• Flagged those with abnormal advanced imaging examinations results as a high-risk group and actively managed their medical treatment and work hours

Existing Measures

- Offered occupational leave to employees with medium/high health risks in Taiwan and Naniing facilities for free advanced imaging examinations. to help them prevent cerebral and cardiovascular diseases
- Used the health management system integrated with the latest employee health check-ups and work hours to evaluate health risks; in addition to informing employees, supervisors and HR were reminded to adjust workloads for said employees
- Combined with the work hour system for risk control, if the employees exhibit abnormal over time, the system will automatically remind employees, supervisors, and HR

- In total, 11,939 employees in the Taiwan fabs received advanced imaging examinations, of which 1,997 were classified as moderately or highly abnormal. Employees were helped to receive reexamination and health education based on the degree of their abnormality. Of these, 508 people who refused re-examination were given health guidance via physician interviews, telephone interviews, or written reviews. Furthermore, 55 people were required to limit work hours or adjust work content according to the doctor's order, and work distribution has been facilitated. Moreover, 16 people received medical treatment.
- Work hours of employees were tracked every month to manage 6,212 people with medium/high health risks, and make sure that they comply with the doctor's orders. Health guidance was arranged for 1,757 people through approaches such as doctor's interviews, telephone interviews, or written reviews. In total, work hours or work content adjustment was implemented for 216 persons.



Biological

Track CDC updates to provide employees with the latest health information

Existing Measures

- Continued to track communicable diseases domestically and abroad and establish preventive/response measures for notifiable diseases; the Disease Prevention Committee continued to develop COVID-19 countermeasures and reporting mechanisms based on changes in the COVID-19 pandemic
- Continued to enforce reporting mechanism for non-notifiable diseases and provided up-to-date information on seasonal flu and dengue fever
- Briefed and provided disease prevention toolkits to employees on business trips to areas with disease outbreaks

- Handled **5,507** high-risk cases in compliance with COVID-19 control measures
- Effectively managed a total of 33,209 instances of notifiable diseases and nonnotifiable diseases to contain the spread
- Distributed 985 disease prevention toolkits to employees going on business trips



Physical

Better identification of physical hazards in the environment

Existing Measures

- Developed a measurement system for ionizing radiation levels, established a full-time control mechanism for radiation sources, and banned individuals with pacemakers from operating such equipment
- Process equipment is tested for nonionizing radiation levels every half year

- There was 0 case of radiation exposure
- Completed the special eye examination of one precision operations machine, and the examination result was normal
- The electric field and magnetic field of the non-ionizing radiation measurement results were far below the ACGIH TLV standard, and all items were normal



TSMC actively establishes an intrinsically safe workplace





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Build Internal-External Alliance

As a leader in the global semiconductor industry, TSMC continues to collaborate with business partners, industry, and academia, hoping to create a sustainable, healthy workplace and minimize occupational risks.

2022 Sustainability Report

Work with External Parties to Optimize Work Environment

In 2022, TSMC attended the Joint Steering Committee ESH Working Group of the World Semiconductor Council on behalf of the semiconductor industry in Taiwan to exchange

TSMC receives the highest recognition of the National Occupational Safety and Health Award

information on safety and health-related risk control measures with various industry players, sharing experiences on the use of chemicals with health risks such as Per- and polyfluoroalkyl substances (PFAS) or N-methylpyrrolidone (NMP), and their substitutes.

In addition, TSMC is willing to share its experience in promoting a safe and healthy workplace. TSMC also collaborated with the Occupational Safety and Health Administration, Ministry of Labor, and the Institute of Environmental and Occupational Health Sciences, National Yang Ming Chiao Tung University, to compile materials for advanced in-service

education by combining workplace risk assessment and management theories with practices in 2021. In 2022, TSMC conducted three training and drill sessions in Northern, Central, and Southern Taiwan. The participants included 155 safety and health managers from the manufacturing industry, healthcare industry, construction engineering industry, water supply and pollution control industry, transportation and warehousing industry, and professional science and technical service industry, etc. Through the selfless sharing of knowledge and experience, the hazard identification and problemsolving abilities of occupational safety professionals

in various industries can be enhanced in a bid to create a safe and healthy working environment.

In October 2022, TSMC was awarded the National Occupational Safety and Health Award's highest honor, the Enterprise Benchmarking Award. TSMC continues to advocate a safety culture centered in human, establish an intrinsically safe workplace and promote physical and mental health of workers. By sharing its experience and collaborating with stakeholders, TSMC reduces the risks of occupational safety and health in the workplace.

TSMC proactively shares its experience in promoting a safe and healthy workplace





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Construction Site Management Process and Mechanism

As TSMC values construction site safety, the Company vigorously aims to create a localized, people-oriented workplace, hiring only employees of local nationality. Since the start of a new construction project, a construction site safety management organization is formed with the contractors, construction site Occupational Safety and Health Committee, and Safety Management Center. TSMC rigorously monitors the construction environment using a comprehensive three-level

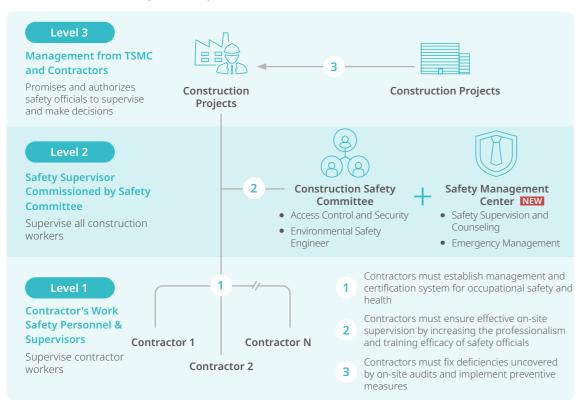
2022 Sustainability Report

management system, requiring contractors to submit a Construction Safety Protection Plan before each construction project, as well as discuss and review safe construction steps through the Safety Management Center and contractor meetings. In particular, before implementing the six high-risk operations, it is necessary to assign dedicated personnel to conduct a pre-construction inspection and full-time supervision to ensure labor safety.

In 2022, TSMC collaborated with third-party safety experts to implement the Construction Safety Management Counseling Project. Besides conducting on-site safety management operation observations and interviewing contractor supervisors in the workplace, the Company also strove to enhance contractors' attitudes towards safety management. Furthermore, a new project contractor operation safety improvement meeting was held, inviting TSMC's long-term contractors to participate in the meeting. At the same time, the American

company DuPont and German company Exyte were invited to share their industry-leading safety management experience, encouraging contractors to generate the core value of "zero occupational safety accidents". The Company also required the management team to commit to creating a safety culture that involves full participation. The primary goal of the fab construction area was to reduce the risk of occupational risks. The program saw the participation of a total of 49 contractors and 140 personnel.

The three-level management system continued at TSMC fab construction sites











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Three-pronged Approach to Construction Site Safety Management



2022 Sustainability Report

Safety Management





Safe Workplace

Existing Measures

- Continued to compile the ESH Bluebook on Fab Construction. The content is divided into nine major chapters, totaling 90 operational management-related items. The Bluebook is slated for publication in 2023, which will be used as an operational guideline for enhancing construction safety in Taiwan
- In continuation of the six high-risk operations, the main contractor and the Safety Management Center will dispatch personnel to oversee the entire process and mitigate risks through intensive supervision
- Implemented the construction site safety facility improvement team proxy system to eliminate risky environmental shortcomings as soon

New in 2022

- TSMC collaborated with third-party safety experts to implement the Construction Safety Management Counseling Project and new project contractor operation safety improvement meeting
- Established the Southern Taiwan Science Park On-duty Response Center and collaborated with the Safety Management Center to monitor abnormal situations and respond to abnormal situations and events through the safety dashboard
- Distributed zero-disaster rewards in the fab construction area to engender a sense of honor, and encourage contractors to create a zero-disaster work environment together. In 2022, a total of 1,061 rewards were distributed
- The construction management system was integrated with access control and risk matrix grading, dividing operations into three levels according to the content of the operations involved: mild/moderate/severe. Moreover, dedicated personnel was assigned to supervise operations with severe risks, achieving a severe risk supervision rate of >85%
- Construction units are graded according to risk. Priority is given to the identification of high-risk construction or construction workers with high violation rates. Furthermore, contractors with poor safety indicators are given guidance

- Established a health management system for high-risk construction groups, where blood pressure monitoring, on-site care, and health education are carried out to implement voluntary health management in conjunction with contractor counselors. A total of 8,836 persons received care through this program
- Education is the foundation of safe behavior, hence teaching materials for 16 courses were integrated with the safety topics selected by seed instructors trained by contractors to implement exhaustive inspection via the three-level audit method to discover various contractor management-related weaknesses and offer quidance
- Carried out safety inspections of <u>high-risk tools</u> by professional personnel to ensure they were safe before entering the fab and using the tools
- Utilized AI image recognition technology to analyze personnel behavior patterns and build an abnormal environmental image model to interpret and prevent abnormal or illegal behaviors in the work area in real time
- Created an independent QR code at every opening in the construction area for patrolling purposes. A total of 1,382 openings were listed for management, achieving 100% protection
- Fitted construction vehicles with intrinsic safety anti-collision facilities; forklifts, skid steer loaders, and water trucks have been equipped with backup cameras and radar as standard equipment. The equipment was installed on 79 vehicles in 2022
- Monitored and audited the construction environment of underground pipelines in the construction area. In 2022, a total of 48 underground pipeline operations were monitored

TSMC collaborates with third-party safety experts to implement the Construction Safety Management Counseling Project

Full-time monitoring of high-risk operations by dedicated personnel



Specific QR codes of each entrance for inspection purposes





Power to Change Society

Committed to uplifting society, TSMC Education and Culture Foundation and TSMC Charity Foundation spotlight the changing social landscape and its needs. The two foundations integrate and invest internal and external resources to empower young students of all ages, care for remote areas and the disadvantaged, elderly people living alone, and foster art and cultural literacy to lay the foundation for a society with common good, beauty, and kindness.

1,907,199

Participants in promoting arts and culture

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16,471

Seniors benefited from care for senio living alone

44,617

LED project beneficiaries

Social Impact

TSMC Education and Culture Foundation

TSMC Charity Foundation



Overview

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Social Impact

2022 Sustainability Report

In line with the TSMC ESG Policy, TSMC actively responds to the United Nations Sustainable Development Goals (SDGs) and monitors diverse social issues, turning sustainable strategies into concrete actions; meanwhile, in reference to the Business for Societal Impact (B4SI) formerly known as London Benchmark Group's (LBG) Impact Principles, the Company analyzes the depth (connection, improvement, change) and the type (behavioral or attitudinal change, skills or personal effectiveness, quality of life or well-being) of the impact of overall resources on beneficiaries, so as to ascertain the overall benefit of resources invested, and use it as the basis for optimizing project execution and extending social impact.



Depth

59.1%		23.8%	17.1%
Change Improvement	\$746 \$301		
Connection	\$216		

Types

67.1%	15.7%	
Skills or Personal Effectiveness		\$847
Behavioral or Attitudinal Chang	<u>e</u> :	\$198
Quality of Life or Well-being		\$218



Inputs

2022 Resource Investments

Unit: NT\$ million

Methods

64.8%	17.8%	10.4%	6.9%
■ Materials and Services Prov	ided	\$81	9
Cash Donations			25
■ Time Invested		\$13	32
Management Fees		\$8	37

Types

65%	31% 4%
Commercial Initiatives	\$824
Community Investments	\$393
Charitable Donations	\$46

Total Investment (NT\$)

1,263 million





2,291,030

Beneficiaries of social engagement programs

Charity partners

Charity programs

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In 2022, to continue driving sustainable social development and establish a reliable support network, TSMC collaborated with domestic and overseas R&D institutions to expand University Programs and provide assistance to address inadequacies in emergency relief and pandemic relief resources. Moreover, the Company teamed up with TSMC Education and Culture Foundation and TSMC Charity Foundation to form a protective shield for underprivileged groups via collaboration between industry, government, and academia. TSMC Education and Culture Foundation is dedicated

2022 Sustainability Report

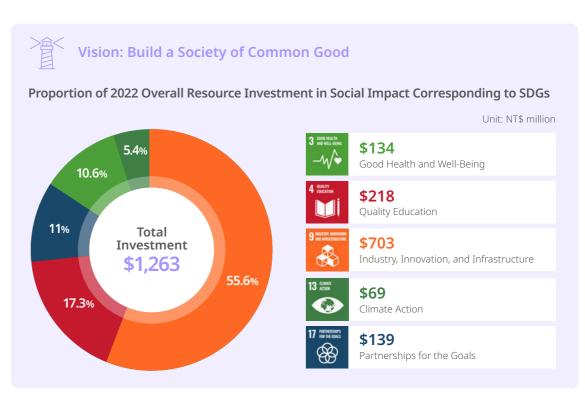
to empowering youths, guiding female students to explore the field of science, and enriching cultural heritage. By joining forces with educational institutions to empower teachers and shape the quality of students, TSMC fosters art recognition and heritage, elevating the spiritual cultivation of the Taiwanese people. TSMC Charity Foundation has connected rural education with local employment, appealing to employees and charity partners across various industries to support remote townships and seniors living alone to promote filial piety and create a society of common good, where children can grow up, young people can apply their talents, and seniors can retire.

In 2022, TSMC and the two Foundations invested more than NT\$1.779 billion in charitable activities. NT\$516 million was used to purchase and donate vaccines to alleviate the urgent domestic demand for vaccines. TSMC also invested more than NT\$1.263 billion into seven major public welfare pillars to promote various projects, listen to, support, and empower stakeholders in the social field, mainly in the form of resources and services, which

accounted for 64.8% of total donations. In terms of the type of resources invested, TSMC continues to strengthen contributions to commercial initiatives and community investments, hoping to strengthen the relationship with the community by focusing on the Company's core business. Concerning the UN SDGs, SDG 9 (Industry, Innovation, and Infrastructure) accounted for 55.6% of the resources invested during the year, followed by SDG 4 (Quality Education) at 17.3%. TSMC also paid attention to SDG 3 (Good Health and Well-Being), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals).











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TSMC Education and Culture Foundation

2022 Sustainability Report

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Cultivate Young Generation				
Hold educational events; provide diversified educational platforms	Ensure the number of overall youth competition event participants is higher than that of the previous year	Ensure the number of overall youth competition event participants is higher than that of the previous year	Youth competition events attracted a total of 2,388 participants, up by 774 participants from 2021 Target: The number of youth event participants is higher than that of the previous year	↑
	Hold \geq 20 popular semiconductor activities with \geq 1,500 participants annually	Hold \geq 20 popular semiconductor activities with \geq 1,000 participants	Held 18 TSMC Journeys of Female Scientists Lectures, with 1,275 participants Target: Hold ≥ 10 popular semiconductor science activities with ≥ 600 participants	↑
	Invest \geqq NT\$33 million in resources annually $^{\text{Note}}$	Invest \geq NT\$33 million in resources annually	Invested NT\$34.04 million Target: Invest ≥ NT\$30 million in resources annually	↑
Promote Educational Collaboration				
Cooperate with educational organizations to narrow the gap in educational resources	Continue to cooperate with educational organizations and invest \geqq NT\$20 million in resources	Invest ≧ NT\$15 million in resources annually	Offered scholarships at five universities and benefitted 98 underprivileged students Target: Continue to offer scholarships at five universities and increase the number of underprivileged students benefited from the scholarships to 97	↑
			Sponsored the Public and Private Experimental Emei Bilingual Junior High School NT\$1.1 million to support education, totaling NT\$3.3 million to date Target: Continue to sponsor NT\$1.1 million	~
			Invested a total of NT\$17.87 million Target: Invest ≧ NT\$15 million in resources annually	↑
Promote Arts and Culture				
Hold art festivals to foster local art groups	Sponsor ten local talented artists or art groups	Sponsor ten local talented artists or art groups	Continued to organize the TSMC Hsin-Chu Art Festival and sponsored 12 domestic art groups Target: Sponsor ten local talented artists or art groups	↑
	≧ 1,500 participants for Chinese in-person opera activities	≧ 1,500 participants in Chinese inperson opera activities NEW	Sponsored 15 Kenneth Hsien-Yung Pai Literature Lectures Target: Organize ≧ 15 humanities lectures in college	~
	Ensure the annual number of beneficiaries for in-person arts and cultural events is \geqq 15,000 people	Ensure the annual number of beneficiaries for in-person arts and cultural events is \geq 15,000 people	Held four TSMC Lectures Target: Continuously organize ≧ four TSMC Lectures	~
			26,821 people participated in in-person arts and cultural activities Target: Hold in-person arts and cultural activities and benefit \geqq 20,000 people	↑
Note: The long-term goals have been revised as TSMC	Education and Culture Foundation expects that the investment and the	growth rate of participants continue to grow in 2030	↑ Exceeded ✓ Achieved — Missed Target	183

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With a vision of cultivating talents and fostering a benevolent society, TSMC Education and Culture Foundation strives to materialize the three themes of Cultivate Young Generation, Promote Educational Collaboration, and Promote Arts and Culture, thereby generating a positive cycle and sustainable development. In 2022, despite the COVID-19 pandemic, TSMC Education and Culture Foundation still invested copious resources to organize numerous educational activities as well as arts and cultural events. We collaborated with educational partners to empower teachers in remote townships, inviting employees to accompany young students to pursue their dreams, inspiring female senior high school students' interests in science, and establishing programs such as Chinese Opera on Campus courses and Peking opera art appreciation microcourses, as well as organizing online arts and cultural activities by capitalizing on the power of science and technology. A total of NT\$100.2 million was invested this year. For more information on the events and the sponsorships, please refer to the official website of TSMC Education and Culture Foundation.

2022 Sustainability Report

Donation by TSMC Education and Culture Foundation

Unit: NT\$ ten thousand



TSMC Education and Culture Foundation Contributions

What We Contributed

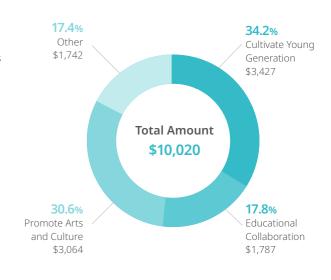


Note: The basis of time calculation is the number of volunteer hours x average hourly salary; the calculation of hours only includes the time spent by TSMC volunteers participating in the Journeys of Female Scientists Lectures and Marie Curie Chemistry Camp

How We Contributed



Focuses of Contributions Unit: NT\$ ten thousand



Core Engagement



Cultivate Young Generation

- Promote popular science education and cultivate female scientist talents
- Provide diverse platforms for youths to undergo self-exploration
- Organize literature, arts, and cultural competitions to enrich cultural qualities



Promote Educational Collaboration

- Empower rural teachers to improve the literacy of students in remote townships
- Sponsor experimental education at junior high Schools and organize literature camps to enrich humanistic qualities
- Sponsor scholarships at universities for underprivileged students and provide digital learning equipment



Promote Arts and Culture

- Cultivate arts and cultural talents and promote the heritage of Chinese opera
- Promote arts and cultural events
- Sponsor cultural broadcasting programs to enhance artistic ambiance





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2022 Sustainability Report

What We Want to Solve

Domestic education often lacks literature, art, science, and exploration courses. As a result, students do not have a holistic education that integrates technology and humanities and thus lack the comprehensive skills required for future talents.

How We Respond

Organize competitions, science camps, lectures, and proposal competitions for senior high school and college students to inspire their interest in science and develop their cultural qualities. At the same time, the aim is to boost their self-confidence, insight, and problem-solving capabilities.

Our Actions

- Promote Popular Science Education and Cultivate Female Scientist Talents
- Provide Diverse Platforms for Youths to Undergo Self-exploration
- Organize Literature, Arts, and Cultural Competitions to Enrich Cultural Qualities

Promote Popular Science Education and Cultivate Female Scientist Talents

Journeys of Female Scientists - Inspire Students' Interest in Science

To subvert the concept of "STEM is not suitable for women" and inspire senior high school girls' interest in science, TSMC Education and Culture Foundation collaborated with National Museum of Natural Science in 2022 to hold the third TSMC Journeys of Female Scientists, inviting students from 12 girls senior high schools to attend the lectures. The lectures included a guided tour of the World of Semiconductors Exhibition Hall and the TSMC Museum of Innovation. Semiconductor popular science workshops were also held in conjunction with lectures by female scientists. At the same time, outstanding female engineers from TSMC also shared their learning and career experience to encourage students to explore STEM. In 2022, TSMC Education and Culture Foundation extended the one day visit to two days and one night indepth popular science activity, hoping to encourage more female students to join scientific research, thereby cultivating scientific talents for the country and the industry. As of 2022, 17 Journeys of Female Scientists Lectures have been held and attended by 3,225 people.

Micro-course Design Helps Students Obtain New Knowledge of Semiconductors

In 2022, easy-to-understand micro-course teaching materials were used to encourage high school students to learn the field of semiconductors, TSMC Education and Culture Foundation used sponsored exhibits from the World of Semiconductors Exhibition Hall of the National Museum of Natural Science to launch the Big Brother and Sister Talk About Semiconductors course in collaboration with NYCU. The course content encompasses semiconductor introduction, manufacturing process, component digital circuit, industry overview, etc. They are combined with Artificial Intelligence of Things (AIoT) experience and a short film competition on semiconductor chip theory to inspire high school students' interest in semiconductors. The courses have been progressively launched at National Hsinchu Senior High School, National Hsinchu Girls' Senior High school, and National Experimental High School at Hsinchu Science Park with 260 participants in total.



Technology is an integral part of people's lives, and there are semiconductors everywhere. I hope to continue to explore developments in semiconductors in my future career.

Taipei First Girls' High School Student

By having more female scientists as role models, young students can understand that the future path is not as difficult as they may think, and it also helps children to enter the technology industry with more confidence.

> Mon-Shu Ho, Professor Department of Physics, National Chung Hsing







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Sponsor Three Major Science Camps

2022 Sustainability Report

With the mission of cultivating future scientists, TSMC Education and Culture Foundation has been a longterm sponsor of Wu Chien Shiung Science Camp, Marie Curie Science Camp, and Wu Ta-You Science Camp, thereby enriching young students' scientific knowledge and expanding their forward-looking insight In 2022, Marie Curie Science Camp invited top scholars to present lectures with the three major themes: sustainable agriculture technology, zero waste resource recycling, and green chemistry. Camp activities included: lectures from top scientists, scientists and entrepreneurs forums, green chemistry experiments promotion and team competitions. The Foundation also invited TSMC engineers to share their educational background, work experience, and the current industry status with the camp participants. The camp attracted 96 enthusiastic participants in total.

activities included the Master and Student Dialogue and Creative Competition camps to broaden students'

international scientific horizons, stimulate their ambition and potential to pursue extraordinary scientific achievements. Furthermore, the camp also invited high school and vocational science teachers to participate in further training activities to explore ways to cultivate outstanding scientific talents. In 2022, a total of 134 students and eight teachers signed up for the event.

TSMC Cup - Competition of Scientific **Short Talk**

TSMC Education and Culture Foundation and the Center for the Advancement of Science Education have jointly hosted the TSMC Cup - Competition of Scientific Short Talk during the last ten years in the hope of elevating the scientific qualities of senior high school students as well as their oral and written skills. The competition included the Science Creative Expression Competition and Popular Science Book Guided Reading Contest. The Science Creative Expression Competition requires the contestants to view the designated reading topics and engage in scientific abstract report writing, scientific and creative

expression short film production, and interactive questioning and pop quiz based on different stages of the competition. The purpose of the competition is to cultivate young people's ability to interpret and tell stories. The Popular Science Book Guided Reading Contest requires participants to write a guide article after reading selected popular science books. Students are expected to obtain new scientific knowledge through reading to develop analytical and critical thinking skills. A total of 755 people participated in the event in 2022.

Provide Diverse Platforms for Youths to Undergo Self-exploration

Guide Youths to Care About Sustainability and Build Dreams Together

TSMC Education and Culture Foundation launched the TSMC Udreamer Project since 2016. The theme for 2022 was set as "Youth for a Sustainable Iseland" and invited college students to care about sustainability and take action. This year's diverse proposals exemplified students' commitment to the topic of sustainability. In addition to the competition, the Foundation also organized the Responsible Grand Tour pilot project, inviting local revitalization experts and youth groups to demonstrate plastic reduction travel. The mentor program was introduced for the first time to the Udreamer Project. The Foundation recruited TSMC employees interested in youth mentoring to guide the award-winning team to turn sustainable thinking into concrete actions. In the end, the 2022 event attracted a total of 161 teams and eight teams were shortlisted to win a total prize of NT\$ three million. In the feedback guestionnaire, 68% of the students recognized the project and expressed their desire to engage in sustainable developmentrelated work in the future.



Participating in the Udreamer Project offered plenty of benefits! I hope to take on more difficult challenges and embrace a more beautiful future!

> Student shortlisted for the Seventh **TSMC Udreamer Project**

The Foundation sponsors the Wu Chien Shiung Science Camp for 20 consecutive years. The camp





Participants enhance their competence and communication skills through science competitions



The final judging of the seventh TSMC Udreamer Project







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Organize Literature, Arts, and Cultural Competitions to Enrich Cultural Qualities

2022 Sustainability Report

Cultivate the Literary of Young People

The Foundation has organized the <u>TSMC Literature Award</u> for 19 consecutive years to cultivate youth literature and encourage creation. In 2022, the theme of My Youth Proposal was applied to continue providing young students with a stage for unleashing their talents for literature. A total of 668 submissions were received for the year, bringing the cumulative number of submissions over the years to 11,179, including short stories, essays, and new poems. Apart from the essay competition, other activities include <u>lecture</u> tours by writers, contestant-judge forums, and an online essay call for submissions on the medium blog.

Dr. F.C. Tseng, Chairman of TSMC Education and Culture Foundation, presents the short story first prize

Promote Chinese Character Education and Calligraphy

The TSMC Calligraphy and Seal-carving Competition is the only annual event in Taiwan that promotes calligraphy and seal-carving education for high school students. With the theme of "Food," the 15th competition incorporates everyday life issues to bring the younger generation closer to traditional culture, inviting gourmet writers to depict classic dishes and poetic stories in the recipes of Sung Dynasty scholars. Furthermore, Kai Ping Culinary School was invited to design the Sung Flower Banquet by using seasonal ingredients. Furthermore, to encourage teachers to promote Chinese character education, the Foundation continues to hold the "creative calligraphy teaching proposal" selection, thereby fostering the development of new teaching proposals, embodying the art of calligraphy and seal carving in life, and allowing students to appreciate the artistic beauty of Chinese characters. The competition attracted a total of 449 participants this year, and 29 creative teaching proposals were received.





Host Literature Lectures in Collaboration with Titans of Literature

The Foundation has long dedicated itself to the humanities education. In 2022, it collaborated with the Center of General Education, the Department of Chinese Literature, and the Center for Language Education at National Tsinghua University to host the Kenneth Hsien Yung Pai Literature Lectures - Classic Chinese and Western Novels, inviting Mr. HsienYung Pai, a literary giant in Chinese literature and 13 other professors in the country to give special classes and take students to explore classic Chinese / western novels, broaden the horizons of ancient and contemporary culture, and care about culture. The lecture includes 15 special classes, attracting 3,754 participants. The class was produced into a video and uploaded to the NTHU OpenCourseWare platform and the TSMC Education and Culture Foundation website for the public. As of 2022, the video has been viewed 148,216 times.



Senior high school students learn to appreciate the beauty of Chinese characters through the calligraphy competition

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2022 Sustainability Report

What We Want to Solve

Schools in remote townships in the country are faced with long-term shortage of teachers and educational resources, resulting in low academic achievement among students. Students from underprivileged homes are trapped by financial circumstances, hence they are unable to explore and turn their lives around.

How We Respond

Collaborate with educational organizations from both the private and public sectors to expand curriculum development and promotion, as well as assist in the training of teachers in remote townships to improve the learning motivation and effectiveness of underprivileged students. Scholarships are also provided for disadvantaged students to reduce their financial burden.

Our Actions

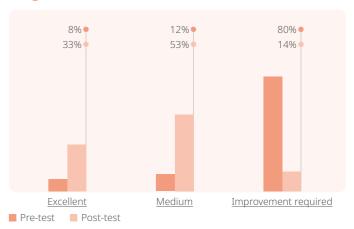
- Empower Rural Teachers to Improve the Literacy of Students in Remote Townships
- Sponsor Experimental Education at Junior High Schools and Organize Literature Camps to Enrich Humanistic Qualities
- Sponsor Scholarships at Universities for Underprivileged Students and Provide Digital Learning Equipment

Empower Rural Teachers to Improve the Literacy of Students in Remote Townships

Teach and Learn Program

TSMC Education and Culture Foundation collaborated with the Common Wealth Education Foundation and the Hwawei Ko Professor Reading Research Center at NTHU to launch a five-year Teach and Learn <u>Program</u> in 2021. The program provides rural teachers with teaching proposal assistance, forms a joint course-preparation group, as well as organizes teacher empowerment workshops, and provides on-site teaching observation and online teaching seminars. In 2022, the program attracted the participation of 94 teachers and 984 new students from 48 elementary schools in rural areas. To understand the program's achievements, teachers who participated in the program were invited to conduct a questionnaire survey in 2022. The results indicate 54% of the respondents believed that the Teach and Learn Program helped to significantly elevate the teaching quality. Moreover, a Chinese character recognition test was conducted on 1,232 students who participated in the program in 2021, and the results showed that 86% of the students possess above-average literacy skills, and the ratio of the Level C students (Improvement required) greatly improved from 80% to 14% comparing to last year.

Impact on Students' Literacy from Teach and Learn **Program**





I was rather confused in the early stage of teaching. Fortunately, the Teach and Learn Program inspired my teaching process.

Chih-Hsuan Chang

Substitute Teacher, Hsia-Yun Primary School

Through the Teach and Learn Program, I can see the curiosity of seven-year-old children and their desire for knowledge!

En-Ju Lin

Keelung FuShing Public School

3.3 million

Invested in Emei Bilingual Junior High School to turn it into an experimental junior high school; since the plan's implementation, the number of students in the school has increased from 39 to 54

984

Students benefited from the Teach and Learn Program







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Sponsor Experimental Education at Junior High Schools and Organize **Literature Camps to Enrich Humanistic Qualities**

Cultural Nourishment through Literature Camp

2022 Sustainability Report

Caring about remote education in Taiwan as its longterm goal, TSMC Education and Culture Foundation collaborated with Cheng Zhi Foundation to transform rural education in Taiwan. In 2022, the Foundation continued to provide funding to Emei Bilingual Junior High School and help to transform it into an experimental junior high school for the third straight year, introducing changes to the teaching quality and learning performance through abundant teacher training and the implementation of professional course preparation resources. With the long-term

resources contribution, the results of the Comprehensive Assessment Program for Junior High School Students show the ratios of English, mathematics, and social subjects that need to be improved are all lower than the previous year. Additionally, the number of students in the school has also increased steadily, from 39 in 2020 to 54 students. In the same year, the Foundation collaborated with UNITAS Magazine to organize the second TSMC Youth Student Literature Camp at Emei Bilingual Junior High School. Through the exciting sharing of writers, 62 young literature enthusiasts from Taoyuan, Hsinchu, and Miaoli were allowed to get close to literature and cultivate their word perception and writing skills.

Emei Bilingual Junior High School Comprehensive Assessment Program for Junior High School Students -Ratio of Grade C Students



■ Chinese ■ English ■ Mathematics ■ Social Studies ■ Natural Sciences

Dynamic challenges introduced students to the world of literature

Tea tasting course of the second TSMC Youth Student Literature Camp

The three-day literature

camp was only a small part

of the long summer holiday,

of literature in my heart like

Literature camp participant Emei Bilingual Junior High School

but it has sown the seeds

roses in the meadow!



Sponsor Scholarships at Universities for Underprivileged Students and Provide **Digital Learning Equipment**

Provide Scholarship and Digital Learning equipment to Underprivileged Students

Dedicated to assisting outstanding yet economically underprivileged students, TSMC Education and Culture Foundation continued to contribute NT\$9.8 million of scholarships to 98 underprivileged students in 2022. In addition to scholarships, the Foundation also provided summer internship opportunities at TSMC for scholarship recipients to learn about industry trends and bridge the gap between learning and practice; the program also sponsors 25 award-winning freshmen with laptop computers to eliminate their digital learning barriers.

Thanks to the scholarship, I was able to go to Kenya to become an international volunteer without financial worry, and gradually find my calling. On the shoulders of a titan such as TSMC, I could see the light of my own future.

> Recipient of Sunrise Program Scholarship National Tsing Hua University

TSMC Youth Student Literature Camp attracts the participation of young literature enthusiasts





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2022 Sustainability Report

What We Want to Solve

Improve predicaments faced by domestic art groups such as inadequate resources, loss of audience and heritage, and foster the public's interest in traditional arts and cultural activities to popularize the art and make it an integral part of life.

How We Respond

Apply digital technology to organize highquality offline and online arts and cultural activities, sponsor exceptional domestic art groups, provide a performance stage, as well as organize rich, diverse programs and activities to raise the public's interest in art appreciation and Chinese opera

Our Actions

- Cultivate Arts and Cultural Talents and Promote the Heritage of Chinese Opera
- Promote Arts and Cultural Events
- Sponsor Cultural Broadcasting Programs to Enhance Artistic Ambiance



Promote Music without Borders Educational Program

In 2022, TSMC Education and Culture Foundation joined forces with National Symphony Orchestra and Taipei National University of the Arts to sponsor the Music without Borders Educational Program, to connect Taiwans music scene to the international stage and vigorously cultivate world-class music talents. The One-Minute Symphony Composition Project recruited young composers to engage in quick creation. German conductor Jun Märkl was invited to mentor the young composers and their composing works were then performed by the NSO orchestra. The performance was appreciated by an audience of 5,973 people; For the Conducting and Composing Advancement Project, Lu Shao-Chia, a well-known Taiwanese conductor residing in Europe, helped aspiring students to refine their conducting skills. The TNUA Orchestra Fall-Winter Concert 2022, was held and attracted an audience of 410 people.

Practical Chinese Opera Learning - Shattering Traditional Frameworks

To promote the heritage of Chinese opera, the Education and Culture Foundation teamed up with Guoquang Opera Company in 2021 to launch the Chinese Opera on Campus Program, opening Chinese opera elective courses at National Tsing Hua University and National Tunghai University. The courses consisted of Chinese opera-related knowledge, opera script appreciation and analysis, Peking opera performance demonstration and teaching; the class attracted 35 students to sign up since the beginning of the first semester in 2021, and the number increased to 95 in 2022. To deepen collaboration and facilitate the appreciation of Peking opera, the Foundation also launched <u>TSMC Theatre</u> at National Yang Ming Chiao Tung University to perform classic opera repertoires. Furthermore, <u>campus micro-courses</u> were also held at three senior high schools in Hsinchu area, where wonderful, guided introductions were arranged in conjunction with live demonstrations by professional actors, taking students to transcend time and space. The performances attracted 644 participants in 2022.



TNUA is extremely fortunate to receive resources from the Foundation to carry on the heritage of the art education program.

> Shien-Ta Su Dean of TNUA School of Music



People participated in Hsin-Chu Art Festival's off-line and on-line activities

95

Students registered in the Chinese Opera on Campus Program

26,821

People participated in the Foundation's offline arts and cultural activities



Music without Borders Educational Program cultivates potential conductors

National Tsing Hua University students take Peking opera as their elective and participate in opera performance





Guoquang Opera Company actors demonstrate how to perform on stage and train potential talent





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Combine Etiquette and Customs - Edutainment

2022 Sustainability Report

The Foundation has sponsored the Tainan City Cultural Affairs Bureau to hold the TSMC Youth Theater Project - 16 Year Old Festival since 2015. The program theme is inspired by the 16 Years Old Coming of Age Ceremony, a traditional custom in Tainan, which combines three major strategies of "viewing theater, making theater, and performing theater" to bring youths closer to traditional customs and enrich their artistic cultivation. In 2022, youths are encouraged to portray the life of the younger generation through narrative history theater and montage-style directing. The program attracted 54 students from 25 high schools in Taiwan to attend in 60 performances, and a total of 39,512 people participated in the promotional activities. The 16 Year Old Festival has demonstrated tremendous success and became the cradle of Taiwan's artistic talents. Over the eight years, a total of 399 youths has participated in the festival with 97 students studying at art-related departments in Taiwan or abroad.



Young people are invited to perform at the 16 Years Old Festival to showcase their passion and vigor

Promote Arts and Cultural Events

Promote Public Appreciation of Artistic Performances

Since 2003, TSMC Education and Culture Foundation has continued to hold the TSMC Hsin-Chu Art Festival, a large-scale art and cultural event in Hsinchu, Taichung, and Tainan. In 2022, the theme was A Feast of the Gods. A series of activities including drama, music, literature, history lectures, and online film exhibition were held around the theme. The Foundation invited Peking opera masters to integrate technology with traditional art, collaborating with the National Symphony Orchestra, Taiwan Film & Culture Association, Guoquang Opera Company, and other art and cultural groups to take the audience to appreciate the cultural connotation of Chinese and western myths through exquisite art performances.158,145 participants joined 15 offline and 27 online events in total.

Enhance the Appreciation of Classical Music

To enhance the public's appreciation of classical music, TSMC Education and Culture Foundation sponsored National Taichung Theater and New National Theatre, Tokyo to launch Mozart's opera The Magic Flute. Darrel Ang, the artistic director of Sichuan Symphony Orchestra and a renowned Singaporean conductor, was invited to collaborate with the National Symphony Orchestra and numerous top international vocalists for four performances at the National Taichung Theater. Activities such as performances, lectures, workshops, and stage tours enable the audience to gain insight into the details of opera creation. A total of 7,825 people participated in the event.

Tales from Chinese Opera program interview



Sponsor Cultural Broadcasting Programs to Enhance Artistic Ambiance

Produce the Radio Program Tales from Chinese Opera

To deepen the younger generation's knowledge in Chinese opera, convey Chinese opera knowledge and classical Chinese literature through auditory sense the Education and Culture Foundation continued to collaborate with IC Broadcasting Company in 2022 to launch the opera broadcasting program Tales from Chinese Opera. Every week, the program introduces the provenance of classic operas and their performance styles. The program also interviews famous Peking opera actors and introduces the exciting on-stage and behind the scenes stories of Peking opera in a humorous manner, as well as offers diverse channels for listeners. As of 2022, more than 863,533 people have listened to the online program.

Produce the Radio Program I-Yun Hsin Talks About the **Classic of Poetry**

TSMC Education and Culture Foundation invited Professor I-Yun Hsin, a master of Chinese studies, to produce a Chinese classic lecture radio program I-Yun Hsin Talks About the Classic of Poetry. Since 2018, he has taught classics such as the Analects, Zhuangzi, Mozi, and Laozi; in 2022, he selected contents from the Classic of Poetry to produce 43 episodes, using simple but vivid explanations to share emotional descriptions and social outlook in the Classic of Poetry. The program attracted a total of 692,075 listeners.



Tales from Chinese Opera opened my eyes to Peking opera, allowing me to gain a deeper understanding of traditional culture.

Jo-Ching Lin

National Hsinchu Girls' Senior High school

Note 3: The donations were contributed by TSMC volunteers as well as internal and external donors supporting the Sending Love initiative in cash, excluding repairs and other supplies.

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TSMC Charity Foundation

2022 Sustainability Report

proximity for ten months in 2022.

Strategies	2030 Goals	2023 Targets	2022 Achievements	
Empower the Rural Community Note 1				
Engage in cross-industry collaboration to equip rural	10,000+ hours of volunteer reading every year	9,000+ hours of volunteer reading	1,175 hours ^{Note 2} of volunteer reading Target: 9,000+ hours	_
students with employability skills and offer a variety of subjects for learning as well as living support	At least NT\$18 million in annual donations to disadvantaged people	At least NT\$15 million in annual donations to disadvantaged people	NT\$15.29 million ^{Note 3} in donations Target: at least NT\$15 million	↑
through volunteer service	Benefit 10,000+ children in rural areas	Benefit 5,000+ children in rural areas	6,358 children in rural areas benefited Target: 5,000+ children	↑
Care for the Elderly				
Collaborate with hospitals across Taiwan through the Network of	Serve seniors living alone 16,000 times every year vi the Network of Compassion	Serve seniors living alone 12,000 times via the Network of Compassion	Services offered 16,471 times Target: 11,000 times	↑
Compassion to support medical and social welfare institutions, improving medical care for the elderly	400,000 meal deliveries via the Network of Compassion	330,000 meal deliveries via the Network of Compassion	Meals delivered 355,692 times Target: 310,000 times	1
	l education and local employment, and renamed the key focus Care for the Disadvanta ion measures stipulated by the Central Epidemic Command Center and service institutio		↑ Exceeded ✓ Achieved — Missed Target	

Overview Sustainable Business Practices Operations and Governance

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Appendix

Strategies	2030 Goals	2023 Targets	2022 Achievements
Promote Filial Piety Work with the Ministry of Education and schools at different evels to produce teaching materials and organize workshops, encouraging cross-generational conversation and parent-child communication for mutual understanding	Promote filial piety education in 120 educational institutions	Promote filial piety education in 70 educational institutions	Promoted filial piety education in 68 educational institutions Target: 60 educational institutions
Protect the Environment			
implement green energy nitiatives advantageous to the underprivileged and the Cherish	Benefit individuals 50,000+ times every year via the Cherish Food Project	Benefit individuals at least 42,000 times via the Cherish Food Project	Benefited individuals 48,143 times Target: 42,000+ times
Food Project to conserve and generate energy and reduce resource waste; promote energy	Offer environmental protection-related volunteer services at least 1,200 times every year	Offer environmental protection-related volunteer services at least 1,000 times	Volunteer services offered 182 times ^{Note 4} Target: 1,000+ times
conservation and environmental education in schools through volunteers	Install solar panels for six social welfare institutions every year NEW	Install solar panels for six social welfare institutions	Solar panels installed for seven institutions ^{Note 5} Target: six institutions
	Replace LED light tubes for 240 elementary schools every year NEW	Replace LED light tubes for 240 elementary schools	LED light tubes Replaced for 246 elementary schools Target: 240 elementary schools
lote 4: In compliance with the epidemic prevention I	measures stipulated by the Central Epidemic Command Center and service institutions,	the Foundation suspended volunteer services requiring physical	↑ Exceeded ✓ Achieved — Missed Target



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Dedicated to becoming a force for positive change in the society, TSMC Charity Foundation has long committed itself to championing four social causes: Empower the Rural Community, Care for the Elderly, Promote Filial Piety, and Protect the Environment. Adopting a hands-on approach to serving those in need, the Foundation leads TSMC employees in efforts to care for members of society and engage with the government, industry and academia to jointly close the urban-rural gap in learning resources and support economically underprivileged groups.

2022 Sustainability Report

In 2022, the Foundation primarily focused on Empower the Rural Community, matching rural education goals to students' employability skills. Partnering with enterprises with the same vision, the Foundation designed and offered career exploration activities, technical and vocational training, and job matching services to fill vacancies in industry and academia.

To play a part in Protect the Environment, the Foundation invested in initiatives that generate green energy for the good of the underprivileged. The Foundation installed solar power generators and replaced existing lights with energy-saving LED light tubes, saving and generating electricity at the same time. These measures have provided underprivileged groups with regular funding from generating green power and built classrooms with better lighting in schools in remote areas, while at the same time saving money on electricity bills.



Core Engagement

Empower the Rural Community

• Close the urban-rural gap in educational resources by injecting resources into rural areas

- Partner with organizations to empower vocational high school students in remote townships and assist them with employment
- Provide underprivileged people with financial support to improve their living conditions and remove barriers to education



Care for the Elderly

• Strengthen the care for seniors living alone by providing much-needed resources and companionship



Promote Filial Piety

• Diversify creative efforts to instill the virtue of filial piety



Protect the Environment

- Conserve and generate electricity for social welfare institutions through implementing green energy initiatives advantageous to the underprivileged and the Cherish Food Project
- Provide environmental and energy conservation education to cultivate sustainable practices





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TSMC Charity Foundation Contributions

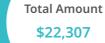
2022 Sustainability Report

What We Contributed^{Note 1}



How We Contributed Note 2





Focuses of Contributions Unit: NT\$ ten thousand







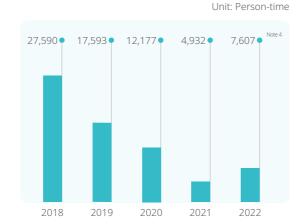


TSMC volunteers lead rural children to tell stories with videos

Total Number of Volunteers Note 3



Number of Volunteered Sessions





Volunteered Hours



In the information age, TSMC volunteers help rural schools improve digital capabilities

- Note 1: Types of contributions are sorted using the definitions of the Dow Jones Sustainability Index (DJSI) into the categories of cash, time, goods and services, and all forms of donations are converted to be shown in New Taiwan dollar (NT\$) for percentage calculation. Time equals volunteered hours multiplied by hourly pay, whereas goods and services equal the amount of money invested by TSMC to provide such goods or services and
- Note 2: Types of projects supported are sorted using the definitions of the Dow Jones Sustainability Index (DJSI) into the categories of commercial activities, charitable donations and community investments, and all forms of donations are converted to be shown in New Taiwan dollar (NT\$) for percentage
- Note 3: The numerous volunteers participating in the Foundation's charity events include TSMC employees, former employees, retired employees, families of employees, employees of partner corporations, and students under University Social Responsibility (USR) programs

2022

Unit: Hours

Note 4: In response to the prevention and control of COVID-19, volunteer activities requiring physical proximity were suspended from the second half of 2021 to the second half of 2022, in compliance with the Ministry of Health and Welfare's pandemic policies and the rules put in place by TSMC's pandemic prevention committee



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2022 Sustainability Report

What We Want to Solve

Schools in remote areas and schools neither in mountains nor cities are plaqued by the inadequate distribution of educational resources and the unsatisfactory support systems hindering students' pursuit of higher education and employment.

How We Respond

Integrate resources from industry, government and academia to help students in elementary schools and junior highs in rural areas improve their subject-oriented studies and cultivate the employability skills of vocational high school students through career exploration activities.

Our Actions

- Close the Urban-rural Gap in Educational Resources by Injecting Resources into Rural Areas
- Partner with Organizations to Empower Vocational High School Students in Remote Townships and Assist Them with Employment
- Provide Underprivileged People with Financial Support to Improve Their Living Conditions and Remove Barriers to Education

Strategies to Empower the Rural Community

Family Support

Emergency

aid, NT\$10,000

Per Household

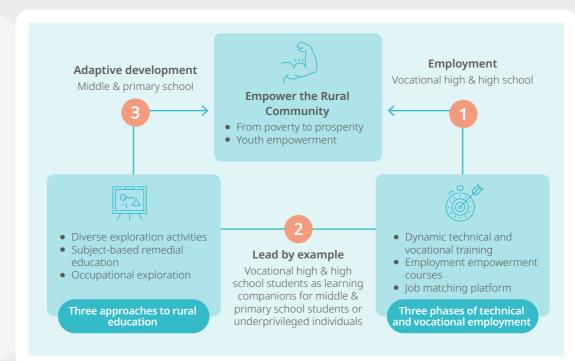
program,

scholarships



Learning Accompany

Teaching service provided by volunteers and University Social Responsibility (USR) programs





Equipment & Resources

Renovations, Internet, computers & tablets, solar panels, energyefficient LED lights, transportation vehicles



Food Support

Meals sponsored and distributed by food businesses and food banks Installation of freezers for food preservation





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Close the Urban-rural Gap in Educational Resources by Injecting Resources into Rural Areas

A Variety of Education to Close the **Resource Gap**

2022 Sustainability Report

In 2022, volunteers led by TSMC Charity Foundation continued visiting elementary schools in remote townships and NGOs providing after-school care to offer students a variety of enjoyable and instructive activities and lessons, including picture book reading, post-processing in photography, and media literacy. Courses on enhancing the pedagogical skills of teachers in rural schools were also organized. In response to the Ministry of Education's focus on science education and hands-on inquiry in the 2019 Curriculum, the science games designed by the Foundation were combined with AI programming courses to cultivate students' scientific thinking skills. Working with National Yang Ming Chiao Tung University on the Programming Education Plan for Hsinchu County project, teachers and students residing in rural areas were taught how to utilize programs to solve life problems. During the pandemic, the Foundation distributed science learning materials and conducted science experiments online so students could learn remotely.

Encourage Career Exploration and Focus on Adaptive Development

To expand educational resources in rural townships and provide rural students with information about career choices, the Foundation has partnered with 104 Job Bank since 2021 to launch the World of Jobs, Road to Employment website, on which interest guizzes based on the Holland Codes were introduced to help students learn about their personality traits. A total of 104 vlogs featuring professionals from all walks of life were produced and featured on the website as valuable reference for students exploring career paths.



TSMC Participating Units

TSMC Charity Foundation, TSMC Storytelling Volunteers, Legal, Quality & Reliability, Fab 2 & Fab 5, Fab 18B, Fab 15B, Intelligent Manufacturing Center, Production Control Integration Department, Intelligent Engineering Center



Cooperating Units

104 Job Bank, China Medical University Hospital, education bureaus of local governments, Ming Chi University of Technology, National Yang Ming Chiao Tung University, National University of Tainan, BoniO Inc.



Institutional Beneficiaries

10 after school programs, 124 elementary schools (1 in Yilan County, 1 in Kinmen County, 5 in Nantou County, 3 in Pingtung County, 1 in Miaoli County, 2 in Taoyuan City, 14 in Kaohsiung City, 41 in Yunlin County, 3 in New Taipei City, 2 in Hsinchu City, 27 in Hsinchu County, <u>1</u> in Chiayi County, <u>2</u> in Changhua County, <u>1</u> in Taichung City, <u>1</u> in Taitung County, 19 in Tainan City)



TSMC's program for enhancing teachers' pedagogical skills covers a variety of subjects and is very informative. A number of tools were introduced to help more disadvantaged families.

Lan-Hsiang Liang

Director of Heart's Ease Care Association

TSMC volunteers led students to conduct enjoyable experiments relevant to our everyday life. Students were inspired to learn actively, expand their horizons, and be passionate about science!

Ching-Fang Yang

Principal of Tainan Municipal Zuojhen Elementary School

134 schools

Served schools and afterschool programs

6.358 students Students benefited

44,254 users

World of Jobs, Road to Employment website accessed users

412 times Volunteer reading services

2.060 hours Volunteer reading





IMC volunteers guides pupils in after-school programs to instill the idea of sustainability





IEC volunteer lead pupils of Meihua Elementary School to conduct enjoyable science experiments as part of a long-term undertaking



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Partner with Organizations to Empower Vocational High School Students in **Remote Townships and Assist Them with Employment**

Technical and Vocational Training and Empowerment to Boost Employment

2022 Sustainability Report

To encourage students to start their careers in their hometowns and find a solution to workforce shortage, the Foundation in 2021 began to partner up with corporations to organize technical and vocational training events in rural areas. Through 30 hours of dynamic vocational training, some students were able to acquire specialized skills that landed them jobs straightaway. The Foundation also arranged for trained vocational high students in rural areas to bring after-school study services to local elementary schools and social welfare institutions, thereby building a successful mode of public welfare beneficial to all parties. Collaborating with Microsoft Taiwan and several labor affairs bureaus on Microsoft Office 365 skill enhancement program, the Foundation honed the Microsoft Office competency skills of disadvantaged youths and augmented the information education of rural teachers.

Call on Fellow Enterprises to Offer Job **Opportunities**

Partnering with Semiconductor Equipment and Materials International Organization (SEMI), the Foundation held a lecture titled Technical and Vocational Talent Development in the Field of Semiconductors during SEMICON Taiwan 2022, inviting members of industry, government and academia to share their perspectives on the advantages of pursuing higher education and employment. Appeals were made to the industry to analyze the structure of workforce costs, restructure internal positions, hire vocational high school students, and look for solutions to workforce shortage. The Foundation simultaneously worked on building a job matching platform on its World of Jobs, Road to Employment website, increasing employment opportunities and the range of job selections for technical and vocational high school talent.



TSMC Participating Units

TSMC Charity Foundation, Human Resources, Material Supply Chain Management Division



Cooperating Units

104 Job Bank, 15 TSMC suppliers, Microsoft Taiwan, Chi Mei Food Co., Ltd., Semiconductor **Equipment and Materials** International Organization, Lohas Biotech Development Corp.



Institutional **Beneficiaries**

National Pei-Kang Agricultural & Industrial Vocational High School, Tu Te Industrial and Home Economics Vocational High School, National Nei-Pu Senior Agricultural-Industrial Vocational High School, National ChiaTung Agricultural Vocational Senior High School, National Tung Kang Maritime and Fishery Vocational High School, National Heng-Chun Industrial & Commercial Vocational High School

The dynamic technical and vocational training session tested our ability to respond appropriately in a given situation. Upon completion of the training, there's a chance you could be hired by Chi Mei Food. The training boosted my confidence and expanded my knowledge.

Yi-Chen Lin

student from Yu Te Industrial and Home Economics Vocational High School

Job matching program

30

Enterprises participated

600 Job opportunities

offered

Microsoft job enhancement courses

City / county government participated

451times

Rural teachers and underprivileged students benefited



Students from National Nei-Pu Senior Agricultural and Industrial Vocational High School visit corporate booths for information on employment

Dynamic technical and vocational training sessions

Rural

vocational high schools

78 Students participated

14 Letters of appointment issued



Students from the Department of Culinary Arts of Yu Te Industrial and Home Economics Vocational High School are led by instructors from Chi Mei Food in breadmaking





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Provide Underprivileged People with Financial Support to Improve Their Living **Conditions and Remove Barriers to Education**

Support the Lives of Underprivileged People

2022 Sustainability Report

In collaboration with the departments of social affairs of local governments, the Foundation launched the NT\$10,000 Per Household and emergency aid programs to financially support underprivileged families and families tackling emergencies. For rural and underprivileged farmers ending up with surplus produce due to lack of market information, TSMC volunteers help them out by way of harvesting, bulk order or sale, giving the earnings back to farmers or donating such surplus produce to social welfare institutions

Support the Pursuit of Education and **Operation of Institutions**

To support hardworking students who can not afford to go to school due to their families' financial conditions, the Foundation offered scholarships for underprivileged students on the recommendations of local departments of education and schools. With the help of the Sending Love platform, appeals were made to the public and corporations to make donations. In 2022, the Foundation funded six rural schools to participate in the School of Future Competencies: Initiative to Support Model Schools in Rural Areas Cultivating Reading Competencies project and installed distance learning equipment. In addition to purchasing items for learning purposes for rural students, the Foundation utilized the TSMC i-Charity platform to secure monthly donations of fixed amounts and organize charity concerts for fundraising. All of these donations went to NGOs committed to long-term rural educational efforts.



TSMC Participating

Human Resources, TSMC Community Volunteers, TSMC Charity Foundation, System Package Integration Program, Quality & Reliability, More-than-Moore Technologies, Product Derivative Technology Development Division, Product Engineering, E-Beam Operation Division, Fab 8, Fab 12A, Fab 12B, Fab 18A, Fab 15B, Fab 14A, Fab 14B, Fab 6, Intelligent Manufacturing Center, Production Control Integration Department



Cooperating Units

Association of Literacy Education, Taiwan, social/ education bureaus of local governments



Institutional Beneficiaries

7 social welfare institutions, 7 afterschools, 23 schools / educational institutions

Thanks to TSMC bringing resources to underprivileged families, a lot of stress from day-to-day living was taken off their shoulders. They felt society was there to help and that they weren't alone.

Hsiang-Mei Huang

Social worker of the private long-term home care institution under Stella Matutina Social Welfare Foundation

When I saw the living environments of seniors living alone, I could feel their loneliness and difficulties. I was glad to be able to help, and I would like to have more opportunities to help them in the future.

> Hsiao-Ping Tou Fab 10 volunteer

Volunteers from Fab 14A and Fab 14B help senior pomelo farmer out by harvesting and buying surplus pomelos



131 times Community volunteers

917hours Volunteer services

68families

Beneficiaries of NT\$10,000 Per Household program

95 students

Scholarships awarded to underprivileged students

30.09 million

Voluntary fundraising by TSMC employees via TSMC i-Charity platform

Accompanied by the TSMC Production Planning Integration department volunteers, pupils from after-school programs attend a charity concert





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2022 Sustainability Report

What We Want to Solve

As Taiwan will soon become a superaged society, the need for long-term care services and facilities increases every year. Insufficient resources pose a particular challenge to the health and well-being of senior citizens living in rural areas and seniors living alone.

How We Respond

Strengthen the Network of Compassion system to bring together medical and social welfare institutions and integrate and distribute long-term care resources from the government and social welfare institutions to offer comprehensive and quality care to the seniors living in rural areas and seniors living alone.

Our Actions

Strengthen the Care for Seniors Living Alone By Providing Much-needed Resources and Companionship



Strengthen the Care for Seniors Living Alone By Providing **Much-needed Resources and Companionship**

Through the Network of Compassion, the Foundation combines resources from medical and social welfare institutions to meet the needs of seniors living alone in rural areas, including offering medical services, meal deliveries, and transportation vehicles, thereby reinforcing the quality and mobility of resources dedicated to caregiving in rural areas. Due to the rising need for providing long-term care in local communities, the Foundation in 2022 collaborated with Taipei Municipal Gan-Dau Hospital and National Yang Ming Chiao Tung University to build a new smart fitness club for seniors. Smart workout devices adapted to train aging muscles were introduced to help prevent disability and delay aging.

During the COVID-19 pandemic, seniors aged 65 years and older were at high risk of severe illness. The Foundation provided long-term care institutions with <u>pandemic</u> prevention and control supplies and nutritional supplements to safeguard the health of seniors and caregivers. Although services requiring physical proximity were suspended, TSMC volunteers led handicraft activities through video conferencing, participated in empowering seniors through storytelling initiatives, and handed out heartwarming presents during holidays and festivals, enriching the lives of seniors residing in caregiving institutions. When the September 2022 Taitung earthquakes damaged many homes of seniors living alone and disadvantaged families, TSMC volunteers joined forces with providers and local governments to repair the damaged houses, employing their facility expertise and efficient division of labor. Throughout the repair process, sufficient care was given to the everyday living spaces and environments of disadvantaged seniors and their supply of goods.



TSMC helping set up a smart fitness club for seniors in the community can utilize the technology researched and developed by the university to measure precise health stats that will help seniors get the most out of their workouts.

Chi-Hung Lin

President of National Yang Ming Chiao Tung University

With the long-term commitment of TSMC volunteers, we have been able to locate resources and enhance the overall quality of our services. Despite all the difficulties we've had, they've supported us all the way, enabling us to establish a sheltered workshop.

Yu-Wen Huang

Director of St. Camillus Center for Intellectual Disability



TSMC Participating Units

TSMC Community Volunteers, TSMC Charity Foundation, Quality & Reliability, Product Derivative Technology Development Division, Product Engineering/E-Beam Operation Division, Fab 2 & Fab 5, Fab 3, Fab 8, Fab 12A, Fab 12B, Fab 18A, Fab 15B, Fab 14A, Fab 14B



Cooperating Units

15 medical and social welfare institutions under the Network of Compassion, Taipei Municipal Gan-Dau Hospital, National Yang Ming Chiao Tung University



Institutional Beneficiaries

10 eldercare institutions and 2 medical service institutions

The volunteers dedicated to repair and energy conservation from the Division of Facility visited earthquake-hit homes to assess the extent of the damage



355,692 times Meals delivered

Helped caregiving institutions buy transportation vehicles Physiotherapists guide the elderly to exercise through smart home fitness equipment



285 homes

Repaired homes damaged in the September 2022 Taitung earthquakes

Offered care to households of underprivileged seniors or seniors living alone



Volunteers from the Quality & Reliability department helped seniors living alone with year-end-cleaning of their living environment



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What We Want to Solve

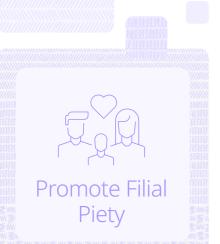
The rapid advance of the digital era has caused generational estrangement and put the family support system at risk of becoming vulnerable. The traditional culture of filial piety has seen a gradual decline, with ever fewer people espousing and practicing the virtue.

How We Respond

Combining resources from industry, government and academia, and by way of educational materials, interactive activities and contests calling for entries, parent-child conversation is guided to achieve better understanding and to develop cohesion in families and harmony in society.

Our Actions

Diversify Creative Efforts to Instill the Virtue of Filial Piety



2022 Sustainability Report

Diversify Creative Efforts to Instill the Virtue of Filial Piety

The Foundation continued working with the K-12 Education Administration under the Ministry of Education to organize parentchild workshops on filial piety, drawing activities, and contests receiving entries on the subject of filial piety. The teaching plans and demonstration videos of the parent-child workshops on filial piety developed by the Foundation were made available for educational agencies to download free of charge. Though storytelling activities by volunteers were suspended during the pandemic, the TSMC i-Charity platform was used to raise funds for pupils and their families in rural areas to watch family-themed movies on Mother's Day, in a bid to let children understand and appreciate the hard work of family caregivers, and to remind the latter to pay attention to their own health and well-being.



TSMC Participating Units

TSMC Charity Foundation, Product Derivative Technology Development Division, Product Engineering, E-Beam Operation Division



Cooperating Units

Chung Yuan Christian University, Ming Chi University of Technology, K-12 Education Administration



Institutional Beneficiaries

Si Wei Elementary School, TEAMTC Community Services Association, Guang Rong Elementary School, ShuangLong Elementary School, Heshing Elementary School, Beyond the Hill Bookstore



A family's warmth is an important stabilizing power for middle-aged parents and children. These activities for promoting filial piety helped children to have a conversation with their parents and grandparents, allowing them to learn more about each other. It was heartwarming and moving.

Yen-Kuang Pu

Director of the General Education Center, Ming Chi University of Technology



Excellent drawings, comics, stories and mini-films on the subject of filial piety received

68 institutions

Promoted filial piety education in 2022



Filial piety parent-child workshop guides parents and children to get to know each other better through painting





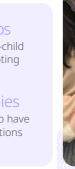
Organized parent-child workshops promoting filial piety

>150 families

Led 150 families to have intimate conversations















2022 Sustainability Report

What We Want to Solve

Climate change impacts the natural environment and threatens certain species. It particularly strains the support systems vital to underprivileged groups, calling into question the stability of such systems in the face of environmental disasters, inequalities in energy distribution, and malnutrition.

How We Respond

With a comprehensive focus on the environment, ecology and society, the Foundation works with industry, government and academia to devise plans that help underprivileged groups reduce resource waste and energy consumption and develop renewable energy sources. TSMC volunteers work on promoting environmental and energy conservation education.

Our Actions

- Conserve and Generate Electricity for Social Welfare Institutions Through Implementing Green Energy Initiatives Advantageous to the Underprivileged and the Cherish Food Project
- Provide Environmental and Energy Conservation Education to Cultivate Sustainable Practices

Conserve and Generate Electricity for Social Welfare Institutions Through Implementing Green Energy Initiatives Advantageous to the Underprivileged and the Cherish Food Project

In the Foundation's efforts to promote green energy, partnerships have been with local governments and social welfare institutions to sponsor the installation of solar panels on the rooftops of institutions. In 2022, the Foundation built seven solar power plants, reducing the monthly electricity bills of social welfare institutions. Through electricity wholesale based on feed-in-tariff contracts, these institutions receive NT\$2.76 million every year to fund their operations. To improve school lighting for elementary school students, the Foundation funded underprivileged students enrolled in vocational colleges to install LED energy-saving light tubes in 246 schools across Taiwan, saving as much as NT\$9.61 million in electricity fees every year—enough to pay for 320,000 more school lunches. To help solve the problem of hunger and reduce food waste, the Cherish Food Project was launched, working with seven food businesses to distribute goodwill foods to 130 underprivileged groups in 16 cities and counties, benefiting individuals 48,143 times.



Student volunteers helping to replace lights in schools not only warmed the hearts of pupils and faculty members but saved 30% on the electricity bill.

Te-Wen Hsu

Principal of Tainan Municipal Yanshuei District Annei Elementary School

When we improved the school's overall lighting, the children were very happy about it. That made us happy, too.

Chun-Yu Lin

Volunteer from Kun Shan University under the University Social Responsibility (USR) program



TSMC Participating Units

TSMC Charity Foundation, Fab 15A



Cooperating Units

7 food companies and 4 vocational universities



Institutional Beneficiaries

Tainan City's Ren-Ai Home, Presbyterian Church in Taiwan Zhutian Church, Pingtung Christian Bethany Home, 2 elementary schools in Yunlin County, Madou Resthome, Shun-Yuan Eldercare Center

Solar panels installed on the idle rooftop of Tainan City's Ren-Ai Home for Senior Citizens



Achievements of the Cherish **Food Project**

48.143 58.862 Note 37,071

Volunteers from Kun Shan University visiting a rural school to replace existing lights with energy-efficient lights

Solar power plants built

2.76 million

Electricity wholesale earned per year (NT\$)

9.61 million

Electricity fees saved per year (NT\$)

246 schools

School installed energy-saving LED light tubes

130

Underprivileged groups benefited regularly from the Cherish Food Project





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Provide Environmental and Energy Conservation Education to Cultivate Sustainable Practices

The Foundation continued to lead TSMC volunteers to give diverse tours and offer courses on environmental and energy conservation to raise awareness of environmental protection and sustainability among rural students and the general public. TSMC Ecology Volunteers, dedicated to the work of ecological preservation, invited and funded rural students to travel to TSMC's premises, where they were given an informative ecological tour. As part of the focus on environmental education, the students learned about biodiversity as well as water and energy conservation. Ecology Volunteers gave tours in Jacana Ecological Education Park to talk about conservation systems and introduced the public in the National Museum of Nature Science to semiconductor science and technology. In 2022, the Foundation co-published the picture book Fen-Fen's Promise with Old Tree Yard Environment Protection Foundation, whose mission is to promote old trees, protect forests, and advocate for an eco-friendly education that views old trees as our friends.

2022 Sustainability Report



Many thanks to TSMC for introducing students to how an effective water recycling system works. It inspired them to care more about environmental protection issues and take action.

Head of Sanitation Division, Guo-An Elementary School

I hope the concept of ecological sustainability will bring about incremental yet profound changes to the public.

> Pei-Chun Tu TSMC volunteer



TSMC Participating

TSMC Charity Foundation, Production Control Integration Department, Fab 6, Intelligent Manufacturing Center, TSMC Ecology Volunteers, TSMC Energy-Saving Volunteers, TSMC Museum Tour-Guiding Volunteers



Cooperating Units

Industrial Technology Research Institute, Jacana Ecological Education Park, Old Tree Yard Environment Protection Foundation, National Museum of Natural Science

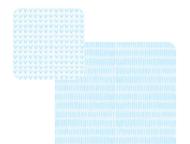


Institutional Beneficiaries

After School Association of Taiwan, Love Infinite Association of Taiwan, Hsinchu I-Link Association, Shinmei Elementary School



FAB 6 volunteers visit rural schools to teach pupils about concepts of energy conservation

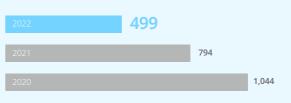


182 times

Ecology Volunteer services offered

>728 hours Ecological tours





Ecology Volunteers lead children to learn about the features of different plants and their roles in the ecosystem



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Corporate Governance

TSMC advocates and acts upon the principles of operational transparency and respect for shareholder rights. We believe that the basis for successful corporate governance is a sound and effective Board of Directors. In line with this principle, TSMC Board of Directors set up the "Audit Committee" and the "Compensation Committee" in 2002 and 2003 respectively. To continue to make our corporate

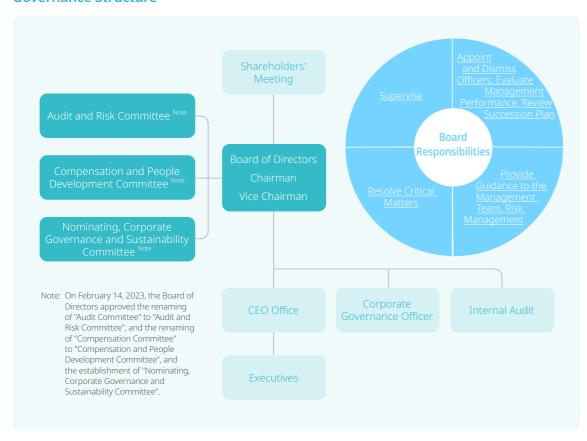
2022 Sustainability Report

governance more comprehensive, the TSMC Board took a step further in February 2023 to expand and strengthen the functions and responsibilities of its committees, including renaming the "Audit Committee" to the "Audit and Risk Committee", and the renaming the "Compensation Committee" to the "Compensation and People Development Committee". In addition, in order to strengthen the selection mechanism for directors, build diversified and professional board, TSMC's Board of Directors approved the establishment of the "Nominating, Corporate Governance and Sustainability Committee" referencing international practices. Each Committee supports the Board to fulfill its responsibilities and each Committee's chairperson regularly reports to the Board on its activities and recommendations.

Board of Directors and Committees

Inheriting the spirit of TSMC's Founder, Dr. Morris Chang's philosophy on corporate governance, under the leadership of Chairman Dr. Mark Liu and CEO & Vice Chairman Dr. C.C. Wei, TSMC's Board of Directors takes a serious and forthright approach to its duties and is a dedicated, competent and independent Board.

Governance Structure



Title/Name	Board of Directors	Audit and Risk Committee	Compensation and People Development Committee	Nominating, Corporate Governance and Sustainability Committee
Chairman Mark Liu	~			~
Vice Chairman C.C. Wei	~			
Director F.C. Tseng	~			
Director Ming-Hsin Kung (Representative of National Development Fund, Executive Yuan)	~			
Independent Director Sir Peter L. Bonfield	~	V Chair	~	✓
Independent Director Kok-Choo Chen	~	~	~	~
Independent Director Michael R. Splinter	~	~	\ Chair	✓
Independent Director Moshe N. Gavrielov	~	~	~	✓ Chair
Independent Director Yancey Hai	~	~	~	✓
Independent Director L. Rafael Reif	~	~	~	~
Jan C. Lobbezoo		<u>Financial Expert</u> <u>Consultant</u>		



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Nomination and Election Directors

2022 Sustainability Report

TSMC has established the "Guidelines for Nomination of Directors" that set out the procedures and criteria for the nomination, qualification and evaluation of Director candidates to be nominated by the Board of Directors, and provide that "Nominating, Corporate Governance and Sustainability Committee" will propose independent director candidates to the Board of Directors. The independence of each independent director candidate is also considered and assessed under relevant laws. The members of TSMC Board of Directors are nominated via rigorous selection processes. It not only considers background diversity, professional competence and experience, but also attaches great importance to his/her personal reputation on ethics and leadership. Directors shall be elected pursuant to the candidate nomination system specified in Article 192-1 of the R.O.C. Company Law. The tenure of office for Directors shall be three years. The Company aims to have at least of 50% independent directors and as least one female director to serve on the Board.

Board Diversity and Independence

The ten members of the Board of Directors represent diversified perspectives, including a complementary mix of skills, experiences, and backgrounds such as that from the industry, academia, and in law. etc. These professionals include citizens from Taiwan, Europe and the U.S. with world-class business operating experience, one of whom is female. The six Independent Directors constitute 60% of the Board, and there is no marital or is within the second degree of kinship relationship between or among

the Directors. As such, the Board of Directors carries independence.

For more details of "Corporate Governance", please refer to TSMC's Annual Report and www.tsmc.com.

Risk Management

TSMC adopts a balanced risk-reward approach to risk management to optimize business returns while considering the overall impact on corporate sustainability. In 2022, the Risk Management Policy was established, approved by the Board of Directors and signed off by the Chairman, affirming the Company's commitment to a proactive and robust risk management system that assist TSMC in making well-considered and risk-based decisions, thereby fulfilling

the Company's ESG vision and actions and delivering sustainable value for TSMC and its stakeholders. To support the implementation of the Risk Management Policy, the Enterprise Risk Management (ERM) framework was enhanced in 2022 to outline the risk management mechanisms, processes, systems and tools. Through a 5-step process of identification, assessment, response, monitoring, and review, potential sustainability risks such as climate change, utility supply, earthquakes, fires, and chemical spillage as well as emerging risks are managed. A series of training courses are provided to foster a risk-aware mindset and culture.

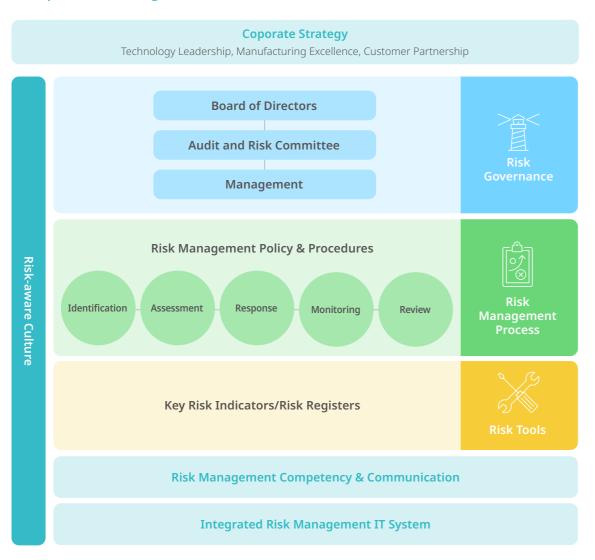
TSMC further renamed the Audit Committee to Audit and Risk Committee in February 2023 to enhance

the Board of Directors' risk oversight of TSMC's ERM framework. At the management level, the risk governance structure comprises the Risk Management Steering Committee, Risk Management Executive Council, Risk Management Taskforces, Central Crisis Command Center, and Crisis Management Team. Risk Management Division works with each function in applying the ERM framework to ensure that significant risks and crises across TSMC are assessed and adequately mitigated. This is performed through risk monitoring, conducting workshops, visiting sites, participating in key meetings, and implementing risk related policies and guidelines. For more details on Risk Management, please refer to 6.3 Risk Management in TSMC's 2022 Annual Report.

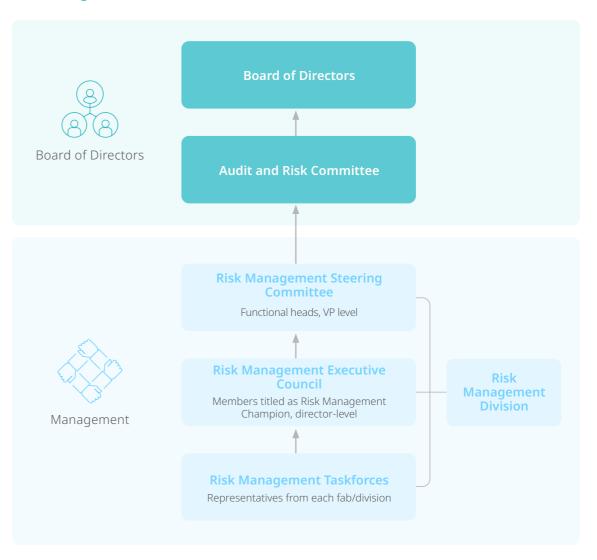


Enterprise Risk Management Framework

2022 Sustainability Report



Risk Management Governance Structure



Administrative discipline/legal

action

Review and analyze corruption risk

assessment

Proposed improvement program

Implement improvement program

Ethics and Regulatory Compliance

2022 Sustainability Report

Ethics

"Integrity" is the cornerstone of TSMC's business philosophy. TSMC established its TSMC Ethics and Business Conduct Policy (Ethics Code) to be the guide for operating TSMC's business and to form a robust culture of integrity within TSMC, with "integrity, commitment, innovation and customer trust" as our core values. At the same time, by establishing the Supplier Code of Conduct and Supplier Sustainability Standards, TSMC extends its core value of integrity into its supply chains and to enable suppliers to demonstrate business with integrity behavior. In addition, TSMC publishes its TSMC Anti-Corruption Commitment on the TSMC website to emphasize TSMC's commitment to its core value of integrity.

TSMC established and published the Complaint Policy and Procedure for Certain Accounting <u>& Legal Matters</u>, making multiple reporting channels available for internal and external voices, and accepting anonymous reports to protect the rights and interests of the Company and its constituencies. All reported incidents collected from these reporting channels are properly recorded, confidentially investigated, well traced, and enhancements to TSMC practices are made where applicable. TSMC keeps individual identities confidential and prohibits any retaliation on any individual who in good faith reports a suspected violation or participates in an investigation. Furthermore, TSMC has an Ethics Committee that oversees the implementation of the Ethics Code and investigations and disciplinary actions for

reported incidents. The Ethics Committee meets quarterly or whenever necessary. In 2022, the Ethics Committee met six times to examine major reported incidents under investigation. Four incidents were verified upon investigation and determined for disciplinary action by the Ethics

Committee. The Company will take progressive disciplinary actions according to the nature and severity of each misconduct.

Ethics Compliance Activities



 The Ethics Committee will evaluate each incident to determine whether it is an exceptional case or whether it results from systemic issues of insufficient awareness in ethics. This allows TSMC to continue evaluating

• The Ethics Committee investigates the reported incidents and determines the disciplinary actions, which are up to and including immediate dismissal, termination of business relationship, and legal actions as appropriate (In 2022, four

incidents were verified upon investigation and determined for disciplinary action by the Ethics Committee)

• Corruption risk assessment is mainly based on business activities, supplemented by operating bases

whether it is necessary to improve its management and internal control procedures



TSMC operates in many countries. To ensure that every business activity in compliance with applicable governing legislation, laws, regulations and regulatory expectations, TSMC has established a complete regulatory compliance system, including a sequence of regulatory identification, compliance policy and procedure formulation, implementation and execution, compliance training program, to closely monitor domestic and foreign government policies and regulatory developments that could materially impact TSMC's business and financial operations.

2022 Sustainability Report

Regulatory Compliance and policy and procedure formulation



2022 Achievements



Regulatory Compliance

- In 2022, TSMC did not receive any reports related to finance, accounting or antitrust matters, nor did we receive any complaints concerning breach of customer privacy and loss of customer data, or any material regulatory violations (where a fine exceeds NT\$1 million), including non-monetary sanctions.
- More information related to TSMC ethics and regulatory compliance, please refer to the 3.5 Ethics section and 3.6 Regulatory Compliance section of TSMC 2022 Annual Report.



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Financial Performance

TSMC believes a strong financial foundation is the key to corporate sustainability. Since the founding of the Company, TSMC has developed prudent business plans, adhered to disciplined capital management, and delivered solid financial performance to help create long-term economic value, which allows the Company to give back to all its stakeholders, including shareholders, investors, employees, customers, suppliers/contractors, government/industry associations, society, and others, and to drive positive changes in society.

2022 Sustainability Report

In an effort to better communicate with investors, TSMC strives to ensure the transparency and timeliness of its financial information. In addition to the regular disclosure of its latest financial results, the Company also sets clear and measurable strategic financial objectives and continues to deliver results that are aligned with its long-term financial targets. In doing so, TSMC is able to strengthen investors' confidence in the Company's long-term investment

value. As the insatiable demand for computation will propel the continued drive for chip performance and a greater need for energy-efficient computing, TSMC expects strong growth potential in its advanced and specialty technologies in the next several years. Thus, from 2021 to 2026, the Company expects its longterm revenue growth, in US dollar terms, to have a compound annual growth rate (CAGR) of 15 to 20%, with a long-term gross margin to be 53% and higher, and a return on equity (ROE) to be 25% and higher across the cycle.

Given the funding requirements to address the business growth opportunities and the need to maintain a solid financial foundation, since 2020, TSMC has issued a total of NT\$311.5 billion in NT dollar denominated corporate bonds and US\$17.5 billion in US dollar denominated corporate bonds with favorable pricing terms. Since the bond issuances, TSMC has continued to maintain the semiconductor industry's highest credit ratings.



Aa3 Moody's Ratings



Four Strategies to Increase Long-term Investment Value



14.9% CAGR in R&D investment Note

8.2% CAGR in R&D headcounts Note



15 million Total capacity exceeded 15 million

12"-equivalent wafers

15.9% CAGR in capital

expenditures Note

in 2022



16.2%

CAGR in net revenue Note

30%

Of the world's semiconductor excluding memory output value produced in 2022



income Note

Average ROE^{Note}

2.5trillion

Cumulative cash dividends from 2004 to 2022 (NT\$)

Note: From 2013 to 2022

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Since TSMC went public in 1994, the Company has been profitable every year and its market capitalization has been growing steadily. As of December 31, 2022, TSMC's market capitalization reached NT\$11.7 trillion, or US\$379.7 billion.

2022 Sustainability Report

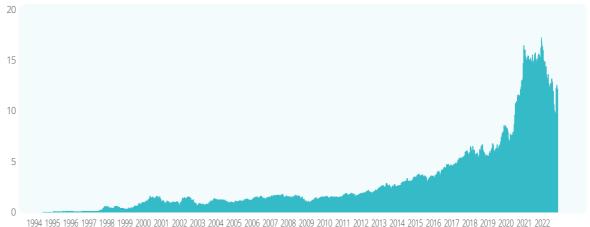
TSMC's solid financial performance enables the Company to distribute profits to shareholders in the form of cash dividends. In June 2021, TSMC's Board of Directors approved the increase in quarterly cash dividend from NT\$2.5 to NT\$2.75 per share. Therefore, TSMC's shareholders

received a total of NT\$11 per share in cash dividends in 2022. From 2004 to 2022, TSMC has paid out a total of NT\$2.5 trillion, or US\$81.5 billion, in cash dividends.

In the future, TSMC intends to maintain a sustainable and steadily increasing cash dividend, and to distribute the cash dividend each year/quarter at a level not lower than the year/quarter before.

Market Capitalization

Unit: NT\$ trillion

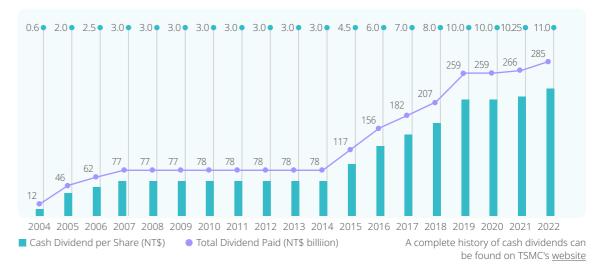


Financial Performance

Unit: NT\$ Billion



Cash Dividends





TSMC supports the government in formulating regulations that encourage enterprise innovation and foster economic growth. The Company's tax policy is reviewed and approved annually by the Chief Financial Officer, which aims to ensure transparency and sustainability in the long term.

2022 Sustainability Report

Tax Policy

- Act at all times in compliance with the spirit and the letter of all applicable tax laws and regulations in the jurisdictions in which we operate.
- Conduct inter-company transactions on an arm's length basis and in accordance with the internationally accepted transfer pricing guidance published by the OECD.
- Be transparent in financial reporting, make disclosures in accordance with applicable regulations and reporting requirements.
- Do not use tax havens or tax structures whose sole purpose is tax avoidance.
- On not transfer value created to low-tax jurisdictions.
- Develop strong, mutually respectful relationships with tax authorities based on transparency and
- Always consider tax as a part of major business decisions
- Analyze the operating environment and assess tax risk through a corporate management mechanism.

Tax Risk Management

TSMC is subject to tax laws and regulations in the various jurisdictions in which it operates or conducts business. Any unfavorable changes in tax laws and regulations in these jurisdictions could increase the Company's effective tax rate and have an adverse effect on its operating results. In order to effectively manage tax risks, TSMC follows internal control processes, identifies, assesses, and manages tax risks from regulatory changes and its business transactions, accounts for them appropriately, and implements and monitors controls over them.

Tax risk management is incorporated in TSMC's enterprise risk management (ERM) system. The risk management organization annually reports to the Audit and Risk Committee on TSMC's key risks and mitigation efforts. For more details on risk management, please refer to the 6.3 Risk Management section in TSMC's 2022 Annual Report.

Tax Governance

The ultimate responsibility for the taxation management of TSMC and its subsidiaries rests with the Chief Financial Officer, who delegates dayto-day responsibility to the Controller. A team of qualified and experienced tax professionals supports the Controller to meet TSMC's tax obligations. In addition, TSMC also leverages external tax service providers for complementary expertise.

TSMC's Audit and Risk Committee is delegated by the Board to oversee the quality and integrity of the accounting, auditing, reporting, and financial control practices of the Company through periodic review of certain major matters, including accounting policies and procedures, internal control systems, legal compliance, and corporate risk management, etc. Among these, tax compliance is included as part of the Company's legal compliance.

Effective Tax Rate

TSMC's effective tax rate and cash tax rate in 2022 were 11.1% and 7.6%, respectively, both of which were lower than the industry average effective tax rate of 15.9% and the industry average cash tax rate of 14.12% based on S&P Global CSA Handbook in the Semiconductors and Semiconductor Equipment industry group, and also lower than Taiwan R.O.C. statutory tax rate of 20%. This was primarily due to a five-year tax exemption for capital investments made in previous years, and tax credit for research and development expenditures according to regulations under the R.O.C. Statute for Upgrading Industries and Statute for Industrial Innovation.

2022 Tax Breakdown Note1



101.5 billion

In 2022, TSMC's total tax payments on a cash basis worldwide

>90%

In 2022, over 90% of TSMC's revenue and profit before tax were generated from its business operations in Taiwan. Meanwhile, over 90% of its tax payments were also made to the Taiwan R.O.C. government

Based on data provided by Taiwan Economic Journal (TEJ) database, TSMC was the largest corporate income tax payer among all public listed companies in Taiwan in 2022

8.1%

TSMC's 2022 income tax payment in Taiwan represented 8.1% of total corporate income taxes collected by the R.O.C. government Note 2



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Information Security

2022 Sustainability Report

Information security and proprietary information protection (PIP) are TSMC's commitments to customers, suppliers, and employees. To strengthen corporate information security protection and management mechanisms, TSMC created the new role of Chief Information Security Officer in 2022 to take charge of information security policy and procedure planning, monitoring, and management. The Company also continues to perform information security risk analysis and develop smart information security technologies and measures, including cloud information security analysis, alarm summaries, the SOAR (Security Orchestration, Automation, and Response) system, etc., to improve protection and monitoring performance. TSMC is also influencing the supply chain by working with SEMI to overcome information security challenges in the semiconductor industry. Through four major directions, information security awareness and protection standards in the industry are raised to achieve the goal of sustainable operations.

TSMC Corporate Information Safety Organization



Robust Information Security Governance

The Board of Directors has authorized the Audit <u>Committee</u> to manage and oversee corporate information security. The Audit Committee is chaired by Sir Peter L. Bonfield, an independent director with a background in information security. In 2022, following the regulations of the Financial Supervisory Commission of Taiwan, TSMC appointed J.K Lin, Senior Vice President of Information Technology, Material and Risk Management, to take on the addition role of Chief Information Security Officer (CISO). Lin is responsible for the overall planning and coordination of company resources, communicating on information security policies and directions. TSMC has established a dedicated information security organization (Corporate Information Security, CIS), led by Director James Tu, is responsible for the implementation,

planning, monitoring, and management of information security operations. TSMC has also established the PIP and Cybersecurity Committee and the IT Security Committee to cooperate with the Company's information technology and related organizations to strengthen corporate information security protection and management mechanisms. Both committees are chaired by the CISO and comprise VP-level executives who meet regularly to review and deliberate on important information security and protection policies as well as project implementation. Every six months, the CIS executives report risk management measures to the Audit Committee, including global information security trends, corporate information security policies, plans, and implementation results. The chair of the Audit Committee also reports on the effectiveness of information security supervision and risk control measures to the Board of Directors.

Implement Information Security Culture and Build Management Mechanisms

TSMC is fully committed to the TSMC <u>Information</u> Security Declaration and continues to work on the five major areas of information security management. Over the years, TSMC has consistently met the information security requirements of customers and third-party agencies. In 2022, TSMC's external audits concluded that no major information security flaws, major violations, incidents of customer data breach and regulatory fines occurred. Moreover, there have been zero complaints concerning breach of customer privacy and loss of customer data from either third parties or regulatory bodies resulting in judicial action. By actively strengthening information security and PIP, TSMC hopes to safeguard market competitiveness and customers and partners' interests.

Five Major Areas of Information Security Management



Adopt International Information Security **Standards**

- Establish automated information security management system, obtain ISO/IEC 27001 information security certification, and pass two external Continual Assessment Visit (CAV) evaluations
- Continuously pass ISO/IEC 15408 facility security certification to create an optimal and safe wafer manufacturing environment
- Comply with international standards to manage and control workplace environments, information security, system operations, and product safety



Professional Talent Cultivation and Certification

- Encourage information security personnel to obtain top international information security certification; in 2022, TSMC employees acquired 47 Cyber Security Management Act licenses, bringing the total to over 140 licenses
- Organize training courses on different topics based on the natures of the organizations and develop best practices for information security operations, management, and control



Strengthen Employee Management

- The PIP Working Committee, comprised of representatives from each organization, meets regularly to address employee feedback by proposing management practices and suggestions in compliance with organizational demands
- Provide comprehensive information security reporting channels and protection; collect employee feedback to assess outcomes, propose improvement plans to strengthen mechanisms for information security operations



Information Security **Training and Social Engineering Drills**

- Require all employees and suppliers to complete information security training programs each year
- Utilize benchmark phishing email testing tools and question databases; regularly detect phishing emails and drill and test employees on common mistakes



Diverse

- Continue to produce awareness posters, lectures, and communication meetings to promote the importance of information security through diverse
- Collect employees' opinions through information security suggestion boxes and regular questionnaires to craft and roll out improvement plans
- Take punitive action against employees for information security noncompliance based on the impact level
- Hold annual internal review meetings to assess policy outcomes for the year and draft goals for the coming year

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Perform Risk Assessment and Strengthen Information Security Measures

TSMC regularly performs information security risk assessments and adopts a comprehensive layered cybersecurity defense. In 2022, information security measures focused on cybersecurity control, information asset management, access control and safety, and workplace security items to strengthen information security defense.

Major Information Security Items and Measures

2022 Sustainability Report



Cybersecurity Control

- Enhance the security and convenience of web browsing, strength email security and protecting against phishing emails and malware
- Strengthen KPI management for cloud security posture management



Information Asset Management

- Introduce endpoint smart terminal protection to detect, analyze, and automatically respond to malware attacks
- Introduce zero downtime patching solutions to strengthen the protection of important
- Integrate automatic information security evaluation into the development process platform to improve application security
- Build information security designs into applications to strengthen security and repair



Access Control and Safety

• Manage information by defining different levels and categories to bolster <u>protection</u> and access control



Workplace Security

• Install multi-layered workplace monitoring and detection equipment to ensure security control

Strengthen Information Security Operations and Management

TSMC has implemented the Business Continuity Management Policy to ensure business continuity. The 24-hour Cybersecurity Incident Response Center (CIRC) is responsible for coordinating related efforts and ensuring the effectiveness of control measures in compliance with the information security incident notification procedures. In 2022, new measures were added, including strengthening cloud information security analysis and alarm summaries for overseas facilities, introducing automatic response systems with preset responses that are automatically executed, etc. In addition, TSMC continues to organize cybersecurity drills, focusing in 2022 on ransomware, remote access, and weaknesses in overseas facilities. The Company also worked with third-party experts to conduct penetration testing and red team vs. blue team drills to enhance information protection and monitoring. In addition to internal measures to strengthen information security at TSMC, the Company recognizes that companies are currently facing dangerous landscapes and have, therefore, invested in information security insurance as the last line of defense to reduce risks of information security incidents.

Strengthen Supplier Information Security

TSMC seeks to strengthen information security across the supply chain in four areas: first, establishing standards; second, assessment & collaboration; third, advocacy; and fourth, risk management. In 2022, the information security practices of 659 suppliers were evaluated, of which 481 received a grade of A and 326 suppliers were able to bring up their grades by one or more levels within six months. The reach of TSMC's Supply Chain Security Newsletter was also expanded. In 2022, four issues were published with a readership of 350,000. TSMC also assisted SEMI in establishing the SEMI Cybersecurity Committee. Chaired by Dr. James Tu, Head of Corporate Information Security at TSMC, the SEMI Cybersecurity Committee advocates information security solutions based on the zero trust model to strengthen supply chain resilience. In 2022, the Committee rolled out four major directions to strengthen information security in the industry, using third-party risk assessment tools to create the SEMI Semiconductor Cyber Security Risk Rating Service dedicated to semiconductor suppliers. The rating service can help suppliers compare baselines, monitor postures, and drive the industry toward a better future.

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2022 Information Security Measure Enforcement Results



Information Security

Assessment

Third-party evaluation on TSMC's

Violations

- 0.04% of employees were found in violation of information security protection and PIP procedures and penalized according to the severity of the damage
- Corrective measures: Additional training and promotion campaigns and better management of information access control and transmission authorization

Information Security Team **Professional Certificate**

Certificates

TSMC information security team obtained 47 international certificates

Information Security Certification

Fabs Obtained ISO/IFC 15408 Certification

Fab 12B, Fab 14A, Fab 15A, Fab 15B, Advanced Backend Fab 2A, 2B and Advanced Backend Fab 5 received ISO/IEC 15408 EAL6 certification under Common Criteria (Site Certification) from the German Federal Office for Information Security (BSI)

ISO/IEC 27001 Information Security Certification

Client IP merge, mask manufacturing, inventory management, and related IT management to support 12-inch wafer manufacturing

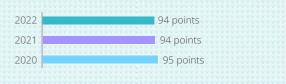
4 Customer Security Audits

Worked with two major clients through on-site information security audits to help them obtain ISO/IEC 15408 certification for their products (produced by TSMC) and ensure information protection during wafer manufacturing

Survey

94 Points

- Obtained an average score of 94 for employee approval of information protection-related policies
- Collected over 54,000 responses with a response rate of over 89%



Employee Feedback

3 Reports

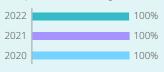
Received a total of 103 reports from employees

Training/Promotion Programs

information security resulted in a score of

99 in 2022, over industry average score

All new employees, a total of over 10,000 individuals, completed information security and protection training courses



All new vendors, a total of over 70,000 individuals, completed PIP training courses

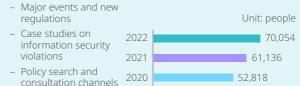


Produced 19 awareness posters to promote important regulations and announcements regarding information protection and information security



61,136 Employees

• All employees completed the annual online information security refresher course, which covered:



2 Social Engineering Drills

Conducted 12 email phishing and social engineering drills with more than 250,000 employees

Supply Chain Security

Published four issues with a total of more than 350,000 recipients

Note: 2022 indicators cover TSMC's Taiwan fabs and overseas subsidiaries

Overview

Sustainable Business Practices Operations and Governance An Innovation Pioneer A Responsible Purchaser A Practitioner of Green Power An Admired Employer

Appendix



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Appendix

Contact Information

About this Report
Sustainability Information Disclosure Framework
— Global Reporting Initiative Index
— United Nations Global Compact Index
— Task Force on Climate-related Financial Disclosures Index
— Sustainability Accounting Standards Board Index
WEF IBC Stakeholder Capitalism Metrics Index
Climate-related Information of Listed Companies
Participation in Industry Associations and Non-Profit Organizations
ESG Performance Summary
Independent Third Party Assurance Statement



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About this Report

2022 Sustainability Report

Adhering to the vision of Uplift Society, TSMC has been issuing non-financial reports for 24 consecutive years. In addition to complying with Global Reporting Initiative (GRI), TCFD Recommendations, Sustainability Accounting Standards Board (SASB), the report also heeds expectations and suggestions from various stakeholders with systematic communication channels in the Company's daily operations and uses materiality analysis to adjust sustainable management practices and align with international sustainability standards. The annual Sustainability Report has become an important tool for managing ESG practices internally and a way to disclose mid- and long-term strategies, practices, and progress. TSMC collaborates with employees, shareholders/investors, customers, vendors/contractors, the government/associations, and society to strive for a sustainable future.

Reporting Period

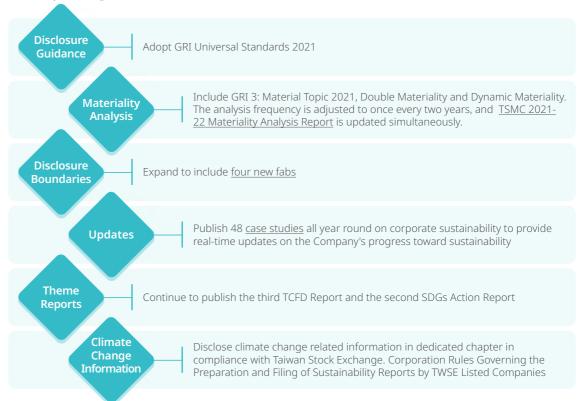
The reporting period is between January 1, 2022 and December 31, 2022. The report is published in June 2023 in both English and Chinese and is available on TSMC ESG website. The report covers major topics of stakeholders concerns as well as TSMC practices in the economic, environmental, social, and governance dimensions. Visit the following links for more historical data and information:



Reporting Scope

The reporting scope includes all TSMC fabs in Taiwan (the corporate headquarters and all wafer fabs and backend fabs in Taiwan), TSMC (China), TSMC (Nanjing), WaferTech, VisEra, and other subsidiaries. Changes from last year include an expansion to Fab 12 Phase 8, Fab 18 Phase 6, 7, and 8 in Taiwan. If the scope of reporting is different from the above statement, a note will be added to explain any differences in this paragraph.

Primary Changes in the 2022 ESG Disclosures



Data Collection Boundaries for Sustainable Development Issues

2022 Sustainability Report

Complete data collected

Partial data collected

— The issue lacks materiality to the institution and is not included in the boundary of data collection

Boundaries Issues	Taiwan Facilities ^{Note1}	WaferTech	TSMC (China)	TSMC (Nanjing)	VisEra	Other Subsidiaries ^{Note2}
Innovation Management	•	_	•	•	_	•
Product Quality and Safety	•	•	•	•	•	•
Customer Relations	•	•	•	•	•	•
Sustainable Supply Chain	•	•	•	•	•	-
Climate and Energy	•	•	•	•	•	•
Water Stewardship	•	•	•	•	•	_
Circular Resources	•	•	•	•	•	-
Air Pollution Control	•	•	•	•	•	_
Diversity and Inclusion	•	•	•	•	•	•
Talent Attraction and Retention	•	•	•	•	•	•
Talent Development	•	•	•	•	•	•
Human Rights	•	•	•	•	•	•
Occupational Safety and Health	•	•	•	•	•	_
Social Impact	•	_	•	•	_	_

Note 1: TSMC's fabs in Taiwan include corporate headquarters, wafer fabs, testing and assembly facilities

Note 2: TSMC subsidiaries or offices in North America, Europe, Japan, South Korea, and other countries

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Report Writing and Quality Management Process



Engagement -



Planning



Editina



Review



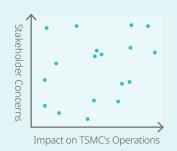
Communication

Inclusivity

Communicate with stakeholders to identify reasonable expectations

Materiality

Identify issues with significant impact to TSMC's operations and sustainability development and of stakeholders' concerns



Comprehensiveness

Define material issues boundaries and data collection

Launch Kick-off Meeting

- Deliver a comprehensive plan
- Define the main theme and content of the Report
- Establish editing and revision guidelines
- Communicate matters that require collaborations for audit



ESG Department



Employee Engagement Ideas

Internal Cross-Functional Meetings

- Share new trends and approaches
- Share the annual plan for improvements
- Report case studies
- Plan the ESG Newsletter



ESG Committee Team Assigned Writer

Compile, edit, and revise in compliance with eight reporting principles set forth by the GRI, TSMC's 21 quality indicators and the SMART principle

Long-term Sustainability Goals

Review the 2030 Sustainability Goals in accordance with the SMART principles

- Specific
- Measurable
- Achievable
- Realistic
- Time-bound

Develop the Six Major Quality

Ensure compliance with 21 quality indicators

- Accuracy
- Balance
- Clarity
- Comparability
- Reliability
- Timeliness

Confirm sustainable activities and performances by the organization

• Audit information accuracy



Division-Level Managers

• Verify information and data



VPs and Above Executives of TSMC Organizations

- Preliminary and on-site paper audit by third parties
- Raise improvement items from audit findings



Independent Verification Organization

• Review and finalize report



ESG Committee Chairperson

Supervise and Guide



Board of Directors

- TSMC Website and ESG Website
- TSMC ESG Newsletter
- Email to Stakeholders
- TSMC ESG Facebook
- TSMC LinkedIn
- Supply Online 360
- Customer Newsletter
- Government's Public Disclosure Platform



Sustainability Report

- EDM to All Employees
- myTSMC Internal Website
- ESG Award Website
- ESG Steering Committee
- ESG Committee
- Internal Cross-Functional Meetings for ESG

Note: Please refer TSMC ESG Website for Certification and Verification

Report Writing Guidelines and Principles

2022 Sustainability Report



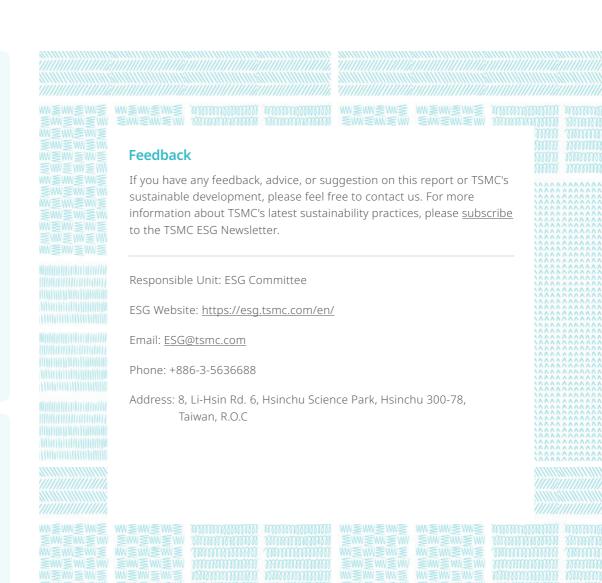
- **GRI Standards**
- TCFD Framework
- SASB Index for the Semiconductor Industry
- AA1000 AccountAbility Principles
- The International Integrated Reporting Framework
- CDP Climate Change/ Water Security
- ✓ The United Nations Global Compact (UNGC)
- The United Nations Sustainable Development Goals (UN SDGs)
- ✓ WEF IBC Stakeholder Capitalism Metrics

- DNV GL Business Assurance Co. Ltd. certified this Report
- In compliance with the <u>DNV</u> VeriSustain[™] Protocol, GRI Standards, SASB Index, and the TCFD Framework



- ✓ IFRSs endorsed by the Financial Supervisory Commission (FSC) with the effective dates
- Regulations Governing the Preparation of Financial Reports by Securities Issuers

Deloitte & Touche



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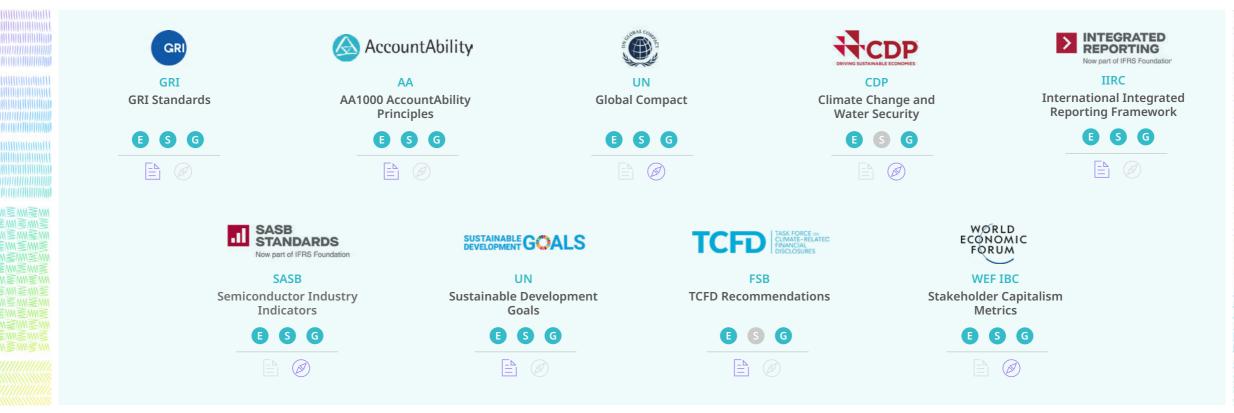
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Sustainability Information Disclosure Framework

Dedicated to driving more positive changes, the TSMC Sustainability Report follows the editorial standards of the Global Reporting Initiative (GRI), AccountAbility (AA), United Nations (UN), Carbon Disclosure Project (CDP), International Integrated Reporting Council (IIRC), Sustainability Accounting Standards Board (SASB), Financial Stability Board (FSB), World Economic Forum International Business Council (WEF IBC) and refers

to their principles of reporting disclosure (to establish a systematic management process for reports) and indicators (environmental, social and governance indicators) to report TSMC's sustainability information and data. TSMC utilizes sustainability information disclosure as a proactive management tool to serve as a guide for organizations to stay in alignment with international sustainability management trends.







2022 Sustainability Report







Climate-related Information of Listed Companies

2022 Sustainability Report

	Items	Execution Status
1	Description on the Board and Management's oversight and governance on climate-related risks and opportunities	See <u>TCFD—Governance</u>
2	Description on how the identified climate risks and opportunities impact the company's business, strategies, and finance (short, mid, long-term)	See <u>TCFD—Strategies & Climate</u> , <u>Change Risks/Opportunities and Response Measures</u>
3	Description on the impact extreme climate events and transitional actions have on finance	See <u>TCFD—Strategies</u>
4	Description on how the climate risk identification, assessment, and management process is integrated in the overall risk management system	See TCFD—Risk Management
5	Should scenario analysis is used to assess the Company's resilience in face of climate change risks, explanations on the scenario, parameters, hypothesis, analysis factors and major financial impacts should be provided	See <u>TCFD—Strategies</u>
6	Should there be transitional programs in response to managing climate-related risks, please explain the program's content and metrics and targets used to identify and manage physical and transitional risks	See <u>TCFD—Metrics and Targets</u>
7	Should the internal carbon pricing is used as the planning tool, the pricing mechanism should be explained	See <u>TSMC Carbon Pricing Mechanism</u>
8	Should climate-related targets are in place, information such as their scope of action, GHG emissions, planned timeline, and yearly achieved progress should be stated; for targets achieved through carbon offset and RECs, the source of offset amount and number of RECs should be stated	See TCFD—Metrics and Targets
9	Carbon inventory and assurance efforts	See chart on the next page



Overview

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	Area	Scope 1		Sco	A		
Year		Total Emissions (metric tons CO ₂ e)	Emission Intensity (metric tons CO ₂ e/NT\$ thousand)	Total Emissions (metric tons CO ₂ e)	Emission Intensity (metric tons CO ₂ e/NT\$ thousand)	Assurance Institutes	Assurance Efforts
	the Parent Company	1,669,770	0.0007	9,510,082	0.0042	DNV	Reasonable level
	Visera	5,845	0.0006	29,683	0.0033	DNV	Reasonable level
2022	TSMC (China)	187,181	0.0066	0	0	DNV	Reasonable level
	TSMC (Nanging)	46,209	0.0011	0	0	DNV	Reasonable level
	WaferTech, LLC	109,784	0.0107	0	0	AWN	Limited level
	the Parent Company	1,808,427	0.0011	8,116,439	0.0052	DNV	Reasonable level
	Visera	7,282	0.0008	39,057	0.0043	DNV	Reasonable level
2021	TSMC (China)	196,834	0.0093	0	0	DNV	Reasonable level
	TSMC (Nanging)	29,778	0.0011	0	0	DNV	Reasonable level
	WaferTech, LLC	105,346	0.0136	0	0	AWN	Limited level

Note 1: Greenhouse Gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perflourocarbons (PFCs), sulfur hexafluoride (SF₆), and nitrogen trifluoride (NF₃)

Note 2: Scope 1 (direct emissions) are emissions based on the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gases Inventories directly owned or controlled by the Company, and the calculation uses the Global Warming Potential (GWP) from IPCC's Fifth Assessment Report; Scope 2 (indirect emissions) are indirect GHG emissions from purchased electricity, heat, and steam

Note 3: New additions to the 2022 emissions boundary include Fab 12 Phase 8, Fab 18 Phase 5, Fab 18 Phase 6, Advanced Backend Fab 2C, and Advanced Backend Fab 6

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Participation in Industry Associations and Non-Profit Organizations Notes

As a key player in the global semiconductor supply chain, TSMC works diligently to integrate the ESG ethos into our daily operations with the aim of sustainable development, setting systematic management strategies, taking tangible action and reviewing results. TSMC works with partners and stakeholders from all walks of life to carry out our environmental and social commitments and continue bringing positive change to the world. TSMC participates in a variety of industry associations and public policy related nonprofit organizations to promote industry dialogue and development, as well as track key issues such as technology innovation, corporate governance, environmental sustainability, human rights, and supply chain management^{Note 2}. In 2022, TSMC participated in 72 industry associations and nonprofit organizations at home and abroad, with expenditures of over NT\$70.94 million^{Note 3}. Total expenditures in the past five years (2018~2022) were about NT\$197.58 million^{Note 4, 5}.

2022 Sustainability Report



Industry Dialogue and Development

TSMC strives for the development of the semiconductor industry. Through participating in industry associations, the Company forges consensus, facilitates collaboration, defines standards, develops talents, and makes policy suggestions to the government in areas including land, water, electricity, talent, intellectual property protection and other areas related to the competitiveness of the industry. Industry associations that TSMC participates in to steer industry development include:

- Taiwan Semiconductor Industry Association (TSIA)
- Semiconductor Industry Association (SIA)
- Semiconductor Equipment and Materials International (SEMI)
- Global Semiconductor Alliance (GSA)
- The Allied Association for Science Park Industries
- Chinese National Association of Industry and Commerce, Taiwan (CNAIC)
- Monte Jade Science & Technology Association of Taiwan
- Taiwan Electrical and Electronics Manufacturers' Association (TEEMA)
- Center for Asia-Pacific Resilience and Innovation (CAPRI)
- Information Technology Industry Council (ITI)
- National Committee on United States-China Relations
- Greater Phoenix Chamber of Commerce

TSMC Chairman Dr. Mark Liu served as Chairman of TSIA for 4 consecutive years since 2019, chaired the World Semiconductor Council for 2 consecutive years since 2021, and currently serves as director of CNAIC. Senior Vice President Y.P. Chin currently serves as chairperson of TSIA's Energy Committee, Vice President Dr. Y.L. Wang currently serves as chairperson of TSIA's Industry and University Committee, Director Han-Wen Fung currently serves as chairperson of TSIA's Environment, Safety and Health Committee, and Director Dr. Cheng-Ming Lin currently serves as chairperson of TSIA's JSTC Committee. Vice President Dr. Douglas Yu currently serves as co-chair of SEMI Taiwan's Packaging & Testing Committee, Senior Director Hsiao-Chin Tuan served as chairperson of SEMI Taiwan's MEMS & Sensors Committee, Director Dr. John Lin currently serves as chairperson of SEMI Taiwan's IC Committee, Director M.D. Chen currently serves as chairperson of SEMI Taiwan's Materials Committee, and Director Dr. James Tu currently serves as chairperson of SEMI Taiwan's Cyber Security Committee. Senior Vice President Rick Cassidy currently serves on the board of GSA. Senior Vice President Y.P. Chin currently serves as executive director of The Allied Association for Science Park Industries, and Vice President Connie Ma served as executive controller of The Allied Association for Science Park Industries. Note 6 Senior Vice President J.K. Lin currently serves as director of TEEMA. Vice President and General Counsel Sylvia Fang currently serves as director of CAPRI. Vice President Peter Cleveland currently serves as director of ITI.

- Note 1: Non-profit organizations in the areas of charity and education are not included here. For details of TSMC's participation in the TSMC Charity Foundation and TSMC Education and Culture Foundation, please see pages 181 to 203 of this report
- Note 2: By law, TSMC is not permitted to make political donations as the Company is majority owned by foreign shareholders. TSMC has always followed this legal requirement and maintained political neutrality but encourages employees to fulfill their civic duty
- Note 3: The five largest membership fees paid or donations made by TSMC in 2022, in descending
 - 1) Center for Asia-Pacific Resilience and Innovation (CAPRI)/ NT\$ 12,000,000 TSMC participates in CAPRI to explore global policy and promote innovative governance by drawing on the experience of the Asia-Pacific region through comparative research on health, innovation, sustainability, and the economy
- 2) Information Technology Industry Council (ITIC)/NT\$11,934,000 The United States is one of TSMC's primary markets. TSMC participates in the ITIC in the U.S. to join other global technology companies to discuss policy trends and industry standards related to technology industry development, and to communicate with the U.S. and global governments on the importance of technology to the global economy
- 3) Taiwan Semiconductor Industry Association (TSIA)/NT\$5,679,000 TSMC participates in the TSIA to support Taiwan's semiconductor industry, develop consensus on the development of the industry through the association's activities and promote healthy growth for the sector through cooperation amid competition
- 4) Semiconductor Industry Association (SIA)/NT\$4,420,960 TSMC participates in the SIA to join other industry members to collectively communicate with the U.S. government and highlight the importance of the semiconductor industry to U.S. economic development, national security, and global competitiveness
- 5) Allied Association for Science Park Industries/NT\$1,980,000 TSMC participates in the Allied Association for Science Park Industries, which serves as a conduit between government and business for promulgation of policies and communication of views. It serves the common interests of companies in Taiwan's science parks and facilitates cooperation for the stable development of science park businesses
- Note 4: TSMC's expenditures of membership and donation for industry associations and nonprofit organizations between 2018 and 2022 were NT\$21,735,668, NT\$20,338,992, NT\$40,197,059, NT\$44,367,769, and NT\$70,943,042, respectively
- Note 5: In addition to the expenditures disclosed in Note 4, TSMC's government relations expenses in 2022 amounted to NT\$83,836,350, with the primary expense being employee payroll. TSMC did not make any political donations in the reporting period. In the past five years (from 2018 to 2022), TSMC did not make any political donations or other spendings related to ballot measures or referendums
- Note 6: Since November 2022, Vice President Connie Ma retired from TSMC



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Technology Innovation

2022 Sustainability Report

Technology innovation is the key driving force moving the industry and economy forward. TSMC not only cares for and invests in technology innovation and participates in the definition of technical standards, the Company also calls on the government and private sector to protect the results of innovation together so that it can gain appropriate economic value and encourage further innovation, creating a fair competitive environment. TSMC participates in industry associations in the area of technology innovation including:

- Epoch Foundation
- K.T. Li Foundation for Development of Science and Technology
- Taiwan Association for Trade Secrets Protection
- Information Technology and Innovation Foundation (ITIF)
- Global Women's Innovation Network
- JEDEC

TSMC Chairman Dr. Mark Liu currently serves as director of both Epoch Foundation and K.T. Li Foundation for Development of Science and Technology. TSMC Vice President and General Counsel Sylvia Fang jointly founded the Taiwan Association for Trade Secrets Protection (TTSP) in 2015 and served as its chairperson for the first two terms to help promote legal reform of Taiwan's trade secret laws and regulations. Currently she is an executive director of the TTSP. Associate General Counsel Dr. F.Y. Shieh currently serves as vice chairman of TTSP.



Corporate Governance

TSMC advocates and acts upon the principles of operational transparency and respects shareholder rights. Based on strong governance foundation, TSMC believes in leadership integrity and adopts ethics, regulatory compliance, and risk management mechanisms into daily business operations. TSMC participates in industry associations in the area of corporate governance including:

- Asia Business Council
- Asian Corporate Governance Association (ACGA)
- Chinese Professional Management Association
- Association of Certified Fraud Examiners, Taiwan Chapter



Environmental Sustainability

Responding to climate change and mitigating climate impact to protect our shared global environment, TSMC integrates green management into daily operations and continues to enhance climate and energy, water stewardship, circular resources, and air pollution control through introducing innovative green technologies. The Company's goal is to become the global standard of eco-friendly corporations. To achieve the commitment of Net Zero Emissions by 2050, TSMC mobilizes supply chain partners to reduce carbon footprint, creating a green supply chain for the semiconductor industry. TSMC participates in industry associations and non-profit organizations in the area of environmental sustainability including:

- Taiwan Association for Net Zero Emissions
- Taiwan Climate Partnership
- Taiwan Institute for Sustainable Energy/Taiwan Center for Corporate Sustainability
- Science and Technology in Society Forum
- RE100
- Business Council for Sustainable Development of Taiwan
- Common Wealth Sustainability Council

TSMC is among the first members of Taiwan Association for Net Zero Emissions, Taiwan Climate Partnership, and Common Wealth Sustainability Council. Senior Vice President J.K. Lin currently serves as vice chairman of Taiwan Association for Net Zero Emissions. Senior Vice President Lora Ho currently serves as director at the Taiwan Center for Corporate Sustainability.



Human Rights and Supply Chain Management

Respecting human rights and creating a respectful workplace are critical to TSMC and our suppliers. TSMC is a full member of the Responsible Business Alliance, and in addition to meeting the alliance's requirements in auditing suppliers, we have also asked our suppliers to strictly comply with local regulations to safeguard human rights. TSMC requires all suppliers to commit to the Assurance to Comply with TSMC's Code of Ethics and Business Conduct and in July 2021, TSMC issued a statement titled Supply Chain Partners Should Ensure Protection of Human Rights During the COVID-19 Pandemic to ensure a dignified work environment. TSMC participates in industry associations in the area of human rights and supply chain management including:

- Responsible Business Alliance (RBA)
- Responsible Minerals Initiative



	Key Indicators	2020	2021	2022
	Revenue (NT\$ billion)	1,339	1,587	2,264
	Net income (NT\$ billion)	518	597	1,017
Operational and	Income tax expense (NT\$ billion)	67	66	127
Economics	Cash dividend (NT\$ billion)	259	266	285
	R&D expenditures (NT\$ billion)	109	125	163
	Capital expenditures (NT\$ billion)	507	839	1,083
	R&D expenses to revenue (%)	8.2	7.9	7.2
	Global patents granted	45,162	50,506	56,693
	Registered trade secrets	100,000	160,000	240,000
	Value generated from improvement projects (NT\$ billion)	15	12	13
	Encourage all major local raw materials suppliers to participate in the Taiwan Continuous Improvement Competition (%)	79	64	74
	Encourage back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Competition (%)	46	67	60
An Innovation Pioneer	Local and back-end packaging materials suppliers that advanced to the finals of the Taiwan Continuous Improvement Award (%)	-	16	17
	New innovative testing methods for product quality and reliability	-	254	272
	Complete quality and reliability certification during the design stage for advanced processes, specialty processes, and wafer-level packaging processes in compliance with the TSMC technological roadmap	Completed	Completed	Completed
	Develop analytical abilities for carcinogenic, mutagenic, and reprotoxic substances and assist the suppliers that supply materials with potential risks in developing such abilities (%)	100	100	100
	NMP replacement rate (%) (Base year: 2016)	59	75	97.2
	Ensure that manufacturing processes are free from PFASs with more than 4 carbon atoms	Ensured that all 3nm process and beyond are free from PFASs with more than 4 carbon atoms	Selected PFHxA substitutes and launched production line testing	Photoresist substitutes that do not contain PFHxA- related substances failed to pass production line testing; to select new substitute materials



	Key Indicators	2020	2021	202
	Tier 1 suppliers' completion rate of the Sustainability Management Self-Assessment Questionnaire (%)	100	100	10
	Critical suppliers' completion rate for receiving third-party audits (by RBA-certified auditing institutions) every three years (%)	40	60	10
	Total number of critical high-risk suppliers that have received audits for the S.H.A.R.P. Program	-	86	10
	Requires suppliers to conduct due diligence for responsible mining; % of legally compliant mines	100	100	10
	Audit at least three suppliers for due diligence in responsible mining each year	-	3	
	Total number of suppliers audited for due diligence in responsible mining	-	3	
	Diversify facilities and assess new suppliers in compliance with the multi-source program (Base year: 2018)	70	109	13.
	Cumulative total of local raw materials suppliers receiving consultation on process advancement and quality improvement (Base year: 2016)	45	55	6
A Responsible Purchaser	Raw materials suppliers invited to observe the annual emergency response drill (Base year: 2016)	111	132	16
	Total number of suppliers that participated in the ESH training program (Base year: 2016)	558	759	96
	Critical high-risk suppliers that received safety and health support (%)	100	100	10
	Increase local sourcing of indirect raw materials (%)	60	60.4	62.
	Increase local sourcing of parts and components (%)	45	46.6	43.0
	Total energy conserved by helping suppliers (GWh) (Base year: 2018)	2.1	3.4	5.3
	Total water conserved by helping suppliers (metric tons) (Base year: 2020)	2,130,000	19,710,000	29,080,000
	Score and reponse rate of suppliers invited to participate in the CDP (Carbon Disclosure Project) in the year	-		C/819
	High-energy-consumption suppliers that have received ISO 14064 certification for GHG emissions (%)	-	51	65
	Waste reduction in major waste-generating suppliers (%) (Base year: 2014)	29.4	31	34



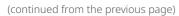
An Innovation Pioneer A Responsible Purchaser A Practitioner of Green Power An Admired Employer

Power to Change Society



2022 Sustainability Report

	Key Indicators	2020	2021	2022
	Greenhouse gas emission (metric ton-CO ₂ equivalent) (Scope 1 and Scope 2 market-based)	9,464,696	10,304,344	11,599,089
	Scope 1 (metric ton-CO ₂ equivalent) Note1	2,004,841	2,151,937	2,018,789
	Taiwan sites	1,710,677	1,808,427	1,669,770
	Subsidiaries ^{Note2}	294,164	343,510	349,019
	Scope 2 (metric ton-CO ₂ equivalent) (market-based)	7,459,856	8,152,497	9,539,765
	Taiwan sites	7,429,951	8,116,440	9,510,082
	Subsidiaries ^{Note2}	29,905	36,057	29,683
	Scope 2 (metric ton-CO ₂ equivalent) (location-based)	8,282,509	9,196,964	10,887,145
	Scope 3 (metric ton - CO ₂ equivalent) Note3	5,511,486	6,049,256	7,502,136
A Practitioner of	Carbon offset (metric ton - CO ₂ equivalent)	4,125	241,577	616,271
Green Power	Fluorinated greenhouse gas emission (metric ton - CO ₂ equivalent)	1,311,530	1,369,478	1,102,353
	Reduction rate of GHG emissions per unit product compared to the base year (metric ton - CO_2 equivalent - 12-inch equivalent wafer mask layer) (%)	23	5	6
	Energy consumption (GWh) (including electricity, natural gas and diesel)	16,919	19,192	22,423
	Direct energy consumption (GWh) (including natural gas and diesel)	861	1,112	1,336
	Indirect energy consumption (GWh) (non-renewable energy)	14,828	16,409	18,895
	Indirect energy consumption (GWh) (renewable energy)	1,230	1,671	2,191
	Renewable energy used at all TSMC fab operation sites (%)	7.6	9.2	10.4
	Renewable energy used at overseas subsidiaries (%)	100	100	100
	Total energy conserved from new energy saving measures since 2016 (GWh/y)	17	24	31



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	Key Indicators	2020	2021	2022
	Energy efficiency after volume production - 10nm & 7nm technology	1.4 (4 th year)	1.5 (5 th year)	-
	Energy efficiency after volume production - 5nm technology	-	0.2 (2 nd year)	0.6 (3 rd year)
	Days of production interrupted due to climate disasters	0	0	0
	NOx emissions (metric tons)	170.36	205.57	159.87
	SOx emissions (metric tons)	38.13	39.48	37.78
	VOC emissions (metric tons)	106.8	107.7	112.9
	Reduction in air pollutant emissions per unit of production (%)	45	54	59
	Reduction rate of volatile organic gases (%)	98.3	98.4	98.9
	Number of unusual events reported in air pollution prevention equipment	0	0	0
A Practitioner of Green Power	ISO 14001 certified sites number	23	24	27
	ISO 14001 certified sites percentage (%)	100	100	100
	Water consumption (million metric tons)	77.3	82.8	104.6
	Taiwan sites	70.6	76.1	96.8
	Subsidiaries ^{Note2}	6.7	6.7	7.8
	Process water recycling rate (%)	86.4	85.4	85.7
	Total water saving (million metric tons)	173	186.3	215.7
	Ultra-pure water usage (million metric tons)	102.4	109.5	132.1
	Tetramethylammonium hydroxide (TMAH) Note 3	6.3	5.5	3.8
	Copper ion (Cu ₂ +) ^{Note 3}	0.07	0.07	0.06

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2022 Sustainability Report

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	Key Indicators	2020	2021	2022
	Reduction % in unit water consumption (liter/12-inch equivalent wafer mask layer) (Base year: 2010)	8.9	14.9	2.6
	% of water pollution composite indicator above effluent standards ^{Note 3}	42.4	42.5	54.3
	Outsourced unit waste disposal per wafer (kg/12-inch equivalent wafer mask layer)	1.01	0.99	0.99
	Waste recycling rate (%)	95	95	96
	Taiwan sites	95	95	96
	Subsidiaries ^{Note2}	77	85	92
	Waste generated (metric tons)	575,740	674,703	744,019
	Outsourced General waste generated	277,340	335,080	342,804
A Practitioner of	Taiwan sites	269,640	326,069	331,499
Green Power	Subsidiaries ^{Note2}	7,700	9,011	11,305
	Outsourced Hazardous Waste generated	298,400	339,623	401,215
	Taiwan sites	280,635	319,763	373,419
	Subsidiaries ^{Note2}	17,765	19,860	27,796
	Develop multiple types of electronic-grade chemicals for resource recycling within TSMC - % of resource recycling within facilities	22	22	28
	Waste treatment vendors that have obtained ISO 14001 or other international EHS Management certifications (%)	80	82	84
	Waste treatment vendors establishing a smart system for tracking waste (%)	-	-	9
	Waste treatment vendors graded as Excellent and Good (%)	75	77	80

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2022 Sustainability Report

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	Key Indicators	2020	2021	2022
	Global Full-time Employees (people)	56,825	65,133	73,090
	Employee training hours	926,379	3,185,784	5,077,993
	Females in all employees (%)	37.1	35.4	34.4
	Females in management (%)	12.5	13	13.3
	Females in junior management (%)	13	13.4	13.6
	Females in top management (%)	10	8.3	6.1
	Females in newly hired technicial professionals (%)	-	21.3	23.7
	Turnover rate (%)	5.3	6.8	6.7
	New hire (< 1 year) turnover rate (%) Note 4	15.7	17.6	15
An Admired Employer	Voluntary turnover rate (%)	5.1	6.7	6.5
	Total compensation amongst industry peers	Top 25%	Top 25%	Top 25%
	Management positions filled through internal promotions (%)	79.3	82.5	88.6
	Management positions filled through internal promotions (%)	45.2	57.6	57.6
	Employees fully committed to their work (%)	96	-	93
	Employees willing to continue working for TSMC in the next five years (%)	95	-	90
	Goals for the issue of sustainably engaged from the Engagement Survey in comparison to the WTW Global High Performance Norm	-	Missed top 50%	-
	Injury frequency rate Note 5	0.42	0.38	0.27
	Injury severity rate Note 6	4	7	3
	Occupational fatalities - employees	0	0	0

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2022 Sustainability Report

	Key Indicators	2020	2021	2022
	Occupational fatalities - contractors	0	0	0
	RBA Self-Assessment Questionnaire (SAQ) scores in all facilities		100	100
An Admired Employer	Incident rate per 1,000 employees	0.311	0.252	0.145
	Cases of occupational disorders caused by exposure to chemicals	0	0	0
	Contractors that have obtained ISO 45001 certification for occupational safety and health management system with help from TSMC (%)	60	65	65
	Total participants in youth competitions	1,551	1,614	2,388
	Promotional events on semiconductor sciences	5	6	13
	Sponsor outstanding local artists or groups	Suspended due to COVID-19	12	12
	Hours of reading services	5,060	4,910	2,060
	Annual cash donations to the disadvantaged (NT\$ million)	1,210	2,263	1,529
Power to Change Society	Children in remote areas that have benefited from TSMC programs	3,279	5,287	6,358
•	Service visits to seniors living alone by Network of Compassion	10,855	15,719	16,471
	Meals delivered by Network of Compassion	-	304,477	355,692
	Promote filial piety education	57	64	68
	Annual beneficiaries of the Cherish Food Program	37,071	58,862	48,143
	Volunteer service from environmental protection volunteers	1,044	794	499

Note: Figures from all Taiwan fabs and subsidiaries of TSMC

Note 3: Figures from all Taiwan Fabs of TSMC

Note 4: Since 2021, the statistic of new hire (< 1 year) turnover rate included VisEra

Note 5: Safety – Injury Frequency Rate=Injury Number x 1,000,000/Total hours worked

According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. Target has been amended according to new definition. See Statistical Analysis of Disabling Injuries for detailed information

Note 6: Safety – Injury Severity Rate=Lost Work Days x 1,000,000/Total hours worked

According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate (FR)/Disabling Severity Rate (SR) are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. Target has been amended according to new definition. See Statistical Analysis of Disabling Injuries for detailed information

Note 1: To ensure consistent data in GHG inventory and reduction goals after 2020, inventory data for Scope 1 will comply with the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gases Inventories starting from 2020 and the base year also change from 2010 to 2020

Note 2: The scope of subsidiaries in Environmental parts includes WaferTech, TSMC China Company Limited, TSMC Nanjing Company Limited and VisEra

Independent Third Party Assurance Statement



Independent assurance statement

2022 Sustainability Report

Scope and approach

Taiwan Semiconductor Manufacturing Company Ltd. ('TSMC' or 'the Company') commissioned DNV Business Assurance Co. Ltd. ("DNV") to undertake independent assurance of the 2022 Sustainability Report (the "Report") for the year ended 31 December 2022.

We performed our work using DNV's assurance methodology VeriSustain™1, which is based on our professional experience, international assurance best practice including International Standard on Assurance Engagements 3000 (ISAE 3000) and the Global Reporting Initiative (GRI) Sustainability Reporting Standards.

The Report also incorporated the relative sustainability reporting guidelines, such as Sustainability Accounting Standards Board (SASB) Semiconductors Sustainability Accounting Standard and Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)

We evaluated the performance data using the reliability principle together with TSMC data protocols for how the data are measured, recorded and reported. The performance data in scope was against TSMC's significant Environmental, Social and Governance (ESG) issues and the 2030 sustainability commitment and the topics set forth in the GRI standards 2021

We understand that the reported financial data and information are based on data from TSMC's Annual Report and Accounts, which are subject to a separate independent audit process. The review of financial data taken from the Annual Report and Accounts is not within the scope of our work.

We planned and performed our work to obtain the evidence we considered necessary to provide a basis for our assurance opinion. We are providing a 'moderate / limited level' of assurance.

Responsibilities of the Directors of TSMC and of the assurance providers

The Directors of TSMC have sole responsibility for the preparation of the Report. In performing our assurance work, our responsibility is to the management of TSMC; however, our statement represents our independent opinion and is intended to inform all of TSMC stakeholders. DNV was not involved in the preparation of any statements or data included in the Report except for this Assurance Statement.

DNV provides a range of other services to TSMC, none of which constitute a conflict of interest with this

DNV's assurance engagements are based on the assumption that the data and information provided by the client to us as part of our review have been provided in good faith. DNV expressly disclaims any liability or co-responsibility for any decision a person or an entity may make based on this Assurance Statement.

Basis of our opinion

A multi-disciplinary team of sustainability and assurance specialists performed work at headquarters and site level. We undertook the following activities:

- Review of the current sustainability issues that could affect TSMC and are of interest to stakeholders:
- Review of TSMC approach to stakeholder engagement and recent outputs;



- . Review of information provided to us by TSMC on its reporting and management processes relating to
- Interview with selected Directors and senior managers responsible for management of sustainability issues and review of selected evidence to support issues discussed. People who worked in functions for financial, legal, environment (including climate change & energy, air emission, water resource, chemical and waste management), human resource, safety, procurement, wellness, product development, information security, intellectual property, trade secret and TSMC cultural and educational foundation
- Site visits to HQ in Taiwan, remoting meeting with other production sites to review process and systems for preparing site level sustainability data and implementation of sustainability strategy. Sites chosen were based on materiality issues
- Review of supporting evidence for key claims and data in the report. Our checking processes were prioritised according to materiality, and we based our prioritisation on the materiality of issues at a
- Review of the processes for gathering and consolidating the specified performance data and, for a sample, checking the data consolidation. Where financial data had been checked by another third party and, where data of scope 1, 2 and 3 of Green House Gases Emission has been verified by DNV, we tested transposition from these sources to the report; Where relevant data and information has been generated from a certified management system note which data and management system certification
- . An independent assessment of TSMC's reporting against the Global Reporting Initiative (GRI) Standards
- . There was a confidential issue that we cannot assess the salary data. The verification was conducted based only on the Chinese version Report

On the basis of the work undertaken, nothing came to our attention to suggest that the Report does not properly describe TSMC's adherence to the Principles.

TSMC has developed its own data management system for capturing and reporting its ESG performances. In accordance with DNV VeriSustain Protocol requirements for a moderate / limited level assurance engagement, we conclude that no systematic errors were detected which causes us to believe that the specified sustainability data and information presented in the Report is not reliable

Without affecting our assurance opinion, we also provide the following observations.

The following is an except from the observations and opportunities reported back to the management of

- . Considering the completeness, balance and transparency of data disclosure, it would be advisable to disclose the environment information and establish targets (i.e. reducing discharge or emission) of domestic and overseas facilities with same scope and depth.
- . To effectively achieve resource cycling goals and performance, it would be beneficial to include overseas facilities in this effort. Currently, only TSMC's Taiwan factory appears to be prioritizing this

Sustainability Context

Sustainability Report provides an accurate and fair representation of the level of implementation of related ESG policies and meets the content requirements of the GRI Standards 2021.



Materiality

The materiality determination process was revalidated based on survey from key stakeholders including employees, customers, suppliers / contractors, NGOs, governments, shareholders, investors, regulatory bodies, local communities and senior management of TSMC and has not missed out any significant and known material issues about the Semiconductor Sector. A methodology has been developed to evaluate the priority of these issues and identified priority issues are fairly covered in the Report. An internal assessment process for monitoring and management on a continual basis for their long-term organisational sustainability has been established.

The Report has fairly attempted to disclose the generic disclosures and management approaches and performances of identified material topics for GRI Standards 2021. The reporting of performance and data are within the Company's reporting boundary and reporting period except for certain material topics. A system to report the performances of material topics are being established and set the internal timelines for

Accuracy and Reliability

The majority of data and information verified at the Corporate Office and sampling operational sites were found to be accurate and nothing came to our attention to suggest that reported data have not been properly collated from information reported at operational level, nor that the assumptions used were inappropriate. Some of the data inaccuracies identified during the verification process were found to be attributable to transcription, interpretation and aggregation errors and the errors have been communicated

Inclusivity

The Company has identified the expectations of stakeholders through internal mechanisms in dialogue with different groups of stakeholders. The stakeholder concerns are well identified and documented. The significant ESG issues identified through this process are reflected in the Report

TSMC 2022 Sustainability Report meets the content requirements of the GRI Standards 2021. The report provides an accurate and fair representation of the level of implementation of related ESG policies

The Company has adequately responded to stakeholder concerns through its policies. ESG Committee, and quarterly / annual financial report, and this is reflected in the Report.

The Company presents the impacts related to its identified material topics by measuring and monitoring impacts through appropriate performance metrics demonstrating outcomes and outputs of its value creation processes. Nothing has come to our attention to suggest that the Report does not meet the requirements related to the Principle of Impact.

For and on behalf of DNV Taiwan 18 May. 2023

Lead Verifie Business Assurance

Statement Number: C594569-2022-TWN-AG-DNV

District Manager Business Assurance

¹ The VeriSustain protocol is available on dny.com



Taiwan Facilities

Wafer Fabs

Corporate Headquarters & Fab 12A

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R&D Center & Fab 12B

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Fab 2, Fab 5

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Fab 3

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Fab 14B

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Fab 15B

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Fab 18A

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Fab 18B

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Backend Fabs

Advanced Backend Fab 1

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Advanced Backend Fab 6

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TSMC Nanjing Company Limited

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