

# Corporate Social Responsibility Report 2019





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# *Innovation Paints a Future of Sustainability*

As members of the global community,  
let us join hands as one  
to map out a sustainable blueprint for the common good of our planet.

Innovation drives us forward at TSMC.  
It beholds the expectations of our stakeholders.  
As we pursue our dreams with courage and resilience,  
TSMC continues to empower development in 5G, Artificial Intelligence, and beyond,  
and to use cutting-edge technology,  
to paint an intelligent and connected future  
in which human lives are made more convenient, comfortable, and safe.

We pride ourselves as a driver of a sustainable future.  
We galvanize each and every bit of positive energy  
to unleash innovation that can bring positive change  
that can be shared by all in a brilliant world.



## Letter from the CSR Executive Committee Chairperson

As a company pursues profitability and growth, it must also be concerned with the environment, society, and corporate governance. Since TSMC's establishment, the Company has not only strived for the highest achievements in its core business of dedicated IC foundry services, but has dedicated itself to corporate governance, and actively developed positive relationships with all stakeholders, including employees, shareholders, customers, suppliers, and society to fulfill its responsibility as a corporate citizen and pursue a sustainable future. For TSMC, the first step in corporate social responsibility is to carry out our core values demonstrate our business principles through our actions, and for every colleague to continue enhancing our three competitive advantages of "Technology Leadership, Manufacturing Excellence, and Customer Trust". In this way, we drive beautiful changes in society and the environment through our leadership position in the industry.

Over the years, TSMC has held to its vision of uplifting society, and applied technology and innovation to help humanity overcome many challenges. The Company has taken numerous concrete actions and actively given back to society in a spirit of gratitude, and we have become a benchmark for the industry. As we strive to do our best in corporate social responsibility, we are also encouraging our employees to make innovative breakthroughs in how they think about things, and how they do things. At the same time, we are

nurturing our empathy and broadening our horizons. I hope that we can have greater social participation from TSMC employees based on our professionalism, to develop more holistically as individuals.

Because of this, we established the Corporate Social Responsibility Executive Committee in 2019, teamed with senior management in many different functions to set the Company's future CSR strategy. It is acting in tandem with the CSR Committee to drive CSR actions and cultivate CSR culture.

We had taken a fresh look at our core abilities, UN SDGs, as well as the areas where our two Foundations can make a difference and encouraging employees to use professional knowledge and passion to help the Company fulfill its social responsibility and give back to society. With that, we also revisited our 2030 goals with concrete measures to fulfill our commitment.

I would like to thank every one of our colleagues diligently doing each thing right in every corner of our company. In our CSR report, you will see how everyone took action for a sustainable future in the past year from various aspects. I hope that everyone in TSMC will take it as personal responsibility to make a full commitment. On the road towards sustainability and the common good, let us continue to drive positive changes together.



Mark Liu

Chairman and Corporate Social Responsibility  
Executive Committee Chairperson

# Letter from the CSR Committee Chairperson

Each year, TSMC renews its commitment to society and the environment through the CSR committee. We insist on an innovative business model, and in 2019, we helped customers innovate 10,761 products using 272 different process technologies, offering more energy-efficient technology applications to deliver a safer and more convenient world to humanity. This year, we made an even greater breakthrough, and extended our sustainable development goals to 2030. With our core values, we hope to align ourselves with the United Nations' Sustainable Development Goals and work together to overcome future challenges.

We have also committed NT\$ 19.66 billion toward environmental protection and successfully implemented 763 innovative programs in energy conservation, water conservation, and waste reduction. Our overseas facilities have once again achieved zero emissions, realizing a green and low-carbon business model. In addition, we continue to evaluate Environmental Profit & Loss (EP&L) enabling us to monetize the environmental impact of manufacturing, and make external costs part of our new mindset for sustainable management. In 2019, TSMC achieved the highest score ever recorded by the Alliance for Water Stewardship (AWS) and became the first semiconductor company to receive platinum certification. In terms of renewable energy, we have established a task force to work closely with the government, accelerate development, and help slow down climate change.

Sustainability is fundamental to TSMC's operations and we are equally committed to the long-term success of our supply chain. In 2019, all tier 1 suppliers completed self-assessments on sustainability, and all high-risk suppliers received on-site audits. We have also continued to require more from our key suppliers, requesting that they work closely with their upstream suppliers to create value in the semiconductor supply chain. What is also worth mentioning is that we are also employing digital technology for supply chain management and expanding our existing management structure. In order to raise the bar for supply chain sustainability, we are creating a "Supply Chain 360" system that can track data, integrate an online learning platform, and offer reporting channels for suppliers.

TSMC issued its first "[Diversity and Inclusion at TSMC](#)" in 2019. We hope to build an innovative and inclusive workplace where our colleagues can work safely, make the best use of their talents, and grow together with TSMC. We have also encouraged our employees to deepen their participation in society. Our colleagues have served 17,593 times and devoted 83,797 hours in volunteer service this year. Through the TSMC Foundation and TSMC Charity Foundation, we are advocating for the disadvantaged, filial piety, education in underserved areas, youth, arts & culture, and environmental protection through a diverse range of programs. We hope to light all corners of society by harnessing the power of making 1+1 greater than 2.

TSMC believes that a company exists to bring positive changes to our world. We know that the future is filled with challenges, but we will always stay true the cornerstones of TSMC – Integrity, and Responsible Operations. With each and every TSMC employee steadfast at their roles, we believe that beautiful changes can continue to happen. It is a beautiful virtuous cycle that will continue to energize TSMC's march towards sustainability.

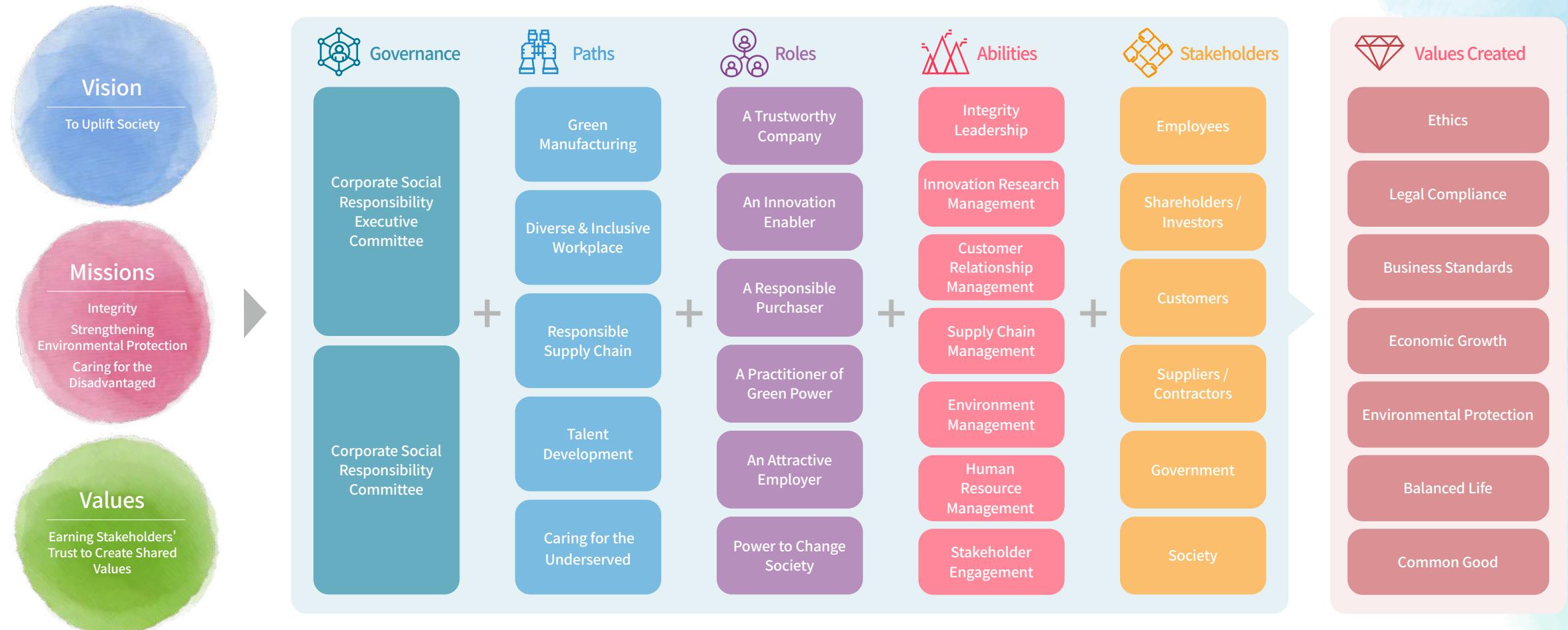


Lora Ho

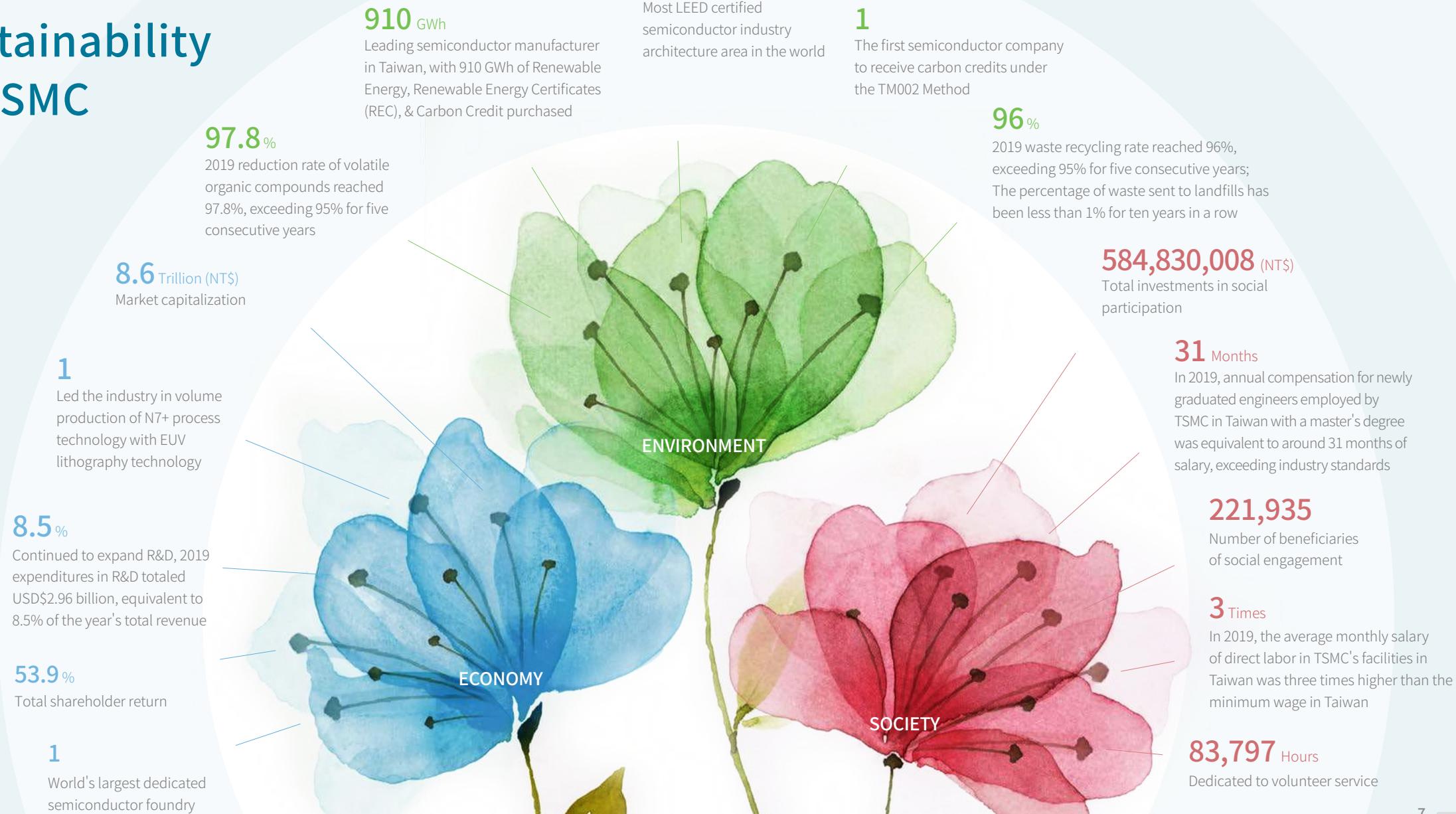
Senior Vice President and Corporate Social  
Responsibility Committee Chairperson



# CSR Implementation Framework



# Sustainability at TSMC



# Awards, Recognitions and Ratings

Dow Jones Sustainability Indices (DJSI)	Dow Jones Sustainability Emerging Markets Index
MSCI ESG Indexes	MSCI ESG Research – AA Ratings
Corporate Knights	MSCI ACWI SRI Index component
Taiwan Institute of Sustainable Energy	Global 100 Most Sustainable Corporations
	The Most Prestigious Sustainability Awards – Top Ten Domestic Corporates
	Taiwan Top 50 Corporate Responsibility Report Awards – IT & IC Manufacturing – Platinum Award
	Sustainable Water Management Awards
	Climate Leadership Awards
	Circular Economy Leadership Awards
Institutional Investor Magazine	Most Honored Company (Technology / Semiconductors)
	Best ESG / SRI Metrics (Technology / Semiconductor) - First Place
	Best Corporate Governance (Technology / Semiconductor) – First Place
	Best CEO (Technology / Semiconductor) - First Place
	Best CFO (Technology / Semiconductor) - First Place
	Best Investor Relations Program (Technology / Semiconductor) - First Place
	Best Investor Relations Professional (Technology / Semiconductor) - First Place
Nikkei Asian Review	Asia300 Power Performers
	Global 2000
Forbes	Asia's Best over a Billion
	Top 100 Digital Companies
FORTUNE	Fortune Global 500
PricewaterhouseCoopers	Global Top 100 Companies by market capitalization for the seventh consecutive year
Taiwan Stock Exchange	Top 5% in Corporate Governance Evaluation of Listed Companies for the fifth consecutive year
Cheers	Top 10 Most Admired Companies to Young Generations



Dow Jones  
Sustainability World  
Index for the 19<sup>th</sup> Consecutive Year



"Prime" Rated by ISS ESG  
Corporate Rating



World's Most Admired  
Companies



MSCI ACWI ESG Leaders  
Index Component



FTSE4Good Emerging Index  
Component / FTSE4Good TIP  
Taiwan ESG Index Component



Forbes – World's Best  
Employers



Corporate Social Responsibility Award –  
Large Cap – First Place



# Our Business

- About TSMC
- Financial Performance
- Tax Policy



# About TSMC

Headquarters

**Hsinchu Science Park, Taiwan**

Founded in

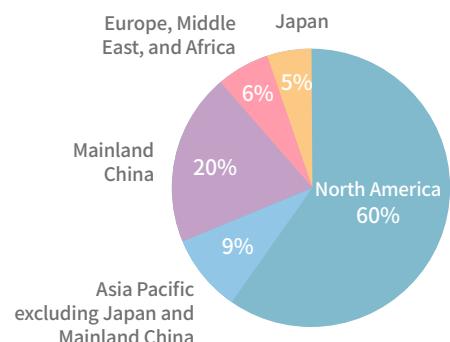
**1987**

Number of Employees

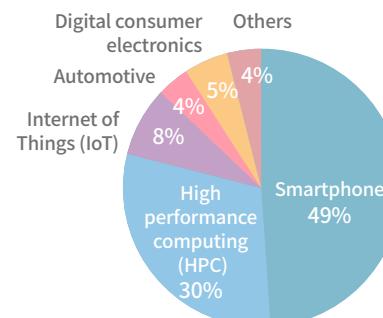
**51,297**

TSMC's four core values of Integrity, Commitment, Innovation, and Customer Trust remain as the cornerstone of its company culture. As world's largest semiconductor foundry and a trusted technology and capacity provider, TSMC always strives to seek greater achievements in its scope of business and to fulfill its corporate social responsibilities for creating a sustainable future when facing the challenges of global climate change and ever-changing global landscapes. TSMC performed better than ever in 2019, netting a consolidated revenue of NT\$1,069 billion and setting a record of year-on-year growth in revenue for 10 consecutive years. As the first and largest dedicated semiconductor foundry, TSMC is committed to offering cutting-edge and comprehensive semiconductor applications solutions. The Company believes in taking responsibility and will continue to move forward with employees, shareholders/ investors, customers, and suppliers to further advance and create sustainable value in the economy, environment, and society.

**Revenue Percentage by Customer Location**



**Revenue Percentage by Product Platform**



**345.26 Billion (NT\$)**

Net income

**10 Years**

10 consecutive years of year-on-year growth in revenue



**52%**

Market share of the total foundry industry

**27%**

7nm (N7) & 7nm+ (N7+) process technologies accounted for 27% of total wafer sales revenue in 2019

**>12 Million Wafer**

Annual capacity owned and managed by TSMC and its subsidiaries exceeded 12 million 12-inch equivalent wafers.

**1**

The world's largest capacity provider for logic ICs

**499 Customers**

Manufactured 10,761 different products for 499 customers using 272 types of process technologies

**50%**

Advanced processes including 16nm & below accounted for 50% of revenue in 2019 , compared to 41% in 2018

TSMC has fabrication plants, subsidiaries or offices throughout Taiwan, North America, Europe, Japan, Mainland China, South Korea, and other countries, allowing it to provide real-time business and technology services to its customers around the world.

# Financial Performance

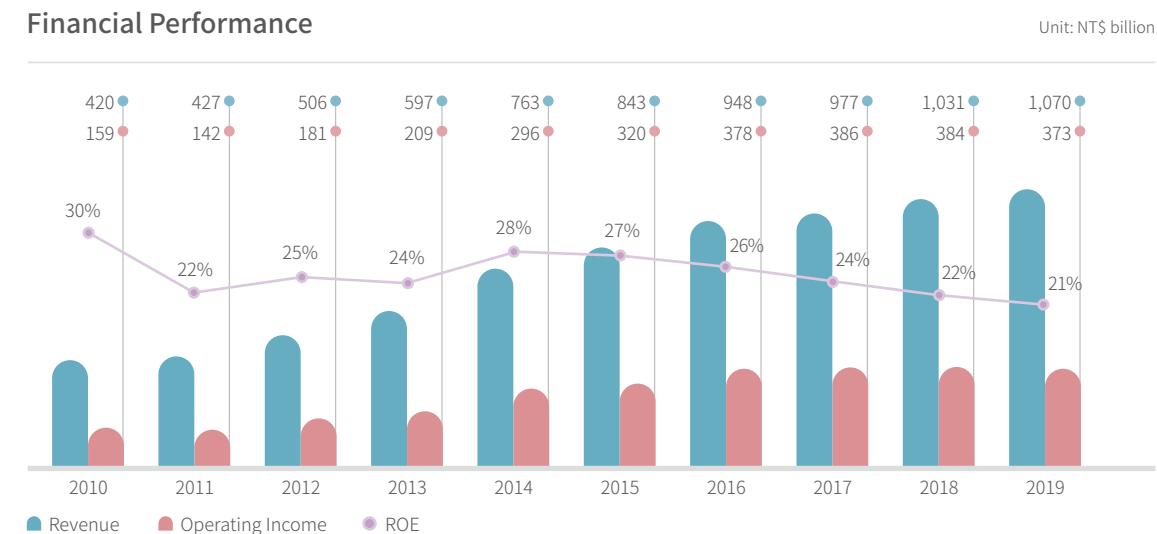
Good financial performance is the key to corporate sustainability. TSMC pursues good financial performance mainly through revenue growth and consistent improvement in profitability to create greater economic value for its stakeholders, including shareholders, employees, customers, suppliers, government, society, and others. To help investors better understand TSMC's long-term investment value, TSMC set clear strategic financial objectives: (1) average return on equity (ROE) to be at least 20% across cycles; (2) compound annual growth rate of net income to be between 5% and 10% for the years 2015 through 2020.

## Four Strategies to Increase Long-term Investment Value



In 2019, TSMC's ROE reached 20.9%; revenue growth calculated in NT dollars reached 3.7%, while net income decreased 1.7%. Net income decreased in 2019 mainly as the Company's capacity utilization was impacted by (1) trade tensions between countries, (2) rising global macroeconomic uncertainties, and (3) inventory adjustments in the semiconductor supply chain. Meanwhile, the Company witnessed an acceleration of the deployment of 5G networks and smartphones in several major markets around the world. The acceleration will trigger a faster worldwide penetration of 5G smartphones with higher silicon content and drive strong 5G-related and HPC demand for TSMC's advanced technologies in the next several years. Therefore, the Company still expects to achieve its strategic financial objectives in 2020.

## Financial Performance



**AA-**

Standard & Poor's (S&P) Ratings

**Aa3**

Moody's Ratings

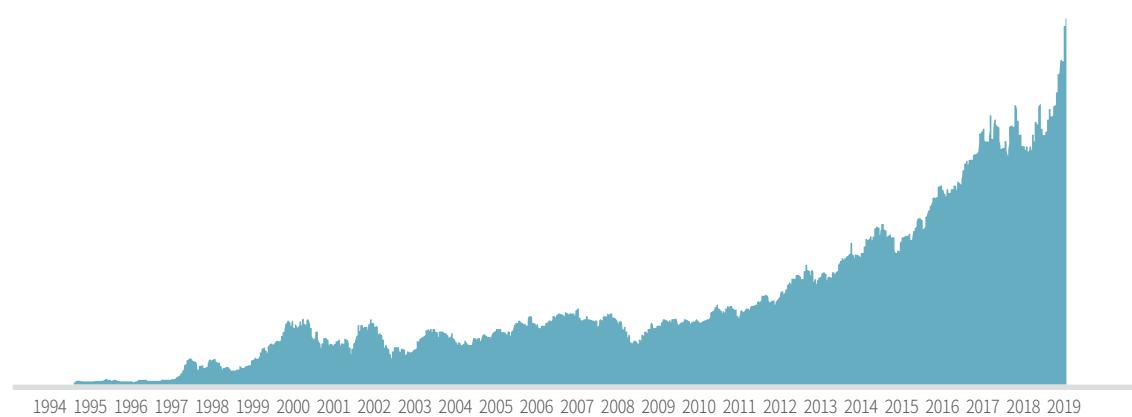
**twAAA**

Taiwan Ratings



## Market Capitalization

Unit: NT\$ trillion



Supported by the Company's strengthening industry position, growth potential and solid operating performance, TSMC's share price, adjusted for cash dividends, increased 53.9% in 2019, marking 11 consecutive years of annual growth. Since the Company went public in 1994, TSMC has been profitable every year and TSMC's market capitalization has been growing steadily. As of December 31, 2019, TSMC's market capitalization reached NT\$8.6 trillion, or US\$288 billion.

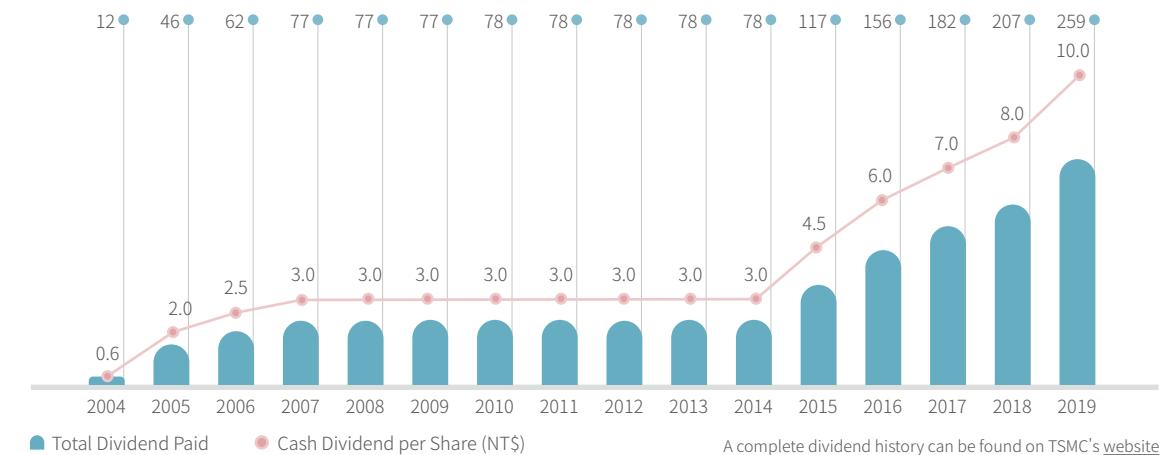
TSMC's solid financial performance enables the Company to distribute profits to shareholders in the form of cash dividends. From 2004 to 2019, TSMC has paid out nearly NT\$1.7 trillion, or US\$53.6 billion, in cash dividends.

In the future, TSMC intends to maintain a sustainable quarterly cash dividend, and to distribute the cash dividend each year at a level not lower than the year before.

In June 2019, TSMC held an annual shareholders' meeting (AGM) to approve the Board's proposed NT\$8 cash dividend per share for full-year 2018 and the revision of the Articles of Incorporation to adopt quarterly dividends. Under the authorization of the AGM, the Board also approved a NT\$2 cash dividend per share for first quarter 2019. Therefore, TSMC's shareholders received a total of NT\$10 per share in cash dividends in 2019.

## Cash Dividend

Unit: NT\$ billion



A complete dividend history can be found on TSMC's [website](#)

In August 2019, the Board further raised cash dividend to NT\$2.5 cash dividend per share for second quarter 2019 profit distribution, which was paid in January 2020. The Company expects TSMC's shareholders to receive no less than NT\$2.5 per share per quarter in 2020, or no less than NT\$10 per share in total annual cash dividends.

**24.8%**

10-Year Averaged ROE  
(2010-2019)

**14.5%**

10-Year Net Income CAGR  
(2010-2019)

**8.6 Trillion (NT\$)**

Market Capitalization at the End  
of 2019

**53.9%**

Total Shareholder Return in 2019

**1.7 Trillion (NT\$)**

Cumulative Cash Dividends from  
2004 to 2019

**10 Per Share (NT\$)**

Total Cash Dividend Payments in  
2019



# Tax Policy

TSMC supports tax policies and incentives that encourage enterprise innovation and foster economic growth. The Company aims for its tax approach and information to be transparent and sustainable in the long term.

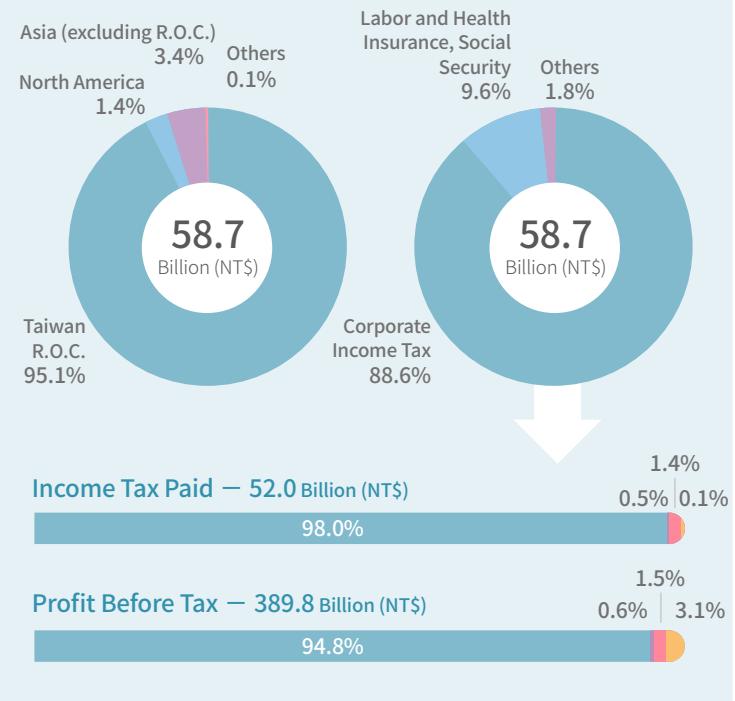
## Eight Commitments

- Act at all times in compliance with all applicable laws and regulations.
- Inter-company transactions are based on the arm's length principle, in compliance with internationally accepted transfer pricing guidance published by the OECD.
- Be transparent in financial reporting. Disclosures are made in accordance with applicable regulations and reporting requirements.
- Do not use tax havens or tax structures whose sole purpose is for tax avoidance.
- Do not transfer value created to low-tax jurisdictions.
- Develop strong, mutually respectful relationships with tax authorities based on transparency and trust.
- Always consider tax as part of major business decisions.
- Analyze the operating environment and assess tax risk through corporate management mechanism.

## Tax Risk Management and Effective Tax Rate

- TSMC is subject to tax laws and regulations in various jurisdictions, in which it operates or conducts business. Any unfavorable changes of tax laws and regulations in these jurisdictions could increase the Company's effective tax rate and have an adverse effect on its operating results. TSMC establishes an enterprise risk management (ERM) program to manage the tax risks. For more details on risk management, please refer to "[Risk Management](#)" section in TSMC's 2019 Annual Report.
- TSMC's effective tax rate in 2019 was 11.5%, lower than 11.7% in 2018, mainly due to lower surtax imposed on unappropriated earnings that primarily resulted from the reduced statutory rate of surtax from 10% to 5%. Besides, the effective tax rate in 2019 was lower than the R.O.C. statutory corporate income tax rate of 20%, due primarily 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 the Statute for Industrial Innovation.

## 2019 Tax Breakdown



■ Taiwan R.O.C. ■ North America ■ Asia (exclude R.O.C.) ■ Others  
Note: TSMC categorizes its profit before tax and taxes paid geographically based on the country in which TSMC and subsidiaries are located

**58.7** Billion (NT\$)

In 2019, TSMC's total tax payments on cash basis worldwide were NT\$58.7 billion

**>90%**

In 2019, 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

**1st**

Based on data provided by "Bloomberg Professional," TSMC was the largest corporate income taxpayer among all public listed companies in Taiwan in 2019

**7.8%**

TSMC's 2019 income tax payment in Taiwan represented 7.8% of total corporate income taxes collected by the R.O.C. government



# Sustainable Governance

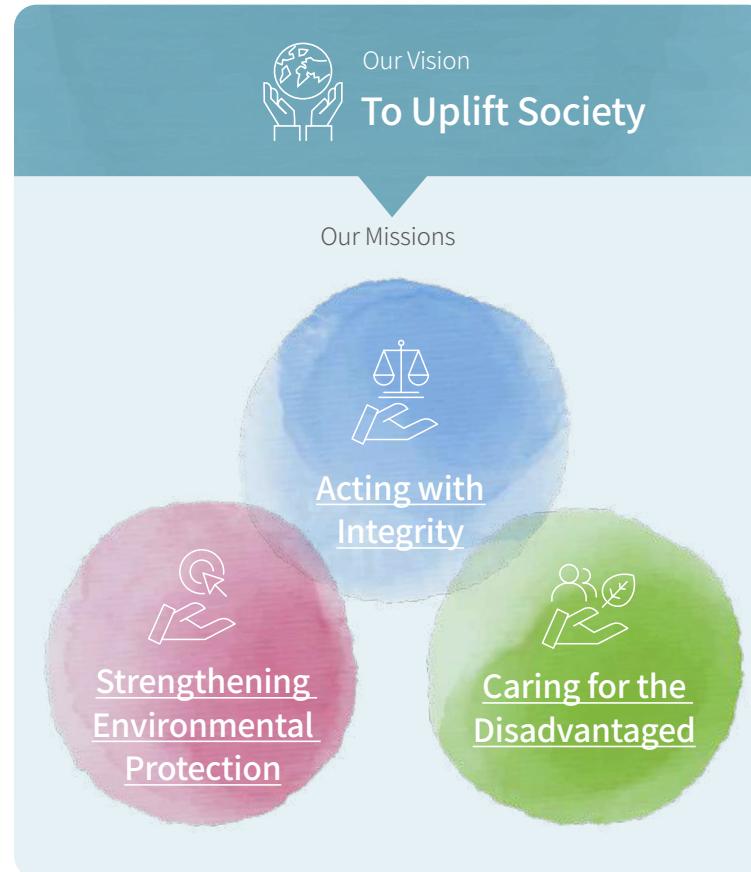
- Corporate Social Responsibility Policy & Matrix
- Corporate Governance
- CSR Management
- Materiality Analysis and Stakeholder Communication
- Sustainable Value Creation
- Carry Out the UN Sustainable Development Goals



# Corporate Social Responsibility Policy & Matrix

Since its establishment, TSMC has not only strived for the highest achievements in its core business of dedicated IC foundry services but has also actively developed positive relationships with all stakeholders including employees, shareholders, customers, suppliers, and society to fulfill its responsibility as a corporate citizen and pursue a sustainable future.

## Corporate Social Responsibility Policy



"TSMC Corporate Social Responsibility Policy" is the top guiding principle for our sustainable development. The "CSR Matrix" set by TSMC's Founder, Dr. Morris Chang clearly defines the scope of TSMC's corporate social responsibility. The horizontal axis shows the seven areas where TSMC aims to set an example: morality, business ethics, economy, rule of law, sustainability, work / life balance and happiness, and philanthropy. On the vertical axis are actions that TSMC has taken to fulfill its responsibilities.

## Corporate Social Responsibility Matrix



# Corporate Governance

## Governance Structure



## 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.

## Four Board Responsibilities

- Supervise
- Evaluate the management's performance & appoint and dismiss officers
- Resolve the important, concrete matters
- Provide guidance to the management team



Note: In addition to all five Independent Directors, the Board appointed Mr. Yancy Hai (currently Chairman of Delta Electronics Inc.) as a member of the Compensation Committee on February 11, 2020.

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, the TSMC Board delegates various responsibilities and authority to two Board Committees, the Audit Committee and the Compensation Committee. Each Committee's chairperson regularly reports to the Board on the activities and actions of the relevant committee. The Board of Directors plays the role to oversee and provide guidance to the Company's comprehensive sustainable management strategies. TSMC established the Corporate Social Responsibility Executive Committee in 2019. TSMC's Chairman chairs the CSR Executive Committee, and the Chairperson of the CSR Committee serves as Executive Secretary. The Chairperson of the CSR Committee reports annually to the Board of Directors on implementation results of the prior year and the future work plan.

## Diversity on Board

TSMC's Board is comprised of a diverse group of professionals from different backgrounds in industries, academia, law, etc. These professionals include citizens from Taiwan, Europe and the U.S. with world-class business operating experience, two of whom are female.

## Corporate Governance Officer

In 2019, the Board of Directors appointed Ms. Sylvia Fang, the Vice President of Legal and General Counsel, as the Corporate Governance Officer responsible for corporate governance matters, including handling of matters relating to Board, Audit Committee, Compensation Committee and Shareholders' meetings in compliance with law, assistance in onboarding and continuing education of directors, provision of information required for performance of duties by directors, and assistance in directors' compliance of law, etc.

## Ethics and Regulatory Compliance

In order to build an effective compliance system of ethical standards and regulatory compliance initiatives, TSMC established not only the Ethics Code, but also the internal policies and procedures in major areas of law. We also track and identify any relevant regulatory changes to ensure that TSMC's internal policies and procedures are effective and up to date. For more details of [Ethics and Regulatory Compliance](#) at TSMC, please also refer to TSMC's 2019 Annual Report "3.5 Code of Ethics and Business Conduct" and "3.6 Regulatory Compliance".

## Nomination and Election of Directors

In 2019, the Board of Directors established "[Guidelines for Nomination of Directors](#)", which describes the procedures and criteria for the nomination, qualification and evaluation of candidates for Directors.

## Risk Management

Based on both its corporate vision and its long-term, sustainable, responsibility to both industry and society, TSMC operates an enterprise risk management (ERM) program to integrate and manage potential sustainability risks including strategic, operational, financial and hazardous risks (climate change, utility supply, earthquake, fire, chemical spill, and conflict mineral) that represent potential negative consequences to operations and financial results. The TSMC risk management organization is composed of RM Steering Committee, RM Executive Council, RM Program and RM Task Force. The risk management framework including risk identification and assessment, risk control and mitigation, risk response, risk monitoring and reporting is applied to identify and prioritize risk controls, implement various controls and risk treatment. The risk management organization periodically briefs the audit committee on the ever-changing risk environment facing TSMC, the focus of the Company's enterprise risk management, and risk assessment and mitigation efforts. The audit committee's chairperson also reports on the risk environment and risk mitigation actions to be taken. For more details of Risk Management, please refer to TSMC's 2019 Annual Report ["6.3 Risk Management"](#).



# CSR Management

In compliance with the vision and mission of the TSMC Corporate Social Responsibility Policy, TSMC has further connected to the international sustainability trend in 2019 by establishing a CSR Executive Committee to serve as the highest level decision-making center for corporate social responsibilities. TSMC's Chairman acts as the chairperson for the committee, and the CSR Committee chairperson serves as the executive secretary. They work with senior executives across different functions to assess TSMC's core operational capability, establish mid-to-long term development goals for CSR, and map out a blueprint for sustainable development that connects TSMC's core advantages with UN sustainable development goals (SDGs).

## Corporate Social Responsibility Executive Committee

Chairperson	Chairman
Executive Secretary	Chairperson of Corporate Social Responsibility Committee
Committee Members	Senior executives from research/technology development, business development, operations, materials and risk management and human resources, etc.
Mission	Chairman leads the management team to formulate the Company's vision and long-term strategy in CSR, and works with the CSR Committee to promote related actions, cultivate sustainable culture, and drive for more positive changes

## Corporate Social Responsibility Committee

Chairperson	Chairman appoints a senior executive to serve as chairperson of the committee
Committee Members	Functional organizations related to the economy, environment, society, and corporate governance propose representatives
Tasks	<b>Quarterly Meetings to</b> <ul style="list-style-type: none"><li>Identify issues of sustainability that need to be monitored, and formulate corresponding action plans</li><li>Supervise interdepartmental communications and resource integration/coordination</li><li>Track the performance results of all facets to sustainable issues, and establish continuous improvement plans</li></ul> <b>Annually</b> <ul style="list-style-type: none"><li>The chairperson of the Committee reports to the Board of Directors annually on the performance results of the current year and work plans for the upcoming year</li></ul>

“



**Wendell Huang**

Vice President, Finance and Chief Financial Officer



**Sylvia Fang**

Vice President, Legal and General Counsel / Corporate Governance Officer



**Dr. Jun He**

Senior Director, Quality and Reliability



**Y.P. Chin**

Senior Vice President, Operations / Product Development

As a corporate citizen, TSMC adheres to its core values, and does its utmost to serve as a world-class company trusted by global investors through solid financials and transparent corporate disclosures.

Our commitment to society and stakeholders is our core value of Integrity, good corporate governance, a culture of strict adherence to regulatory compliance, and intellectual property protection. These commitments are key to ensuring TSMC's sustainable future.

Quality is fundamental in our work and the services we provide. TSMC is unequivocally devoted to developing sustainable operations and the continued improvement of supply chain quality. We strive to do so through strengthening a culture of quality, sharing case studies of success, working closely with customers and suppliers, coalescing around common core values, and continued innovation.

Customers are important partners of TSMC. Through continuous innovation and manufacturing excellence, we strive to build long-term relationships with our customers and serve as a trusted, long-term partner that clients can rely for success.

The existing CSR Committee serves as the communication platform that integrates and brings together different departments and employees to carry out TSMC's sustainable development blueprint. Task forces that are set up for quarterly meetings and based on issues identify sustainable topics related to company operations and of stakeholders' interest. The task forces formulate corresponding strategies and guiding principles, compile CSR budgets for each organization, coordinate resources, plan and carry out the annual plans, and track progress to ensure that CSR strategies are fully fulfilled in the daily operations of TSMC.



“

### J.K. Lin

Senior Vice President, Information Technology and Materials Management & Risk Management



TSMC values corporate social responsibility and continues to require commitment and effort from global supply chain partners. We buy responsibly and use our actions to help propel the semiconductor supply chain into a sustainable future. We expect our suppliers to set goals, achieve them, and continue to raise the bar for themselves and the industry.

### J.K. Wang

Senior Vice President, Operations / Fab Operations



Green manufacturing is the cornerstone of sustainable operations. While pursuing technological innovations, TSMC continues to emphasize energy conservation, water conservation, waste reduction, and environmental protection in general. TSMC is committed in cultivating a corporate culture with strong environmental protection awareness. We also continue to adopt renewable energy, recycled water, and circular economy to ensure that such resources are used at maximum efficiency levels. We hope to work with our supply chain to become a stabilizing force in environmental protection and sustainability.

### Connie Ma

Vice President, Human Resources



Our employees are our most important asset in maintaining a competitive edge. They are the driving force for social development and upgrading industry. Looking ahead, we will increase partnerships with academic institutions to cultivate a talent pool for TSMC and the semiconductor industry. We continue to build a diverse and inclusive work environment so talents are willing to join us and contribute to TSMC. At the same time, we also encourage employees to participate in society and care for the disadvantaged.

### Dr. Y.J. Mii

Senior Vice President, Research & Development / Technology Development



TSMC is cultivating talents for the semiconductor industry and leading the world in the latest semiconductor technology. We continue to drive Moore's Law forward and help our customers develop innovative, high-tech products. In doing so, we hope to create a sustainable future through the power of technology.



## CSR Reporting to the Board of Directors in 2019

### Achievements

- In response to climate change, the committee strengthened the performance of green manufacturing, developed diverse technologies for resource regeneration, realized circular economy, and used more renewable energy.
- TSMC pushed for a sustainable supply chain and continued to conduct supplier risk assessments, asking all suppliers to sign the Supplier Code of Conduct, and carry out the [Responsible Supply Chain Action Plan](#).
- According to the sustainable development blueprint mapped out by the CSR Executive Committee, TSMC continued to align its core business with SDGs.
- The TSMC Education and Culture Foundation and the TSMC Charity Foundation actively supported our youth, arts education, education in remote areas, and the disadvantaged to bring positive changes to society.

### 2020 Work Plans

- Develop renewable energy & recycled water, realize the circular economy, and continue to promote green manufacturing.
- Reinforce human rights, environmental protection, safety, and operational resilience among suppliers to build a sustainable supply chain.

## CSR Committee Achievements in 2019

- Formulated 2030 goals and execution plans for each organization according to the nine UN SDGs selected by Chairman and CSR Executive Committee members
- Fulfilled green manufacturing, helped Taiwan develop renewable energy, developed green tools with suppliers, advocated for building water recycling plants, increased the percentage of resource recycling, and realized the circular economy
- Led the domestic supply chain to upgrade, continued plans to purchase locally, and established a comprehensive auditing and coaching system for suppliers. Conducted environmental P&L assessments for suppliers for the first time to ensure sustainable development across the supply chain
- The TSMC Charity Foundation established the [Sending Love](#) charity platform, leveraging digital technology to improve education in remote areas. The TSMC Education and Culture Foundation promoted exquisite arts, increased its momentum to support youth cultivation, and built a diversified education program that can be tailored to each student's needs

“



**Dr. Wei-Jen Lo**

Senior Vice President, Research & Development / Technology Development



**Dr. Kevin Zhang**

Vice President, Business Development



**Dr. F.C. Tseng**

Chairman, TSMC Education and Culture Foundation



**Sophie Chang**

Chairperson, TSMC Charity Foundation

Corporate social responsibilities are not simply words but acts of love that can call forth the warmth of humanity and ultimately help make our society a better place.



# Materiality Analysis and Stakeholder Communication

Each year, TSMC complies with GRI Standards for Stakeholder Inclusiveness, Sustainability Context, Materiality, and Completeness. Through three phases that include identification, analysis, and confirmation, we assess sustainability issues and carry out materiality analysis to align TSMC's strategies for sustainability management with our long-term goals. The GRI Standards also serve as a guideline for compiling our CSR report, allowing us to examine TSMC's current progress in sustainability, promote improvement within organizations, and create shared value for society and TSMC.

## Phase 1: Identification

In compliance with the AA 1000 SES (Stakeholder Engagement Standards, SES) and taking into account the level of importance and relevance, TSMC regards the following six stakeholders: employees, shareholders/investors, customers, suppliers/vendors, and government & society (community, academic institutions, media, NGO/NPO) as the major stakeholders for communication. In 2019, we identified 16 sustainability issues to serve as the basis for materiality analysis. The issues of sustainable products was divided and then integrated into innovation management and product quality, allowing disclosure to be more focused and comprehensive. Other result-oriented issues that are part of GRI general disclosures such as corporate governance, risk management, stakeholder communication, financial performance, and taxes will be regularly disclosed in the Company's annual report, website, CSR Report, and CSR website, instead of being mapped in the materiality matrix.

### Step 1: Define Major Stakeholders

#### 6 Categories of Stakeholders

Based on "internal/external groups or individuals that have an impact on TSMC or being impacted by TSMC," we have identified six major stakeholders including employees, shareholder/investors, customers, suppliers/vendors, government & society (community, academic institutions, media, NGO/NPO), etc.

#### 16 Issues

We have compiled 16 issues related to TSMC's sustainability from four major sources: international sustainability standards and regulations (GRI Standards, ISO26000, UN Global Compacts, RBA, and UN SDGs), sustainability-oriented investment agencies (DJSI, CDP, TCFD, MSCI ESG Index, and SDGs Invest), TSMC's development targets and vision, and stakeholder communication.

## Phase 2: Analysis

Applying sustainability to the Company's daily operations is the core mindset of promoting sustainability management at TSMC. In 2019, we attempted to involve ourselves in daily operations in order to truly understand what our stakeholders feel through various channels. This is in addition to the usual survey on sustainability that we hand out to all stakeholders and we were able to collect 436 surveys this year. For employees, TSMC hosted over 2,000 cross-level meetings, face-to-face discussions, interviews, and various forms of meetings to strengthen our understanding of what our colleagues expect from TSMC and their recommendations for promoting sustainability within the company. For suppliers, we've included, for the first time, a section on sustainability in surveys for suppliers to which we were able to collect 383 responses during the Supplier Management Forum. We also raised the level required for participating in discussions on materiality in 2019. Chairman Mark Liu leads the CSR Executive Committee, along with CSR Committee Chairperson and Senior Vice President Lora Ho, to analyze the impacts of each issue on operations (profitability, revenue, customer satisfaction, employee cohesion, risk) with a total of 114 colleagues that include TSMC's vice presidents, senior fab directors, and fab directors. We hope that this can help us reach a consensus of major issues and map out a future roadmap to sustainability.

### Step 3: Assess Level of Interest

#### 819 Surveys Collected

#### >2,000 Employee Communication Meetings

In 2019, we collected 436 valid surveys from critical stakeholders defined by TSMC. We also hosted over 2,000 communication meetings to understand our colleagues' expectations for TSMC and collected 383 supplier surveys during the Supplier Management Forum to serve as basis for analysis on the level of interest.

#### 114 Colleagues

Taking into account the impact on the economy, environment, and society, TSMC identified the impact of each sustainability issue through five operational aspects: profitability, revenue, customer satisfaction, employee cohesion, and risk. A total of 114 colleagues including Chairman, senior vice presidents, vice presidents, senior fab directors, and fab directors participated in the investigation.

#### 13 Issues

According to the results from step 3 & 4, we have mapped out the materiality matrix for TSMC. The CSR Committee have discussed and agreed on the results, identifying 13 material issues and three potential issues.

### Phase 3: Confirmation

The CSR Committee was able to identify 13 sustainability issues as material based on analysis from the materiality matrix with three remaining issues identified as potential subjects that require attention. Based on these sustainability issues, we have established a long-term target, strategy, and action plan for 2030. We are also assessing each issues' impact on TSMC's value chain including supply chain, company operations, and customers. In pursuant to GRI Standards, we have also identified 20 material topics specific to TSMC. Based on reporting requirements, we have collected company information, data, and management approach to be disclosed in the 2019 CSR Report that will serve as motivation for continued improvement. Compared to assessment results in the last year, there was improvement in Water Management and Occupational Safety and Health. Management contributed the improvement to the growing importance of these two issues on company operations which led to adjustments to the materiality matrix and resulting in it becoming a focus of sustainability within the company.

### Step 6: Decide Disclosure Boundaries

### Step 7: Review Disclosed Content

#### 4 Stages

Procurement, wafer fabrication, packaging/testing, and customer use are the four major stages of TSMC's value chain, which determine sustainability disclosure boundaries to help identify the impact of such issues on our upstream and downstream stages.

#### 20 Topics

We have aligned the 13 major issues with the 20 specific topics in the GRI Standards to collect and disclose relevant information based on the reporting requirements and management approach dictated by GRI. Other sustainability issues deemed significant by the CSR Committee were disclosed at the same time.

### TSMC Materiality



Note: Corporate governance, risk management, stakeholder communications, financial performance, and taxes were generally disclosed and result-oriented issues. While they were not mapped in the materiality matrix, relevant information will be regularly disclosed in the Company's annual report, CSR Report, and CSR website.



## Material Issues & the TSMC Value Chain

Focus	Material Issues	Operational Impact					GRI Standard Specific Topics	Upstream <sup>Note 1</sup>	Company Operations <sup>Note 2</sup>	Downstream <sup>Note 3</sup>
		Profitability	Revenue	Customer Satisfaction	Employee Engagement	Risk				
Ethical Management	Ethics Code			✓	✓	✓	Anti-corruption & Anti-competitive Behavior	✓	✓	✓
	Regulatory Compliance			✓	✓	✓	Environmental Compliance & Socioeconomic Compliance	✓	✓	✓
Innovation and Service	Innovation Management	✓	✓	✓			Energy		✓	✓
	Sustainable Product	✓	✓	✓			Customer Health and Safety	✓	✓	✓
Responsible Supply Chain	Customer Service		✓	✓			Customer Privacy			✓
	Supplier Sustainability Management	✓	✓		✓		Procurement Practices, Supplier Environmental Assessment & Supplier Social Assessment	✓		
Green Manufacturing	Energy Management	✓			✓		Energy	✓	✓	✓
	Climate Change				✓		Emissions & Economic Performance	✓	✓	✓
Inclusive Workplace	Water Management				✓		Water, Effluents and Waste	✓	✓	✓
	Air Pollution Control				✓		Emissions	✓	✓	
Common Good	Waste Management				✓		Effluents and Waste	✓	✓	✓
	Talent Attraction and Retention	✓		✓			Economic Performance, Labor/Management Relations, Diversity and Equal Opportunity, and Market Presence	✓	✓	✓
Inclusive Workplace	Talent Development	✓		✓			Training and Education	✓	✓	✓
	Human Rights	✓	✓	✓			Labor / Management Relations, Non-discrimination, Freedom of Association and Collective Bargaining, Forced or Compulsory Labor, and Human Rights Assessment	✓	✓	✓
Common Good	Occupational Safety and Health		✓	✓			Occupational Health and Safety	✓	✓	✓
	Social Participation			✓			Economic Performance, Indirect Economic Impacts, and Local Communities	✓	✓	

Note 1: "Upstream" boundaries are raw materials, equipment, and related services purchased by TSMC

Note 2: "Company Operations" boundaries are wafer fabrication and packaging/testing services offered by TSMC

Note 3: "Customer Use" boundaries are customer products manufactured by TSMC



## Material Issues & Risk Management

Material Issues	Risk Consideration	Risk Type			Risk Mitigation	Our Approach
		Strategic	Operational	Hazardous		
Code of Ethics and Business Conduct	Employee violations of the TSMC Ethics Code	✓	✓		<b>Reinforce Both Internally and Externally:</b> The management team of TSMC takes ethics and regulatory compliance seriously. It is reflected not only internally in the formulation of compliance policies and procedures, providing training and promotion activities, and periodic assessments and declarations, but also externally through the participation of third parties. Furthermore, the culture of ethics and regulatory compliance is cultivated through effective reporting channels and whistleblower protection	Please refer to " <a href="#">Ethics and Regulatory Compliance</a> " in this Report
Regulatory Compliance	Regulatory non-compliance by the company	✓	✓		<b>Regulatory Compliance:</b> Ensure the Company's regulatory compliance through a series of measures to track and evaluate legislation, set and implement plans for regulatory compliance, conduct compliance training and maintain open reporting channels	Please refer to " <a href="#">Ethics and Regulatory Compliance</a> " in this Report Please refer to 2019 TSMC Annual Report: <a href="#">6.3 Risk Management</a>
Innovation Management	Inability to foresee changes in technologies and develop innovative technologies	✓			<b>Technology Leadership:</b> Continuous investment and efforts on leading-edge technology development to maintain TSMC's technology leadership in the semiconductor industry	Please refer to " <a href="#">Innovation Management</a> " in this Report
	Inadequate intellectual property protection		✓		<b>Patent Protection:</b> TSMC continuously updates the Company's patent portfolio to fully protect its R&D achievement through expanding its portfolio <b>Trade Secret Protection:</b> TSMC strengthens the Company's operations and intellectual property innovation through the registration and management of trade secrets, which involves recording and integrating applications for trade secrets that are competitive advantages for the Company	Please refer to " <a href="#">Innovation Management</a> " in this Report Please refer to 2019 TSMC Annual Report: <a href="#">6.3 Risk Management</a>
Product Quality	Challenges to with product quality and yield	✓			<b>Quality Capability Improvement:</b> Leverage machine learning to construct an outgoing visual defect inspection and classification system for 12-inch wafers to increase employee productivity <b>Raw Material Management:</b> Stricter control of purchased raw materials, build comprehensive testing capabilities for incoming shipments, strengthen trial tests before the use of raw materials, and reinforce online IC chip inspections	Please refer to " <a href="#">Product Quality</a> " in this Report
Customer Service	Losing customers	✓			<b>Precise Response:</b> Provide excellent customer service through close collaboration with customers and customer meetings and surveys on a regular basis to understand and respond to their requirements and feedback <b>Virtual Fab:</b> Provide comprehensive information in a timely manner to ensure the success of customer's final products; strengthen processes and systems to hold the highest standards to protect customer product information	Please refer to " <a href="#">Customer Service</a> " in this Report
Supplier Sustainability Management	Supplier concentration and supplier non-compliance with TSMC or legal requirements		✓		<b>Improve Supply Chain Sustainability:</b> Carry out the four major management approaches of Code Compliance, Risk Assessment, Audit Participation, and Consistent Improvement. Following the TSMC Business Continuity Management Policy, we will reinforce supply chain resilience and continue to disperse production sites as well as assess new suppliers to achieve a diverse sourcing strategy	Please refer to 2019 TSMC Annual Report: <a href="#">6.3 Risk Management</a> Please refer to " <a href="#">Supplier Sustainability Management</a> " in this Report
Energy Management	Energy shortage or power outage	✓	✓		<b>Increase Energy Efficiency:</b> Plan for new energy-saving measures each year and actively implement energy-saving measures, increasing the efficiency of power consumption	Please refer to " <a href="#">Climate Change and Energy Management</a> " in this Report
Climate Change	Operational impact and rising GHG emissions brought on by climate change	✓	✓	✓	<b>Drive Low-carbon Manufacturing:</b> Continue to use best available technology to reduce emissions of greenhouse gases (GHG), becoming an industry leader in low-carbon manufacturing <b>Use Renewable Energy:</b> Continue to purchase renewable energy while establishing a solar-energy power system, increasing the use of renewable energy <b>Strengthen Climate Resilience:</b> Establish climate change countermeasures and preemptive precautions, lowering the risks of climate change	Please refer to " <a href="#">Climate Change and Energy Management</a> " in this Report

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Material Issues	Risk Consideration	Risk Type			Risk Mitigation	Our Approach
		Strategic	Operational	Hazardous		
Water Management	Water scarcity or shortage and the environmental impact of wastewater			✓	<b>Risk Management of Water Resources:</b> Enforce climate change mitigation policies, implement water conservation and water shortage adaptation measures <b>Develop Diverse Water Sources:</b> Integrate internal and external company resources to develop regenerated water technology; implement water conservation and the use of regenerated water in the manufacturing process <b>Develop Preventive Measures:</b> Improve the efficiency of water pollution prevention and removal of water pollutants	Please refer to " <a href="#">Water Management</a> " in this Report
Waste Management	Environmental impact of waste or waste management vendors' non-compliance with TSMC or legal regulations			✓	<b>Source Reduction:</b> Promote waste reduction by waste source separation and demand low consumption chemical equipment from our suppliers <b>Circular Economy:</b> Collaborate with business partners to develop new waste recycling technology in order to increase the amount of waste recycled and reused <b>Audit and Guidance:</b> Conduct joint evaluation and supervision based on standards of waste management firms in the high-tech Industry	Please refer to " <a href="#">Waste Management</a> " in this Report
Air Pollution Control	Environmental impact of air pollutants			✓	<b>Use Best Available Technology:</b> Adapt best available technology to deal with pollution caused by operations and mitigate environmental impact <b>Strengthen Monitoring of Prevention Facilities:</b> Leverage backup systems and dual-track management, along with pollutant monitors, to ensure that equipment functions as intended and prevent abnormal occurrences	Please refer to " <a href="#">Air Pollution Control</a> " in this Report
Talent Attraction and Retention	Unable to attract talent		✓		<b>Hire Employees with Shared Visions &amp; Values:</b> Establish a standard for talent selection; build diverse recruiting channels; promote the internship program and the Overseas Recruitment Project; and work with top universities around the world to facilitate momentum for long-term growth	Please refer to " <a href="#">Talent Attraction and Retention</a> " in this Report
Talent Development	Talent cultivation and training programs are unable to support innovative technologies and operations of new fabs in TSMC		✓		<b>Advocate for Self-learning:</b> Offer diverse learning resources and channels to encourage self-learning among employees and improve their technical capabilities in order to achieve of technology development or volume production tasks	Please refer to " <a href="#">Talent Development</a> " in this Report
Human Rights	Allegations of human rights violations			✓	<b>Human Rights Due Diligence:</b> Continue to strengthen our commitment to human rights and risk mitigation according to the TSMC Human Rights Policy and Responsible Business Alliance Code of Conduct <b>Sustainability Risk Management:</b> All suppliers are required to comply with the Code of Ethics and Business Conduct, and to follow regulations on human rights and conflict-free minerals. TSMC continues to conduct sustainability risk assessments, and encourages major critical suppliers to join the Responsible Business Alliance (RBA)	Please refer to " <a href="#">Human Rights</a> " in this Report Please refer to " <a href="#">Supplier Sustainability Management</a> " in this Report
Occupational Safety and Health	Occupational accidents, occupational diseases, earthquakes, fires, chemical hazards, emerging infectious diseases (e.g. COVID-19)			✓	<b>Advocate Safety Culture:</b> Deeply instill a people oriented safety culture, manage safety risks and establish an intrinsically safe working environment <b>Comprehensive Health Management:</b> Implement the prevention of occupational diseases and promote a comprehensive health management <b>Internal-External Alliance:</b> Collaborate with external parties to establish a safer working environment in our supply chain <b>Reinforce Responses to Compound Disasters:</b> Regularly carry out drills for compound disasters, e.g. fire drill for earthquake-induced fires, improve the aseismic capabilities of tools and equipment, enhance production recovery capability and new fab planning <b>Prevention of Infectious Diseases:</b> Establish a guideline for the response of notifiable diseases; convene a committee for disease prevention when necessary; identify, implement, and monitor the pandemic to adopt appropriate measures	Please refer to 2019 TSMC Annual Report: <a href="#">6.3 Risk Management</a> Please refer to " <a href="#">Occupational Safety and Health</a> " in this Report



## Stakeholder Communication

### Employees

We strive to uphold the Company's values, strengthen awareness of ethics among employees, offer a challenging and enjoyable work environment, foster an open-style management model, and become the most appealing employer for our employees

60

Labor-management meetings

3,998

Cases handled by internal communication channels

### Communication Channels / Frequency

- Communication and work meetings within organizations / daily
- Communication meetings of all levels / quarterly
- Labor-management meetings / quarterly
- Fab Caring Circle, Employee Opinion Box and Ombudsman System / as needed
- Employee survey / annually
- Ethics training / annually
- Employee core values survey / biannually

#### Issues

- Talent Attraction and Retention
- Talent Development
- Human Rights
- Social Participation
- Ethics and Regulatory Compliance

#### Focus Areas

- Strengthen industry-academia collaborations around the world to discover and cultivate more young talent
- Expand interaction and cooperation across functions to broaden employee vision and foster well-rounded talent
- Leverage big data or AI tools to upgrade office automation to improve productivity and reduce work hours
- Participate in more events hosted by the TSMC Education and Culture Foundation and the TSMC Charity Foundation for deeper social participation
- Suggest the Company to include technical staff into annual ethics and regulatory compliance trainings

#### Responses from TSMC

- Launched semiconductor courses in universities for the first time, hosted a large-scale IC layout competition, and continued to offer shuttle programs and IC layout courses in universities
- Strengthened framework for employee development, and adopted a dual-track system covering both management and technical expertise to allow employees to develop to their full potential in the right places according to their personal characteristics and skills
- Emphasized on talent transfer and development internally; enhanced internal transfer management to achieve 100% internal transfer rate
- Dedicated to intelligent knowledge by introducing the latest Industry 4.0 and Industrial AI technology to build a knowledge base for engineering analysis
- Encouraged employees to serve as volunteers and build greater connections with the community; devoted resources to those in need through the TSMC Education and Culture Foundation and the TSMC Charity Foundation to help employees engage deeply in social participation
- Technical staff were included to receive annual ethics and regulatory compliance trainings for the first time, with a completion rate of 99.71%. We also offered trainings on conflicts of interest for 1,134 production line managers as part of efforts to raise ethics awareness.

“

I've served at TSMC for over 12 years and I'm very lucky to have been tasked with expanding into a new field that we direly need to expand into. With support from management, I've been given a high degree of freedom in carrying out the task, making it highly fulfilling.

Dr. Bharath Pulicherla  
2019 TSMC Academician



Dr. Bharath Pulicherla, TSMC Academician, received recognition from Dr. Mark Liu, Chairman of TSMC



## Shareholders / Investors

To help investors understand TSMC's investment value, TSMC communicates with investors about its growth strategies, stable profitability, good shareholder returns, and performance in sustainability

**307**

Institutional investors

**322**

Conferences and meetings

## Communication Channels / Frequency

- General shareholders' meeting / annually
- Investor conferences / quarterly
- Domestic and overseas broker conferences / periodically
- Face-to-face meetings and telephone conference calls / as needed
- Emails / as needed
- Annual report, CSR report, and annual report on Form 20-F with the US Securities and Exchange Commission / annually
- Major announcements on the Market Observation Open System / as needed

### Issues

- Financial Performance
- Innovation Management
- Risk Management
- Climate Change

### Focus Areas

- Impact from global politics and economy on the Company's operations and its countermeasures
- Changes in the competitive environment
- Future growth potential and profitability
- Dividend policy
- Measures in response to climate change and energy policy

### Responses from TSMC

- In 2019, through quarterly investor conferences and 322 investor meetings, TSMC communicated with its investors about market trends, growth strategies, and profitability, and expressed its opinions on changes in the business environment
- With the support of strong operating performance and future growth potential, TSMC has been providing positive return on investment to investors for 11 consecutive years.
- TSMC started distributing cash dividends on a quarterly basis in 2019. Shareholders of TSMC common shares received a total of NT\$10 cash dividend per share in 2019, a 25% increase from 2018.
- Increased usage of renewable energy and identified climate change risk and opportunities within the TCFD framework; TSMC proposed a Project for Increasing Energy Efficiency in Manufacturing, making it the first in the industry to implement the New Generation Equipment Energy Conservation Program

“

TSMC is one of the best Asian companies in sustainability practices. The company continues to push the envelope of technology and improves power efficiency of its products, and communicates with stakeholders in compliance with international practices. These efforts are reflected in the company's robust ROC, which underpins its outperformed share price. We look forward to seeing greater success from TSMC in coming years.

**Toby Hudson**

Head of Asia ex Japan Equity Investments / Schroders Investment Management (Hong Kong), LTD.

TSMC is making technologies become more energy-efficient and affordable in the future, which will help us manage the world's resources to improve our lives and drive future innovation. We would like to see further improvement in the Company's carbon footprint, becoming the benchmark for sustainability report disclosure in Asia and around the world.

**Michael McBrinn**

Partner / Generation Investment Management LLP.



## Customers

We offer customers high-quality products, services as well as the highest degree of protection for proprietary information through innovations and cutting-edge process technologies

33

Customers involved in quarterly assessments

136

Quarterly assessment meetings

## Communication Channels / Frequency

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

### Issues

- Innovation Management
- Product Quality
- Customer Service

### Focus Areas

- Technology development schedules and plans
- Capacity planning and production information
- Manufacturing excellence
- Information transparency and protection

### Responses from TSMC

- Offered customers 765 types of manufacturing and process technologies in line with the technology roadmap
- Continued to optimize the TSMC-Online™ function, allowing customers to make production orders such as batches of experiment or product transfers
- Set up an Early Failure Rate System internally to ensure product information is updated in real-time, resolve process flaws, increase product yield, lower reliability risk, and strengthen partnership with customers
- Fab 14B all received security certifications with the highest security standard for products and related PIP protection. TSMC is now qualified to produce security IC products and receive orders for high-security products.

“

TSMC offers transparent and predictable manufacturing information, so we have no surprises on our operations. They deliver products on time, respond quickly when we have urgent needs, take responsibility, and are very professional.

Sunny Gupta

Renesas Electronics Corporation / Vice President, Worldwide Operation

Xilinx's 16nm new products achieved single-digit FIT (Failure in Time) rate soon, and has since maintained an outstanding record on quality and reliability. TSMC Q&R team's hard work, as well as their leadership, contributed greatly to our success.

Dr. Antai Xu

Senior Director of Reliability Xilinx, Inc.



## Suppliers / Contractors

Suppliers and contractors are important partners to TSMC's operations, and together we strive to develop new process technologies, improve quality, comply with environmental safety and health regulations, and better business ethics and code of conducts. We also hope to strengthen partnerships with suppliers to create a sustainable supply chain

702

Suppliers participated in the TSMC Supply Chain Management Forums

112

Supplier audit & communication meetings

### Communication Channels / Frequency

- Supplier Management Forum, Responsible Supply Chain Forum, Supply Chain Environment, Safety, and Health Forum, Advanced Materials Forum / annually
- On-site support & audit / as needed
- TSMC supplier code of conduct campaign / annually
- Supplier ethics survey / biannually
- Supplier self-assessment questionnaire / annually

#### Issues

- Ethics and Regulatory Compliance
- Product Quality
- Sustainable Management in the Supply Chain; Environmental Protection, Safety and Health

#### Focus Areas

- Stayed focus on TSMC's ethics and regulatory compliance and supplier code of conduct
- Carried out sustainable actions and continued to improve
- Emphasized on the quality requirements of raw materials
- Built an efficient mechanism for waste management

#### Responses from TSMC

- All tier 1 suppliers signed the Supplier Code of Conduct and complied with business ethics (completion rate: 100%)
- 98.8% of suppliers believe that Supplier Code of Conduct training materials and case files were helpful in realizing and promoting the code; 84.9% of suppliers are now aware of reporting channels in TSMC
- 46 critical suppliers completed third-party supplier audits on sustainability risk by RBA-certified institution; 16 suppliers received consultation on process advancement and quality improvement
- Worked with suppliers to develop electronic-grade materials recycling; held the Responsible Supply Chain Forum and related training courses, sharing practical experiences which were then applied into the factory operations of our suppliers

“

Protecting the environment is an important corporate social responsibility, and we will continue to promote green manufacturing and work with TSMC to build a better, sustainable supply chain.

Doris Hsu

Chairperson of GlobalWafers Co., Ltd. & Taiwan Speciality Chemicals Co., Ltd.



Doris Hsu, chairperson of GlobalWafers Co., Ltd. & Taiwan Speciality Chemicals Co., Ltd., received recognition at the Supply Chain Management Forum

With a belief in respecting the environment and life sustainability, sustainable development is at the foundation of all the businesses we build and we are happy to work with TSMC to create a green supply chain.

Al Chuang

Taiwan Country Manager of Versum Materials Taiwan



## Government

Focus on TSMC's patent applications and overall technology, profit-seeking enterprise income tax payments and increasing investment incentives, purchasing renewable energy, programs for recycled water, and TSMC's promotion and experience sharing on Occupational Safety and Health

88

Government meetings attended

84

Industry association conferences and meetings

### Communication Channels / Frequency

- Official correspondences and visits / as needed
- Interviews to provide industry experience and advice / as needed
- Conferences (e.g. briefings, public hearings, symposia, seminars, meetups) / as needed
- Communication platforms of the industry associations / monthly

#### Issues

- Tax Policies
- Innovation Management
- Climate Change and Energy Management
- Water Management
- Occupational Safety and Health

#### Focus Areas

- Development trends of advanced semiconductor technology and the current situation of TSMC's technologies
- Purchase of renewable energy
- Use of recycled water
- Waste management and promotion of circular economy
- Compliant to regulations on water pollution prevention and control, air pollution prevention, and chemical substances control, etc.
- Assisted in improving occupational safety and health management in the supply chain

#### Responses from TSMC

- Offered a general course on the process technology, development, and applications of the semiconductor industry to the National Tax Administration of Northern Taiwan Province under the Ministry of Finance so the government can be familiar with the semiconductor industry
- Overseas locations are all using renewable energies now; Taiwan factories continued to purchase renewable energy in order to achieve the goal that 20% of electricity consumption of 3nm technology production will be renewable energy, and to reach the long-term goal that 25% of all the Company's electricity consumption will be renewable energy in 2030.
- Participated in the government's promotion of recycled water. TSMC is scheduled to begin to use first-phase water supplies from the Yongkang water regeneration facility by the end of 2020.
- On behalf of the Taiwan Semiconductor Industry Association and the Taiwan Science Park Association of Science and Industry to discuss with the Environmental Protection Administration regarding air pollution emission standards and the Toxic and Concerned Chemical Substances Control Act for the semiconductor industry
- Held four Environmental, Safety, and Health Experience-sharing Workshops; Suppliers are required to better manage energy conservation, fire safety, and occupational safety and health

“

In addition to creating economic value in the industry, TSMC is devoted to promoting circular economy, proving its outstanding performance in economic development and environmental protection through recycled water, refinement of sulfuric acid waste, and recycling of copper metals.

Dr. Yuh-Ming Lee

Distinguished Professor and Director, Institute of Natural Resource Management, National Taipei University





## Society

TSMC hopes that the TSMC Education and Culture Foundation can offer resources for education and arts to cultivate well-rounded talents in the new era; focuses of the TSMC Charity Foundation are on emergency relief aid, volunteer service, and various charity programs

189

Cooperating charity groups

221,935

Cumulative number of beneficiaries

### Communication Channels / Frequency

- Volunteer service / at least once per week
- [TSMC LinkedIn](#) / as needed
- Foundation websites / as needed
- "[Sending Love](#)" charity platform / as needed
- Project cooperation and visits / as needed

#### Issues

- Social Participation

#### Focus Areas

- Promotion of charity, education and culture programs
- Increased the number of cooperating charity groups as well as beneficiaries and the scope of our volunteer service
- Focused on TSMC's efforts to resolve social issues and its impact
- Continued to promote art and cultural activities; expanded sponsorships for outstanding local art groups

#### Responses from TSMC

- In 2019, the TSMC Education and Culture Foundation expanded its support for the diverse education program and devoted NT\$ 96.69 million; it was also the first time that TSMC participated in the ATCC Case Competition and we expanded the event to include the TSMC Youth Dream Building Project, encouraging youth to act on their creative ideas and participate in social issues. Eighty-nine groups of students from Taoyuan, Hsinchu, Miaoli, and Tainan in a total of 21 colleges and universities attended the competition.
- In 2019, the TSMC Charity Foundation devoted funds, resources, and volunteers to target four charity projects: Caring for Elders Living Alone, Promoting Filial Piety, Taking Care of the Disadvantaged, and Environmental Protection. The foundation focused on putting resources into Education in Remote Areas and Aid for the Disadvantaged, with 8,174 volunteers serving nearly 84,000 hours. Donations exceeded NT\$143 million.

“

We are grateful for the support and counseling provided by the TSMC Education and Culture Foundation. Right now, we are still a small social enterprise but we will strive to create value in society through charity work just as the TSMC Education and Culture Foundation has consistently done.

**Allen Yeh**

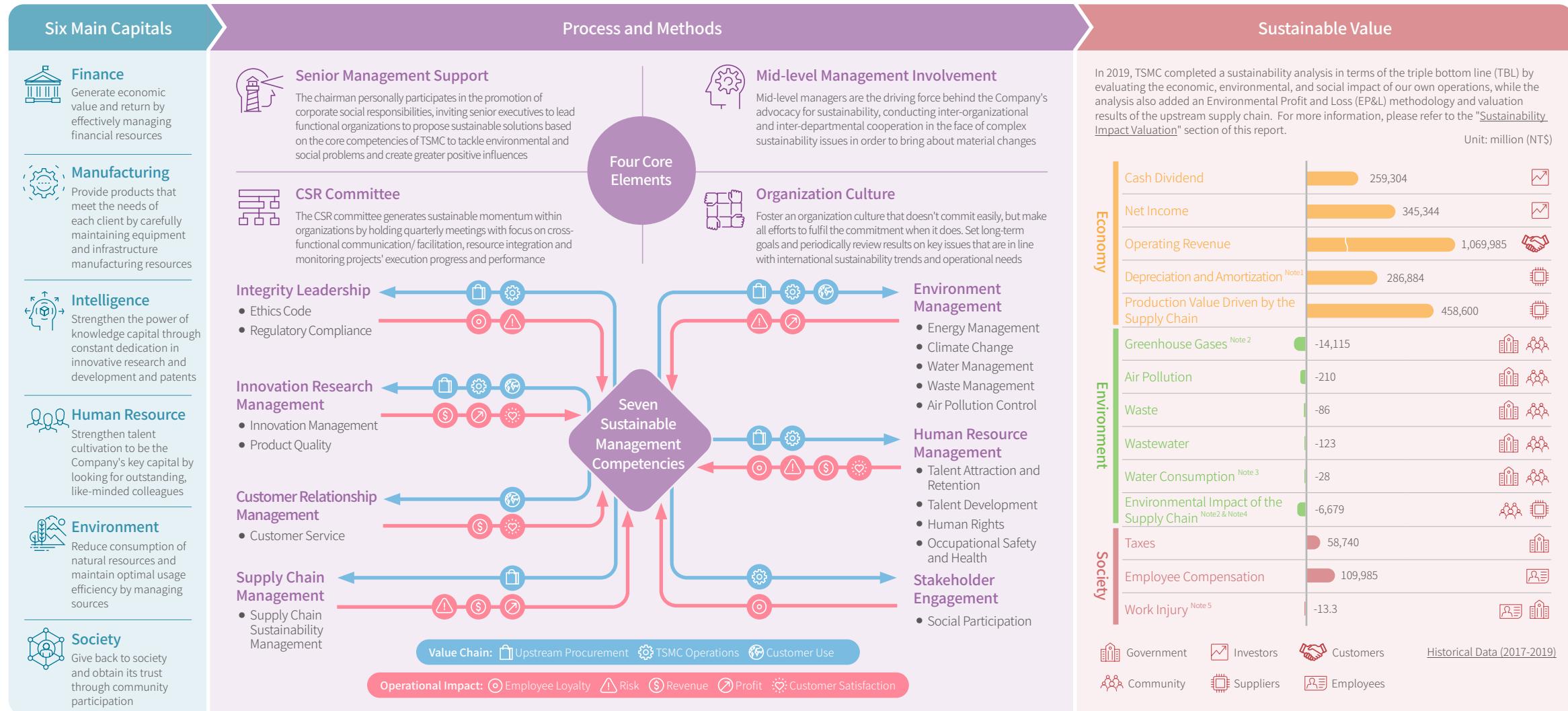
Leader of Package Plus, the TSMC team that participated in the 17<sup>th</sup> ATCC Case Competition

The Ten Thousand Dollars Per Household Program initiated by the TSMC Charity Foundation has eased the burden of financial stress and warmed our hearts. My work and family life was able to get on track when we were receiving aid so we really appreciate all your efforts!

**Ms. Shih**

Beneficiary of the Ten Thousand Dollars Per Household Program in Tainan

# Sustainable Value Creation



Note 1: "Production Value Driven by the Supply Chain" was calculated with assistance from the Industrial Economics & Knowledge Center. In 2019, the Directorate General of Budget, Accounting and Statistics (DGBAS) issued the Input-Output Table for 2016, therefore the "Production Value Driven by the Supply Chain" for 2017 to 2019 was calculated based on the 2016 Input-Output Table.

Note 2: Environmental Profit and Loss (EP&L) presented in this section is the monetary assessment of possible external impacts from TSMC's purchase and production. For the costs and economic benefits arising from the implementation of environmental protection projects, please refer to "Environmental Cost" in TSMC's 2019 annual report. For the methodologies of environmental profit and loss, please refer to the [TSMC 2019 Environmental Profit and Loss \(EP&L\) Report](#). For past impact-related projects, please refer to the [TSMC 2016-2017 Social Impact Valuation Report](#).

Note 3: The impact of water consumption was originally calculated based on the environmental characteristics of the countries where each production site was located. Taking into consideration of regional differences in water stress, we adjusted the methodology to calculate the impact of water consumption based on the environmental characteristics of where the fab is located (i.e. Hsinchu or Tainan) in 2019. We also updated calculations for 2017 and 2018 accordingly.

Note 4: Environmental impact of the supply chain includes only tier 1 suppliers which TSMC had more than two transactions with them in 2019 with the transaction amount exceeding NT\$ 10 million. A total of 441 suppliers met the criteria. We then calculated their environmental impact based on their industry and the procurement dollar amount by using the Environmentally Extended Input-Output Analysis (EEIOA) method.

Note 5: Calculation of industrial injury value = industrial injury cost + medical cost + willingness to pay price to avoid occupational injury.

## Sustainability Impact Valuation

Common good is TSMC's vision for fulfilling corporate sustainability. We've integrated concepts of Profit and Loss (P&L) with sustainable management to establish a Strategy Map by focusing on causal relationship, using an outside-in perspective to measure the social impact of TSMC's value chain. For "Customer Use", we've leveraged the latest process technologies to help our customers enable their innovations and improve energy efficiency. We hope to promote health, safety and convenience with technology while helping to build a low-carbon society. For "Upstream Procurement", we are taking advantage of our role as an industry leader in the global semiconductor industry to improve the technologies and competency of local suppliers, and propel development and production value for the semiconductor industry chain. In the face of environmental issues within the supply chain, we also advocate for a responsible supply chain that can reduce its impact on the environment and society. In "TSMC Operations", we work on renewable energy, green manufacturing, reclaimed water sources, and the circular economy based on innovations. In doing so, we hope that we are able to reduce the costs and impact of resource consumption on the society.

Meanwhile, TSMC is working with a team from the Corporate Sustainability and Social Responsibility Center of the Tunghai University. Since 2018 we have introduced an assessment for Environmental Profit & Loss (EP&L) which puts a monetary value on the social costs incurred throughout the global production process. The introduction of EP&L allows us to consider our environmental footprint and its external costs throughout our decision-making process. In 2019, we further expanded our EP&L analysis towards upstream procurement, hoping that we are able to discover more opportunities to reduce environmental footprint and increase social welfare, creating a more sustainable

supply chain and generating greater synergy for our value chain.

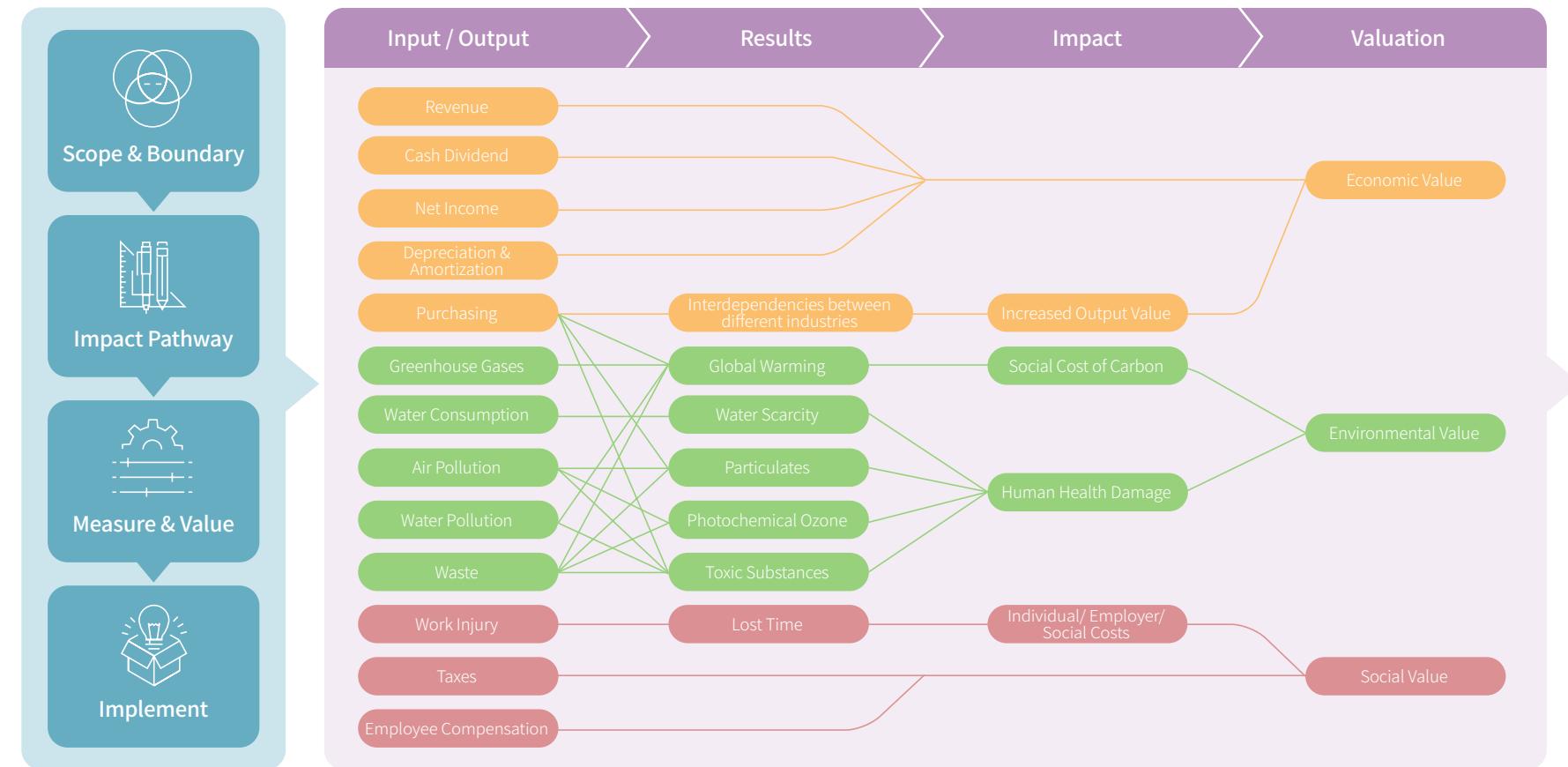
In 2019, in terms of TSMC Operations, TSMC generated NT\$1.07 trillion in revenue, made a provision of NT\$286.9 billion for depreciation and amortization, and issued NT\$259.3 billion in cash dividend. TSMC not only helped customers and suppliers succeed, but also offered good

returns to its investors. In terms of social value, we paid NT\$168.7 billion in taxes and payroll, supporting our government to expand infrastructure and social welfare, and to create more job opportunities, while occupational injuries resulted in NT\$13 million cost to society. Environmental footprint and resource consumption during the production process also resulted in NT\$14.6 billion of environmental costs. For upstream procurement, TSMC helped drive

NT\$458.6 billion of production value in the supply chain while incurring NT\$6.7 billion in environmental costs.

Looking into the future, TSMC will continue to promote sustainability impact assessment. We will improve sustainable management performance through four major principles of insight, collaboration, transformation, and impact to create more significant value for society.

## TSMC Sustainability Impact Valuation Model



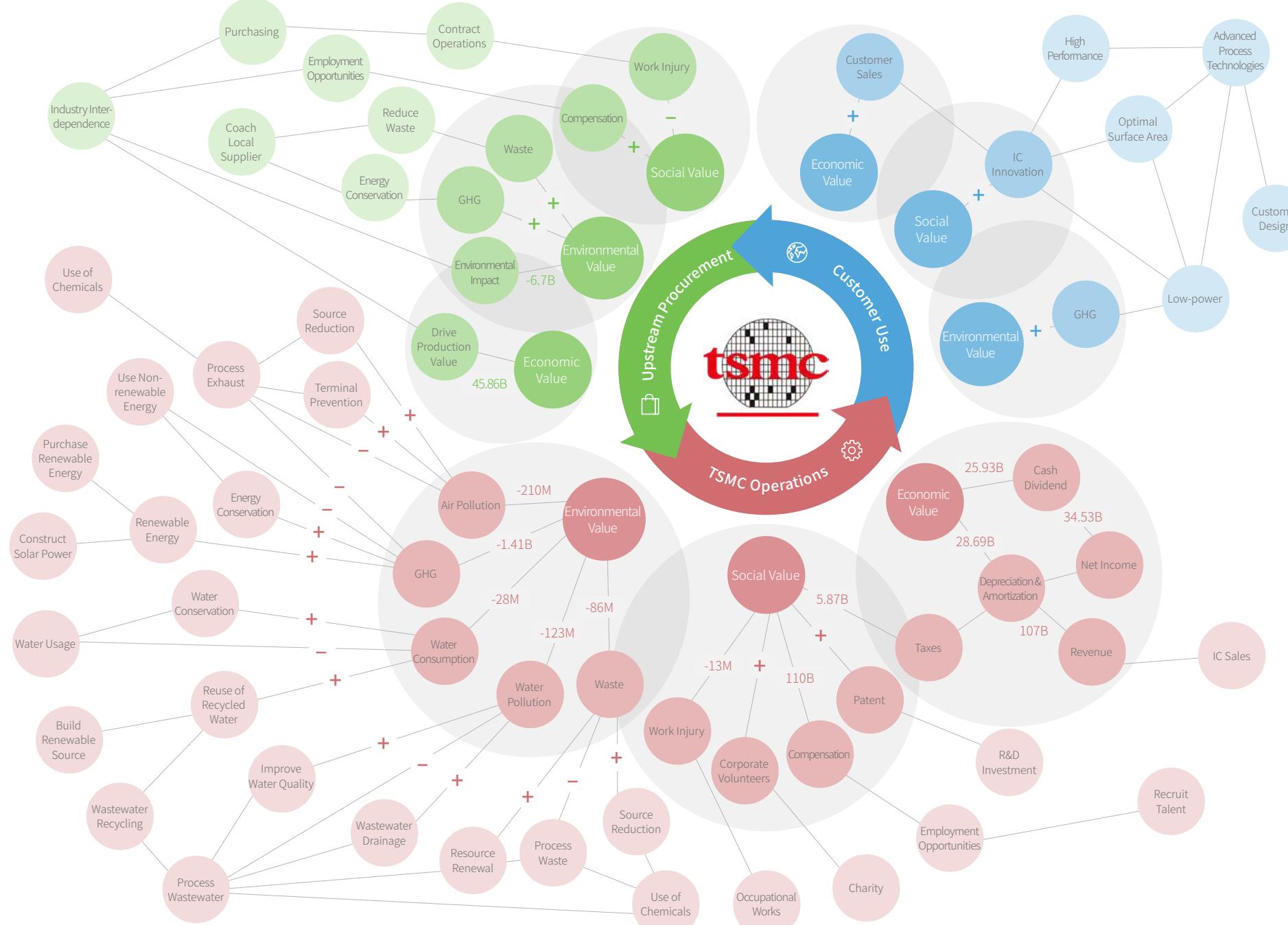


# Sustainability Impact Strategy Map

From purchasing and production to customer usage, TSMC has outlined a strategy map for the value chain derived from the causal relationship between of these interconnected lines for inspecting our various actions comprehensively. A monetary value is embraced as a sustainable management tool to measure the potential external costs (-) and values (+) that TSMC generates on the economy, environment, and society.

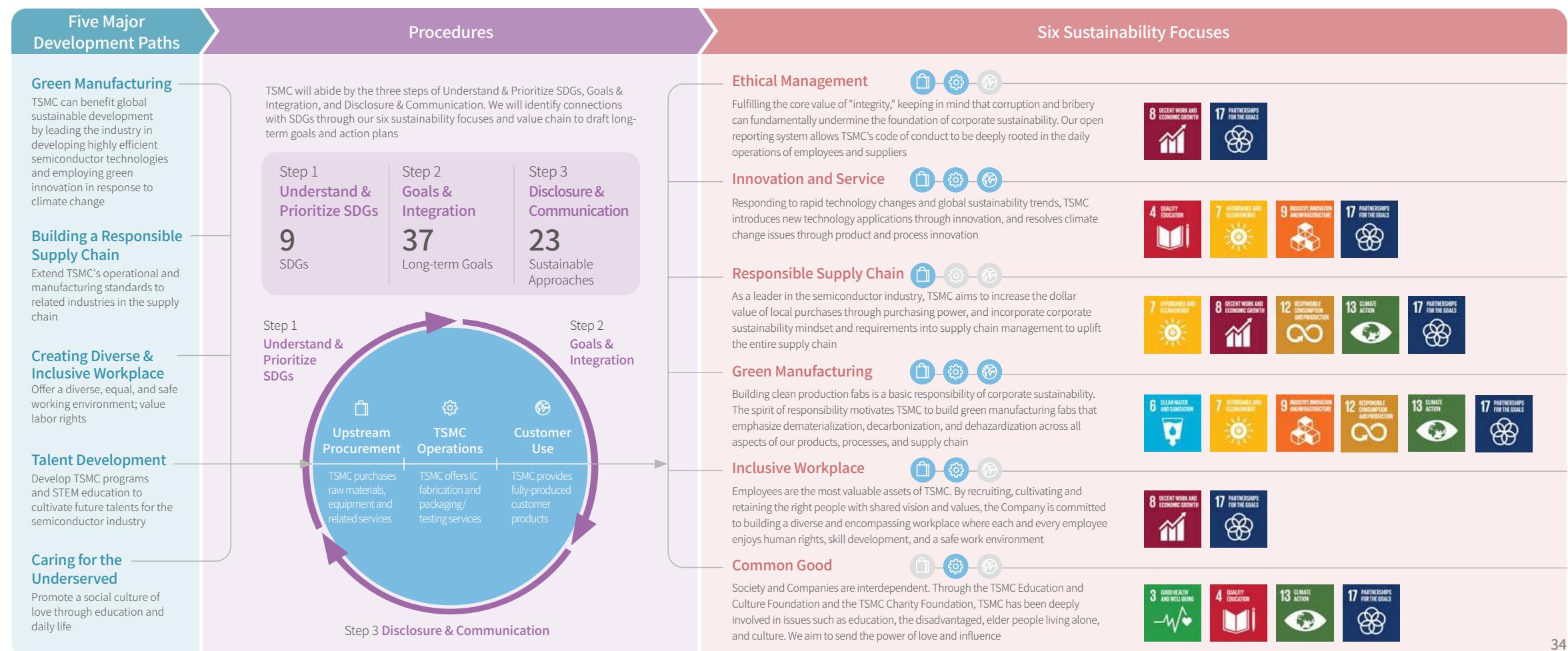
Note 1: The "Strategy Map" is derived from the Balanced Scorecard, a performance management tool researched and developed by Robert S. Kaplan and David P. Norton in the late 1990s. The Balanced Scorecard connects goals with driving factors to serve as a tool for management.

Note 2: The "TSMC Sustainability Impact Strategy Map" employs concepts of performance management to connect predicted results in value chain activities with causality among driving factors. We then apply the concept of P&L to identify positive or negative impacts to the economy, environment, and society. Such positive or negative impacts include direct or indirect economic value as well as the external costs or benefits brought onto the natural environment or society.



# Carry Out the UN Sustainable Development Goals

Grounded in our mission to build a lasting foundation, TSMC is steadfastly committed to our business principles and four core values of integrity, commitment, innovation, and customer trust. By adhering to our core business, TSMC is focused on our core competencies and primary business while actively carrying out the United Nations' Sustainable Development Goals (SDGs). We hope that TSMC's efforts can bring about positive changes and impacts to the challenges faced by humanity. In 2019, Chairman Mark Liu and CSR Committee Chairperson and Senior Vice President Lora Ho established the CSR Executive Committee with senior management from Technology Development, Business Development, Operations, Materials and Supply Chain Management, and Human Resources. Starting with six sustainability focuses, the CSR Executive Committee has established five major development paths for CSR, collaborating to build a vision and blueprint for implementing SDGs. In 2019, TSMC chose nine major SDGs, drafted 37 long-term goals, and implement 23 sustainable approaches. With Goal 17 of the SDG – global partnerships – at the core, we collaborate with stakeholders inside and outside of TSMC as well as business partners along the value chain. Through participation, cooperation, and dialogue, we hope to build an inclusive and prosperous future together.



**Good Health and Well-being**

- Offer better medical care to elder people living alone
- Provide 12,000 service visits to elder people living alone through Network of Love

**Quality Education**

- Promote filial piety among young generations
- Promote filial piety education in 120 educational institutions

**Care for the educationally disadvantaged**

- Continuously collaborate with public and private educational organizations and provide no less than NT\$12 million in resources annually

**Volunteer readers for children in remote areas**

- Provide more than 10,000 hours of reading service each year

**Clean Water and Sanitation****Reduce water consumption**

- Reduce unit water consumption (liter/8-inch equivalent wafer mask layers) by 30% (Base year: 2010)

**Raise the standard for wastewater**

- Water pollution composite indicator 30% above effluent standards

**Increase usage of reclaimed water**

- Increase the replacement rate of reclaimed water by more than 30%

**Affordable and Clean Energy****Aim for energy-efficient production**

- Double energy efficiency (8-inch equivalent wafer-mask layers/kWh) after five years of mass production for each process technology

**Encourage suppliers to conserve energy**

- Provide consultation on power reduction for suppliers and reduce energy consumption by a cumulative total of 1,500 GWh (Base year: 2018)

**Adopt renewable energy**

- Renewable energy accounts for 20% of energy consumption of new fabs starting from 3 nm, and the purchasing of renewable energy to increase annually until 25% of manufacturing fabs' power consumption is supplied from renewable energy and non-fab power consumption is 100% from renewable energy

**Linking SDGs and TSMC's Sustainable Development Goals for 2030****6 CLEAN WATER AND SANITATION****7 AFFORDABLE AND CLEAN ENERGY****8 DECENT WORK AND ECONOMIC GROWTH****9 INDUSTRY, INNOVATION AND INFRASTRUCTURE****12 RESPONSIBLE CONSUMPTION AND PRODUCTION****13 CLIMATE ACTION****Decent Work and Economic Growth****Offer competitive compensation**

- Continue to maintain a position above the 75<sup>th</sup> percentile among industry peers in total compensation

**Support local suppliers**

- A cumulative total of 145 local raw materials suppliers receive consultation on process enhancement and quality improvement (Base year: 2016)
- Encourage all major local raw materials suppliers and 75% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Competition; 60% to advance to the finals

**Facilitate sustainability in the industry**

- Tier 1 suppliers' completion rate of the Sustainability Management Self-Assessment Questionnaire: 100%
- Completion rate of critical suppliers reporting on the status of sustainability management in their critical upstream supply chains: 100%
- Tier 1 suppliers' completion rate for signing the TSMC Supplier Code of Conduct: 100%
- Tier 1 suppliers completion rate for signing the TSMC Guidance on Supplier Business Conduct and conducting internal training every two years: 100%
- Critical suppliers completion rate for receiving third-party audits every three years: 100%
- Completion rate of annual ethics and regulatory compliance training to employees: 100%

**Industry, Innovation and Infrastructure****Encourage innovation**

- To maintain TSMC's technology leadership, annual R&D expenditure amounts to 8.5% of revenue
- Exceed 50,000 global patent granted

**Green product innovation**

- Decrease the Product Environmental Footprint by 30% for each unit product (Base year: 2010)

**Promote workplace safety**

- Disabling Injuries Frequency Rate (FR) < 0.45
- Disabling Severity Rate (SR) < 6
- All waste treatment vendors acquire ISO14001 or other international EHS Management certifications
- Completion rate of providing consultation to all vendors with high risk operations and auditing health and safety standards in their facilities: 100%
- Assist all contractors with high risk operations in obtaining ISO 45001 certification for occupational health and safety management system
- A cumulative total of 1,500 local suppliers participate in the Environmental, Safety, and Health (ESH) training program

**Climate Action**

Implement strategies in response to climate risks

- Reduce greenhouse gas emissions per unit of production (metric ton of carbon dioxide equivalents (MTCO<sub>2</sub>e)/8-inch equivalent wafer mask layers) by 40% (Base year: 2010)
- 0 days of production interruption due to climate disasters

Enhance the resilience against climate risks

- A cumulative total of 300 suppliers observe annual emergency response drills (Base year: 2016)

Have more environmental & energy conservation volunteers

- Environmental protection volunteers provide over 1,200 services each year

**Responsible Consumption and Production**

Reduce the output of industrial waste

- Outsourced unit waste disposal per wafer (kilogram/8-inch equivalent wafer mask layers) ≤ 0.22

**Promote a circular economy**

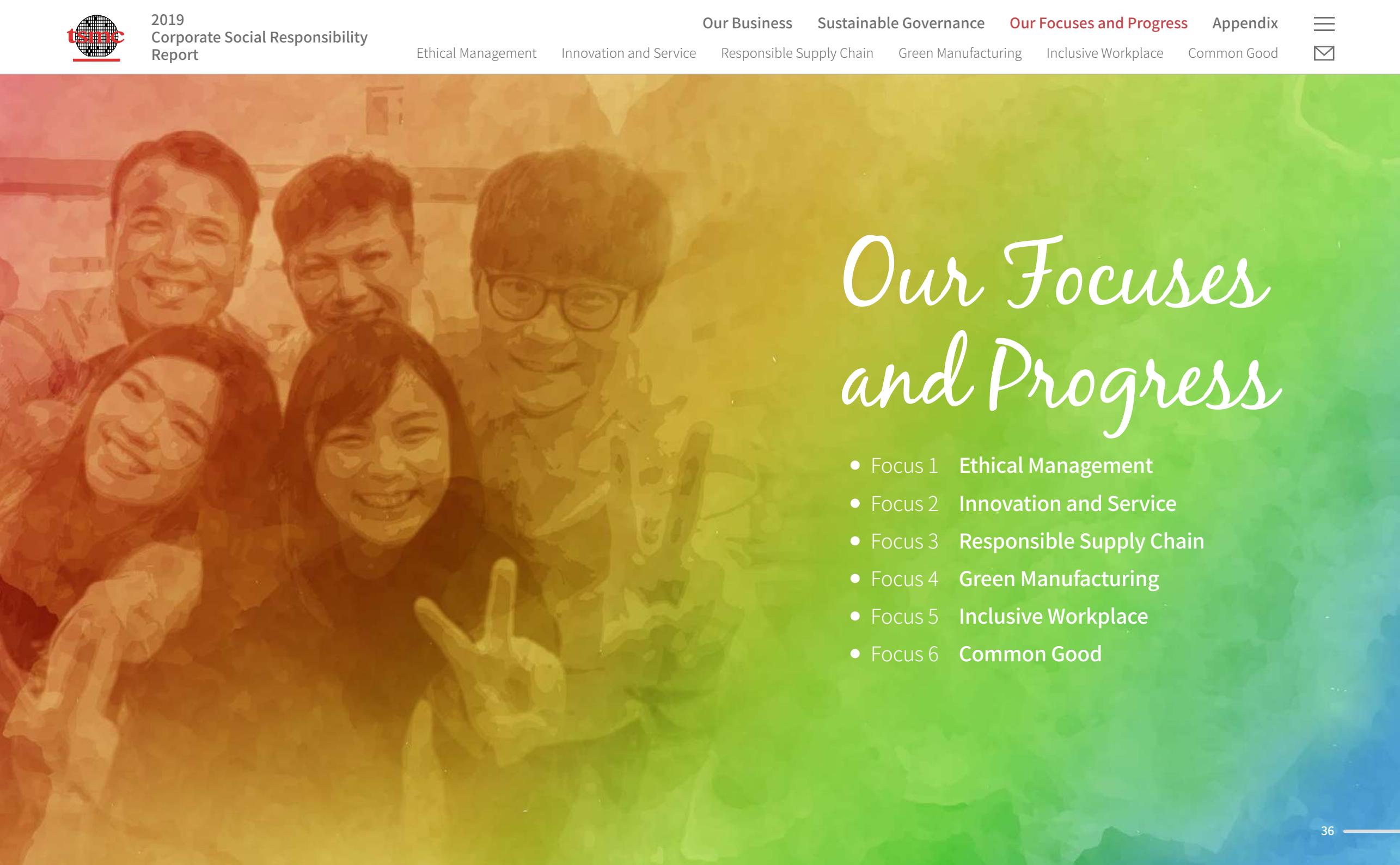
- Develop multiple types of electronics-grade chemicals for TSMC's resource circulation
- Reduce waste production among major local suppliers by 35% (Base year: 2014)

**Improve recycling abilities**

- Develop the ability to analyze 100% of CMR (Carcinogenic, Mutagenic and Reprotoxic) substances and help major suppliers develop the same capabilities

**Advocate for personal health management**

- Zero cases of occupational hazard caused by exposure to chemicals



# Our Focuses and Progress

- Focus 1 **Ethical Management**
- Focus 2 **Innovation and Service**
- Focus 3 **Responsible Supply Chain**
- Focus 4 **Green Manufacturing**
- Focus 5 **Inclusive Workplace**
- Focus 6 **Common Good**



## Focus 1

# Ethical Management

## A Trustworthy Company

With foundations built on the core value of Integrity, TSMC is a company that has always governed itself with the highest standards. The ethical culture of TSMC employees is continuously strengthened through comprehensive education and training. At the same time, TSMC works hand in hand with its customers and supply chain to serve the mutual benefit of the industry, and serves as a trustworthy partner to its stakeholders.

### 47,504 People

47,504 employees completed annual courses on Business Ethics and Regulatory Compliance

### 100%

All tier 1 suppliers signed the TSMC Guidance on Supplier Business Conduct and conducted internal training at the completion rate of 100%

### 98.8%

98.8% of suppliers agreed that TSMC promotion events for business ethics helped improve their understanding of business ethics





# Ethics and Regulatory Compliance

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Reinforce Both Internally and Externally

The management team of TSMC takes ethics and regulatory compliance seriously. It is reflected not only internally in the formulation of compliance policies and procedures, providing training and promotion activities, and periodic assessments and declarations, but also externally through the participation of third parties. Furthermore, the culture of ethics and regulatory compliance is cultivated through effective reporting channels and whistleblower protection.

- Completion rate of annual ethics and regulatory compliance training to employees: 100%

- 99.6% completion rate for annual employee training on ethics and regulatory compliance. A follow-up survey of employees that completed training found that 85.9% were aware of reporting channels, and 95.1% believed TSMC takes a serious approach in implementing the TSMC Ethics Code as well as investigating and reprimanding violations<sup>Note</sup>  
Target: 98% completion rate of ethics and regulatory compliance training

- No material regulatory violation (where fines exceed NT\$1 million)

- No material regulatory violation  
Target: No material regulatory violation

- 100 % completion rate for annual training on ethics and regulatory compliance for managers and remain above 98% for all employees

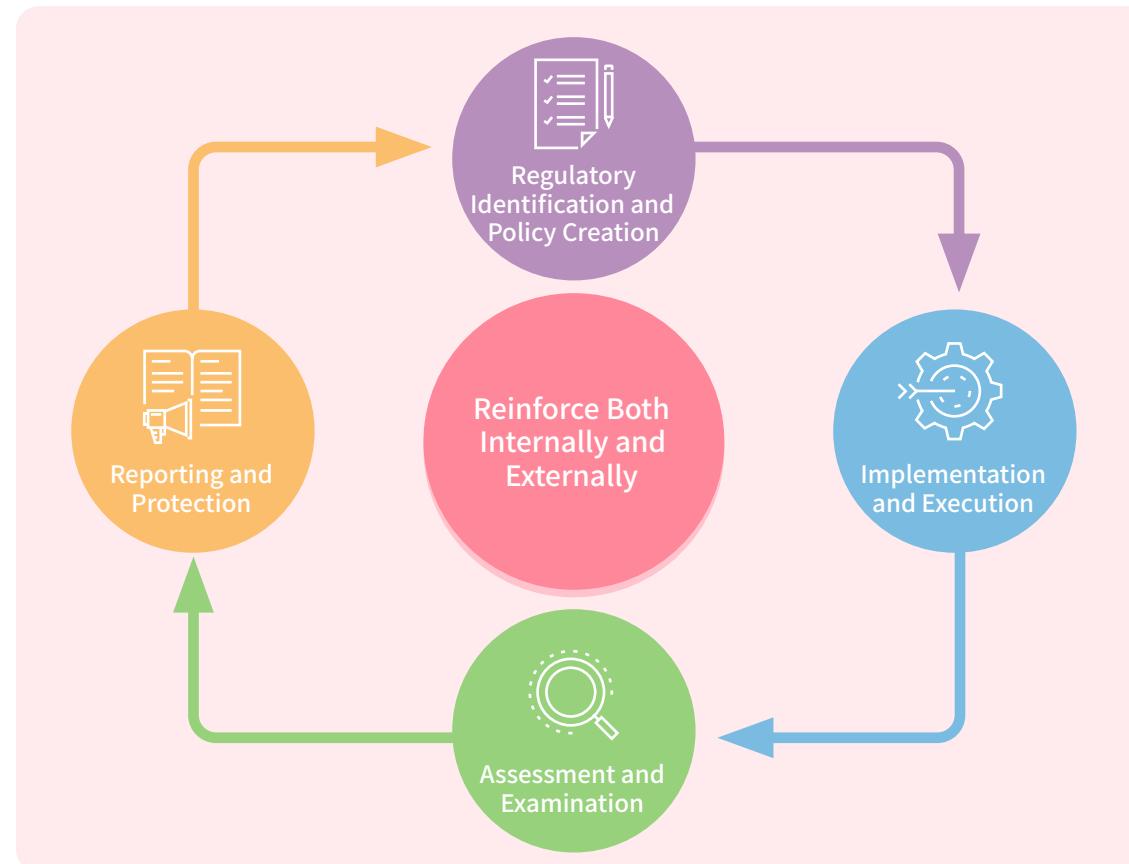
- No material regulatory violation

● Exceeded   ● Achieved   ● Missed Target

Note: Interviewed employees from TSMC's facilities in Taiwan, TSMC North America, TSMC Europe, TSMC Canada, TSMC Japan, TSMC Nanjing, TSMC China, TSMC Korea, and TSMC Technology, Inc.

Integrity is the most important core value in TSMC's ethics and regulatory compliance system. The system is built using a sequence of regulatory identification, compliance policy and procedure formulation, implementation and execution, self-assessment and examination, as well as open reporting channels and whistleblower protection. The Company's management team acts in accordance with our Ethics Code, and fosters a robust ethics and regulatory compliance through the tone from the top.

### The Compliance Cycle



#### Reinforce Both Internally and Externally

Integrity is TSMC's most significant core value. The Company exercises self-discipline by complying with the highest ethical standards and substantially implements integrity, equality, and transparency in daily operations. TSMC holds zero tolerance for corrupt practices and strictly prohibits any behavior of bribery, fraud, blackmail, misuse, misappropriation of the Company's assets, or impairment of the Company's interest for personal gain. [TSMC's Code of Ethics and Business Conduct](#) (the Ethics Code) is the guideline for implementing the aforementioned core values. Every employee is required to shoulder the weighty responsibilities of both maintaining high ethical standards and the Company's reputation.

In view of the importance of compliance with the Ethics Code, the Company's management team periodically reports to the Board and the Audit Committee on ethics and regulatory compliance. TSMC formed an Ethics Committee, which oversees implementation of the Ethics Code as well as the investigation and disciplinary action of reported incidents. Meanwhile, TSMC enhances suppliers' understanding and compliance with the Company's Ethics Code through the "[Supplier Code of Conduct](#)" and the "[TSMC's Anti-Corruption Commitment](#)", bringing the core value of integrity into supply chains and demonstrating it in business behavior.

#### Regulatory Identification and Policy Formulation

By periodically tracking regulatory changes, TSMC identifies potential risks and impacts arising from regulatory changes. According to the results of regulatory identification, TSMC assesses whether internal regulations align with the changes to ensure that relevant policies and regulations are applicable and appropriate. In 2019, TSMC updated our privacy policy and cookies policy on our website and privacy notices to TSMC employees in alignment with the latest practices under the EU General Data Protection Regulation and related risk assessments.

#### Implementation and Execution

Implementing laws and relevant internal regulations is an important part of TSMC's ethics and regulatory compliance. All organizations, subsidiaries and employees are required to ensure their business operations are compliant with laws, Company policies, and regulations. Through an annual Control Self-Assessment (CSA), all employees examine their own compliance performance and are open for audit by the Internal Audit organization.

#### Training and Promotion

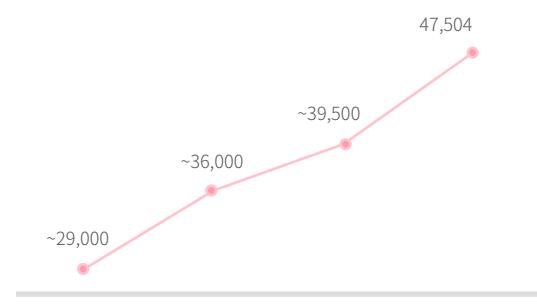
To raise employee awareness of ethics and regulatory compliance, TSMC provided various training courses for all employees with relevant



job responsibilities based on laws and relevant internal regulations. The training courses included face-to-face courses and promotions as well as mandatory and elective online courses. Through posters around our facilities, guidelines and FAQs of regulation compliance on the Company's intranet, internal email distributions, and promotional articles, TSMC ensures that all employees have timely access to new information of regulations and have a deeply-ingrained awareness of various issues.

### Employee Completion Summary of the Annual Ethics & Regulatory Compliance Course

- The training covered anti-corruption, conflict of interest, reporting channels, and whistleblower protection
- Face-to-face<sup>Note</sup> and digital training



Note: TSMC (China) technicians, employees assigned abroad, and employees with specific responsibilities are provided with face-to-face training

In 2019, TSMC provided regulatory compliance training courses such as ethics and anticorruption, prevention and reporting of conflict of interest, export control, proprietary information protection, intellectual property rights protection, privacy and personal information protection, conflict-free minerals, and antitrust laws to a total of 47,504 employees. TSMC also offered 38 face-to-face compliance training courses on subjects regarding export control and anti-trust laws for related departments. To ensure that production line managers are fully aware of TSMC regulations on conflict of interest, TSMC trained 22 trainers to give lectures to target trainees, production line managers in Taiwan factories, on this topic using a case studies approach; a total of 1,134 production line managers completed this training. In 2020, TSMC plans to offer advanced online courses on four subjects – export control, insider training, corruption, and anti-trust – to further enhance TSMC employees' awareness in regulatory compliance.

### Supplier Management

TSMC believes suppliers play key roles in the Company's realization of ethics and regulatory compliance. Through constant and concrete actions, TSMC demonstrates to its suppliers the determination to strictly adhere to the high ethical standards adopted in its Ethics Code, and ensures that suppliers follow accordingly.

### Case Study

## Introduce Multiple Training Platforms for Technicians to Enhance TSMC's Core Value of Integrity

In 2019, TSMC officially introduced the eLearning annual mandatory program to our technicians to increase the coverage of employee ethics training. TSMC customized the content of the courses in accordance with their daily work and responsibilities, emphasizing relevant ethics issues and regulations. For example, technicians whose jobs involve handling personal information of other employees need to be aware of information protection related laws to ensure that the course is effective. Additionally, considering technicians work in shifts, the training is provided on flexible schedules and through multiple platforms such as face-to-face communication meetings, production notes, and e-learning. In 2019, the training completion rate for technicians was 99.7%, with a total of 15,622 technicians completing the training.

### Technician Ethics Training Completion Summary

- |                                   |   |   |
|-----------------------------------|---|---|
| <b>Completion Rate:</b> - (5,256) | <b>Completion Rate: 96.2%</b> (8,489/8,829) | <b>Completion Rate: 99.7%</b> (15,622/15,668) |
| - Employee Communication Meetings | - Employee Communication Meetings           | - Employee Communication Meetings             |
| - Production Notes                | - Production Notes                          | - Production Notes                            |

Taiwan Facilities<sup>Note 1</sup>

Taiwan Facilities<sup>Note 2</sup>

Taiwan Facilities & Subsidiaries

2017

2018

2019

Note 1: TSMC Fab 12A, Fab 12B, Fab 14A, Fab 14B, Fab 15A, Fab 15B, and Advanced Backend fabs

Note 2: TSMC Headquarter, all Taiwan fabs, and Advanced Backend fabs



For more details, please refer to TSMC's CSR website:  
["Introducing Multiple Training Platforms for Technicians to Enhance TSMC's Core Value of Integrity"](#)



## Assessment and Examination

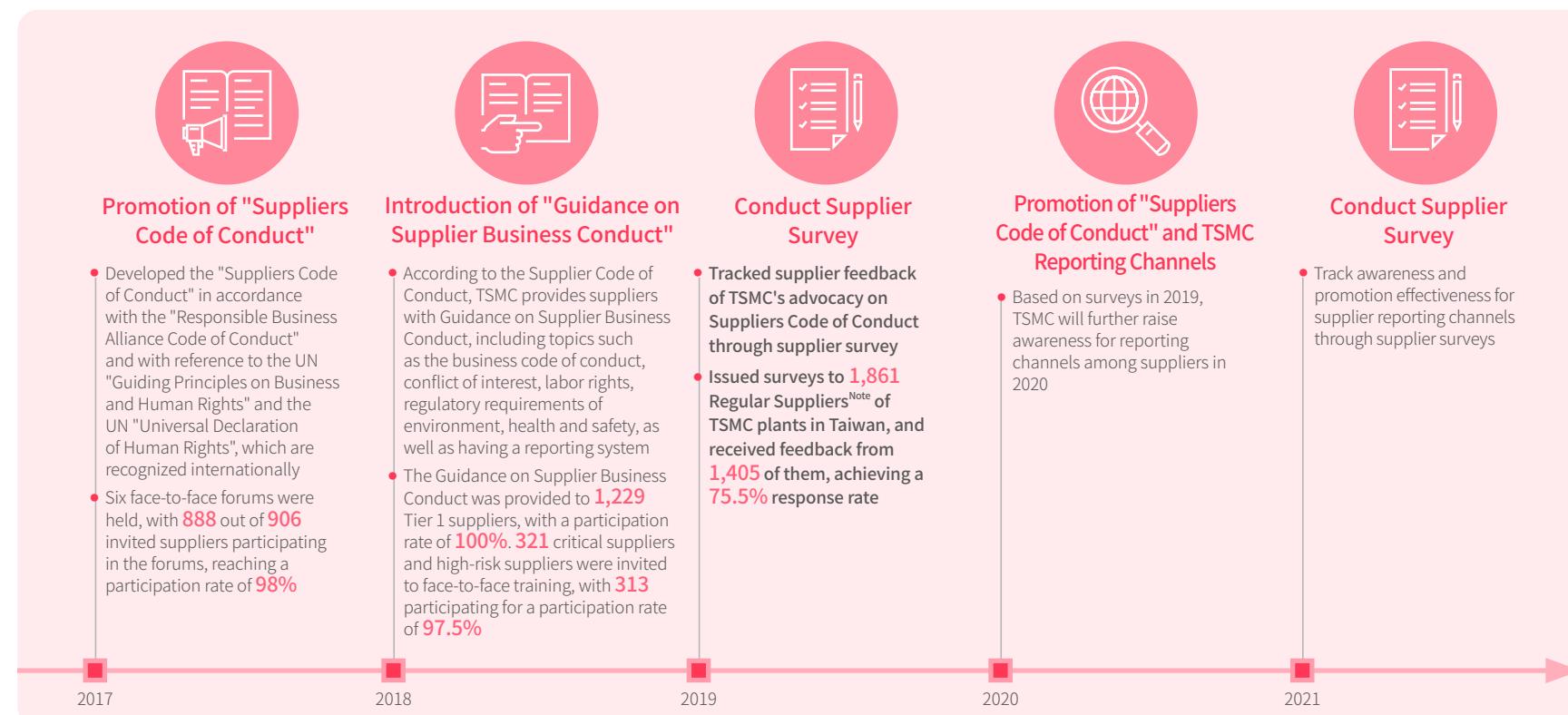
To implement the Ethics Code and to avoid potential conflicts, TSMC requires every newly-hired employee to complete a conflict of interest declaration upon arrival. Employees with specific job grades or positions need to complete the declarations annually. In 2019, 17,668 TSMC employees completed the Annual Conflict of Interest Declaration to which all declarants agreed to comply with the "TSMC Code of Ethics and Business Conduct."

Internal Audit performs an audit according to the annual audit plan approved by the Board of Directors and reports the results and follow-up improvement plans to the Board and management. Internal Audit will also administer the CSA and assess its fulfillment by each fab/division to ensure effectiveness and for internal self-assessment.

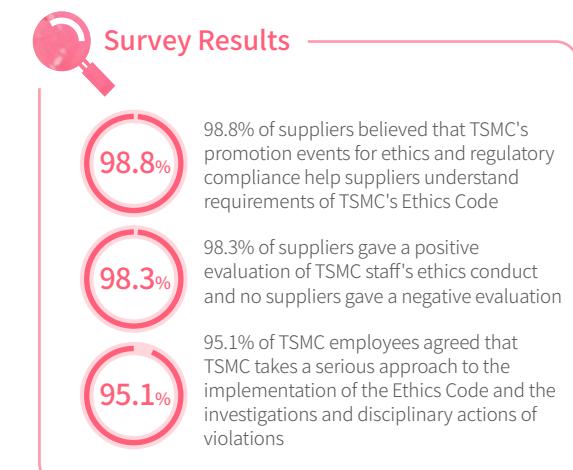
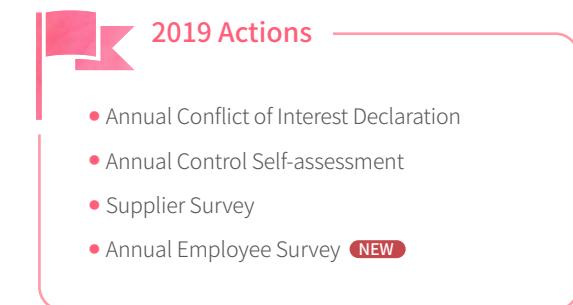
In addition, every two years, TSMC performs anonymous surveys to suppliers and employees in turn to periodically evaluate the effectiveness of the promotion of ethics and regulatory compliance. To closely track employee feedback for ethics and regulatory compliance, TSMC introduced a brief Annual Employee Survey in 2019 to increase the frequency of survey and adjust

promotion content based on the feedback. According to aforementioned surveys, 84.9% of suppliers and 85.9% of employees were aware of reporting channels, suggesting that there is still room for improvement. As a result, raising awareness further for reporting channels will be our focus in 2020.

## Supplier Management at TSMC



Note: Regular Suppliers are defined as suppliers with transactions over NT\$ 1 million in the last 18 months since the survey was issued. This is to help exclude suppliers without business dealings with TSMC.





## Reporting and Protection

TSMC establishes and discloses its [Complaint Policy and Procedure for Certain Accounting & Legal Matters](#) and pledges to comply with the relevant regulations in the policy. Open and multiple reporting channels are available for internal and external voices. All reported incidents collected from reporting channels inside or outside of TSMC are properly recorded and traced. TSMC also prevents any form of retaliation by providing proper protection for any individual who in good faith reports a suspected violation or participates in an investigation. The Ethics Committee examines major reported incidents that are investigated. In 2019, the Committee held six such meetings in total. TSMC investigates each individual case

according to its characteristics through specific divisions, and treats every received case seriously, carefully, and effectively to ensure accuracy of the investigation. Investigated cases confirmed to be true will be disciplined respectively, including dismissal, termination of the business relationship, and legal prosecution as appropriate. The TSMC Ethics Committee will evaluate each case to determine whether it is an exceptional case or whether it results from systemic issues of insufficient awareness in ethics. This will allow TSMC to continue evaluating whether it is necessary to improve its management and internal control procedures. Activities such as emails to employees that disclose the violations and disciplinary

actions in each quarter are conducted to promote employees' awareness and avoid recurrence of similar incidents.

In 2019, we didn't receive any report related to finance or accounting matters, or any material regulatory violation (where a fine exceeds NT\$1 million).

In 2019, the incidents reported through the Audit Committee Whistleblower System, Ombudsman System, and Irregular Business Conduct Reporting System totaled 205. Among them, 132 cases were related to employee relations, 47 cases were categorized as others (e.g. asking personal questions or private matters), and 26 cases were related to ethics. Only 2 incidents were "verified

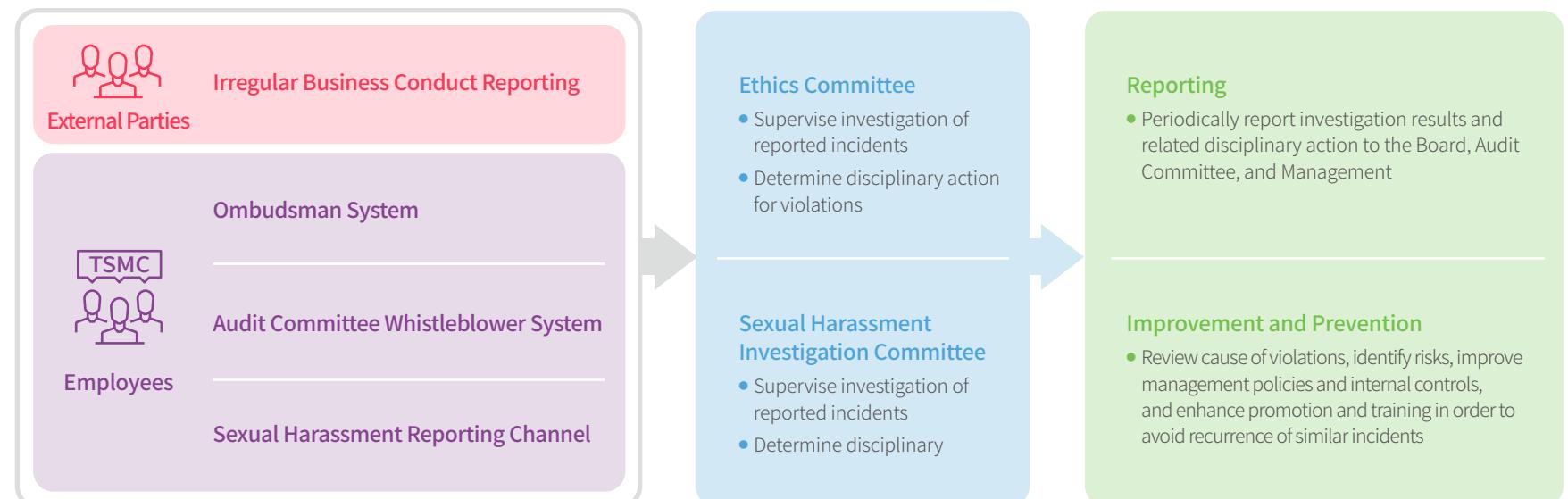
upon investigation" and determined for disciplinary action by the Ethics Committee. One incident involved an employee who violated Company regulations by asking a supplier to book a hotel and prepay for the employee, and that employee received an admonition. The other incident involved an employee who committed a serious violation of Company ethics conduct by taking advantage of his/her position to demand a personal loan from the supplier, and the employee was dismissed. In 2019, TSMC leveraged the two violations to strengthen ethics promotion for all employees in supplier-related activities.

## Historical Incidents

Unit: cases



## Reporting Channels and Procedures



Note: For reported cases related to sexual harassment, please refer to "Inclusive Workplace" in this Report

## Focus 2

# Innovation and Service

### An Innovation Enabler

As the leader in dedicated IC foundry industry, TSMC has driven continued progress in global technology through innovation. We care about our customer's feedback and have been expanding our R&D scale over the years. We insist on producing sustainable products with high quality and low energy consumption, and have also established a mechanism to protect our customer's proprietary information. We hope to provide our customers next generation innovations and designs through leading technology and manufacturing excellence.

### 3,600 Patents/ 10,000 Trade Secrets

Protected intellectual property rights, with over 3,600 patents approved globally and over 10,000 trade secrets registered

93%

Maintained great working relationships, with customer satisfaction exceeding 90% for six consecutive years

>15 Billion (NT\$)

Completed 49,356 quality improvement cases across departments, creating NT\$15 billion in value





# Innovation Management

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Technology Leadership

Continuous investment and efforts on leading-edge technology development to maintain TSMC's technology leadership in the semiconductor industry

- To maintain TSMC's technology leadership, annual R&D expenditure amounts to 8.5% of revenue

- Successful risk production of industry-leading 5nm process technology

Target: Risk production of 5nm, the 5<sup>th</sup> generation FinFET CMOS platform technology for SoC

- 5nm process technology in volume production

### Sustainable Products

Assess the environmental and social impact of each stage in the entire product life cycle and provide our customers with products that have low environmental, carbon, and water footprints

- Decrease the Product Environmental Footprint by 30% for each unit product (the base year is 2010)<sup>Note</sup>

- Finished the product life cycle assessment on VisEra and TSMC fabs in Taiwan. Overseas subsidiaries are being built

Target: Complete product life cycle assessment on all manufacturing fabs

- Complete product life cycle assessment on all manufacturing fabs
- Complete the establishment of a digitalized internal environmental profit & loss assessment system
- Complete environmental profit & loss assessment on suppliers (including inventory on 50 key suppliers)

### Intellectual Property Protection

Patent protection: continue to strengthen patent portfolio by keeping patent applications in sync with the Company's R&D resources to make sure that all research achievements are fully protected

Trade secret protection: enhance business operation and intellectual property innovation through trade secret registration and management that documents and consolidates the applications of the Company's competitive trade secrets

- Exceed 50,000 global patent granted

- Nearly 6,500 global patent applications

Target: >5,100 patents

- Exceed 5,300 global patent applications

- Exceed 100,000 trade secrets registered

- Over 10,000 trade secret registrations

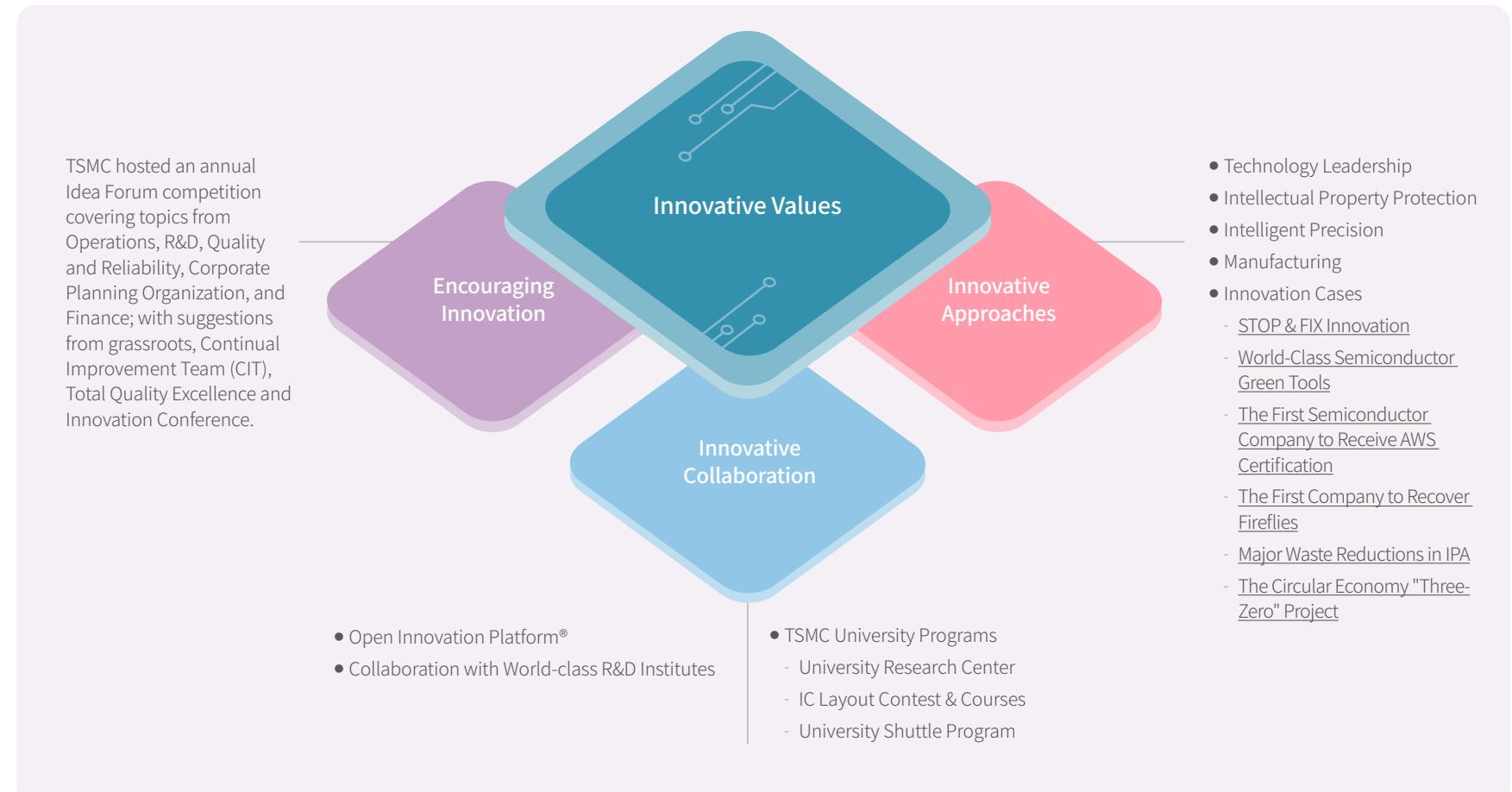
Target: >10,000 registrations

- Exceed 12,000 trade secret registrations



## Innovation Management Framework

In response to the rapidly evolving semiconductor industry, TSMC has been striving to build an innovative work environment that highly encourages innovation since its establishment. In the face of challenges imposed by existing and new competitors in 2019, TSMC continues to enhance the Company's leading technological competitive advantages through an internal incentive scheme for innovation. Employees are encouraged to bring forth a variety of innovations to enhance organizational innovation vitality. Meanwhile, TSMC also dedicates resources to helping our customers, the industry, and academia drive interdisciplinary innovation collaborations, including product innovation with our customers, technical talent innovation with research institutions, and green innovation with our suppliers.

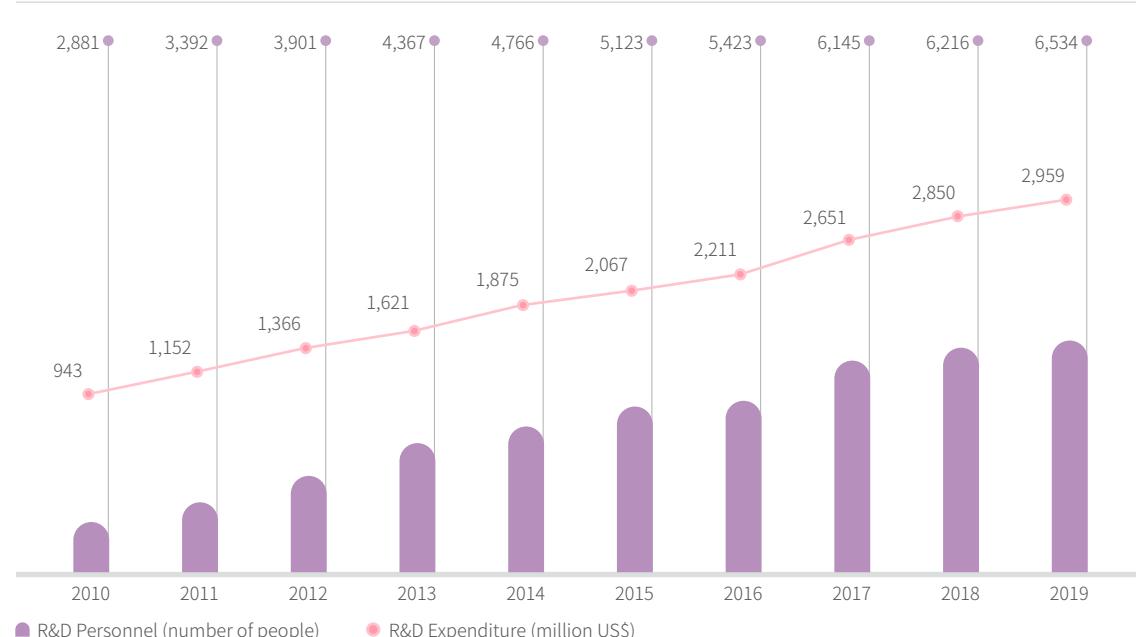




## Technology Leadership

TSMC continued to expand its scale of research and development in 2019. The total R&D expenditure for the year was US\$ 2.959 billion, a 4% increase from the previous year and 8.5% of the Company's total revenue. The R&D team has grown to a team of 6,534 people, a 5% increase from the previous year. The scale of TSMC's R&D investments is on par with top tech companies worldwide and even surpasses some of the company's respectful counterparts.

### Continuous Investment in R&D



To continue along the Moore's Law trend and to assist our customers in successful, fast product development and delivery, TSMC has been continuously investing in R&D to offer industry-leading process technologies and design solutions. In 2019, following the transfer to manufacturing of the 7nm+ technology node and the successful risk production of 5nm technology, the Company's R&D organization continued to fuel the pipeline of technological innovation needed to maintain industry leadership. While TSMC's 3nm technology, the sixth generation of technology platform to make use of 3D transistors continues full development, the Company

has initiated the development of 2nm technology, a pioneering effort within the semiconductor industry, and at the same time, is progressing in research and exploratory studies for nodes beyond 2nm.

In addition to developing CMOS logic technology, TSMC is also involved in the development of a wide range of other semiconductor technologies to satisfy customer's demand for mobile SoC products and other applications, such as smartphones, high-performance computing, IoT, automotive electronics, etc.

In 2019, TSMC maintained strong partnerships with world-class research institutions, including the Semiconductor Research Cooperation (SRC) in the U.S. and the Interuniversity Microelectronics Centre (IMEC) in the Belgium. TSMC also continued to expand research collaboration with leading universities throughout the world for two grand purposes; the advancement of semiconductor technologies and the nurturing of talent for the future.

### Specialty Technologies / Integrated Interconnect & Packaging Technologies

<b>3D IC and TSMC-SoIC® (System-on-Integrated Chips)</b>	<ul style="list-style-type: none"> <li>Completed process validation for System on Integrated Chips (SoIC®), an innovative wafer-level package technology</li> </ul>
<b>Advanced Fan-Out and InFO (Integrated Fan-Out)</b>	<ul style="list-style-type: none"> <li>Achieved high-volume production of Gen-4 Integrated Fan-Out Package on Package (InFO-PoP) for mobile processor packaging</li> <li>Successful qualification of Gen-5 InFO-PoP advanced packaging technology for mobile applications and Gen-2 Integrated Fan-Out on Substrate (InFO-oS) for HPC applications</li> </ul>
<b>Power IC/Bipolar-CMOS-DMOS (BCD)</b>	<ul style="list-style-type: none"> <li>Developed 40nm BCD (Bipolar-CMOS-DMOS) technology – unique in the industry – offering leading-edge 20-24V HV devices with full compatibility to 40nm ultra-low-power platform and integration of RRAM, in turn, enabling low power, high integration and small footprint for high-speed communication interface in mobile applications</li> </ul>
<b>Embedded Flash Memory</b>	<ul style="list-style-type: none"> <li>Developed 28nm eFlash for high performance mobile computing and high performance low-leakage platforms, which achieved technical qualification for automobile electronics and micro controller units (MCU)</li> </ul>
<b>CMOS Image Sensor Technology</b>	<ul style="list-style-type: none"> <li>Developed the latest generation CMOS image sensors of sub-micron pixel for mobile applications and embedded 3D metal-insulator-metal (MiM) high-density capacitors for global shutter and high dynamic-range sensor applications</li> </ul>



## Technology Leadership and Innovational Achievements

### Applications

- 22nm ultra-low leakage (22ULL) technology began volume production to support IoT and wearable devices applications. In addition, 22ULL low Vdd (low operating voltage) solutions were ready.
- 16nm FinFET Compact RF (16FFC RF) technology delivered the world's first FinFET device whose fT can reach >300GHz, and also completed the development of the world's first and best FinFET device whose fmax can reach >400GHz. This high-performance and cost-effective technology will be used in many applications such as radar sensing and AR/VR to reduce chip power consumption and die size and to enable SoC designs.
- 22ULL RF technology extended its support for wireless LAN power amplifier devices and ultra-low leakage devices. This further supports chip development for 5G mmWave mobile communication and IoT applications.
- 22ULL embedded RRAM technology started risk production. This technology can support various applications such as IoT MCUs and AI memory devices.
- In work with customers, TSMC successfully demonstrated Organic light-emitting diode (OLED) on silicon panel technology on both 8-inch and 12-inch high voltage (HV) technologies, which paves the way for AR/VR suppliers to develop next

generation goggles for various industrial, medical and consumer electronics applications.

- TSMC offers the next generation global shutter CMOS image sensor(CIS)and enhanced near infrared (NIR) CIS technologies, making machine vision systems safer, smaller, and consume less power.
- Successfully supported customer to deliver the world's smallest CMOS-MEMS (micro-electromechanical systems) monolithic accelerometer in wafer level chip scale packaging (WLCSP) format, smaller than 1mm<sup>2</sup> in size. This small footprint can help reduce the size and weight of many IoT and wearable devices.
- Successfully developed InFO-PoP (Integrated Fan-Out Package-on-Package) technology which integrates 7nm SoC (System-on-Chip) and DRAM (dynamic random access memory) for advanced mobile device applications and delivered several customer products to market in high volume in 2019.
- Successfully developed 16nm silicon in wafer level chip scale packaging (WLCSP) technology and delivered customer products to market in high volume for IoT and high-end smartphone applications.

2019

### CMOS Logic Technologies

- 5nm FinFET technology led the foundry to successfully entered risk production.
- 7nm FinFET plus technology entered volume production and led the world to deliver customer products to market in high volume.

2018

### Specialty Technologies / Integrated Packaging Technologies for Conductors

- The World's first 7nm automotive platform
- Completed process validation for System on Integrated Chips (SoIC®), an innovative wafer-level package technology
- Achieved High-volume production of Gen-4 Integrated Fan-Out Package on Package (InFO-PoP) for mobile processor packaging
- Successful qualification of Gen-5 InFO-PoP advanced packaging technology for mobile applications and Gen-2 Integrated Fan-Out on Substrate (InFO-oS) for HPC applications
- Developed 40nm BCD (Bipolar-CMOS-DMOS) technology – unique in the industry – offering leading-edge 20-24V HV devices with full compatibility to 40nm ultra-low-power platform and integration of RRAM, in turn, enabling low power, high integration and small footprint for high-speed communication interface in mobile applications
- Developed 28nm eFlash for high performance mobile computing and high performance low-leakage platforms, which achieved technical qualification for automobile electronics and micro controller units (MCU)
- Developed the latest generation CMOS image sensors of sub-micron pixel for mobile applications and embedded 3D metal-insulator-metal (MiM) high-density capacitors for global shutter and high dynamic-range sensor applications

2017

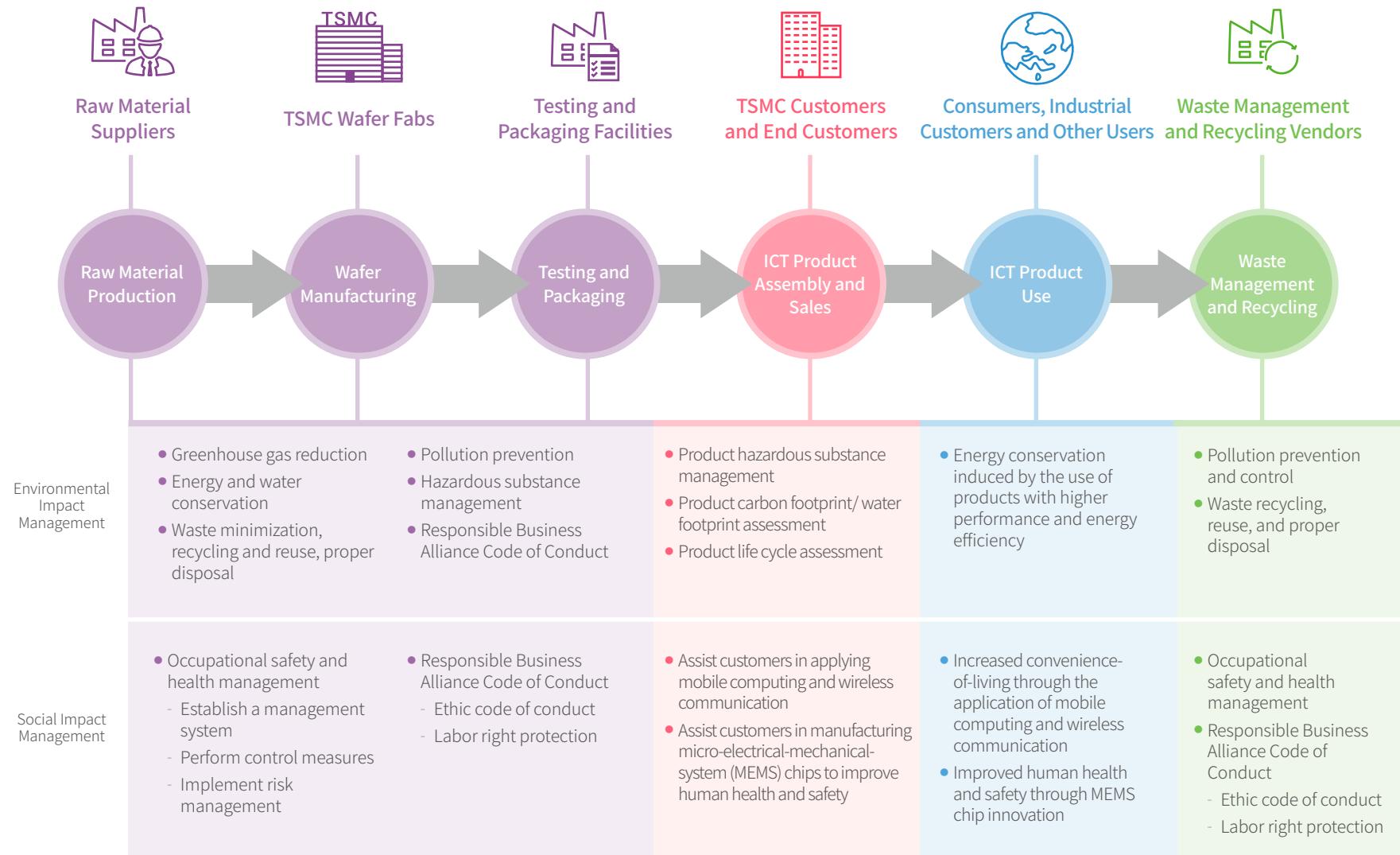
- N7+ technology entered risk production, the industry's first commercially available EUV (extreme ultraviolet) process technology.

- Completed the transfer to manufacturing of the industry leading 7nm technology, the fourth generation of technology to make use of 3D FinFET transistors.

- The world's leading volume production of InFO PoP Gen-2 for mobile application processor packaging
- Launched 0.18 μ m third generation BCD technology resulting in the leading performance quick charger and wireless charger.
- 40nm high-voltage phase-2 technology readiness for both LCD (Liquid-Crystal Display) and OLED(Organic Light-Emitting Diode) drivers



## Environmental/ Social Impact Considerations for TSMC Product Life Cycles



## Sustainable Products

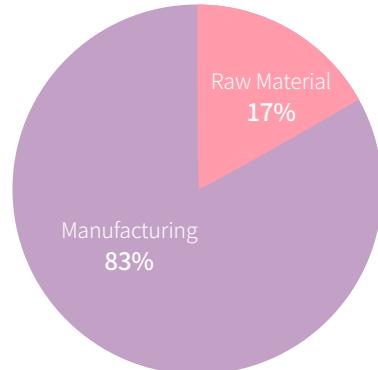
When designing its product life cycle, TSMC factors in sustainability, hoping to reduce the environmental and social impact of its products. The Company puts continues efforts on assisting customers to achieve better energy efficiency throughout product design, material manufacturing, transportation, product manufacturing, testing, packaging, and other stages. In addition to its strong efforts in hazardous substance management, pollution prevention, and energy and resource conservation, TSMC also demands and assists its suppliers in thoroughly implementing environmental protection measures. The Company will continue to reduce the environmental, carbon, and water footprints throughout the life cycle of its semiconductor products.

## Value Environmental Profit & Loss and Strive to Reduce Environmental Footprint

In 2019, TSMC finished the product life cycle, carbon footprint, and water footprint assessments on every manufacturing facility in Taiwan. The Company also achieved ISO14040, ISO14067, and ISO14046 certification. TSMC's overseas subsidiaries are scheduled to be assessed and certified by a third party in 2021. According to the results of product life cycle, carbon footprint, and water footprint assessments, approximately 80% of the overall environmental impact derives from wafer fabrication. The secondary source of impact results from raw material production. The environmental impact of transportation is relatively mild. To learn more about TSMC's efforts in reducing environmental impact, please refer to the "["Green Manufacturing"](#) section of this report.

In 2019, TSMC collaborated with Tunghai University on a research about each TSMC manufacturing fab's energy and resources consumption, greenhouse gas emission, exhaust, wastewater, waste disposal, and other factors involved throughout the product life cycle. An assessment was conducted on the impact to external environment and human health, i.e., the environmental profit and loss (EP&L) assessment. Results show that the following factors, from most significant to least significant, have the greatest impact on the environment: greenhouse gas emissions ([please refer to page 102 of this report](#)), air pollutant emissions (primarily from ammonia), and effluent (primarily from heavy metals). TSMC has already implemented countermeasures to tackle ammonia emissions with early results yielding significant improvement; to learn more, please refer to the "[Air Pollution Control](#)" section of this report. As for the treatment of heavy metal in the effluent, in addition to continuing

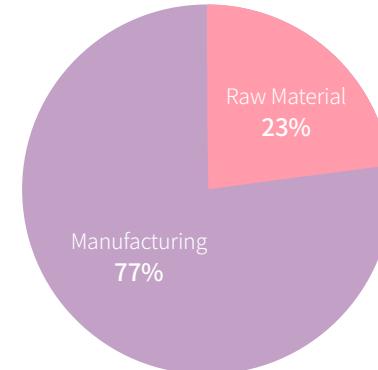
#### Wafer Product Carbon Footprint Assessment (eq average of an 8-inch wafer)



the existing practice of copper reduction and recycling, the Company has newly established the cobalt recycling and treatment system in advanced manufacturing fabs in 2019. For more information, please refer to the "[Water Management](#)" section of this report.

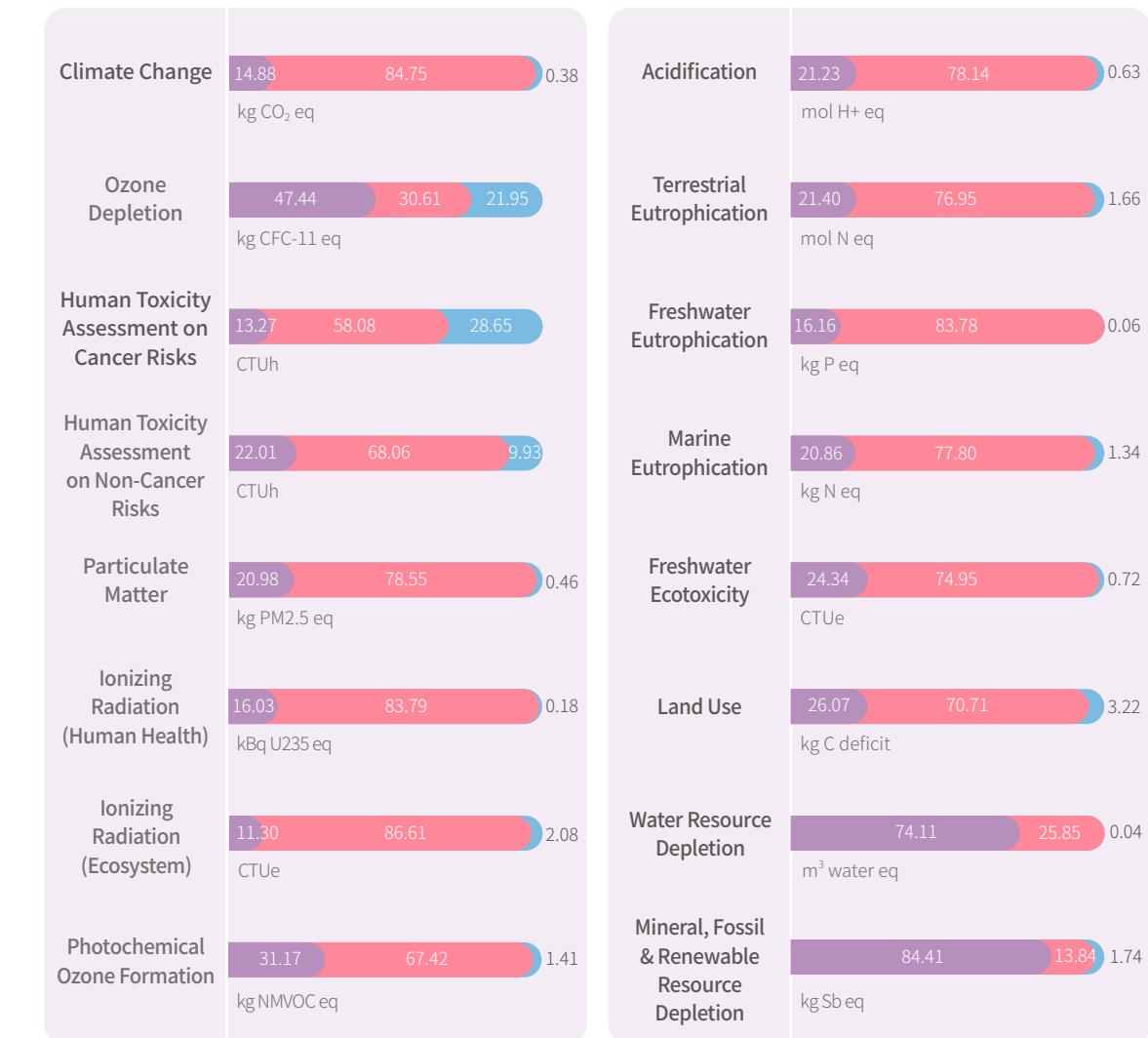
Taking EP&L as a driver to enhance sustainable management internally, TSMC introduced an EP&L assessment tool in the Company's Total ESH Management (TSM). The system consolidates the annual environmental data of each manufacturing facility and calculates the EP&L of the year to serve as a reference for internal management and improvement. The research project in collaboration with Tunghai University will continue into 2020 on a larger scale to involve raw material suppliers as TSMC seeks to work with supply chain partners to find opportunities for reducing environmental impacts.

#### Wafer Product Water Footprint Assessment (eq average of an 8-inch wafer)



#### Wafer Product Life Cycle Assessment (eq average of an 8-inch wafer)

■ Raw Material ■ Manufacturing ■ Transportation Unit: %



## Help Customers Create Energy-efficient & Sustainable Products

Through innovation and advanced manufacturing technology, TSMC continues to introduce more advanced energy-saving semiconductor products to enable ICT applications with better energy efficiency. In the meantime, TSMC is also extending applications of smart buildings, smart manufacturing, and smart grids. When global consumers or enterprises are continuously using a variety of products, which are produced on TSMC's advanced semiconductor manufacturing process, the outstanding energy efficiency will significantly reduce global electricity consumption.

To learn more about the impacts of technological advancement of semiconductor technologies on global electricity consumption, TSMC collaborated with the Industry, Science and Technology International Strategy Center (ISTI) and deduced that technological advancement of semiconductor products and applications can enhance the energy efficiency of computers, communication networks, data centers, power plants, and improve the global energy efficiency eventually. In 2019, ISTI research results show that the use of communications, data processing, and industrial electronic end-products can reduce electricity consumption in the U.S. by 197,000 GWh and Europe by 145,000 GWh in 2025. The findings suggest that TSMC's endeavor in advanced technology and innovative power-saving product development can bring substantial contribution on energy conservation worldwide.

Since the aforementioned assumption requires further verification, TSMC will continue its collaboration with ISTI in researching about how semiconductor product applications that can contribute to energy conservation. The Company will further categorize its products in order to more precisely estimate TSMC's contribution to energy conservation in Taiwan and worldwide.

## More Advanced, More Capable, and More Energy-efficient Electronic Products

As the world's most trusted dedicated foundry service provider, TSMC is consistently first to provide next-generation, leading-edge foundry technologies. The Company also offers comprehensive specialty

technologies and excellent frontend and backend packaging integration capabilities. With TSMC's manufacturing technologies, customers can unleash their design innovations in a wide range of applications including smartphone, high performance computing (HPC), Internet of Things (IoT), automotive, digital consumer electronics and so on. In light of the drastic change of global climate and the evolution of energy structure and technology development, chip products with stronger performance and higher power efficiency has become significant to electric product development. TSMC rigorously drives the semiconductor process technology development with higher density and reduced power consumption, which will provide customer with the leading advantages on performance, power, and area (PPA), helping customers produce more advanced, more capable, and more energy-saving products.

## Semiconductor Applications Contribute to Global Energy Conservation

TSMC	TSMC's Role	IC Products	Product Power Consumption	Impact on Power
<ul style="list-style-type: none"> <li>Leader of innovation and advanced process technologies</li> <li>Provider of cutting-edge technologies</li> <li>Producer of more advanced, energy-efficient products</li> </ul>	<ul style="list-style-type: none"> <li>ICT products of better energy efficiency</li> <li>Extended applications of smart buildings, smart manufacturing, and smart grids</li> </ul>	<ul style="list-style-type: none"> <li>Enhance energy efficiency of computers, communication networks, data centers, and power plants</li> <li>The adoption of end-electronic products like communications, data processing, and industrial products contribute to energy conservation on a national or regional level</li> </ul>	<ul style="list-style-type: none"> <li>Electricity consumption reduced by 0.197 trillion kWh (United States)<sup>Note</sup></li> <li>Electricity consumption reduced by 0.145 trillion kWh (Europe)</li> </ul>	

Note: The results above are based on the assumption that TSMC's technological development can have such impacts on global electricity consumption. The numbers are not the actual energy conservation figures contributed by TSMC



One remarkable example is that Ambiq Micro delivered its Apollo3 Blue wireless SoC in 2019, setting a new standard in energy efficiency for battery-powered endpoint devices. Leveraging both Ambiq Micro's Subthreshold Power Optimized Technology (SPOT™) platform and TSMC's 40nm ultra low power (ULP) low operating power (low-Vdd) technology in TSMC's IoT platform, the Apollo3 Blue with TurboSPOT™ brings groundbreaking levels of energy efficiency for battery-powered devices by increasing the computational capabilities of the ARM Cortex M4F core to 96MHz while lowering the active power consumption to less than six microamperes per

megahertz (6uA/MHz). Apollo3 Blue's unprecedented energy efficiency and superb computing power make it a key enabler for true intelligence to mobile, battery-powered endpoint devices, including IoT, hearable, wearable, and voice-activated products.

In total, TSMC deployed 272 distinct process technologies, and manufactured 10,761 products for 499 customers in 2019 to continue to bring significant contribution to the advancement of modern society.

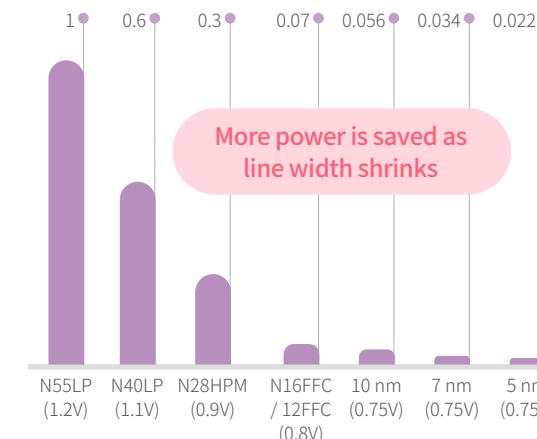
### Chip Die Size Cross-Technology Comparison



Note 1: The logic chip/SRAM/IO (Input/Output) ratio, which affects die size and power consumption, was re-aligned

Note 2: Source: TSMC

### Chip Total Power Consumption Cross-Technology Comparison

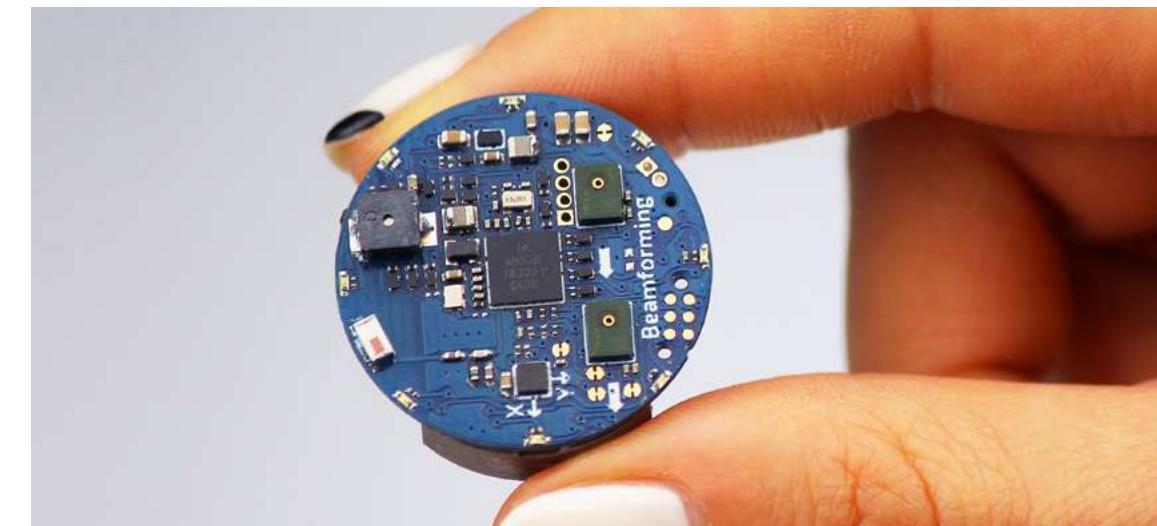


Note 1: The logic chip/SRAM/IO (Input/Output) ratio, which affects die size and power consumption, was re-aligned

Note 2: Source: TSMC

### TSMC Collaborates with Ambiq Micro to Unleash Innovation

TSMC's Role	IC Products	Product Power Consumption	Impact on Power
<ul style="list-style-type: none"> <li>Provide 40ULP Low Vdd process technology</li> </ul>	<ul style="list-style-type: none"> <li>Help Ambiq Micro deliver Apollo3 Blue wireless SoC</li> </ul>	<ul style="list-style-type: none"> <li>ARM Cortex M4F core computational capabilities increased to 96MHz</li> <li>ARM Cortex M4F core active power consumption reduced to &lt; 6uA/MHz</li> </ul>	<ul style="list-style-type: none"> <li>Increase energy efficiency for IoT, hearable, wearable, and voice-activated products</li> </ul>



Ambiq Micro's Apollo 3 Blue wireless SoC (Photo courtesy of Ambiq Micro)

## Social Contribution by TSMC Foundry Services

### Unleash Customers' Chip Innovations that Enhance Mobility and Convenience

7nm FinFET plus (N7+) technology entered volume production in 2019 and led to deliver customer products to market in high volume. N7+ technology is the world's first commercially available extreme ultraviolet (EUV) enabled foundry process technology. Its success demonstrates TSMC's world-leading capabilities in EUV volume production.



7nm FinFET plus (N7+) technology entered volume production in 2019 and led to customer products delivery in high volume. N7+ technology is the world's first commercially available extreme ultraviolet (EUV) enabled foundry process technology. Its success demonstrates TSMC's world-leading capabilities in EUV volume production.

- Innovative TSMC process technology helps chips achieve faster computing speeds in a smaller die area, leading to smaller form factors of electronic devices
- TSMC SoC technology integrates more functions into one chip, reducing the total number of chips in electronic devices, resulting in a smaller system form factor
- New TSMC process technology helps chips consume less energy so the mobile devices will have a longer battery life
- TSMC helps unleash more convenient wireless connectivity such as 3G / 4G and WLAN / Bluetooth, meaning people can communicate more efficiently and work anytime and anywhere, significantly improving the mobility of modern society

TSMC successfully supported customer to deliver the world's smallest CMOS-MEMS monolithic accelerometer in chip scale packaging (CSP) format, smaller than 1mm<sup>2</sup> in size in 2019. This small footprint can help reduce the size and weight of many IoT and wearable devices.

- Extend CIS production applications from traditional RGB (red, green, blue) sensing to 3D depth sensing, optical fingerprint, and NIR machine vision, etc.
- Extend MEMS production applications from traditional motion sensing to microphone, bio-sensing, medical ultrasound actuators and more
- Adopted for consumer electronics, smartphones and other electronic devices to make life more convenient
- Adopted for advanced medical treatments and preventative health care applications to improve human health
- Adopted for automotive electronics to improve car safety systems

contributing to a total of 375 patents. 8 prolific inventors contributed to 885 U.S. patents.)

To ensure TSMC's freedom in business operation, strengthen its industry leadership, and protect its leading-edge technologies which are the fruits of TSMC's countless R&D efforts, the Company has set forth IP capitalization and management strategies in alignment with its business operation objectives and R&D resources. TSMC has also established a mechanism to generate company value from intellectual property. In addition, the Company continues to improve its IP portfolio quality, reduce maintenance costs, and invest in IP portfolio and IP management systems to assure the technology leadership and maximize business profits.

### Patent Protection Mechanism

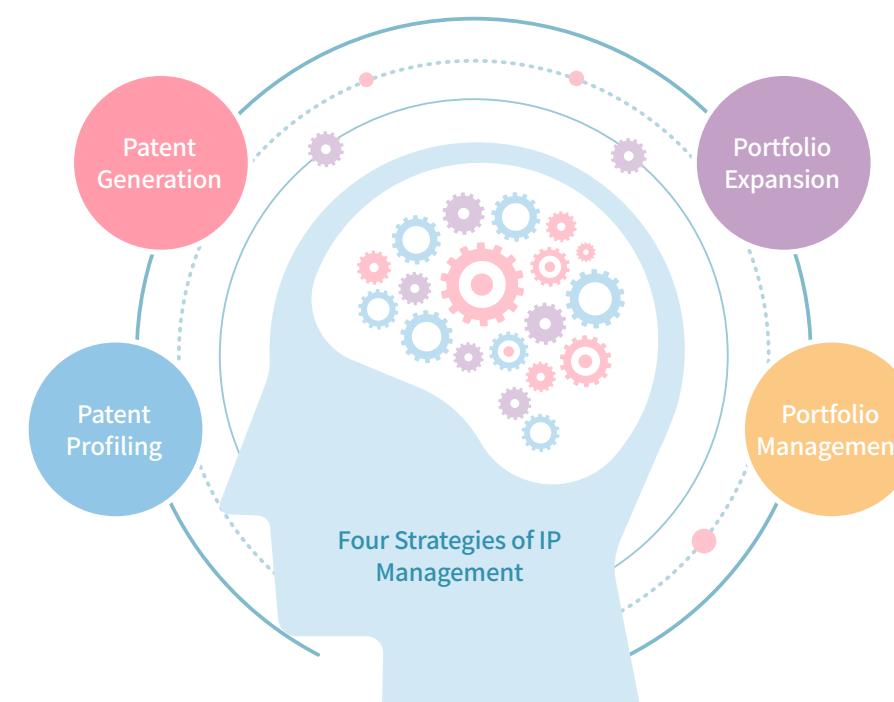
Internally, TSMC establishes a diversified reward system to encourage employees are encouraged to file patent applications for their inventions as diversity and innovation in design are highly valued and encouraged. The Company also has a systematic mechanism for patents and intellectual property set up a robust patent and IP management along system with a hierarchical review process to monitor the quantity and quality of employee patent applications. In 2019, TSMC held many Innovation-driven events for employees IP promotion activities including the Patent Campaign (with over 1,700 inventions submitted), Online Quiz Game (with nearly 3,500 participants), and Patent Week (with a 1,400-people turnout). These activities have successfully encouraged TSMC employees to file their inventions (493 employees received the U.S. patents for the first time at TSMC,

Externally, TSMC has built close ties with both domestic and international patent offices through technical exchanges, assisting patent examiners in better understanding the technical content of TSMC and consequently accelerating the patent examination process in order to obtain high quality patent protection. In addition, TSMC has been assisting the government in building a sound and comprehensive intellectual property protection system by regularly

sharing corporate experiences and suggestions on patent system and review efficiency.

### Four Strategies of IP Management

TSMC's IP management measures are implemented under four strategies, patent profiling, patent generation, patent portfolio expansion, and patent portfolio management. With its review mechanism, reward system, and education and training programs, the Company is dedicated to protecting its research and development results and upholding its industry-leading position.



### Achievements in Both Quantity and Quality



#### Number of Patent Applications

- Over **55,000** global patent applications accumulated
- Nearly **6,500** global patent applications filed in 2019
- **Top 10 patent applicant** in the U.S. in 2019
- **No. 1** in Taiwan patent applications for four straight years



#### Number of Granted Patents

- Over **39,000** global patents accumulated
- Received over **3,600** global patents issued in 2019, including over **2,300** U.S. patents



#### Patent Quality

- Highest patent approval rate, reaching **99%**, among the top **100** patent holders in the US in 2019



For more details, please refer to TSMC CSR website: [TSMC Creates a Global Strategic Patent Portfolio: Continue Pioneering in Top 10 of U.S. Patent Assignees for the third Consecutive Year](#)

## Trade Secret Protection

In order to comprehensively and effectively manage intellectual property innovation, TSMC records and integrates applications for trade secrets that contribute to the company's technology leadership, manufacturing excellence, and customer trust.

In 2019, TSMC introduced advanced technology like Intelligent Automation (IA) and Artificial Intelligence (AI) into the Trade Secret Registration and Management System and continued to strengthen the company's competitiveness. The system features prompt and effective data analysis and assistance for technology developers. In addition, the system is synchronized with other internal

systems like human resources system and contract system to perform joint applications.

TSMC encourages its employees to keep trade secret in a centralized management system. In order to increase the quality and quantity of trade secrets, TSMC grants the annual Golden Trade Secret Awards to its employees to recognize their contribution. As of 2019, TSMC had given 1,335 awards to more than 4,600 employees who had registered trade secrets. In addition, the number of trade secrets registered has been increasing every year since the establishment of the Trade Secret Registration and Management System in 2013. As for 2019, over 10,000 trade secrets were registered, which set a new record in the Company's history.



## Intelligent Precision Manufacturing

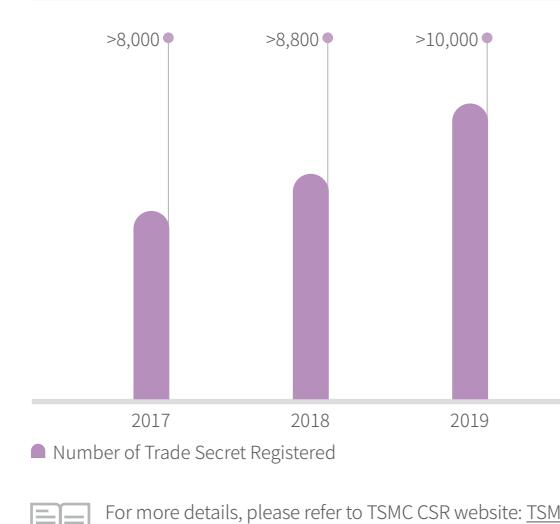
As world's largest semiconductor foundry service provider, manufacturing excellence is the cornerstone of TSMC's competitive advantage. TSMC is the industry's first automated manufacturer. Amid the increasing complexity of advanced manufacturing and customer demand on quality, TSMC has taken a further step to create an intelligent manufacturing environment featuring self-diagnosis and self-feedback capabilities. The Company has also applied AI to wafer fabrication and constructed a development platform with machine learning technology. Through constant Fab Alignment and benchmarking, TSMC has successfully reached

a high level of consistency in quality throughout different fabs (Fab Matching), further strengthening the Company's competitive advantages.

In 2019, dedicated to AI and knowledge integration, TSMC conducted industry-academia exchanges with Harvard University, University of Cincinnati, and the Ohio State University to introduce Industry 4.0 and Industrial AI to the semiconductor industry. Experts and engineers at the production line are called upon to jointly build a knowledge base for engineering analysis and to apply manufacturing experiences to AI intelligent models. It effectively improves the precision of intelligent models and allows for parameter adjustments in a dynamic manufacturing process. While securing wafer quality consistency, the Company also invests heavily in AI talent cultivation and acquisition. As of 2019, TSMC boasts a team of nearly 1,000 IT professionals and 200 experts on machine learning.

To fulfill its commitment to manufacturing excellence and quality, TSMC has enhanced the production capacity of 7nm advanced manufacturing process by 2% in 2019. The defect parts per million (DPPM) of automotive products was significantly reduced to 10 ppm in only three and a half years. With intelligent precision manufacturing, TSMC is able to continuously inject innovation vitality into the global IC industry and to be a trusted partner for customers to rely on for years to come.

## Trade Secret Registrations 2017-2019



For more details, please refer to TSMC CSR website: [TSMC Adopts Intelligent Automation \(IA\) and Artificial Intelligence \(AI\) Technologies for Trade Secret Management Innovation](#)

## Manufacturing Excellence

- First automated 12-inch GIGAFAB® facilities in the industry built
- 100% automated wafer fabrication achieved

- Productivity of employees at mature manufacturing process foundries increased by 10% to 15% annually

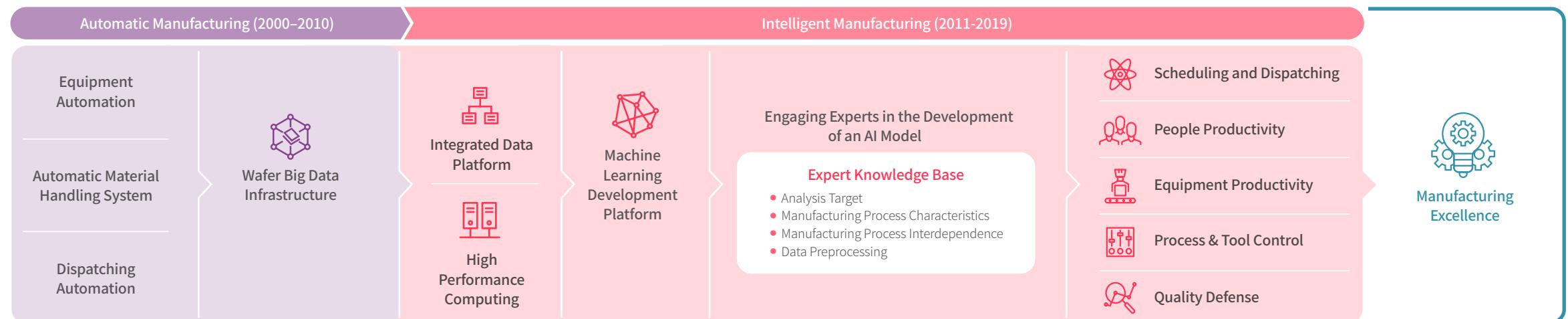
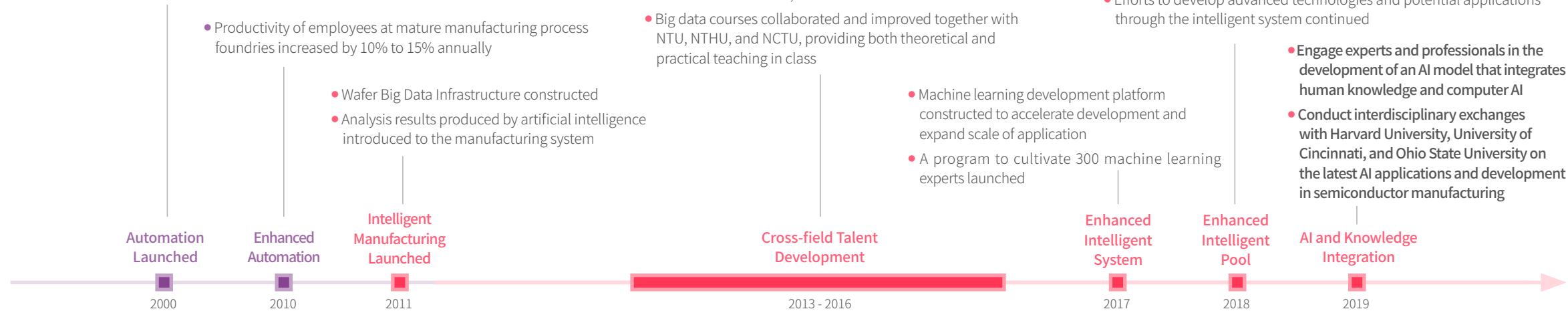
- Wafer Big Data Infrastructure constructed
- Analysis results produced by artificial intelligence introduced to the manufacturing system

- Big Data Analytics for Semiconductor Manufacturing Contest held for three consecutive years in collaboration with MoST and NTHU, with 300 teams from 50 universities
- Big data courses collaborated and improved together with NTU, NTHU, and NCTU, providing both theoretical and practical teaching in class

- Machine learning development platform constructed to accelerate development and expand scale of application
- A program to cultivate 300 machine learning experts launched

- Research pool consisting of 1,000 IT experts and 300 machine learning experts built
- Efforts to develop advanced technologies and potential applications through the intelligent system continued

- Engage experts and professionals in the development of an AI model that integrates human knowledge and computer AI
- Conduct interdisciplinary exchanges with Harvard University, University of Cincinnati, and Ohio State University on the latest AI applications and development in semiconductor manufacturing



## Open Innovation Platform®

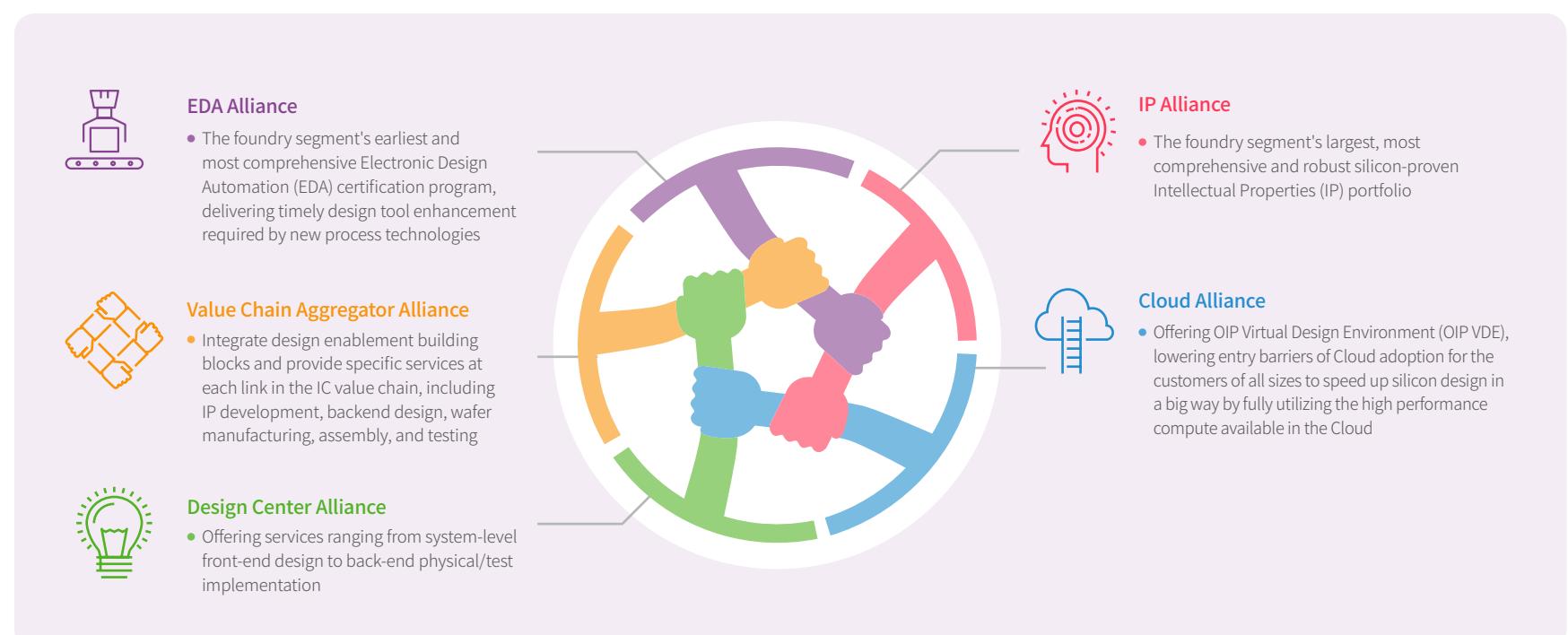
TSMC's Open Innovation Platform® promotes industry innovation for a comprehensive design infrastructure in the semiconductor design community by TSMC and its OIP alliance partners in EDA development, Intellectual Property (IP) implementation in order to achieve design & process technology co-optimization, also to provide backend packaging & test services and the enablement of IC designs in the Cloud.

In 2019, TSMC further teamed up with OIP alliance partners by combining EDA tool certification and OIP-VDE (Virtual Design Environment) in the Cloud, to ensure customers can more securely and efficiently work on their product design & innovation, thus shorten the design cycle and deliver to market faster to gain competitive advantages in business opportunities.

In 2019, TSMC and OIP ecosystem partners continue to provide comprehensive solutions to address the market demands for Mobile, HPC, Automotive and IoT design applications. Furthermore, there are continuous developments of new solutions to enhance Power, Performance and Area (PPA) on advanced & specialty process technologies, as well as comprehensive RF design platform for emerging markets, such as 5G design applications. The wide range of 3DIC ecosystem that covers both technology & application aspects is aimed to unleash customer's innovation to efficiently design and successfully roll out more sophisticated high quality products.

In addition to industry collaborations, TSMC also provides long-term support to universities around the world, including National Taiwan University, National Chiao Tung University and National Tsing Hua University, helping them to conduct silicon validation of their research through TSMC University Shuttle Program.

### TSMC's Five OIP Alliances



## Comprehensive Solutions in Advanced, Specialty and 3D IC Technologies

### Advanced Technology

- In 7nm, 6nm, 5nm and smaller process nodes

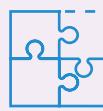
### Specialty Technology

- In Ultra-Low Power (ULP) /Ultra-Low Leakage (ULL), RF, Analog, Bipolar-CMOS-DMOS (BCD), Non-Volatile Memory (NVM), High Voltage (HV), Sensor, etc

### 3D IC Technology

- Offering System on Integrated Chips (SoIC), Wafer on Wafer (WoW), Integrated FanOut (InFO), Chip on Wafer on Substrate (CoWoS), etc

## OIP Objectives

**By**

- Collaborating with EDA and IP partners to
- Embed TSMC silicon technology into their products and services



### Help Customers

- Access TSMC technology earlier in the design cycle
- Increase correlation between EDA tools and TSMC silicon
- Attain optimum PPA (Power, Performance, Area) in TSMC and third party IPs targeted for TSMC silicon



TSMC



OIP Partner



Customer

→ TSMC Technology

→ Partner Product

→ Customer Design



## TSMC University Programs

### • University Research Center

TSMC has established research centers in collaboration with top universities in Taiwan and dedicated research funds to encourage university professors to conduct groundbreaking semiconductor research projects. As the research centers strive to develop leading-edge technologies in semiconductor devices, material science, manufacturing process, and IC

design, they are also incubating talents for the field of semiconductors. Up to 2019, more than 178 professors and 2,500 outstanding students in areas including electronic engineering, physics, material science, chemistry, chemical engineering, and mechanical engineering joined TSMC's university research centers. Moreover, TSMC has also launched "TSMC Semiconductor Program" for the first time in 2019, and attracted over 200 students to enroll. Jointly developed by TSMC and the university, the courses are

tailored to narrow the gap between industries and academics, and strengthen talent quality as well as competitiveness in the industry. TSMC will also continue to work with other universities to develop comprehensive semiconductor programs on device/integration, process/module, and equipment engineering.

In addition to investing in university research centers, TSMC also conducts strategic research projects with universities in Taiwan and overseas

through industry-academia joint development projects. A variety of innovative research topics cover technologies in transistors, conductors, photomasks, materials, simulations, and special processes. In 2019, TSMC has collaborated with 7 universities in Taiwan and 15 universities overseas. 73 professors were involved in a total of 79 joint development projects with TSMC, with annual research funds exceeding NT\$113 million. As of 2019, more than 100 U.S. patent applications had been filed.

## University Research Center & Industry-Academia Joint Development Project

Collaboration Project	University	Beneficiary	Collaboration Details	Dedicated Resources
University Research Center	<ul style="list-style-type: none"><li>National Chiao Tung University</li><li>National Taiwan University</li><li>National Cheng Kung University</li><li>National Tsing Hua University</li></ul>	<ul style="list-style-type: none"><li>Undergraduate students</li><li>Graduate students</li><li>PhD students</li></ul>	Provide research assistantship to encourage outstanding students to focus on the study of semiconductor devices, materials, manufacturing processes, and IC design without financial issues	<ul style="list-style-type: none"><li>Total of NT\$15.36 million research assistantship granted in 2019</li><li>149 students benefited from the grants <small>Note</small></li></ul>
Industry-Academia Joint Development Project	<ul style="list-style-type: none"><li>7 universities in Taiwan and 15 universities overseas</li></ul>	<ul style="list-style-type: none"><li>Professors</li></ul>	Offer research funds to encourage university professors to propose new semiconductor research programs and incubate semiconductor talents	<ul style="list-style-type: none"><li>NT\$111.3 million</li></ul>



### 7 Universities in Taiwan

National Chiao Tung University, National Taiwan University, National Cheng Kung University, National Tsing Hua University, National Sun Yat-sen University, National Taiwan University of Science and Technology, and Chang Gung University

### 15 Overseas Universities

Massachusetts Institute of Technology, Stanford University, University of California, San Diego, Georgia Institute of Technology, Harvard University, University of Michigan, University of Wisconsin-Madison, University of California, Berkeley, University of Illinois at Urbana-Champaign, University of Texas at Dallas, Cambridge University, Tyndall National Institute, Ireland, The Chinese University of Hong Kong, and Tohoku University

Note: Maximum amount granted to undergraduate program is NT\$100,000, NT\$120,000 to a graduate program, and NT\$360,000 to a PhD program. Scholarship was granted to 78 undergraduate students, 20 graduate students, and 51 PhD students in 2019



## Case Study

# Launch Semiconductor Programs in Collaboration with Top Universities to Incubate Semiconductor Talent

To foster a vibrant environment for semiconductor talents in Taiwan and further attract more outstanding students to join the semiconductor industry, TSMC launched "TSMC-NTHU" Semiconductor Program in collaboration with National Tsing Hua University in 2019. More than 200 students enrolled in the elective courses. TSMC Semiconductor Programs in collaboration with National Taiwan University, National Cheng Kung University, National Taiwan University of Science and Technology, and National Taipei University of Science and Technology are scheduled to open for student enrollment in 2020.

## First Program in 2019 Offers Outstanding Students with Internships, Job Interviews & Better Compensation

The TSMC Semiconductor Program is designed to enhance the professional competencies required for talents in the field of advanced process research and

### TSMC-NTHU Semiconductor Program Course Plan

#### Device Next-Generation Device Development

- Advanced Device Development
- 1. Semiconductor Devices Physics
- 2. Introduction to Solid-State Physics
- 3. Introduction to Quantum Mechanics
- 4. Semiconductor Devices Design and Simulation
- 5. Measurements of Device
- 6. Electric Circuits
- 7. Engineering Mathematics 1
- 8. Engineering Mathematics 2
- 9. Neuromorphic Computing and AI Application

#### Processing Advanced Processing and Integration Technology

- IC Technology
- 1. Semiconductor Processing
- 2. Electronics 1
- 3. Electronics 2
- 4. Electromagnetism
- 5. Applied Photonics
- 6. Introduction to Integrated Circuit Design
- 7. Electronic Thin Film
- 8. Application of Plasma Engineering
- 9. Silicon Processing Technology for Microelectronics
- 10. Experimental Design and Statistics Applications
- 11. Special Topic on Advanced Process and Integration
- 12. Semiconductor Experiment

#### Material Failure Analysis of Integrated Circuits

- Material Analysis Technology
- 1. Coherent X-ray and Electron Diffraction Microscopy
- 2. Applications of Synchrotron X-ray Absorption Spectroscopy
- 3. Materials Analysis



This is the first time for a domestic leading company and universities to work together for systematic programs. NTHU loves to see this kind of cooperation to reach a win-win result, in which students can find best jobs, and TSMC can recruit best talents.

Sinn-Wen Chen

Senior Vice President, National Tsing Hua University

TSMC's programs are like the guideline for dummies. Students with no ideas about their own future won't get lost along the path of the programs.

Cheng-Yuan Chiu

Student of the Department of Engineering and System Science, National Tsing Hua University



For more details, please refer to TSMC CSR website:  
[TSMC and Top Universities Jointly Launch Semiconductor Programs to Incubate Semiconductor Talents](#)



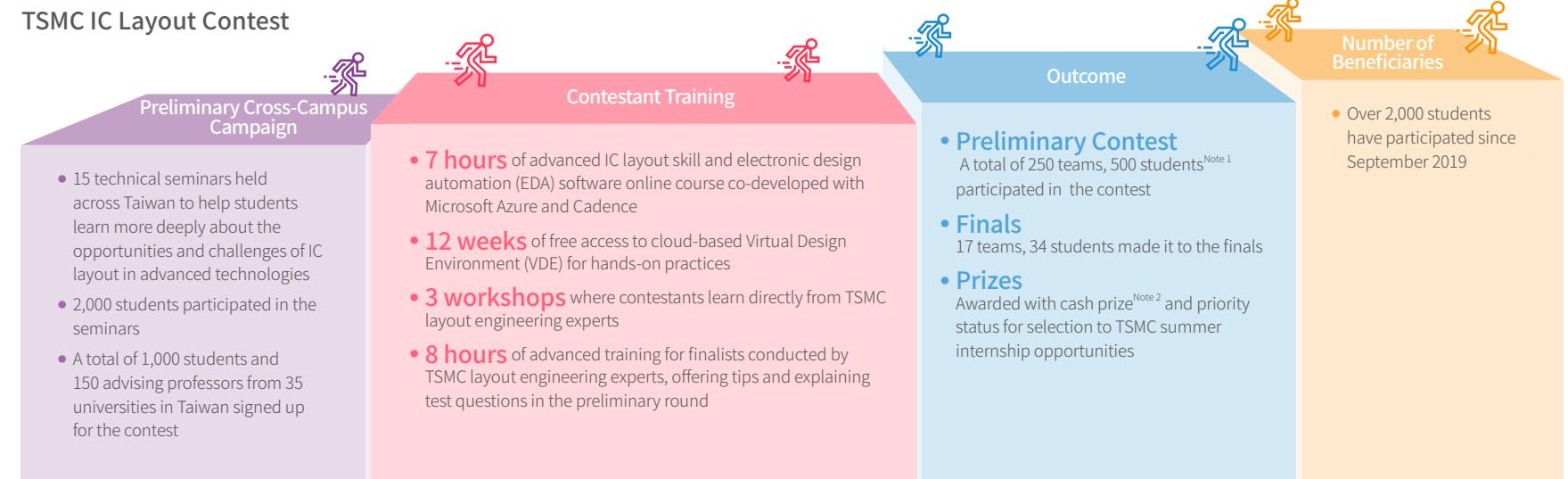
## • IC Layout Contest & Courses

Technology evolves rapidly. To continue along the Moore's Law trend, TSMC has been driving semiconductor nodes towards 7nm process technology and further. In light of increasingly intricate advanced process technologies, the quality of chip layout affects overall performance by as much as 20%. TSMC sets out to provide our customers with competitive advantages of power, performance, and area (PPA) on TSMC's advanced processes to win market opportunities. To fulfill our commitment, we are leading the industry in the cultivation of top IC layout talents well-versed in design and technology co-optimization (DTCO).

In 2019, TSMC launched the first national IC Layout Contest to further enhance the learning effects of "TSMC-NTUT IC Layout and Design," a program that has been running for four years to prepare students for the future with industry links and experiences. The contest is an unprecedented measure to overthrow the dated perception in academia that IC layout is merely the implementation of design layouts. Throughout the four-month contest, students learned about the latest process technologies in the semiconductor industry and key techniques in circuit layout. It is TSMC's endeavor in cultivating the next generation IC layout talents for the semiconductor industry in Taiwan and worldwide.

For more details, please refer to TSMC CSR website:  
[TSMC Leads the Industry by Hosting the First "TSMC IC Layout Contest" in the Cloud](#)

## TSMC IC Layout Contest



Note 1: The contest was originally designed with 300 contestants. Due to an overwhelming influx of entries, the limit was adjusted to 500, and lots were drawn to confirm official contestants out of 1,000 applicants

Note 2: The first place, second place, third place, and honorable mention teams won NT\$200,000, NT\$100,000, NT\$80,000 and NT\$20,000 prizes and plaques, respectively. Additional plaques and a NT\$10,000 cash prize were given as completion awards to all the teams who persisted in completing the competition.

## IC Layout Courses

Course Title	Cooperative Partner / Method	Frequency	Number of Beneficiaries
TSMC-NTUT IC Layout and Design Courses 18 lessons in one semester	<ul style="list-style-type: none"> <li>National Taipei University of Technology (NTUT): Theories and teachings</li> <li>TSMC <ul style="list-style-type: none"> <li>Lecturers designated by TSMC Layout Design Engineering Division to demonstrate circuit layout design with case studies</li> <li>Provide key IC manufacturing process, layout techniques and IP resources</li> <li>Onsite instruction and Q&amp;A</li> <li>Offer summer internship opportunities</li> </ul> </li> </ul>	Once a year	A total of 120 students since 2016



I started circuit design and chip layout research in my undergraduate years. But I didn't realize the need to combine process technology and chip design expertise to save area and achieve better performance for both digital and analog layout until I participated in the "TSMC IC Layout Contest" workshop. Thank you TSMC for providing such an opportunity to enrich our knowledge of IC Layout.

Min-Yang Chiu

Contestant/graduate student, Department of Electrical Engineering, National Tsing Hua University

## • TSMC University Shuttle Program

In 2019, TSMC University Shuttle Program helped professors and students of 25 universities around the world in turning IC design into actual chips and verifying the application performance of their designs in end-systems. Fields of research of the current year extend across 5G communications, Biotechnology, Artificial Intelligence, Internet of Things (IoT), and power-saving technologies. In an effort to keep up with the technology trends, Massachusetts Institute of Technology (MIT) and National University of Singapore (NUS) have integrated research efforts in the application of IoT and energy conservation measures to data and hardware security.

Through the substantiation of theories and research projects in class, TSMC and universities are actively joining hands to cultivate new innovative semiconductor talents.

TSMC University Shuttle Program demonstrated fruitful research results in 2019. A total of 27 papers were published in the IEEE Journal of Solid-State Circuits (JSSC) and presented at the International Solid-State Circuits Conference (ISSCC), a prestigious conference known as the "Olympics of IC design." The number of papers published has doubled from the previous year. In addition, the research projects with University of California, Los Angeles (UCLA) and MIT have obtained the U.S. patents.

## 2019 Featured Projects and Partners



**Artificial Intelligence and Hardware Security**  
**Dr. Anantha P. Chandrakasan**  
Dean of the School of Engineering, MIT



**TeraHertz and Millimeter Wave Technology Application**  
**Dr. M.C. Frank Chang**  
Distinguished Professor of Electrical Engineering, UCLA



**Artificial Intelligence and Memory-based Security Application**  
**Dr. Meng-Fan (Marvin) Chang**  
Distinguished Professor of Electrical Engineering, National Tsing Hua University



**Mixed Signal Circuit and RF Technology Application**  
**Dr. Shen-Luan Liu**  
Distinguished Professor of Electrical Engineering, National Taiwan University



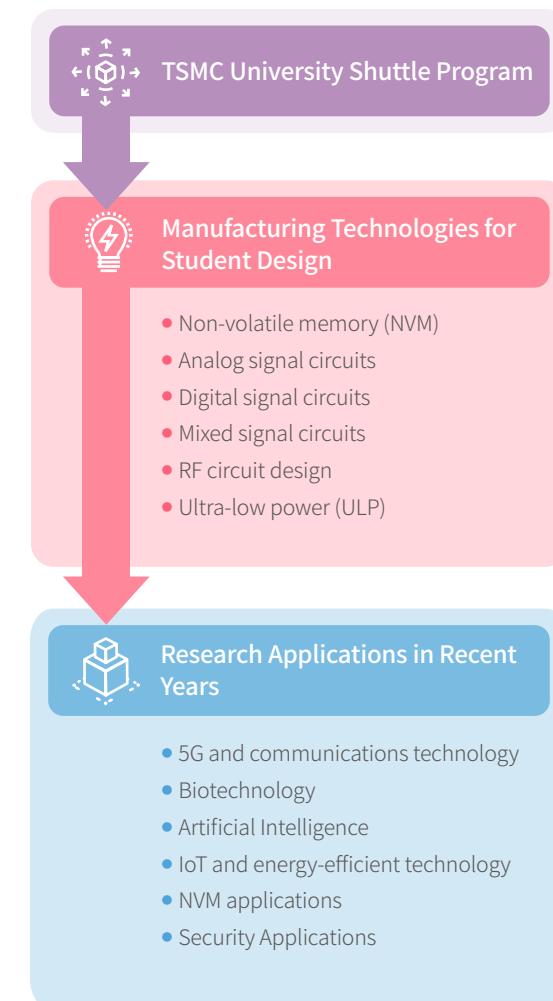
**Wireless Technology and Artificial Intelligence Application**  
**Dr. Shyh-Jye Jou**  
Professor of Electronic Engineering, Institute of Electronics, National Chiao Tung University



**Wireless Technology (5G+ and 6G) and Biomedical Sensors for Cancer Tumor Detection**  
**Dr. Ali M. Niknejad**  
Professor of Electrical Engineering and Computer Sciences, UC Berkeley / Faculty Director of the Berkeley Wireless Research Center (BWRC)

Note: Cooperative partners are sequenced in alphabetical order

## 2019 TSMC University Shuttle Program Manufacturing Process Technology and Field of Research



“

TSMC's University Shuttle Program has allowed Taiwanese and foreign students alike to further delve into semiconductor studies and examine or refine their designs. It is a great program that enhances R&D competencies and drives technology development in the semiconductor industry.

**Dr. M.C. Frank Chang**  
Distinguished Professor of Electrical Engineering, UCLA

I appreciate TSMC's effort in assisting National Chiao Tung University in substantializing our innovation R&D projects in high-speed fiber-optic communication, 5G communication system and AI IC through the University Shuttle Program. We are also able to verify the performance of our research results and publish them in prestigious international journals and conferences where our research efforts were received recognition.

**Dr. Shyh-Jye Jou**  
Professor of Electronic Engineering, Institute of Electronics, National Chiao Tung University



# Product Quality

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Quality Culture Enhancement

Promote continuous improvement programs to enhance the internal quality culture

Encourage local suppliers to participate in the Taiwan Continuous Improvement Award to strengthen a culture of quality and competitiveness within TSMC's local supply chain

- Generate up to NT\$20 billion in value from improvement projects and involve outstanding projects in the Taiwan Continuous Improvement Award

- Completed 49,356 improvement projects<sup>Note 2</sup>

Target: 43,000

- Generated a benefit of NT\$15 billion in value

Target: NT\$10 billion

- Encourage 100% of major local raw materials suppliers and 75% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award; 60% to advance to the finals<sup>Note 1</sup> **NEW**

- 100% of major local suppliers participated in the Taiwan Continuous Improvement Award

Target: 100%

- Generate NT\$11 billion in value from improvement projects and involve at least five outstanding projects in the Taiwan Continuous Improvement award

- 100% of major local suppliers of raw materials suppliers and 30% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award

### Quality Capability Improvement

Leverage machine learning to construct a visual defect inspection and classification system for outgoing 12-inch wafers to increase employee productivity

Develop hazardous substance analysis capabilities in chemical laboratories to ensure occupational health and safety (OHS)

Strengthen management for hazardous substances to improve green manufacturing

- Increase the productivity of each visual inspection worker that are responsible for outgoing 12-inch wafers to 7,000 pieces
- Increase the productivity of each visual inspection worker that are responsible for outgoing packages by 5% per month and 50% accumulatively (base year: 2019) **NEW**

- Increased the productivity of each 12-inch wafer outgoing visual inspector to 5,258 pieces per month

Target: 5,250 pieces

- Develop the ability to analyze 100% of CMR (Carcinogenic, Mutagenic and Reprotoxic) substances and help major suppliers develop the same capabilities **NEW**

- Developed the ability to analyze 83% of CMR substances

Target: 77 %

- Increase the productivity of each visual inspection worker that are responsible for outgoing 12-inch wafers to 5,415 pieces per month and the monthly productivity of each visual inspection worker that are responsible for back-end packaging by 5% **NEW**

- Develop the full ability to analyze 100% of CMR substances

Note 1: Major suppliers are those that meet at least one of the following conditions: 1. accounted for 85% of purchasing expenses; 2. single-source supplier; 3. ongoing orders in each quarter

Note 2: "Continuous Improvement Team (CIT) Activities" and "Suggestion Program" have been merged into "Improvement Projects" in 2019

● Exceeded   ● Achieved   ● Missed Target

(Continue on next page)



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### Strategies & 2030 Goals

### 2019 Achievements

### 2020 Targets

#### Quality Capability Improvement

Leverage machine learning to construct a visual defect inspection and classification system for outgoing 12-inch wafers to increase employee productivity

Develop hazardous substance analysis capabilities in chemical laboratories to ensure occupational health and safety (OHS)

Strengthen management for hazardous substances to improve green manufacturing

- N-methylpyrrolidone (NMP) 100% replacement (Base year: 2016)
- No process involves Perfluoroalkyl Substances (PFASs) that have more than 4 carbons

- 100% compliance with hazardous substance regulations and customer requirements  
Target: 100%
- 86% completion of substituting all PFOA-related (Perfluoroctanoic Acid, PFOA) substances Note  
Target: 100%
- 38% reduction in the use of NMP Note  
Target: 70%

- Reduce the use of NMP by 95%
- Do not use PFASs with more than 4 carbons for the development of advanced processes of 3nm and below

#### Quality Application Realization

Based on the Company's technology roadmap, complete reliability qualification for advanced process technologies, specialty process technologies and wafer-level package process in the design and development stage

- Based on the Company's technology roadmap, complete reliability qualification for advanced process technologies, specialty technologies and wafer-level package process in the design and development stage

- Complete reliability qualification for 5nm process technology, 22nm embedded MRAM and the fourth generation integrated Fan-Out packaging (INFO)  
Target: Complete reliability qualification for 5nm process technology and specialty technologies

- Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in accordance with the R&D targets

Note: Formula and process parameter adjustments and more testing were necessary because of issues with product yield during the testing of substitute chemicals in 2019, which is why the substitution project was behind schedule

● Exceeded   ● Achieved   ○ Missed Target



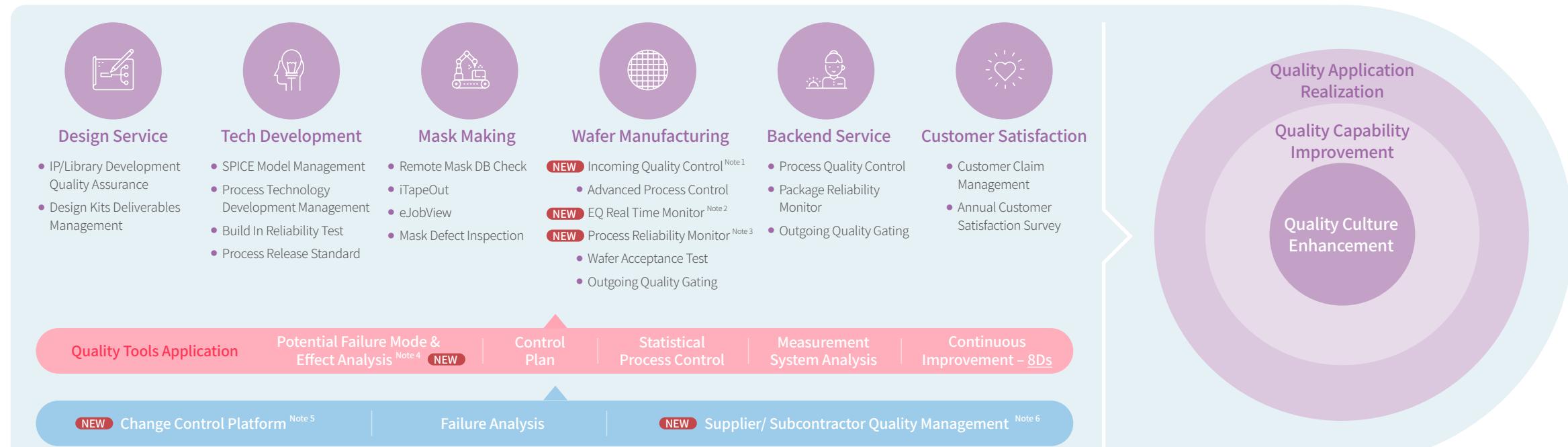
TSMC strives to provide global customers with outstanding semiconductor foundry services. To ensure customer satisfaction, TSMC pays attention to the quality of each operational aspect and reinforces a corporate culture of consistent hard work. In face of problems and challenges, the Company stays proactive and takes effective measures to ensure that customers receive products and services of the best quality.

TSMC is leading the way for the continued advancement of semiconductor manufacturing processes and also actively trying to improve chip product quality and reliability. To fulfill its commitment to customer's product quality and increase end user's life quality, TSMC rigorously strives to help customers realize their product energy efficiency and high performance and achieve the goal of sustainable development. TSMC

has built an IATF 16949 quality management system in line with automotive industry quality standards. The Company has leveraged information technology to build a rigorous management and quality control systems for the processes of design service, technology development, mask making, wafer manufacturing, and backend service.

Besides seeking constant improvement, TSMC also extends the quality requirements to Tier 1 and Tier 2 suppliers. Using its own experience, the Company also attempts to help partners improve their quality culture, capabilities and applications in order to enhance the quality management of TSMC, and the semiconductor supply chain.

## TSMC Quality Management System



Note 1: Add quality inspections for incoming materials at critical control points to ensure quality

Note 2: Improve the real-time monitor system of photo process and establish the guideline for monitoring parameters to improve abnormal events handling flow in case of the production and delivery of defected products

Note 3: Establish the Early Failure Rate System for real-time information in order to reduce the defect yield and risk in reliability as well as increase product yield

Note 4: In compliance with the international standard for automotive industry, the latest version of AIAG-VDA FMEA was introduced in 2019 and is expected to be completed in 2020

Note 5: Strengthen the connection of review between the change in mask making information and wafer manufacturing to reduce the risk of errors in the change

Note 6: Suppliers are required to apply statistical process control and maintain the reliability of the process and the quality of upstream raw materials to enhance the analysis of such materials. The supply chain is required to receive ISO 9001 certification and to assess the management of process change in order to enhance the quality management of raw materials

## Quality Culture Enhancement

Quality is the collective responsibility of all TSMC employees. In order to strengthen company's quality culture, improve employees' problem-solving abilities, and develop quality control systems, TSMC and its Quality and Reliability Organization held the Total Quality Excellence & Innovation Conference and series of seminars/training sessions about the design of experiments, statistical process control, metrology, and deep/machine learning in 2019. TSMC consistently encouraged its employees to innovate and drive cross-team observation and learning, and promoted the quality culture with quality awareness posters, demonstration of outstanding projects, cash bonuses, and public recognition. In 2019, employees proposed

49,300 improvement projects and generated a benefit of NT\$15 billion in value. To promote employees' initiatives as well as to prevent quality abnormalities and outdated operational regulations, the concept of "STOP & FIX" was proposed in 2019 and has created a potential benefit of NT\$2.8 billion in value with over 5,500 projects, enhancing the company culture of good quality.

In 2020, TSMC continues to help employees develop quality management capabilities through the promotion and implementation of new strategies. The Company also continues to participate in the Taiwan Continuous Improvement Competition to promote outstanding projects in the local semiconductor supply chain as well as other industries in order to increase industrial competitiveness in Taiwan.

## 2019 Quality Improvement Projects

Group	Projects	Benefit
 Quality Improvement	Reduced charging remains on the wafer surface by improving etching de-scum capabilities	<div style="display: flex; align-items: center;"> <span style="font-size: 2em;">15%</span> <ul style="list-style-type: none"> <li>• Increased average product yield in advanced manufacturing processes by 15%</li> <li>• Increased competitiveness in advanced manufacturing process and achieve customers' AI/high-performance chip applications</li> </ul> </div>
 STOP & FIX	Significantly improved cleanliness of the sputter chamber by redesigning a rougher surface texture for the chamber	<div style="display: flex; align-items: center;"> <span style="font-size: 2em;">88%</span> <ul style="list-style-type: none"> <li>• Reduced AlPad related defects by 88%</li> </ul> </div>
	Fixed etching stop layer Cu pits and hillock defect problem to reduce 5G mobile chip leakage	<div style="display: flex; align-items: center;"> <span style="font-size: 2em;">40%</span> <ul style="list-style-type: none"> <li>• Improved 5G product yield by 40% and announced five U.S. patents</li> </ul> </div>
	<b>STOP:</b> Avoid yield loss of new products caused by die cracks when entering volume production <b>FIX:</b> Completely prevent die cracks caused by stress on ejector pins	<div style="display: flex; align-items: center;"> <span style="font-size: 2em;">60 million</span> <ul style="list-style-type: none"> <li>• Found problems before products were scrapped and prevented the loss of NT\$60 million worth of wafers</li> </ul> </div>

## Improvement Projects

Unit: thousand cases



Note: "Continuous Improvement Team (CIT) Activities" and "Suggestion Program" in the 2018 report have been merged as "Improvement Projects" in the 2019 report

## Value of Improvement Projects

Unit: NT\$/ hundred million



## Categories of Improvement Projects in 2019



## Case Study

## Prevent Yield Loss in New Products with STOP & FIX

TSMC has been working hard to raise quality awareness on STOP & FIX since 2019. Through promotional posters, educational training and the demonstration of outstanding projects, the Company continues to improve the corporate culture of "proactively detecting and correcting abnormalities" and to encourage employees to find potential quality risks at work and to further achieve the ultimate goal of preventing abnormalities.

In 2019, the Advanced Packaging Operations Division discovered quality abnormalities in the die of a new product. Investigations show that the problem was caused by the array of ejector pins. Therefore, the Company proposed "The Project of Improving the Array of Ejector Pins to Improve Die Yield," to formulate the best model of stress and specification based on mechanics, and sends feedback to the R&D team to start the volume production of high-quality products. The project (1) discovers new abnormalities and develops systems of testing and prevention, and (2) improves treatment procedures and increases effectiveness and timeliness. The project also won the first place among all outstanding STOP & FIX projects in the Total Quality Excellence & Innovation Conference.



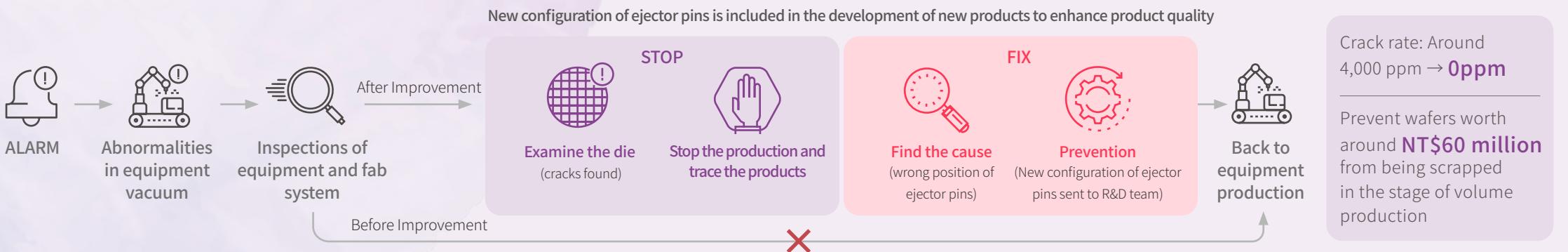
### Detection and Correction of Abnormalities (STOP)

In the die adhesive manufacturing process of new products in the Advanced Packaging Operations Division, two consecutive die seemed abnormal in a vacuum. In addition to stopping the equipment for inspection, proactively examine the products and detect fine cracks that were considered the main cause of vacuum abnormalities. Immediately conducted the comprehensive testing and completely ceased production for the model.



### Analysis of Causes & Prevention (FIX)

Through cause analysis and testing, the Advanced Packaging Operations Division confirmed that the array of equipment ejector pins is in the same direction as the lattice in silicon wafers so that the residual stress caused cracks in products. The best configuration of ejector pins was found through stress simulation. Continuous testing ensured that no more cracks were in the products, and the results were sent back to R&D team for the better management from original source. Around NT\$ 60 million wafers were protected from being scrapped in the stage of volume production.



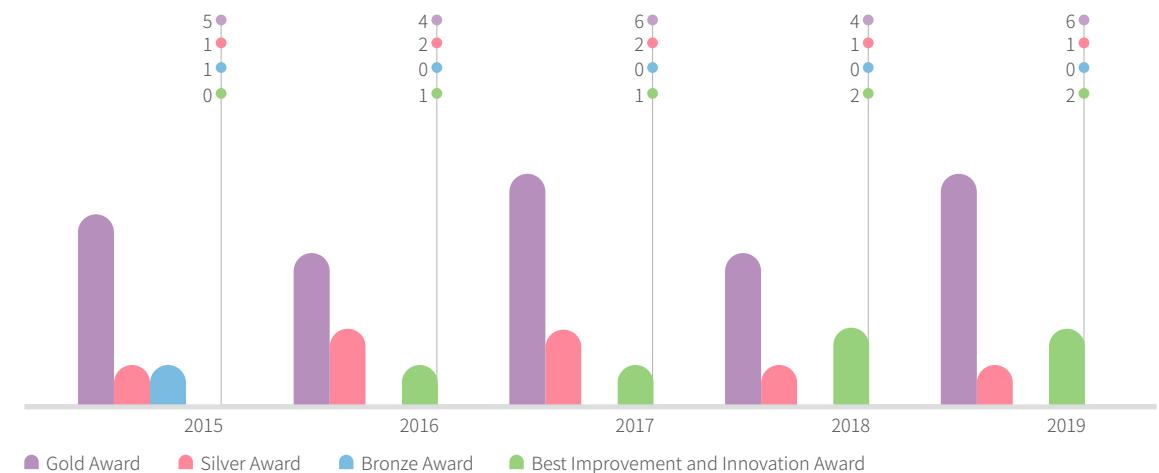
In 2019, TSMC participated in the Taiwan Continuous Improvement Award and achieved six Gold Awards, one Silver Award, and two Best Improvement and Innovation Awards for outstanding performance. TSMC has received more Gold Awards than any other companies in Taiwan for the ten consecutive years and more Best Improvement and Innovation Awards for four consecutive years. TSMC, having won one Best Improvement and Innovation Awards each year, later showed great improvement by winning two awards for two consecutive years.

### TSMC Projects in the 2019 Taiwan Continuous Improvement Competition

 <b>Advancement of CMP Production capacity in special technologies</b> Golden Award Best Improvement and Innovation Award	 Total capacity increased	 Bubble defect improved	Total benefit <b>NT\$512 million</b>		
 <b>Improvement in etching defect</b> Golden Award Best Improvement and Innovation Award	 Defects decreased	 Number of scraps decreased	Total benefit <b>NT\$162 million</b>		
 <b>Studying equipment's productivity to make a breakthrough in capacity</b> Golden Award	 Capacity of 12-inch equipment increased	 Productivity of employees increased	Total benefit <b>NT\$12 billion</b>		
 <b>Development of new infrastructure of smart monitoring to increase the productivity of inspectors</b> Golden Award	 Productivity increased	 Monitored amount reduced	 Monitoring speed increased	 Total number of control wafers and related costs reduced	Total benefit <b>NT\$216 million</b>
 <b>Advancement of Product Delivery Efficiency</b> Golden Award	 The time spent on sending the product into the machine has been reduced by 40%	 The machine idle time for advanced process has been reduced by 3.2%	Total benefit <b>NT\$326 million</b>		
 <b>Improved 3D IC Advanced Packaging Technologies</b> Golden Award	<b>14.6 kL</b> Annual use of chemical solutions of scrapping due to human error reduced	<b>0</b> Zero false reports of scrapping due to human error	 Fully automated	Total benefit <b>NT\$183 million</b>	

### TSMC Achievements in the Taiwan Continuous Improvement Competition

Unit: cases



Outstanding Achievements in 2019 TSMC Taiwan Continuous Improvement Award

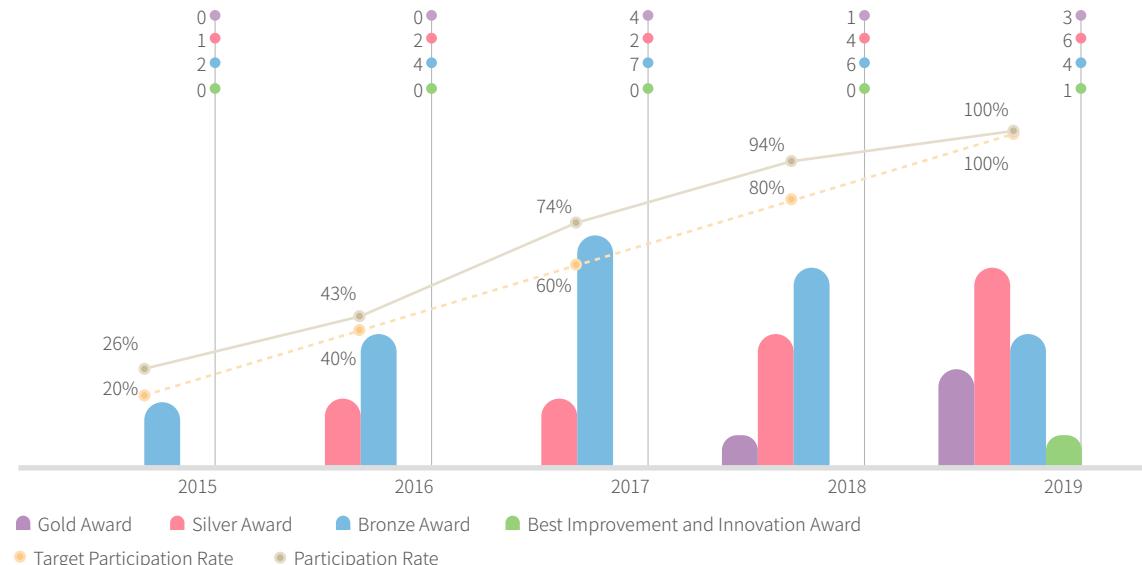


As the world's largest dedicated semiconductor foundry, TSMC always tries hard to influence and encourage local suppliers to participate in the Taiwan Continuous Improvement ward in order to improve quality management through practical achievements and increase the competitiveness of Taiwan local industry and supply chain.

In 2019, TSMC encouraged all of its major local suppliers to participate in the competition, winning three Gold Awards, six Silver Awards, four Bronze Awards, and one

Best Improvement and Innovation Award in a feat that outshined performances and number of participants in 2018. In order to continuously increase the quality of its supply chain, TSMC not only invited senior management of the suppliers to attend to Taiwan Continuous Improvement Award but also required those who didn't advance to the final to submit improvement reports. The Company published the winners' information on the [official TSMC website](#) for public recognition, encouraging more local suppliers to make further improvements.

#### TSMC Supplier Participation in the Taiwan Continuous Improvement Competition



#### Quality Capability Improvement

In order to improve quality and efficiency, in 2014, TSMC started to utilize machine learning technology and deep learning method, and successfully applied advanced spectrum analysis to automated classification of wafer defects so that differences among processes and equipment were detected, immediately triggering improvement. A defect inspection and classification

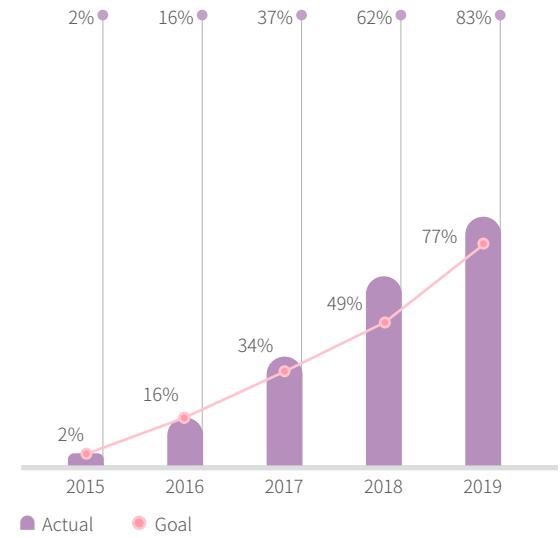
system for 12-inch wafers was established to refine the consistency of outgoing inspection. In 2019, the productivity of each 12-inch wafer outgoing visual inspector has increased to 5,258 pieces per month.

The Company's Quality and Reliability Organization, in collaboration with its Corporate ESH Division, has classified the current suspect materials and established a sampling plan for testing. As for the control and management of new materials, TSMC not only requires

#### Outgoing Visual Inspector Productivity for 12-inch Wafers



#### Detectable CMR Substances

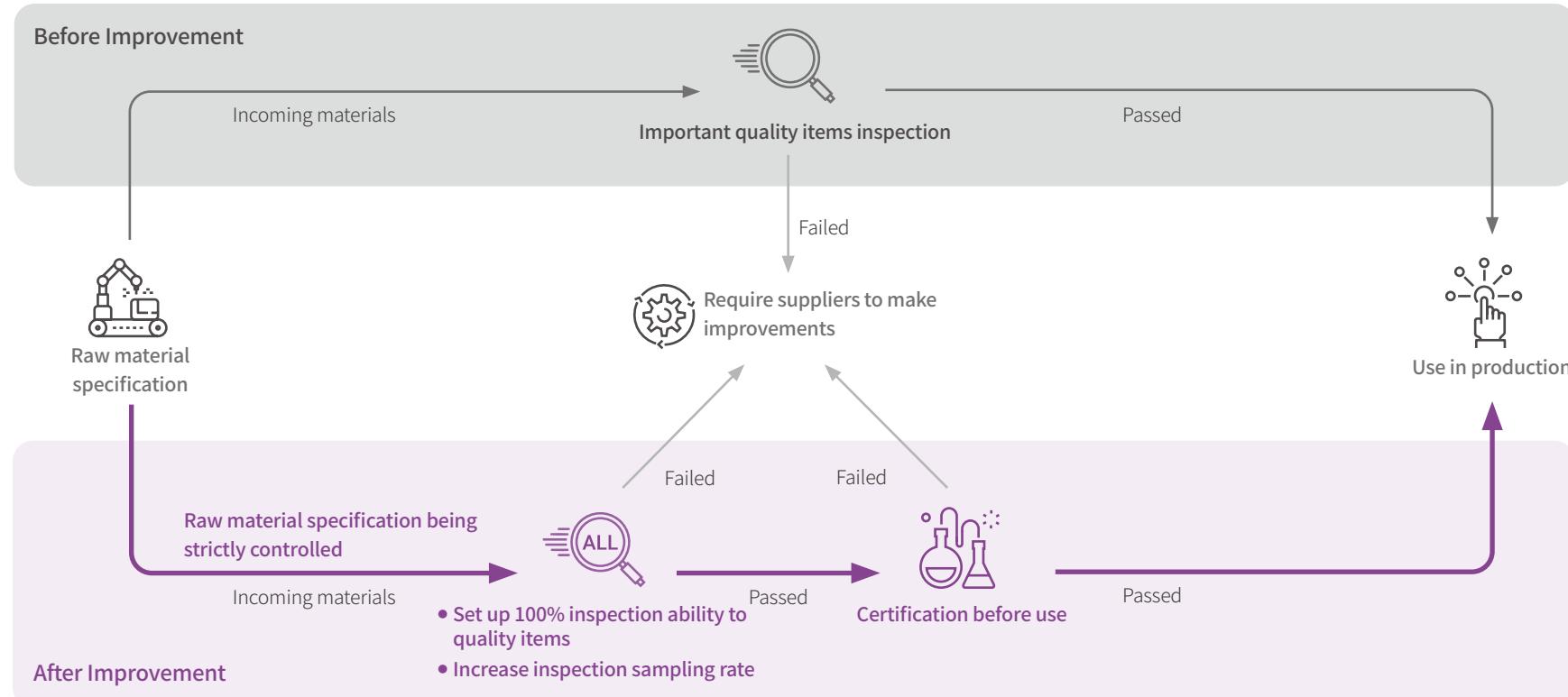


the suppliers to declare whether the provided materials comply with the regulations but also carry out sampling tests to ensure that supplier declarations are accurate. In 2019, TSMC further strengthened the ability of its

chemical laboratories to analyze suspicious substance, having analyzed 83% of the substances for CMR effects. The Company also introduced testing strategies to the major suppliers, which can quickly detect 178 hazardous

substances in semiconductor materials, improving their abilities to manage hazardous substances.

### Better Management of Incoming Raw Materials



### TSMC's Commitment to Hazardous Substance Management



100% compliance with law and regulations and customer standards on hazardous-substance-free products

None additional Group 1 carcinogens as defined by the International Agency for Research on Cancer (IARC)

Initiate early projects of the manufacturing process change and the substitution of chemicals ahead of regulatory requirements and make plans for annual replacements

Restrict the use of long-chain PFASs with 8 carbons and above. New chemicals shall not contain short-chain PFASs with 5 to 7 carbons



In 2020, TSMC will continue to promote innovations, including smart copying the productivity and experience of 12-inch wafer outgoing visual inspectors, and setting goals of increasing the productivity of outgoing visual inspectors for back-end packaging by 5% each year.

In 2019, a batch of photo-resistor provided by a chemical supplier contained different materials that consequently caused heteropolymers in the liquid photo-resistor and had a negative effect in the 12nm and 16nm wafers produced by TSMC Fab 14B. In order to guarantee wafer quality, TSMC immediately scrapped the defective wafers, informed all impacted customers, proposed alternative plans through individual communication, and strengthened online wafer testing to enforce stronger controls on incoming materials. In addition, TSMC increased capabilities of testing incoming materials provided by suppliers and enforced a certification procedure before using the materials in production in order to ensure that the quality is in accordance with requirements of the advanced process technology.

In 2019, TSMC, in collaboration with SEMI, invited SEMICON, which had only been held in the U.S. and Europe, to hold the forum in Taiwan for the first time in

order to increase the competitiveness of Taiwan local supply chain in the global semiconductor industry. 55 suppliers and 147 industry representatives participated in the event. TSMC also shared its innovations and management regarding the analysis of CMR substances as the Company has been dedicated to helping the global semiconductor industry produce higher-quality green products and realizing the goal of global sustainable management.

Regarding the chemical management in manufacturing process, TSMC considers the comprehensive management of hazardous substances an important step in improving quality capability. The replacement plan of PFOA-related substances continued in 2019. Photo-resistor, the chemical that contains PFOA, is a key material in the manufacturing process. TSMC has tested a new, PFOA-free photo-resistor multiple times but problems with product yield means that formula and processing parameters must be adjusted and therefore delaying the substitution project. By May 2020, the completion rate has reached 86%. It is expected to reach 100% by the end of 2020. As for short-chain PFASs with 4 carbons, which has received worldwide attention, TSMC started an investigating/evaluating substitution project regarding existing

chemicals in 2019 and also conducted evaluations of excluding such substances in the R&D phase.

In addition, TSMC has initiated a replacement project ahead of regulatory requirements regarding NMP, a commonly used chemical recognized as toxic for birth and reproduction. In 2019, the NMP substitution

project also faced issues with product yield because of substituting chemicals. TSMC will continue to make formula adjustments and more testing to reach the goal of reducing the use of NMP by 95% in 2020.



For more details, please refer to TSMC CSR website: [TSMC Collaborates with SEMI to Hold the Strategic Materials Conference in Taiwan for the First Time](#)

The Materials Committee of SEMI Recognized Young Scholars at the Event to Inspire Local Professionals



## Restriction and Management of PFASs

	Regulations	Overview of TSMC management
 <b>PFOS-related substances</b>	<ul style="list-style-type: none"> <li>UN Annex B on persistent organic pollutants (semiconductor manufacturing process exempted)</li> </ul>	<p><b>Quality Application Realization</b></p> <ul style="list-style-type: none"> <li>The substitution of existing chemicals completed by 2010</li> <li>Listed as a TSMC restricted substance</li> </ul>
 <b>PFOA-related substances</b>	<ul style="list-style-type: none"> <li>EU REACH Annex 17: Usage restricted since 2020/7/4 (semiconductor manufacturing process exempted)</li> <li>UN Annex A on persistent organic pollutants (semiconductor manufacturing process exempted)</li> </ul>	<ul style="list-style-type: none"> <li>The substitution of existing chemicals 86% completed</li> <li>Listed as a TSMC restricted substance</li> </ul>
 <b>PFASs that contain 5 to 7 carbons</b>	<ul style="list-style-type: none"> <li>Restricted substances listed in the chemical restriction of EU research proposals</li> </ul>	<ul style="list-style-type: none"> <li>Listed as a TSMC restricted substance (Avoid the use of such substance. If necessary for research and development, approval of VP-level executives is required)</li> </ul>
 <b>PFBS-related substances</b>	<ul style="list-style-type: none"> <li>EU listed as a substance of very high concern (SVHC) in 2020/1/16</li> </ul>	<ul style="list-style-type: none"> <li>Listed as a substance of very high concern in TSMC; Evaluate not use in the advanced process of 3nm and below</li> </ul>

## Quality Application Realization

TSMC's Quality and Reliability Organization is in close collaboration with its R&D team, and continues to focus on the advanced logic manufacturing process, specialty process, advanced packing technologies development and quality qualification to ensure that component features, product yield and reliability meet the requirements.

As for the advanced logic manufacturing process, in 2019, TSMC completed the qualification for 5nm FinFET transistors to ensure that its 5nm process technology is highly competitive for mobile communication and high-performance computing applications. The 5nm process is expected to enter volume production in 2020. In the aspect of specialty process technologies, qualification for embedded Magnetic Random Access Memory (MRAM) on TSMC 22nm ultra-low leakage (22ULL) process platform has been completed. As for CMOS image sensor technology, TSMC has completed the qualification for 45nm near infrared CMOS (Complementary Metal Oxide Semiconductor) image sensor and ASIC (application-specific integrated circuits) Wafer-on-Wafer application.

In order to continue reducing product defects, improve process control, detect abnormality early on, and prevent quality incidents from affecting customers, TSMC's Quality and Reliability Organization and Fab Operation are collaborating in a cross-team effort to apply advanced statistical techniques and quality tools towards the creation of an immediate defense system in wafer factories. In 2019, TSMC continues to enhance the design

and application of automotive products and update the automotive quality system to version 2.0. The Company also provided exclusive resources to its customers in the automotive industry with DPPM demands so they can conduct analysis on returned merchandise and real-time Physical Failure Analysis (PFA) to drive process improvement. In 2019, TSMC established the quality control of automotive products on its 7nm and 12nm process technologies so that the Company is ready for the automotive electronics market in 2020.

TSMC did not have any massive product recall in 2019, showing that TSMC products have been able to reach or exceed customers' demand for quality and reliability. With manufacturing excellence and high-quality service, TSMC will support customers to seize the business opportunities in the four growing markets that are mobile communication, high performance computing, IoT (Internet of Things) and automobile electronics, increase their competitiveness, provide global consumers high-quality electric products, and bring everyone a better life.



For more details of Product Quality, please refer to [TSMC's 2019 Annual Report](#)

# Customer Service

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Precise Response

Provide excellent customer service through close collaboration with customers and customer meetings/surveys on a regular basis to understand and respond to their needs

- Maintain customer satisfaction rating of over 90%
- Every million 12-inch wafers shipped, the number of engineering quality and reliability issues improved to 60% of the level in 2019 **NEW**

- Customer satisfaction rating of 93%  
Target: >90%

- Maintain customer satisfaction rating of over 90%
- Every million 12-inch wafers shipped, improve the number of engineering quality or reliability issues to 95% of the level in 2019

### Virtual Fab

Provide comprehensive information in a timely manner to ensure the success of customer's products; strengthen processes and systems to hold the highest stands to protect customer product information

- In line with TSMC's technology roadmap, provide customers with over 1,200 types of available wafer manufacturing and process technology; over 170 types of advanced packaging technology
- Pass customer product information audit with no major flaws

- In line with TSMC's technology roadmap, provided customers with over 765 types of available wafer manufacturing and process technology  
Target: > 750 types of technology
- Passed customer product information audit with no major flaws  
Target: No major flaws

- Provide customers with over 800 types of available wafer manufacturing and processing technology; over 60 types of advanced packaging technology
- Pass customer product information audit with no major flaws

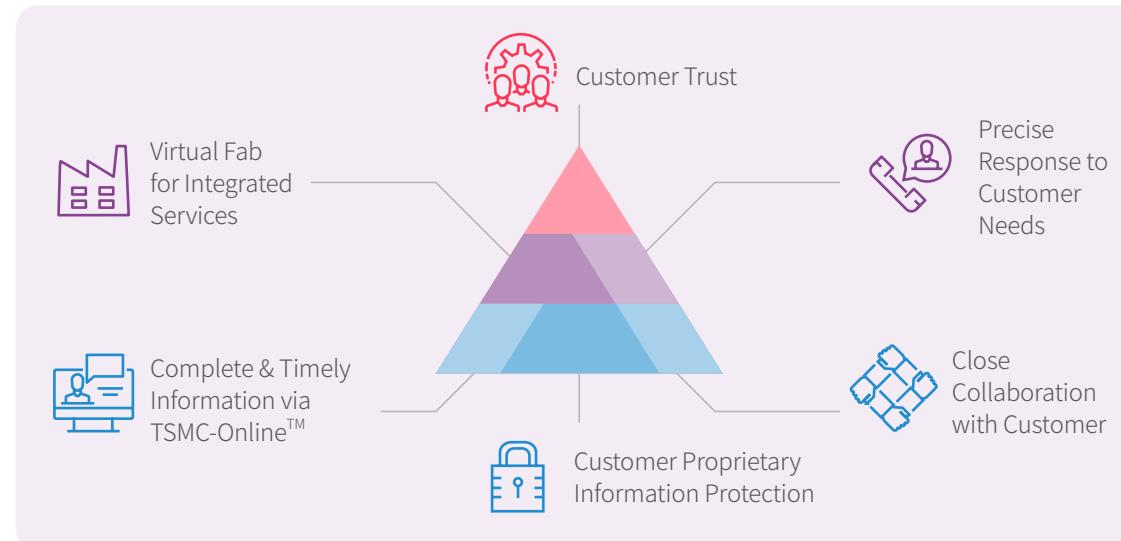
To become customers' trusted partner, TSMC vigorously strives to provide the best service to customers as to help customers achieve success. TSMC has established a devoted customer service team, which is a dedicated coordination window to provide the timely assistance and creates the best customer experience, from design support, mask making, and wafer manufacturing, to backend services. TSMC also commits to protect customer's confidential information with highest standard. TSMC wins customer's continuous trust, and was chosen as their foundry service provider, thereby ensuring TSMC's continue growth in the future.

### Precise Responses

TSMC treats customer feedback and expectations as an important basis for improving and developing customer relationship. TSMC learns about customer needs through multiple channels, and customers can then utilize these channels to provide feedback on the performance of business behavior, relationship, technology, quality, yield, design support, manufacturing, customer service, and further expectations for the future. TSMC reviews and analyzes customer feedback regularly, develop improvement plans upon them, and view it as a complete customer needs handling process. According to the annual

customer satisfaction survey in 2019, TSMC received a high score of 93%, keep maintaining high rating above 90% in 6 consecutive years. In 2019, in response to customers' expectation in continuous quality improvement for product segments required higher quality, TSMC created a new theme of improvement: "STOP & FIX." Combining with a series of quality training activities, TSMC strengthens employees' capability to provide quality services and encourages employees to adhere to the quality and be the front-line guardian of quality. In an ever-changing market, the close collaboration with customers helps TSMC continuously satisfy its customers' needs with advanced technology, manufacturing excellence, and high-quality service.

### The Customer Service Strategy Pyramid



### Annual Customer Satisfaction Ratings



### Various Communication Channels for Customers



## Virtual Fab Provides Integrated Customer Service

The instant information update and thorough protection of customer's confidential information are crucial for TSMC to build customer trust. To facilitate customer interaction on a real-time basis, TSMC-Online™ offers a suite of web-based applications that allow TSMC to play an active role in collaborations with its customers in design, engineering and logistics. Customers thus have a 24-7 access to critical information and are able to create customized reports to facilitate effective wafer management. Design collaboration lies upon data availability and accessibility, and provides customers with accurate and the most updated information at each stage of design life cycle. Engineering collaboration provides engineering lots, wafer yields and wafer acceptance test analysis, as well as quality and reliability data. Logistics collaboration provides information about customer order placement, shipments and delivery. To serve

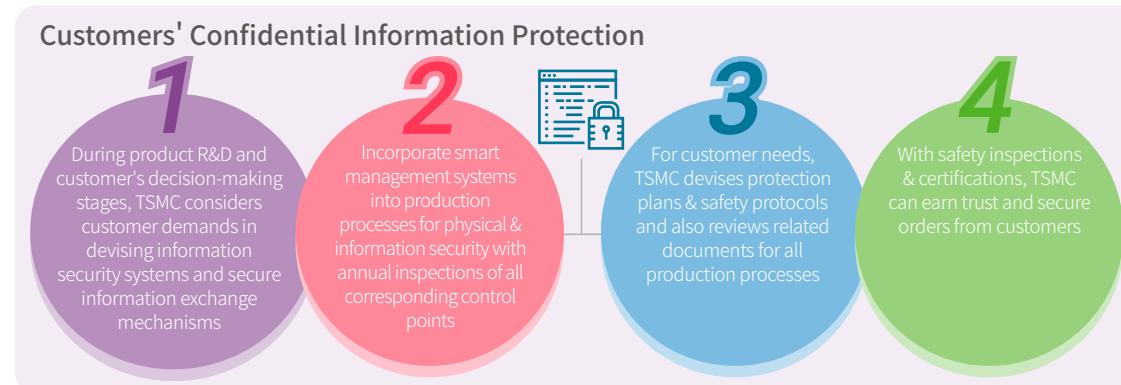
as a customer's "virtual fab," through TSMC-Online™, customers can access transparent and comprehensive wafer manufacturing information and services. Thereby, customers can manage their products on a real-time basis to achieve product success. In 2019, in line with technology roadmap, TSMC now provides customers with over 760 types of available wafer manufacturing and process technologies and over 60 types of advanced package technologies. Proprietary Information Protection is a promise from TSMC to guarantee the interests of its customers. As a customer's "virtual fab," TSMC holds the highest standard to protect its customers by implementing a special safety monitoring mechanism throughout the whole production process with annual audit of all control points.

In 2019, TSMC helped customers achieve ISO 15408 certification for various types of high-security chip products. ISO 15408 certification, an international standard under [the Common Criteria for Information Technology Security Evaluation](#), is a security evaluation

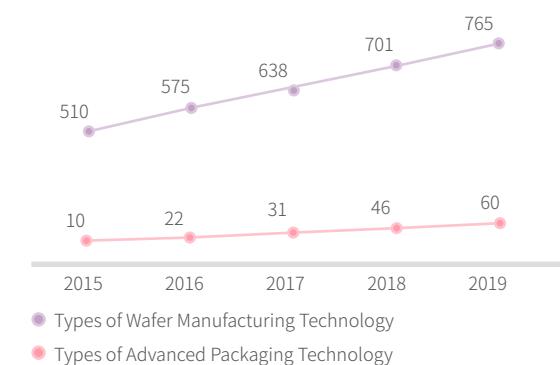
standard for information products and systems. It is given in two major forms: product certification and site certification. To avoid any redundancy certification process on the part of its customers and provide a better customer experience by expediting customer's product certification processes, TSMC continues to obtain site certifications for its various foundry businesses according to demands. In 2019, TSMC successfully achieved ISO 15408 certification for its Fab 14B. Compliant to the highest standard for the production of security products and the protection of proprietary information, Fab 14B is fully qualified to readily accept orders for high-security products. For customers with such demand, therefore, TSMC is able to provide a safe manufacturing environment and ensure

optimal safety management not only in the production process but also along the supply chain. Furthermore, TSMC ensures the safety and reliability of the end-products manufactured with its security and aims to pass all annual inspections on customer products and information protection, thereby deepening trust and partnership with its customers.

TSMC strongly believes that constant innovation and high-quality products and services are the key factors to maintain a long-lasting customer satisfaction. As a trusted technology and capacity provider in the global logic IC industry, TSMC will continue to be service-oriented and maximum-total-benefits silicon foundry as to become a long-term important partner that customers can trust and rely on for success.



## Types of Wafer Manufacturing Technology/Advanced Packaging Technology



Note 1: 2019 index includes Taiwan Facilities and Subsidiaries  
Note 2: The cut-off date of "types of wafer manufacturing technology" and "types of Advanced Packaging Technology" is December 31



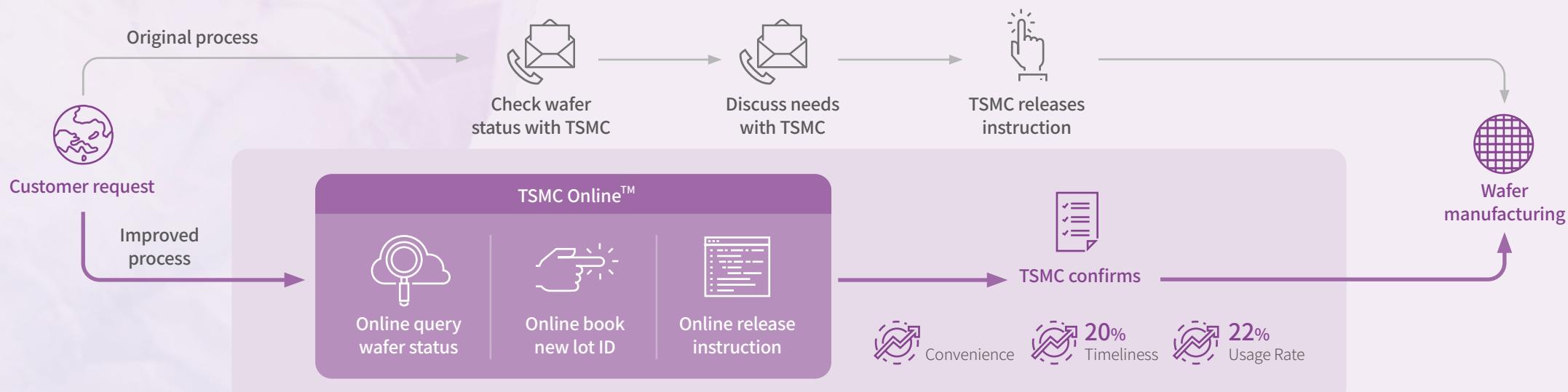
## Case Study

## Enhance Self-Service Wafer Instructions - Real Time Customer Service

In 2019, to improve the timeliness and convenience of customers wafer manufacturing instruction, TSMC integrated product information and wafer production system, improved customer lot handling notice process, and enhanced TSMC-Online™ function. Now, customer can release manufacturing instructions to not-yet processed wafer or stacked-wafer products in TSMC-Online™ without time-zone constraint. Before this enhancement, if customer had manufacturing instruction to not-yet processed wafer or stacked-wafer product which is with complicate

manufacturing process, customer need to contact TSMC off-line. Then TSMC counterpart would help to release customer's instruction accordingly. Now, customer can per request to reserve wafer ID with manufacturing instruction in TSMC-Online™. The instruction will be released to manufacturing system directly after confirmation. Besides, TSMC integrated the information from Bill of Material and wafer production system. Combining with optimized system user interface, customers have a clear overview of wafer status and wafer instruction process in TSMC-Online™. This new service enhancement

can reduce wait time from time zone differences. After the new functions launched in March 2019, the usage rate increased by 22% and timeliness improved by 20%.





## Proprietary Information Protection

Proprietary Information Protection is a promise from TSMC to customers, shareholders and employees. TSMC responds to the increasing importance of proprietary information protection in regard to maintaining current and future competitive advantage, and devises "Proprietary Information Protection — PIP" policy to define the proprietary information protection and management guidelines. TSMC trade secrets and related undisclosed confidential information are protected under these guidelines in the best interest of company, shareholders, employees, customers, and vendors.

TSMC has created its PIP Committee, an organization dedicated to the Proprietary Information Protection, chaired by senior vice president of information technology and materials management & risk



### TSMC's Strategy for Proprietary Information Protection

TSMC considers the Proprietary Information Protection (PIP) as part of its core business strategy. To fulfill its commitment to PIP, the Company has adopted four approaches: information classification and control, access authorization, training programs, and compliance auditing. These measures serve to protect the proprietary information of not only TSMC and its subsidiaries but also any third party entity that conducts business dealings with TSMC. Furthermore, TSMC continues to enforce IT security measures, actively identifying potential vulnerabilities and risks for data breach, assessing possible damages, and developing mitigation measures to fulfill its commitment to Proprietary Information Protection.

## Seven Major Approaches of PIP Implemented in 2019



## IT Security Management Measures in 2019

TSMC has developed specific methods for the assessment of information security risks, created clear protocols for management, built automated information security management system, and obtained ISO 27001 certification for information security, thereby becoming compliant with international standards for information security management. In response to all kinds of cyber-attacks and external threats to information security, TSMC continued in 2019 to enforce information security risk management measures, enhance detection, and strengthen defensive measures. For example, TSMC has created automated anti-virus system to prevent malware from infiltrating into its intranet; it has strengthened the control of intranet and firewalls to prevent the spread of virus across facilities or equipment; it has installed endpoint anti-virus measures; it has developed and

deployed information security monitoring applications to monitor internal computers and alert of any security problems; it has stepped up detection of computer vulnerabilities and ensured that software programs are up-to-date; it has also enhanced detection of phishing emails and taught employees how to identify them. TSMC ensures the validity and legitimacy of information security protocols and procedures through regular reviews and evaluations, thereby minimizing information security risks and protecting the company from ever-evolving and ever-growing security threats.

### Training and Campaigns for PIP & Information Security

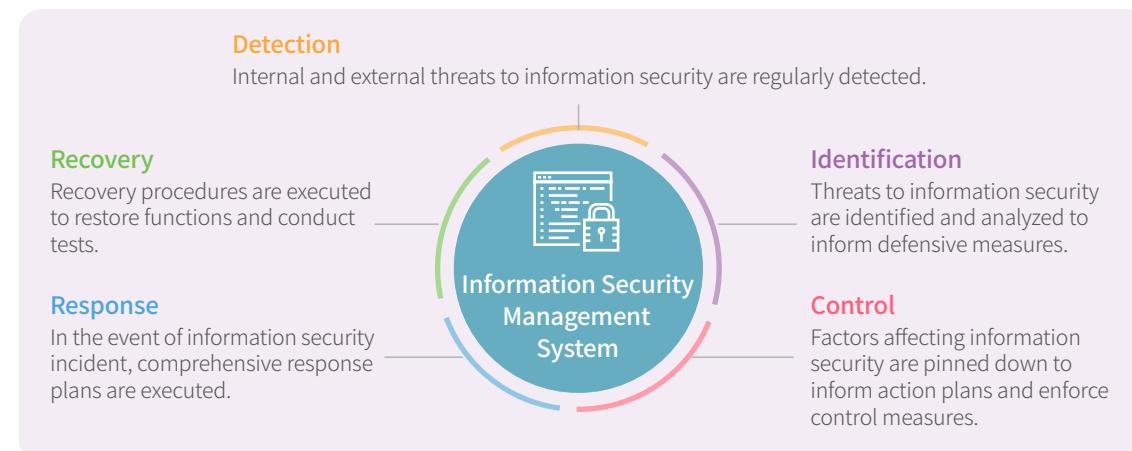
TSMC offers regular and diverse training programs and conducts continued promotion programs to impose PIP

awareness and obligations on all employees, making them recognize the importance of PIP and to equip them with the knowledge and capabilities needed to minimize the risk of information breach. For example, the Company has taught its employees how to identify phishing emails and provided clear guidelines to employees and contractors to avoid infractions of information security protocols. Furthermore, TSMC targets its efforts at employees by establishing internal PIP Working Committees in its organizations and functional units. In a total of 60 organizations, including TSMC's Taiwan facilities and overseas subsidiaries, PIP Guardians hold monthly meetings to keep track of situations on the ground, raise suggestions on information security for their organizations, and design PIP measures that meet the specific needs of their organizations, keep pace with changing conditions, and adapt to local circumstances. In addition, employees can raise their PIP concerns and report

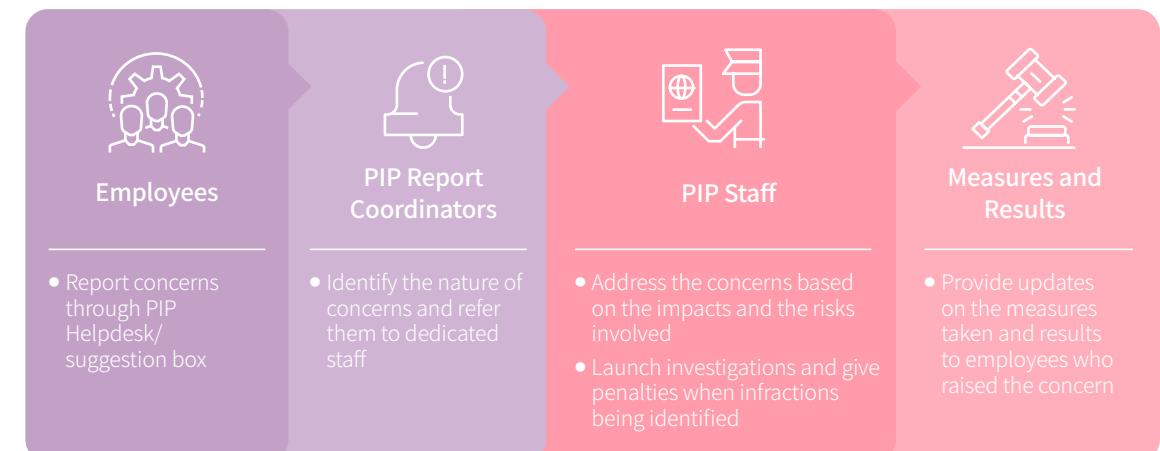
information security incidents through a Helpdesk hotline or an online suggestion box. The reports will be handled and addressed by dedicated staff.

For suppliers, TSMC established Supplier's Chain Security Association in 2019, which holds Supply chain security interaction meeting with important suppliers that work closely with the company to discuss Proprietary Information Protection and information security policies and possible improvements. To protect the interest of both parties by avoiding information breach, TSMC launched a quarterly newsletter of TSMC Supply Chain Security Newsletter from the third quarter of 2019 to keep suppliers updated about any change in regulations and the newest announcements.

## Structure of Information Security Management System



## PIP and Information Security Incident Reporting



## 95 Points

95 points average score for employees PIP engagement. Conducted a PIP engagement survey, collected over 40,000 surveys with over 85% response rate

## 14 PIP Micro-film

A PIP Micro-film Contest was held with 14 microfilms created, in which Vice President level or above executives reminded employees the importance of PIP to TSMC's competitive edge

## 24 PIP Posters

A total of 24 PIP posters were created to promote important regulations and announcements

## 48,000 Employees

Over 48,000 employees completed the annual PIP online refresher e-learning course

### Course content

- Core concepts that underlie PIP policies
- Major events and new regulations in 2019
- Case studies on PIP regulatory violations
- Ways to check PIP regulations and seek consultancy if needed

## 1 Fab achieved ISO 15408 certification

Fab 14B was successfully certified by the German Federal Office for Information Security (BSI) for ISO/IEC 15408-EAL6 under Common Criteria (Site Certification), thus becoming fully qualified to readily accept orders for security chips and high-security products

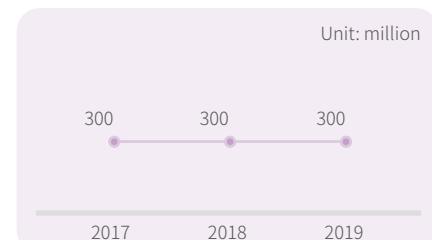


# 2019 Proprietary Information Protection Enforcement Report



## 3 Million Checks

Number of PIP Inspections Conducted Each Month

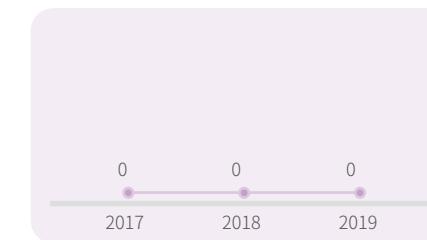


Approximately 3 million PIP checks conducted per month, including

- PIP contraband detection
- Entry control on premises
- Inspections on the handling of proprietary information
- Inspections on the use of emails
- Inspections of contractors' PIP practices

## 0 Case

Zero cases of customer information breach from information security incident



Note 1: 2019 PIP performance indicators cover TSMC's Taiwan facilities, TSMC (China), and TSMC (Nanjing)

Note 2: To strengthen the protection of proprietary information, TSMC enforced inspection and detection measures for printed documents and physical security in 2019, resulting in a higher infraction rate than the year before

## 4 Customer Security Audits

TSMC assisted four customers in obtaining international security certifications for their products, and ensured their product information protection during manufacturing

## 100%

All new employees, a total of over 3,000 individuals, have completed PIP training courses

## 100%

All new vendors, a total of over 25,000 individuals, have completed PIP training courses

## 12 Regulations

Newly created or revised 12 PIP regulations

## 1.29%

1.29% of employees were caught violating PIP regulations and protocols<sup>Note 2</sup> and were given penalties consistent to the severity of damage caused by their violations. Penalties include demerit, warning, and suspension of duty. Major violation will result in termination of employment and lawsuit (i.e. Trade Secret Law)

**The main cause of violation:** personal negligence or practices not compliant to PIP protocols

### Corrective measures

- Strengthen PIP promotion campaigns and training programs
- Reinforce control on data access and data distribution
- Reinforce control on document printing and data access
- Offer online consultancy service and training programs on new regulations

## TSMC Delivers Unrivalled Manufacturing Flexibility

# >12 Million

The output volume in 2019 exceeded 12M in 12-inch wafer equivalents

### Technologies

2019 **272**

2018 **261**

2017 **258**

### Customers

2019 **499**

2018 **481**

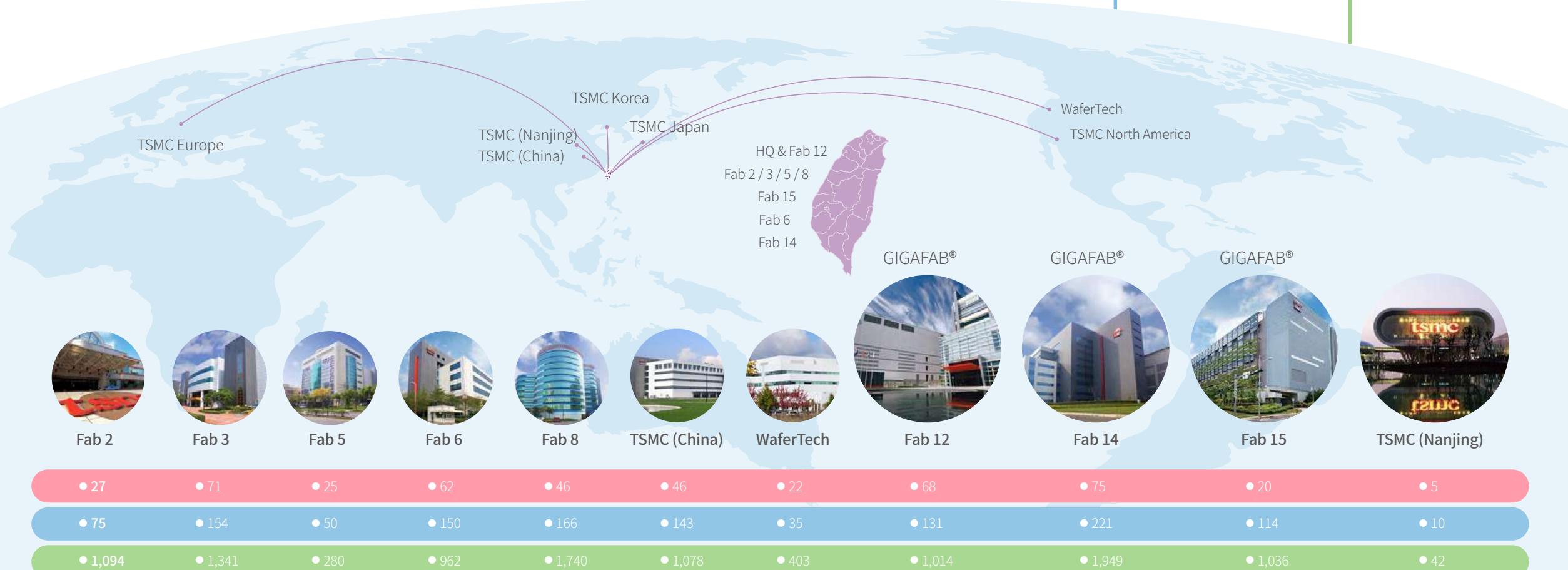
2017 **465**

### Products

2019 **10,761**

2018 **10,436**

2017 **9,920**



## Focus 3

# Responsible Supply Chain

## A Responsible Purchaser

As the world's largest dedicated IC foundry, TSMC is committed to remaining a responsible purchaser by encouraging upstream and downstream suppliers to seek advancements in technology, quality, delivery, environmental protection, human rights, health and safety. We will strive vigorously to support the development of a sustainable supply chain.

**100%**

Tier 1 suppliers signed the Supplier Code of Conduct and Self-Assessment Questionnaire on Sustainable Management, with 100% completion rate

**100%**

100% raw materials purchased were DRC conflict-free

**28.5%**

Reduced waste output by major local waste-producing suppliers by 28.5%





# Supplier Sustainability Management

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Sustainability Risk Management

All suppliers are required to comply with the Code of Ethics and Business Conduct, and to follow human rights and conflict-free mineral guidelines. TSMC continues to assess sustainability risk and encourages critical suppliers to join the Responsible Business Alliance (RBA).

- Suppliers comply with TSMC Code of Ethics, taking actions according to the [TSMC Supplier Code of Conduct](#)<sup>Note 1</sup>

- Tier 1 suppliers' completion rate for signing the TSMC Supplier Code of Conduct: 100% <sup>Note 2</sup>
- Tier 1 suppliers' completion rate of the Sustainability Management Self-Assessment Questionnaire: 100%
- Tier 1 suppliers completion rate for signing the TSMC Guidance on Supplier Business Conduct and conducting internal training every two years: 100%
- Completion rate of critical suppliers reporting on the status of sustainability management in their critical upstream supply chains: 100% <sup>Note 3, Note 4</sup>
- TSMC continues to monitor supplier employees working at TSMC facilities
- [Supplier due diligence on conflict-free minerals](#): 100% of the minerals used to comply with conflict-free requirements

- Continue to assess sustainability risk and encourage critical suppliers to join the [Responsible Business Alliance \(RBA\)](#)

- Critical suppliers completion rate for receiving third-party audits (by RBA-certified auditing institutions) every three years: 100% <sup>Note 6</sup>

- Improve supply chain emergency preparedness, which benefits both the suppliers and TSMC <sup>Note 7</sup>

- Continue to diversify production sites and assess new suppliers; develop 125 multi-source supply solutions (Base year: 2018) <sup>Note 7</sup>

- All tier 1 suppliers signed the TSMC Supplier Code of Conduct at the completion rate of 100%  
Target: 100%

- All tier 1 suppliers completed the Sustainability Management Self-Assessment Questionnaire at the completion rate of 100%  
Target: 100%

- All tier 1 suppliers signed the TSMC Guidance on Supplier Business Conduct and conducted internal training at the completion rate of 100% <sup>Note 5</sup>  
Target: 100%

- Critical suppliers are required to report on the status of sustainability management in their critical upstream supply chains: the completion rate is 100%  
Target: NEW

- Quarterly review on the attendance of supplier employees working at TSMC factory sites  
Target: Continuously require critical suppliers to accept professional audits

- [Sourcing conflict-free raw materials](#)  
Target: 100%

- A total of 46 critical Suppliers completed third-party supplier audits on sustainability risk by RBA-certified institutions  
Target: 45 critical suppliers

- Developed 56 multi-source supply solutions  
Target: NEW

● Exceeded   ● Achieved   ● Missed Target

- All tier 1 suppliers sign TSMC Supplier Code of Conduct and Sustainability Management Self-Assessment Questionnaire; completion rate: 100%

- Critical suppliers report on the status of sustainability management in their critical upstream supply chains; completion rate: 100%

- TSMC continues to monitor the supplier employees attendance who working at TSMC factory sites

- [Supplier due diligence on conflict-free minerals](#): 100% of minerals used comply with conflict-free requirements

- Continue to require critical suppliers to receive third-party audits by RBA-certified auditing institutions. The target is requiring 60 critical suppliers to complete third-party audits

- The target for improving supply chain emergency preparedness: develop 64 multi-source supply solutions

(Continue on next page)

Note 1: Since 2018, suppliers are required to re-sign and commit every year; in 2019, the requirement expanded to Tier 1 suppliers of TSMC (China) and TSMC (Nanjing)

Note 2: Tier 1 supplier refers to a supplier trading with TSMC directly with more than two orders per year and selected mainly spending-based. In 2019, 1,226 suppliers met the criteria

Note 3: Critical Suppliers: In 2019, 110 suppliers met the criteria - a supplier which either (1) accounts for 85% of the purchasing expenses, or (2) is a single source of purchase

Note 4: Status of sustainability management: Critical Suppliers are required to ask critical upstream companies in their supply chain to comply with the Code of Ethics and follow TSMC Supplier Code of Conduct requirements

Note 5: TSMC Guidance on Supplier Business Conduct is the training material for the TSMC Supplier Code of Conduct. If its content doesn't change significantly, the suppliers are required to re-sign and commit in every two years

Note 6: TSMC requires critical suppliers to complete third-party audits every three years. Since the first batch of suppliers (177 suppliers that met the criteria) conducted third-party audits in 2018, TSMC expects that by 2021 100% of the suppliers will complete third-party audits

Note 7: Using the TSMC Business Continuity Management Policy as guidelines, TSMC aims to reduce disruption risk to the flow of raw materials and continues to improve supply chain emergency response capabilities, benefiting both the suppliers and TSMC

Note 8: Including the raw materials used by TSMC, such as chemicals and gases



(Continued from previous page)

### Strategies & 2030 Goals

### 2019 Achievements

### 2020 Targets

#### Local Supply Chain Optimization

Improve the core capability of local suppliers, safeguard the rights of local entry-level labor, increase local sourcing, and collaborate with suppliers on power, water, and waste reduction

##### Provide consultation for the supplier to continue improving

- A cumulative total of 1,500 local suppliers participate in the Environmental, Safety, and Health (ESH) training program (Base year: 2016)<sup>Note 1</sup>
- A cumulative total of 300 suppliers observe annual emergency response drills (Base year: 2016)
- A cumulative total of 145 local raw materials suppliers receive consultation on process enhancement and quality improvement (Base year: 2016)<sup>Note 2</sup>

##### Increase local sourcing<sup>Note 6</sup>

- 64% for indirect raw materials
- 60% for spare parts
- 40% for backend equipment<sup>Note 7</sup>

##### Provide consultation on power reduction for suppliers and reduce energy consumption by a cumulative total of 1,500 GWh (Base year: 2018)

##### Reduce waste production among major local suppliers by 35% (Base year: 2014)<sup>Note 9</sup>

● A cumulative total of 411 suppliers participated in the Environmental, Safety, and Health (ESH) training program<sup>Note 3</sup>

Target: NEW

● The average ESH audit score for local suppliers: 78<sup>Note 4, Note 5</sup>

Target: 80

● Integrated Responsible Supply Chain Forum into TSMC's annual Supply Chain Management Forum

Target: holding the Responsible Supply Chain Forum

● 22 suppliers attended the observation and learning program of the annual emergency response drill (Cumulative total: 90)

Target: 20 suppliers this year, 88 in total

● 16 suppliers received consultation on process enhancement and quality improvement (Cumulative total: 33)

Target: 7 suppliers this year, 33 in total

● 59% for indirect raw materials

Target: 57.5%

● 50% for spare parts

Target: 50%

● 34% for backend equipment<sup>Note 8</sup>

Target: 36%

● Provided consultation on power reduction for 12 suppliers, and reduced energy consumption by a cumulative total of 97 GWh, accounting for 1.3% of the total energy consumption

Target: 0.5% (Base year: 2018)

● Waste production among major local suppliers reduced by 28.5%

Target: 28%

● Exceeded   ● Achieved   ● Missed Target

● A cumulative total of 500 suppliers participate in the Environmental, Safety, and Health (ESH) training program

● Hold the annual Responsible Supply Chain Forum

● A cumulative total of 110 suppliers observe annual emergency response drills

● 12 suppliers receive consultation on process enhancement and quality improvement (Cumulative total: 45)

● 60% for indirect raw materials

● 50% for spare parts

● 36% for backend equipment

● Provide consultation on power reduction for suppliers, and reduce energy consumption by a cumulative total of 200 GWh (Base year: 2018)

● Reduce waste production among major local suppliers by 29.1%

Note 1: The number of suppliers here is an accumulated total

Note 2: In the first stage, TSMC plans to provide consultation for 38 suppliers on process enhancement and quality improvement by 2020; starting in 2021 in the second stage, TSMC plans to provide consultation for ten suppliers every year

Note 3: In 2019, TSMC increased the frequency of ESH training programs for the suppliers from twice a year to every quarter. The training program consists of experience sharing, which is popular among the suppliers. Therefore, TSMC met the target of 2025 in advance. TSMC plans to provide consultation for 38 suppliers on process advancement and quality improvement by 2020; starting in 2021 in the second stage, TSMC plans to provide consultation for ten suppliers every year

Note 4: The scoring scale of ESH audit for local suppliers ranges from 1 to 100: 60 is the minimum passing score, 70 to 80 is intermediate, 80 to 90 is excellent, 90 and above is outstanding

Note 5: TSMC increased audit items and raised the scoring standard in 2019; therefore the supplier annual audit score failed to meet the target

Note 6: Increase local sourcing in TSMC's main region of operation - Taiwan

Note 7: The percentage of local sourcing in backend equipment excluded machinery requested by customers

Note 8: For backend equipment, due to the increased proportion of advanced packaging and elevated quality requirements, packaging equipment suppliers in Taiwan are currently unable to meet TSMC production requirements

Note 9: Referring to suppliers producing 80% of the local waste in raw materials. Calculation formula: A/(A+B)(%) ; A: waste reduced by the factory in the underlying month (metric tons);

B: waste produced by the factory in the underlying month (metric tons).

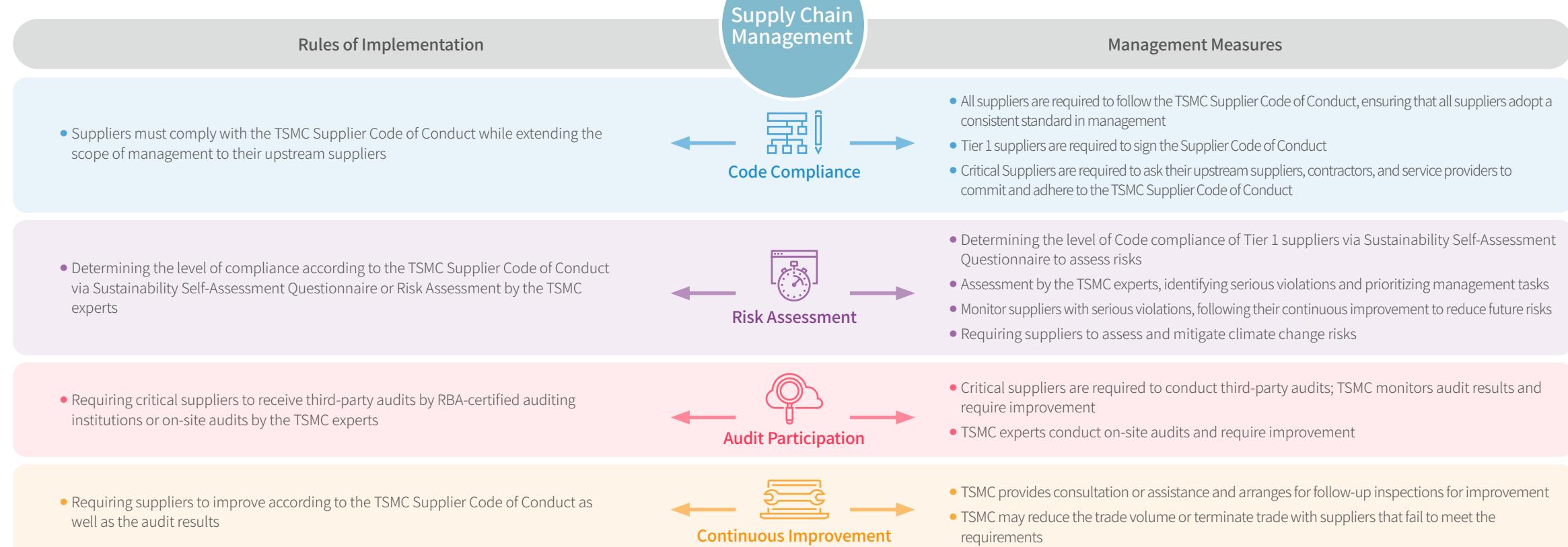
As a leader of the global semiconductor industry, TSMC continues to drive improvement of the supply chain, and is committed to an environmentally and socially responsible business model. In 2019, TSMC continued to deepen its two policies of "Sustainability Risk Management" and "Local Supply Chain Optimization" anchoring supply chain development to the core value of sustainability. Working closely with suppliers, TSMC actively works to ensure the safety of the work environment, the dignity of labor, ethical business

conduct, and environmental protection. By implementing the 4 guiding principles of Code Compliance, Risk Assessment, Audit Participation, and Continuous Improvement, TSMC encourages supplier partners to continue improving, commit to essential values, and take the initiative to promote sustainable practices to their upstream suppliers. Together, TSMC and the suppliers are joining hands to build a responsible supply chain in the semiconductor industry.

## Implementing the Four Guiding Principles of Supply Chain Management

TSMC values sustainable supply chain development and requires suppliers to comply with the TSMC Supplier Code of Conduct, in which suppliers must follow the 4 guiding principles, and take responsibility for implementing the principles

in practice. The Four Guiding Principles are the embodiment of TSMC's core belief in establishing a responsible supply chain. These measures benefit all parties and guides the semiconductor supply chain to a virtuous cycle.





## Code Compliance

The TSMC Supplier Code of Conduct is based on the [Code of Conduct](#) by Responsible Business Alliance (RBA). It requires suppliers to comply with the Code of Conduct while encouraging them to ask their upstream suppliers, contractors, and service providers to approve and adopt the same code in practices and management as well. New suppliers must sign the TSMC Supplier Code of Conduct to be eligible for partnership. This is to ensure that the suppliers understand TSMC's sustainability requirements, comply with

the commitment, and undergo risk assessments and audits in future collaborations. In 2019, the scope of the TSMC Supplier Code of Conduct extended to Tier 1 suppliers of TSMC subsidiaries, such as TSMC (Shanghai) and TSMC (Nanjing), to cover TSMC supply chains worldwide.

## Risk Assessment

To better understand the status of the supplier, TSMC evaluates supplier performance via the Sustainability Self-Assessment Questionnaire (SAQ), On-site Audit, Records of Serious

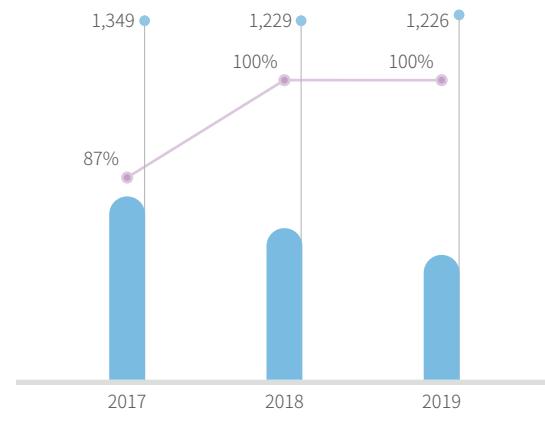
Violations, and TSMC experts, to identify the high-risk suppliers of the year. In 2019, TSMC identified 109 high-risk suppliers across four categories, which are raw materials, spare parts, packaging/ testing, and waste processing. This way, TSMC effectively evaluates the sustainability risk of the entire supply chain.

In 2019, Tier 1 suppliers in Taiwan, where the TSMC headquarters is located, completed 908 Self-Assessment Questionnaires at the completion rate of 100%. The SAQ this year contains five major categories specified in

the TSMC Supplier Code of Conduct - Labor, Health and Safety, Environmental requirements, Ethics, and Management. The SAQ results show the suppliers' awareness of sustainability management and allows TSMC to identify supplier risks. The SAQ results showed that compliance with the TSMC Supplier Code of Conduct by suppliers in Taiwan exceeded 96 on average. Among the items in the [five categories](#), compliance with labor policies, especially work hours regulations, require the most improvement.

TSMC is working with suppliers to mitigate climate change risks; we will continue to require suppliers with high energy [consumption](#) to conserve energy, reduce carbon emissions, and receive ISO14064-1 greenhouse gas certifications.

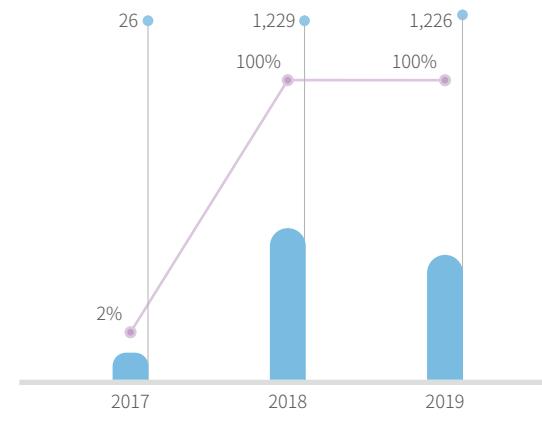
## Compliance & Management Summary of Supplier Code of Conduct



■ Number of Tier 1 suppliers  
● Percentage of Suppliers that Signed the Supplier Code of Conduct

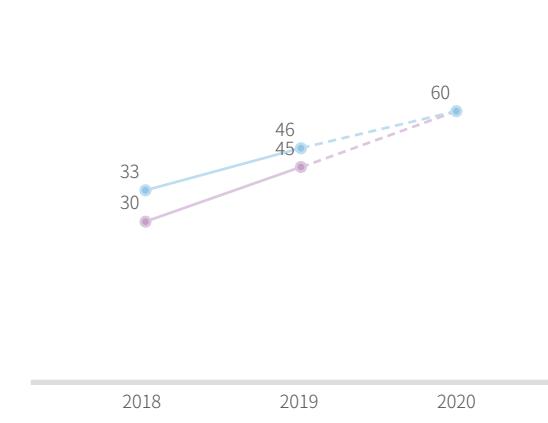
Note: Since 2018, TSMC formally defines Tier 1 suppliers as suppliers trading with TSMC directly with more than two orders per year, which are mainly fee-based

## Overview of Self-Assessment Questionnaire Results



■ Number of SAQs retrieved  
● Percentage of SAQs retrieved

## Overview of Third-Party Supplier Audits



■ Number of suppliers completing audits  
● The target number of suppliers completing audits

## Audit Participation and Continuous Improvement

Among Tier 1 suppliers, TSMC requires all critical suppliers to undergo third-party audits on sustainability risk by RBA-certified auditing institutions. Forty-six critical suppliers completed supplier audits in 2019, and TSMC expects all critical suppliers to complete third-party audit by 2021, at the completion rate of 100%. The audit allows TSMC to evaluate actual risks and enhance the overall performance of the suppliers. For high-risk suppliers, the TSMC experts conducted on-site audits and required improvements. The completion rate was 100%.

## 2019 Supplier Audit Results



### TSMC Experts

- Suppliers Audited<sup>Note 1</sup>

**57** Raw Materials, Spare Parts, and Packaging/ Testing Suppliers

- Audit Methods

**59** On-site Audits

- Audit Results and Actions

#### Violations

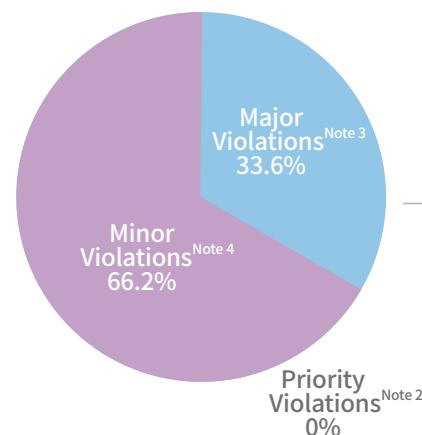
- Insufficient maintenance of fire protection, and lack of awareness and knowledge in occupational safety and health

#### Follow-up Actions

- Require suppliers to appoint a person in charge of fire protection, and enhance fire protection training
- Continue to hold experience-sharing workshops; emphasizing audit violations and improvement in 2020
- Compile the TSMC Supplier Sustainability Standard, which encompasses the major audit violations, and require suppliers to sign and comply with the Standard

- Distribution of Audit Violations

4.3%	Organization and System of Environmental, Safety, and Health Management
7.5%	Pollution Prevention
2.1%	Climate Change <sup>Note 5</sup>
1.1%	Hazardous Substance Management
7.7%	Safety Management
17.1%	Occupational Safety and Health
15.7%	Fire Protection Management and Fire Prevention
5.6%	Earthquake Protection
5.1%	Emergency Response



Note 1: For the auditing results, please refer to the [Waste Management](#) section. Two companies serve both as raw materials suppliers and waste disposal partners, and were audited by two separate Teams of Experts

Note 2: Priority violations are the most severe violations of the TSMC Supplier Code of Conduct, including environmental pollution, severe legal violations, hiring child labor or forced labor



### Third-Party Auditing Institutions

- Suppliers Audited<sup>Note 1</sup>

**46** Critical Suppliers

- Audit Methods

**46** Third-party Supplier Audits on Sustainability Risk by RBA-certified Auditing Institutions

- Audit Results and Actions

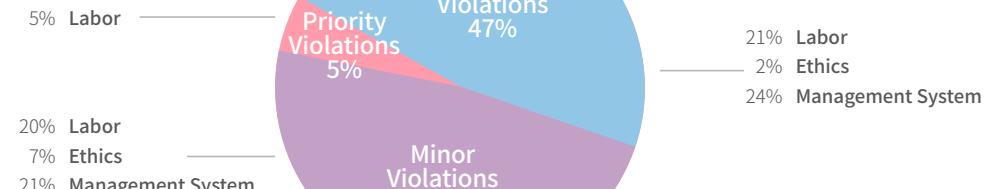
#### Violations

- Enhancing compliance on work hours for supply chain workers
- Establishing a transparent management system

#### Follow-up Actions

- Require the suppliers to establish a more comprehensive policy on human rights, examine the timeliness of labor human rights regulations, and enhance internal education and implementation
- Continues to ask the suppliers to improve and eliminate violations

- Distribution of Audit Violations



Note 3: Major violations refer to the lack of systematic management, legal violations that could be corrected immediately, and significant discrepancies between implementation and proper ESH procedures, such as daily operations not adhering to ESH procedures, legal violations that could be rectified quickly and have no ESH impact or the lack of necessary ESH procedures

Note 4: Minor violations refer to deviations from ESH procedures in practice and implementations or lack of documentation, such as incomplete training records, not fully conforming to ESH procedures or incomplete ESH procedures

Note 5: Climate change audits focus on greenhouse gas emissions and responding measures for natural disasters caused by climate change

## Supplier Risk Assessment Process and Results

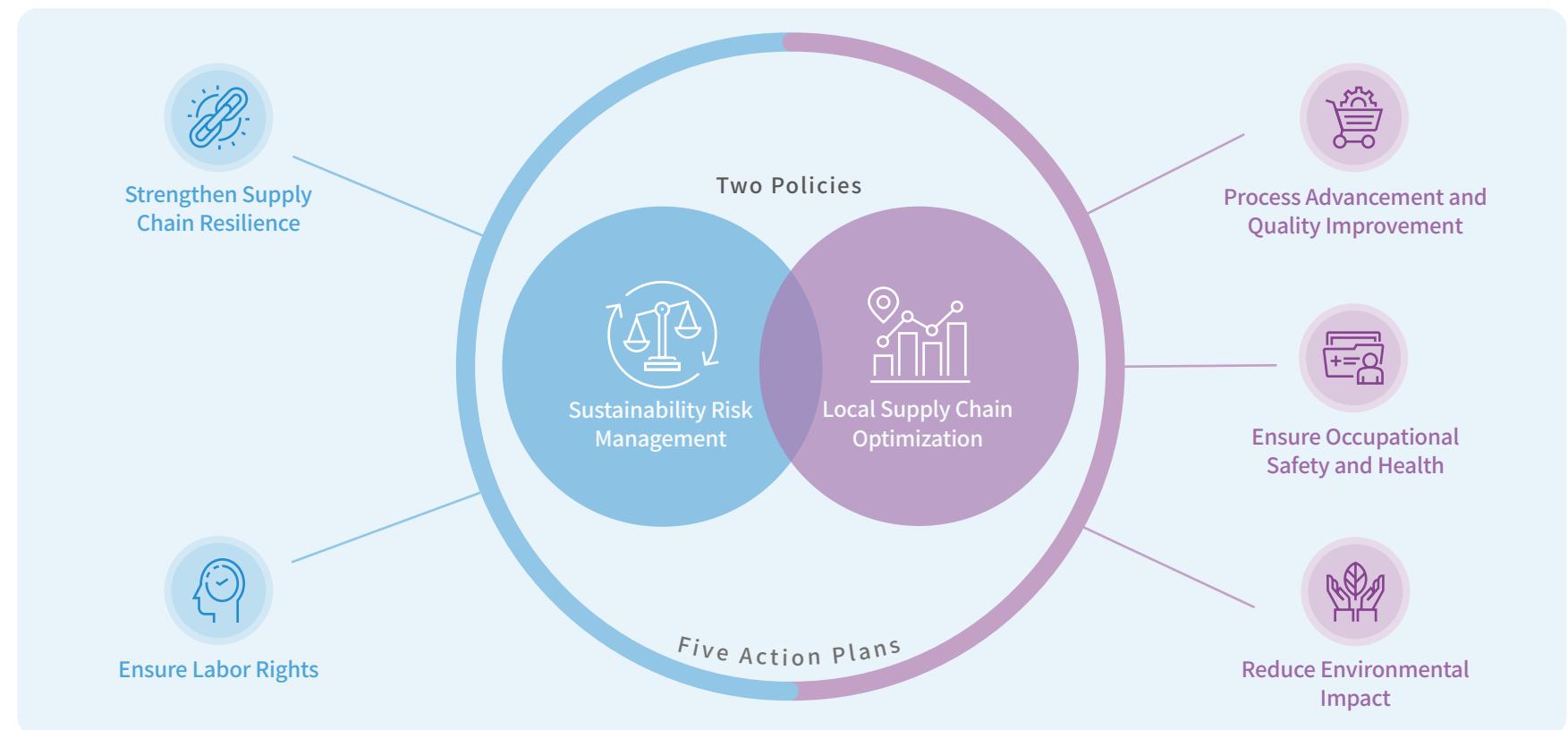


## Continuously Improving Supply Chain Sustainability

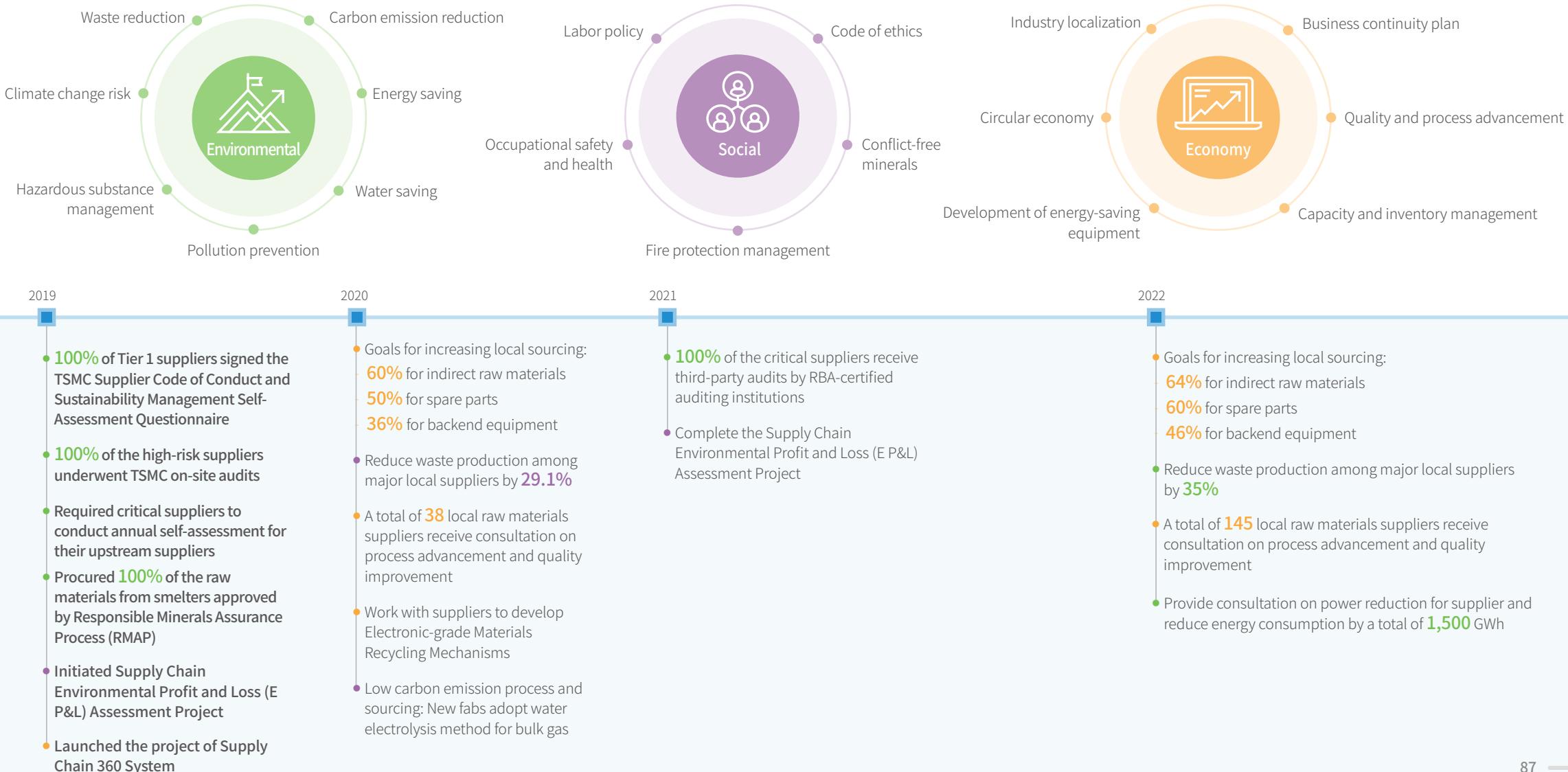
TSMC cares about the sustainability of the environment, the society, and the economy, aiming to improve supply chain management and influence the industry towards sustainability by building a responsible supply chain. Therefore,

TSMC set two strategies – Sustainability Risk Management and Local Supply Optimization – based on the five core categories stated in the TSMC Supplier Code of Conduct: Labor, Health and Safety, Environmental Requirements, Ethics, and

Management, to ensure continuous improvement. Five Action Plans have been created based on these core values, propelling TSMC's path towards sustainability into a positive cycle.



## Responsible Supply Chain Action Plan





## Sustainability Risk Management

TSMC aspires to grow along with suppliers and create a work environment that guarantees the dignity of the workers and ethical business conduct. To this end, TSMC is committed to auditing and consultation for suppliers to ensure continuous improvement in terms of compliance, labor rights, ESH practices, and emergency response. In 2019, TSMC continued to deepen its efforts to strengthen supply chain resilience

and labor rights, formulate emergency response measures, and reduce risks via auditing. TSMC, along with suppliers, are committed to the sustainable business growth. TSMC began establishing the Supply Chain 360 system in 2019, integrating communication channels with suppliers to exchange information swiftly, effectively, and seamlessly.

Problems / Challenges	Tactics / Actions	Number of Suppliers	Performance
<p> <b>Strengthen Supply Chain Resilience</b></p> <ul style="list-style-type: none"><li>Since TSMC's supply chain is mainly located in areas with frequent earthquakes, inadequate emergency response capacity would result in a higher risk of supply disruption due to the disaster</li><li>The supply chain must continue improving code compliance, labor rights, and ESH measures</li></ul>	<ul style="list-style-type: none"><li>The Supply Chain 360 system integrates communication channels with suppliers, increasing the precision and timeliness of information</li><li>Continue to develop multi-source supply solutions</li></ul> <ul style="list-style-type: none"><li>Invite suppliers to attend TSMC observation and learning program of annual emergency response drills</li><li>Require critical suppliers to receive third-party audits by RBA-certified auditing institutions</li><li>TSMC (Nanjing) underwent RBA VAP certification</li></ul> <ul style="list-style-type: none"><li>Quarterly review on supplier employees working for seven consecutive days at TSMC factory sites: occurrence decreased by 50% in 2019</li><li>Strengthen workplace safety management for contractors, especially on-site operational subcontractors and downstream subcontractors, and specify penalties and fines for workplace safety violations</li><li>Strengthen workplace safety management for contractors, including workplace safety management in the comprehensive supplier evaluation</li><li>Require contractors and subcontractors at all levels to sign the Contract Labor Payment Implementation Measures statement provided by TSMC</li><li>Require Tier 1 suppliers to sign and comply with the TSMC Code of Ethics and Supplier Code of Conduct</li><li>Continue due diligence to ensure sourcing of 100% conflict-free minerals</li></ul>	<p>22</p> <p>46</p>	<ul style="list-style-type: none"><li>The procurement department works with the IT, quality control, ESH, and risk management divisions to establish the Supply Chain 360 system</li><li>TSMC R&amp;D, quality control, and manufacturing departments work together to formulate annual multi-source supply solutions, requiring suppliers to diversify production bases and evaluate new suppliers to reduce the disruption risk of supply from single sources. In 2019, TSMC completed the multi-source supply solutions for <b>56</b> items, including chemicals and gases</li></ul> <p><b>In 2019, 22</b> suppliers attended the observation and learning program of <u>emergency response drills</u> and participated in <u>emergency response center tours</u> and <u>response equipment training programs</u>.</p> <p><b>In 2019, 46</b> critical suppliers received third-party audits by RBA-certified auditing institutions</p> <p>TSMC (Nanjing) received RBA VAP certification</p> <ul style="list-style-type: none"><li>Quarterly reminder on the attendance of supplier employees working at TSMC factory sites</li><li>Specify violation penalties in the order form. Once suppliers accept the order, they are considered to have accepted the violation penalties Note</li></ul> <p><b>In 2019, United Integrated Services and Fu Tsu Construction received TSMC Outstanding Supplier Awards</b></p> <p>Require Tier 1 contractors to enclose proof of payment to subcontractors upon requesting payment from TSMC, which is a necessary condition</p> <p>Tier 1 suppliers signed the statement at the completion rate of <b>100%</b></p> <p><b>Completed 100%</b> of due diligence on conflict-free minerals sourcing for the supply chain and took the initiative to monitor cobalt sources</p>
<p> <b>Safeguard Labor Rights</b></p> <ul style="list-style-type: none"><li>Employees working consecutively for seven days</li><li>Insufficient workplace safety rules for contractors and subcontractors at TSMC factory sites</li><li>Contractors do not pay downstream subcontractors on time</li><li>Contractors do not sign the TSMC Code of Ethics or Supplier Code of Conduct</li><li>Contractor compliance with regulations on sourcing conflict-free mineral raw materials</li></ul>		(Tier 1 suppliers)	

Note 1: In 2019, there were still instances of supplier employees working at TSMC factory sites working for seven consecutive days. TSMC has stressed the importance of work hour management

Note 2: Added violation penalties to the order form in 2018, and the practice continued in 2019

## Case Study

### Sourcing Conflict-free Minerals

As a leader in the global high-tech industry supply chain, TSMC supports sourcing conflict-free raw materials as a practice of humanitarianism and compliance with the ethical code of society. Therefore, TSMC adopted a series of compliance measures based on industry best practices, including the due diligence framework set by the Organization for Economic Cooperation and Development (OECD) Model Supply

Chain Policy for a Responsible Global Supply Chain of Mineral from Conflict-Affected and High-Risk Areas. TSMC is also a firm supporter of the Responsible Business Alliance (RBA) and Global e-Sustainability Initiative (GeSI), requiring suppliers to source conflict-free raw materials according to the Responsible Minerals Assurance Process (RMAP). TSMC requires suppliers to comply with its conflict-free minerals

sourcing policy and sign a statement on conflict-free minerals for products containing tantalum, tin, gold, and tungsten; Starting from 2019, TSMC has also begun disclosing the source smelters for the cobalt used in TSMC products to customers.

#### Number of suppliers certified by 2019 TSMC Conflict-free Minerals Due Diligence



**37**

Tier 1 suppliers



**256**

Smelters

#### Conflict-free Minerals Management Process



#### TSMC Conflict-free Minerals Due Diligence





## Local Supply Chain Optimization

Local supply chain optimization is a critical TSMC procurement strategy, which aims to ensure corporate sustainability by providing consultation and diverse resources for suppliers and by sharing TSMC experience, for strengthening suppliers' capabilities for emergency response, process advancement, and quality improvement. By working together, TSMC and suppliers can solve environmental issues effectively with reduced processing costs and counter the rising costs caused by climate change and resource depletion. TSMC also requires suppliers to comply with the Code of Conduct, reduce energy consumption and waste in the supply chain, recycle resources, and propel the progress of the supply chain.



TSMC's sharing of its practical experience and know-how with us is extremely helpful for improving ESH professionalism and capabilities in our factory.

Chen Yun-Yu EHS Vice President of Air Products San Fu-TSMC Supplier

Problems / Challenges	Consultation Tactics / Actions	Number of Suppliers	2019 Performance
Action Plans <b>Process Advancement and Quality Improvement</b> <ul style="list-style-type: none"> <li>Challenges in improving measurement technology, enhancing quality, and expanding output capacity for advanced processes</li> </ul>	<ul style="list-style-type: none"> <li>Hold two 2019 Advanced Process Materials Forums<sup>Note 1</sup></li> <li>Provide consultation for suppliers on capacity deployment, improving advanced measurement technology, and enhancing manufacturing quality</li> </ul>	33	<ul style="list-style-type: none"> <li>Invited 33 material suppliers for advanced processes to the event; a total of 150 people participated in discussions on the future road map for the quality of advanced processes, driving synchronized growth for suppliers and TSMC</li> </ul>
Action Plans <b>Ensure Occupational Safety and Health</b> <ul style="list-style-type: none"> <li>The performance of occupational health safety and health management of several local suppliers have not met TSMC requirements</li> </ul>	<ul style="list-style-type: none"> <li>Continue to work with third-party consultants to provide on-site consultation for suppliers to improve suppliers' occupational safety and health performance<sup>Note 2</sup></li> <li>Hold Responsible Supply Chain Forum and <u>Environmental, Safety, and Health Experience-sharing Workshops</u> to provide on-site consultation for suppliers, offering advice on environmental protection and occupational safety and health, and requiring tangible actions for improvement</li> </ul>	21	<ul style="list-style-type: none"> <li>TSMC invited suppliers exposed to occupational safety and health risks to participate in the Supply Chain Occupational Safety and Health Improvement Program; 21 suppliers joined in 2019. TSMC and consultants visited the factory sites, requesting improvements on noise and ventilation for environments where chemicals are used</li> </ul>
Action Plans <b>Reduce Environmental Impact</b> <ul style="list-style-type: none"> <li>Reduce environment impact, energy consumption, and resource depletion caused by localized manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>Increase the proportion of local sourcing, set sourcing targets for indirect raw materials, spare parts, and backend equipment</li> <li>Require <u>top ten waste-producing suppliers</u> to continuously reduce waste and report on the progress made each year</li> <li>Formulate Electronic-grade Materials Recycling Mechanisms, and assemble implementation teams</li> <li>Procure raw materials made with environmentally friendly processes</li> <li>Require local suppliers with higher energy consumption to reduce power usage</li> </ul>	10	<ul style="list-style-type: none"> <li>59% for indirect raw materials, 50% for spare parts, 34% for backend equipment</li> <li>Waste production of supplier business units reduced by 28.5% (Target: 28.5%)</li> <li>Evaluated the technology of current electronic-grade chemicals suppliers and electronic-grade materials recycling vendors</li> <li>Procured bulk gas made with environmentally friendly processes: using the electrolysis method to produce hydrogen to reduce carbon emissions</li> <li>Asked 12 local suppliers that consume 5 GWh and above per year to reduce power consumption by 97 GWh</li> </ul>

Note 1:TSMC held 2019 Advanced Process Materials Forums in May and September 2019, and the theme was Analysis on Organic Pollutants in Semiconductor Materials

Note 2:In 2019, TSMC worked with Occupational Safety and Health Administration, Ministry of Labor, and Professor Lin Yu-Wen from Fu Jen Catholic University for the third consecutive year, inviting twenty-one suppliers in spare parts washing, pump maintenance, and filtration material maintenance for washing towers to participate in the Supply Chain Occupational Safety and Health Promotion Project. Through document review and on-site inspections, TSMC offered advice on improving management procedures and workplace environment, hardware construction, and promoting labor health



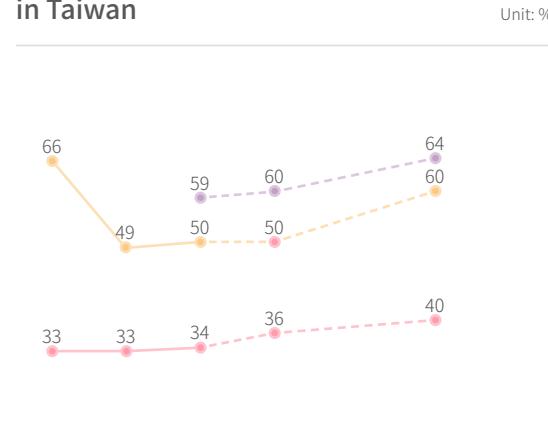
## First Integration of Responsible Supply Chain Forum and TSMC Supply Chain Management Forum

In 2019, TSMC integrated its Responsible Supply Chain Forum with the TSMC Supply Chain Management Forum for the first time, resulting in an increase in the attendance of high-level managers from supplier companies by 71%. It shows the determination of TSMC and suppliers for sustainability; by elevating the level of communication, the suppliers gain a better understanding of TSMC standards and requirements on environmental protection, occupational safety and health, and disaster management. In the forum, TSMC

reiterated its expectations for the suppliers to pursue the UN SDGs12 - to ensure sustainable consumption and production patterns, and to work with TSMC to fulfill corporate social responsibility. Suppliers and TSMC will continue to implement environmental protection policies, focus on reducing energy consumption, carbon emissions, and water usage, prevent pollution, and facilitate a circular economy.

Also, in the Supply Chain Management Forum, TSMC conducted its first questionnaire surveying the suppliers' awareness on sustainability strategies and future directions, quality control mechanisms, auditing, compliance, and implementation of the code of business

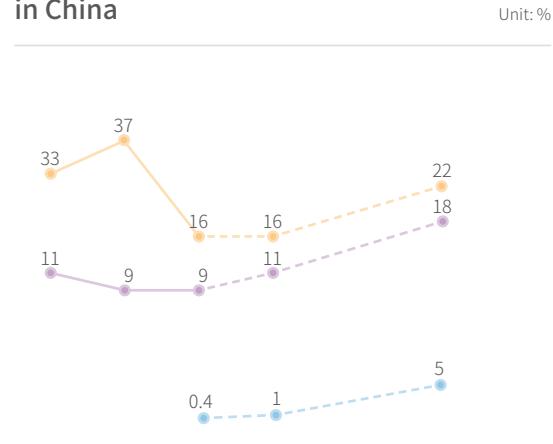
**Percentage of Local Sourcing in Taiwan**



● Indirect raw materials ● Backend equipment

○ Spare parts

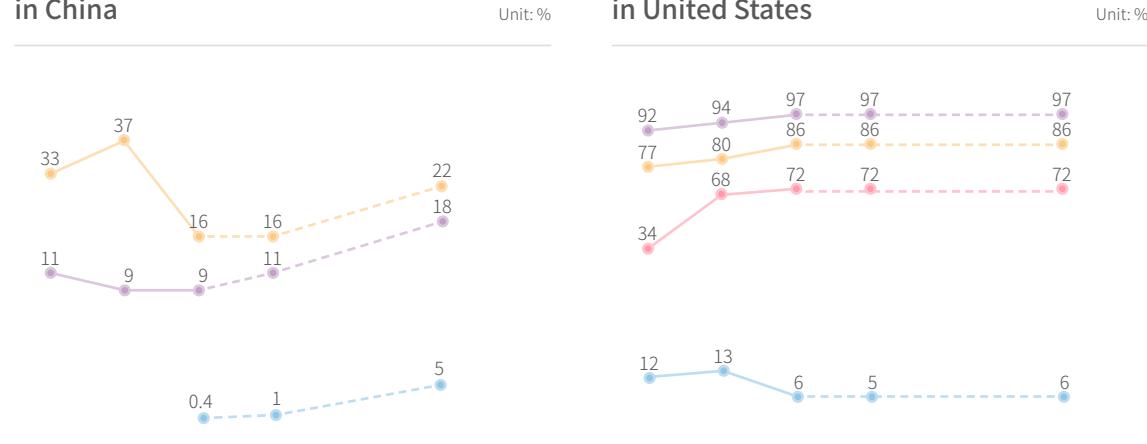
**Percentage of Local Sourcing in China**



● Direct raw materials ● Indirect raw materials

○ Equipment ○ Spare parts

**Percentage of Local Sourcing in United States**



● Direct raw materials ● Indirect raw materials

○ Equipment ○ Spare parts

ethics. Over 84% of the suppliers responded that sustainability strategies require the most emphasis; the survey shows that TSMC's dedication to a sustainable supply chain and the continuous requirement for suppliers to be responsible for their upstream supply chain have borne fruitful results.

## Continue to Promote the Upgrade of Local Supply Chain

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. The Company's headquarters is responsible for all procurement. To build a sustainable supply chain,

TSMC considers improving the sustainability of the local semiconductor industry to be a critical goal and views the continuous upgrade of the local supply chain as an essential strategy. In 2019, TSMC devoted to the following management measures:

- Set targets for local sourcing<sup>Note1</sup> to increase or maintain the percentage of local sourcing
- Proactively improve the technological levels and quality of suppliers of critical equipment, spare parts, and raw materials to increase local sourcing
- Invite international companies to set up factories in Taiwan, elevating the entire supply chain

Localizing the supply chain increases supply flexibility, shortens development time for new products, and cuts unnecessary costs while reducing carbon emissions of the supply chain and ensures the quality and efficiency of customer service. For many years, TSMC has set local sourcing targets and has continued to promote local procurement. Although subsidiaries including TSMC (China)<sup>Note2</sup>, TSMC (Nanjing), WaferTech in the US and others each have independent procurement units, as a part of the TSMC global supply chain, these subsidiaries also push for supply chain localization since enhancing the capabilities of local suppliers would benefit both the suppliers as well as TSMC.

Note 1: Local sourcing refers to the suppliers that manufacture or process in the local area

Note 2: Starting in 2019, the volume of local sourcing in China include that of TSMC (China) and TSMC (Nanjing). 100% of the equipment procured is currently 100% imported, while the percentage of local sourcing for spare parts is lower because TSMC (Nanjing) uses imported spare parts



## 2019 Results of Consultation for Local Raw Materials Suppliers on Process Advancement and Quality Improvement

Scope of Consultation	Categories / Number of Suppliers	Problems	Improvement Methods	Achievements
 <b>Consult on Spare Part Development for Advanced Processes</b>	 <b>2</b> Spare parts maintenance suppliers  <b>1</b> Spare parts coating supplier  <b>1</b> Spare parts machining supplier	<ul style="list-style-type: none"><li>The percentage of imported, high-level spare parts for several advanced processes is still too high, as local suppliers lack critical processing technology</li></ul>	<ul style="list-style-type: none"><li>Assemble experts to provide consultation for local suppliers, specify areas for development, offer technological training, and assist in certification, benefitting both the suppliers and TSMC</li></ul>	 <ul style="list-style-type: none"><li>✓ There are <b>381</b> items planned</li><li>✓ <b>51</b> items have been completed</li></ul>
 <b>Capacity Deployment</b>	 <b>3</b> Chemicals suppliers  <b>2</b> Photoresists suppliers  <b>1</b> Gases supplier	<ul style="list-style-type: none"><li>Capacity insufficient to meet advanced process requirements</li></ul>	<ul style="list-style-type: none"><li>Production line expansion</li></ul>	 <ul style="list-style-type: none"><li>✓ Capacity increase</li></ul>
 <b>Improve Advanced Measurement Technology</b>	 <b>5</b> Chemicals suppliers  <b>1</b> Photoresists supplier  <b>8</b> Gases suppliers	<ul style="list-style-type: none"><li>Measurement technology insufficient to meet advanced process requirements</li></ul>	<ul style="list-style-type: none"><li>Add analytical instruments and methods</li></ul>	 <ul style="list-style-type: none"><li>✓ Zero rejects</li><li>✓ Detection threshold increased by <b>10%</b></li><li>✓ Capability for IC material analysis</li></ul>
 <b>Improve Environment, Safety, and Health Performance</b>	 <b>1</b> Backend supplier	<ul style="list-style-type: none"><li>Failed to establish an Environment, Safety, and Health Management system</li><li>Failed to identify or reduce fire risks</li></ul>	<ul style="list-style-type: none"><li>Establish an Environment, Safety, and Health management system and receive ISO45001 third-party certification</li><li>Identify fire risks, and improve measures to reduce fire risks</li></ul>	 <ul style="list-style-type: none"><li>✓ Improved audit scores by <b>25%</b></li><li>✓ From Failed to Intermediate</li></ul>



## Case Study

# Collaboration with Taiwan Specialty Chemicals Corporation - TSMC 2019 Outstanding Supplier Award Winner for Breakthrough in Quality

Supply chain localization not only ensures source and quality stability for TSMC materials; working with local raw materials suppliers allows TSMC to improve the production quality of critical raw materials, expand capacity, reduce the carbon footprint for the supply chain, and strengthen supply chain sustainability.

## Localization Maximizes Production Benefit of Critical Raw Materials

TSMC products require a specialty gas - Disilane (Si<sub>2</sub>H<sub>6</sub>). Due to the high purity and precision necessary for semiconductor production, the technological barrier led TSMC to procure this gas from overseas suppliers. In 2017, TSMC assembled an inter-departmental project team consisting of experts in supply chain material management, quality and reliability, and facility services, to provide consultation for a local semiconductor raw materials supplier, Taiwan Specialty Chemicals Corporation, on Disilane production. After multiple on-site audits and technology exchanges, the Disilane produced by the Taiwan Specialty Chemicals Corporation now meets advanced processes requirements from TSMC.

In 2019, Taiwan Specialty Chemicals Corporation received a TSMC Outstanding Supplier Award, which is the evidence of synchronized growth for both local suppliers and TSMC.

## Collaboration Process of TSMC and Local Raw Materials Supply Chain



## Forging an Advanced Local Supply Chain

TSMC took the initiative to establish a more effective supply chain, systematically inviting foreign companies to set up factories in Taiwan. By doing so, TSMC firstly reduces supply chain procurement risk, and secondly, offers the local region employment and business opportunities, further strengthening supply chain sustainability.

### Invite International Companies to Produce in Taiwan

Japanese manufacturer EBARA is the second largest supplier of semiconductor vacuum pumps worldwide. Responding to TSMC's dedication to localization and sustainability, EBARA set up factories in Taiwan upon TSMC's invitation. This venture allows EBARA to keep in step with customer demands, as well as improve company competitiveness relying on TSMC's influence in the global semiconductor industry.



### Provide Consultation for Manufacturing Processes, Benefiting Both the Suppliers and TSMC

EBARA has manufactured spare parts in Taiwan since 2011, while TSMC assists in product quality certification. TSMC has been closely involved in product enhancement as well as design improvement for spare parts, offering timely assistance. As a result, EBARA managed to reduce overall manufacturing cost, improve output capacity and efficiency, and become more competitive in the global market. Meanwhile, EBARA's marginal effect on the supply chain helped to elevate Taiwan's manufacturing capabilities for pump-related spare parts, benefiting the entire supply chain.

As of 2019, EBARA has fully supported TSMC's expansion in capacity for advanced processes, and the products manufactured in Taiwan, in return, were sold by the parent company in Japan to customers worldwide. EBARA's capacity in Taiwan has surpassed 80%, making Taiwan a critical source for vacuum pump spare parts in the world.

### Five Stages of Supplier Setting Up Factories in Taiwan



## Focus 4

# Green Manufacturing

## A Practitioner of Green Power

TSMC's goal is to facilitate coexistence and mutual prosperity between business and environment. Aiming to become a practitioner of green power, we assimilate green management into our business and implement continuous improvement projects in the areas of climate change, energy management, water management, waste management, and air pollution control. We hope to protect our environment while increasing the Company's value.

---

**1**

Led the world to reach 93% reduction rate of fluorinated greenhouse gases (F-GHGs) and nitrous oxide processing equipment exhaust

### 133.7 Million Metric Tons

Recycled 133.7 million metric tons of water in total

### > 300 Million (NT\$)

Promoted the Circular Economy Project to create over NT\$300 million of value through recycling and waste reduction





# Climate Change and Energy Management

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Drive Low-Carbon Manufacturing

Continue to use best available technology to reduce emissions of greenhouse gases (GHG), becoming an industry leader in low-carbon manufacturing

- Reduce greenhouse gas emissions per unit of production (metric ton of carbon dioxide equivalent (MTCO<sub>2</sub>e)/8-inch equivalent wafer mask layer) by 40% (Base year: 2010)<sup>Note</sup>

- Reduced greenhouse gas emissions per unit of production (metric ton of carbon dioxide equivalent (MTCO<sub>2</sub>e)/8-inch equivalent wafer mask layer) by 17%  
Target: 16.5%
- Reduced fluorinated greenhouse gas (F-GHG) emissions per unit of production (MTCO<sub>2</sub>e/8-inch equivalent wafer mask layer) by 65%  
Target: 60%
- Total fluorinated greenhouse gases emissions decreased 15%  
Target: 15%

- Reduce greenhouse gas emissions per unit of production1 (metric ton of carbon dioxide equivalent (MTCO<sub>2</sub>e)/8-inch equivalent wafer mask layer) by 18%

### Use Renewable Energy

Continue to purchase renewable energy and establish solar-energy power systems, increasing the use of renewable energy

- Renewable energy accounts for 20% of energy consumption of new fabs starting from 3nm, and the purchasing of renewable energy to increase annually to achieve 25% renewable energy for fabs and 100% renewable energy for non-fab facilities

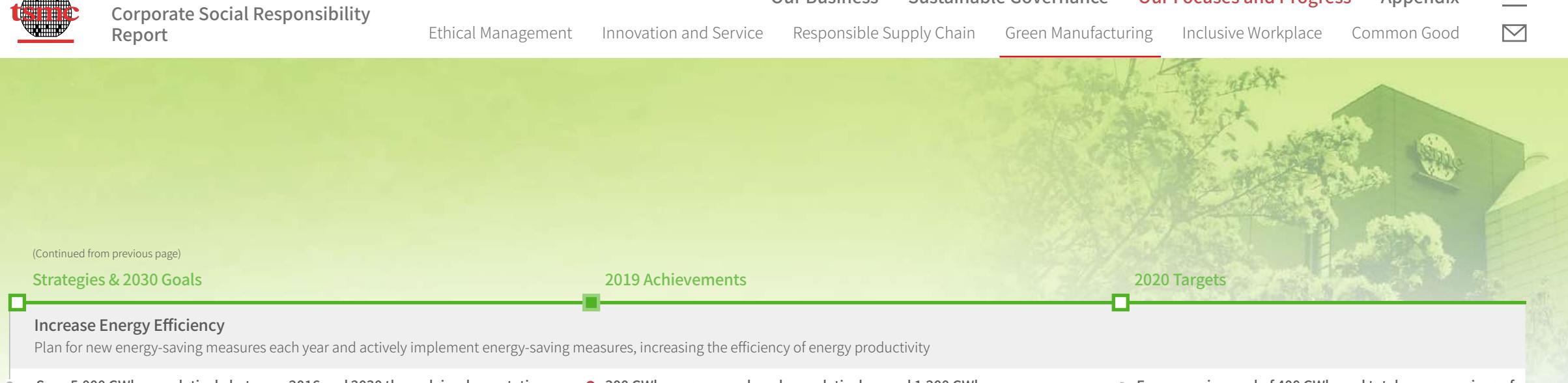
- 910 GWh of Renewable Energy, Renewable Energy Certificates (REC), & Carbon Credit purchased, achieving 6.7% of TSMC's power consumption  
Target: All overseas sites use renewable energy
- Taiwan sites continued to negotiate 700MW of additional long-term renewable energy purchases  
Target: Negotiating

- Continue to purchase renewable energy until it makes up 7% of TSMC's energy consumption, and overseas sites use 100% renewable energy

● Exceeded   ● Achieved   ○ Missed Target

Note: Reduction of greenhouse gas emissions includes reduction of fluorinated greenhouse gas emissions. This indicator will be used as of 2020 to manage the performance of various practices

(Continued on next page)



(Continued from previous page)

#### Strategies & 2030 Goals

#### 2019 Achievements

#### 2020 Targets

##### Increase Energy Efficiency

Plan for new energy-saving measures each year and actively implement energy-saving measures, increasing the efficiency of energy productivity

- Save 5,000 GWh cumulatively between 2016 and 2030 through implementation of new energy-saving measures
- Double energy efficiency after five years of mass production for each process technology<sup>Note 1</sup>

- 300 GWh energy saved, and cumulatively saved 1,200 GWh  
Target: 200 GWh; 1,100 GWh
- Energy efficiency of 16-nm and above process technologies in the fifth year of mass production improved 1.4 times on average; energy efficiency of 10-nm technology in the third year of mass production improved 0.7 times on average  
Target: **NEW**
- Energy consumption per unit of production increased 17.9%  
(Base year: 2010)<sup>Note 2</sup>  
Target: Reduction of 11.5%

- Energy saving goal of 400 GWh, and total energy savings of 1,600 GWh
- Process energy efficiency of 10-nm process technology improves 0.8 times in fourth year of production

##### Strengthen Climate Resilience

Establish climate change countermeasures and preemptive precautions, lowering the risks of climate disasters

- 0 days of production interruption due to climate disasters

- 0 days of production interruption due to climate disasters  
Target: 0 days

- 0 days of production interruption due to climate disasters

Note 1: Energy efficiency is the product equivalent per each kWh of power (8-inch equivalent wafer-mask layer/kWh)

Note 2: The increased complexity of new process technologies and manufacturing processes results in increased power consumption in new process equipment, causing the power consumption of <10-nm processes to be double that of >16-nm technologies

● Exceeded   ● Achieved   ● Missed Target

In 2019, the European Parliament declared a climate emergency in response to the frequent climate disasters around the world. TSMC effectively adapted to the potential impacts of climate disasters on business operations by strengthening climate-resilient designs for its facilities and reinforcing emergency response disaster drill plans. Furthermore, the Company purchased 910 GWh of renewable energy and improved its energy management, investing additional resources to the development of energy-saving designs for production equipment. Through a series of relentless efforts, carbon emissions per unit of production continued to decrease, effectively mitigating greenhouse gas emissions.

In 2019, TSMC reported steady decreases in carbon emissions per unit of production while it continued to expand production capacity and develop new technologies. As declared in the Corporate Social Responsibility Policy and Environmental Protection Policy, responding to climate change is the responsibility of sustainable business such as TSMC. Striving to become a world leader in green manufacturing is our mission. We believe that only through cooperation with business partners, industry, government, academia, and all of society can we work together to overcome the severe challenges of climate change.

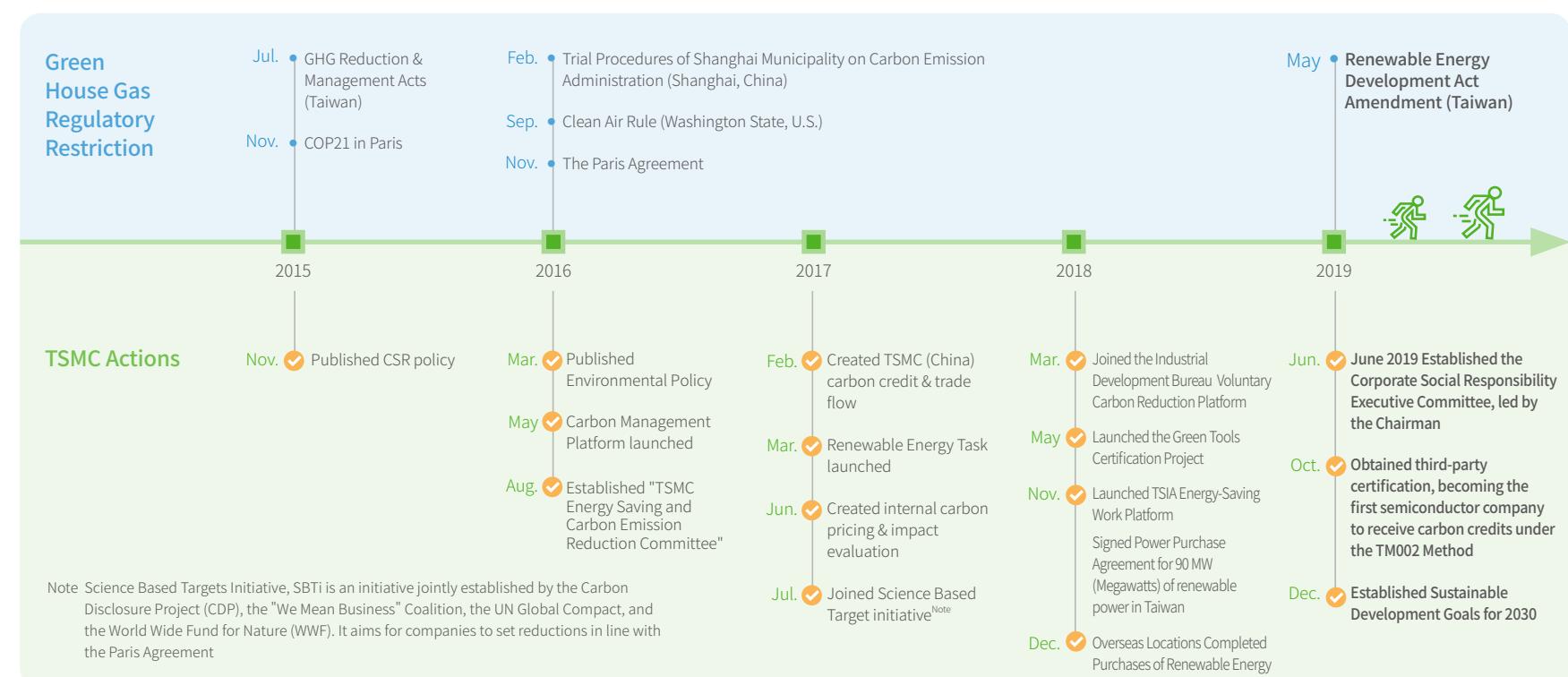
With the continuous advancement of process technology, integrated circuits are growing increasingly complex and therefore, the power required to manufacture them continues to grow. Even though in 2019 TSMC invested considerable resources into the development of renewable energy and green

tools, implemented 503 energy-saving measures, and introduced new energy-saving equipment, energy consumption per unit of production still did not reach the anticipated reduction goals. With a commitment to green manufacturing, TSMC will continue to purchase renewable energy and expand renewable energy power generation to increase the percentage of renewable energy in TSMC's energy structure, reduce greenhouse gas emissions from production activities, and achieve the goals of greenhouse gas reduction.

TSMC established the Corporate Social Responsibility Executive Committee in 2019. Led by the Chairman, TSMC's management team examines a variety of corporate sustainable development issues, and climate change received the greatest focus. In addition to biannual reviews, the CSR Executive Committee must report the company's climate actions and outcomes to the Board of Directors every year. Extreme climate and global warming may lead to potential business crises, and therefore TSMC is focused on three main goals:

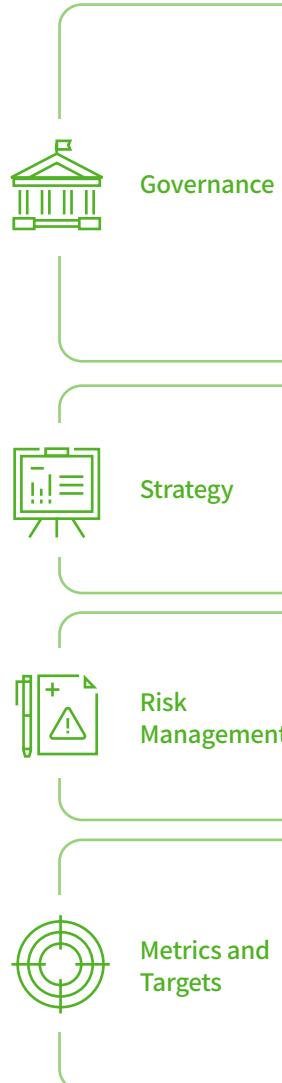
compliance with regulations, energy conservation and carbon reduction, and the management of carbon assets. In 2019, the Task Force on Climate-related Financial Disclosures (TCFD) framework proposed by the Financial Stability Board (FSB) was used to identify TSMC's climate risks and opportunities. Based on the results, measures and goal management were established to effectively track response progress and outcomes, thereby lowering the financial impact of climate risks on business operation.

## A History of Responses to Climate Change





## TSMC Task Force on Climate-related Financial Disclosures (TCFD)



### Corporate Management Strategies and Actions

- Board of Directors reviews climate change-related risks and opportunities
  - [Corporate Social Responsibility Executive Committee](#)  
The Corporate Social Responsibility Executive Committee is TSMC's top management organization in climate change management. The CSR Executive Committee is chaired by the Chairman, and the chair of the Corporate Social Responsibility Committee serves as the executive secretary. It reviews TSMC's climate change strategies and goals every six months and reports to the Board of Directors
  - [The Corporate Social Responsibility Committee](#)  
Chaired by the Senior Vice President of Europe & Asia Sales, the CSR Committee promotes sustainability projects in accordance with its strategies and goals and reviews implementation performance every quarter
  - [The Energy Saving and Carbon Emission Reduction Committee](#)  
The Energy Saving and Carbon Emission Reduction Committee is the Company's management organization for taking action on climate change risk and opportunity. It is chaired by the Senior Vice President of Fab Operations. Every quarter, this Committee formulates management plans, reviews implementation status, and discusses future plans
- Engage in cross-departmental discussions, and identify short-term, mid-term, and long-term climate risks and opportunities
- Major climate risks and opportunities are evaluated for the potential impact to Company operations and finance
- Carry out scenario analyses and evaluate Science Based Targets (SBT)
- Use the TCFD framework to construct TSMC's identification procedure for climate risks
- Set appropriate response plans in accordance with climate risk identification and ranking results
- Integrated climate risks identification and ranking in Enterprise Risk Management(ERM) process
- Set management metrics related to climate change
- Followed ISO 14064-1 to conduct regular inventory of greenhouse gas emissions to examine the impact on the company's operations.
- Drew up climate change management targets and examine progress and actual performance towards reaching the targets



### 2019 Implementation Status

- Composed of high-level managers from various departments, the CSR Executive Committee was established in December 2019, to set long-term targets and development directions for climate change and renewable energy by 2030. For more details, please refer to the section entitled "[CSR Management](#)"
- The CSR Executive Committee Executive Secretary and Senior Vice President of Fab Operations jointly presented a report on green manufacturing actions that save energy and reduce carbon, as well as the purchasing of renewable energy and future practices to the Board of Directors, and received the board's support
- The Senior Vice President of Information Technology and Materials Management & Risk Management presented a report on climate change-related risk for water resources, power supply and natural disaster to the Board of Directors. Furthermore, backup plans and hardware infrastructure have been established.
- 503 energy-saving measures, divided into eight categories, have been planned and implemented, saving 300 GWh of electricity, and making TSMC the first semiconductor company in Taiwan to receive carbon credits under the TM002 Method. For more details, please refer to the section entitled "[Increase Energy Efficiency](#)"
- Based on the results of cross-departmental discussions on [climate risks and opportunities](#), nine opportunities and seven risks have been identified in total. For more details, please refer to the section entitled "[Climate Risk and Opportunity Matrix](#)"
- Completed the [Climate Change Risks and Opportunity Evaluation Project](#), and used the [Carbon Pricing](#) mechanism to prompt the promotion and development of energy conservation and carbon reduction activities
- Used the 2° C global warming scenario of the Intergovernmental Panel on Climate Change (IPCC) to analyze climate risks during operation, and devised relevant mitigation measures that complied with the [Adaptation policy framework for climate change](#) and developed strategies for renewable energy purchasing to meet SBT
- The TCFD workshop was hosted. Through [cross-departmental](#) discussions, climate-related risks/opportunities were identified and ranked, and their financial impact was evaluated.
- Reported climate-related risks/opportunity evaluation results and financial impact to the chair of the Corporate Social Responsibility Committee, and then carried out response plans
- For more details, please refer to the section entitled "[6.3 Risk Management](#)" in the 2019 TSMC Annual Report
- Researched and devised climate change performance indicators, including greenhouse gas emissions per unit of product, renewable energy purchasing, total energy saved, and days of production interruption due to climate disasters. For more details, please refer to the section entitled "[Climate Change and Energy Management Strategies, Goals, and Outcomes](#)"
- In accordance with carbon inventory results, the risks of Scope 1 emissions were reduced effectively because of continuous implementation of carbon reduction actions. The risk of Scope 2 indirect greenhouse gas emissions due to electricity consumption and the risk of Scope 3 due to supplier indirect emissions continue to increase. For more details, please refer to the section entitled "[Greenhouse Gases \(GHG\) Inventory](#)"
- Set climate change and energy management goals for 2030 in accordance with climate change performance indicators while top management performed reviews on implementation performance on a regular basis. For more details, please refer to the section entitled "[Climate Change and Energy Management Strategies, Goals, and Outcomes](#)" and "[GHG Reduction Standard Practices](#)"

## Climate Risk Matrix

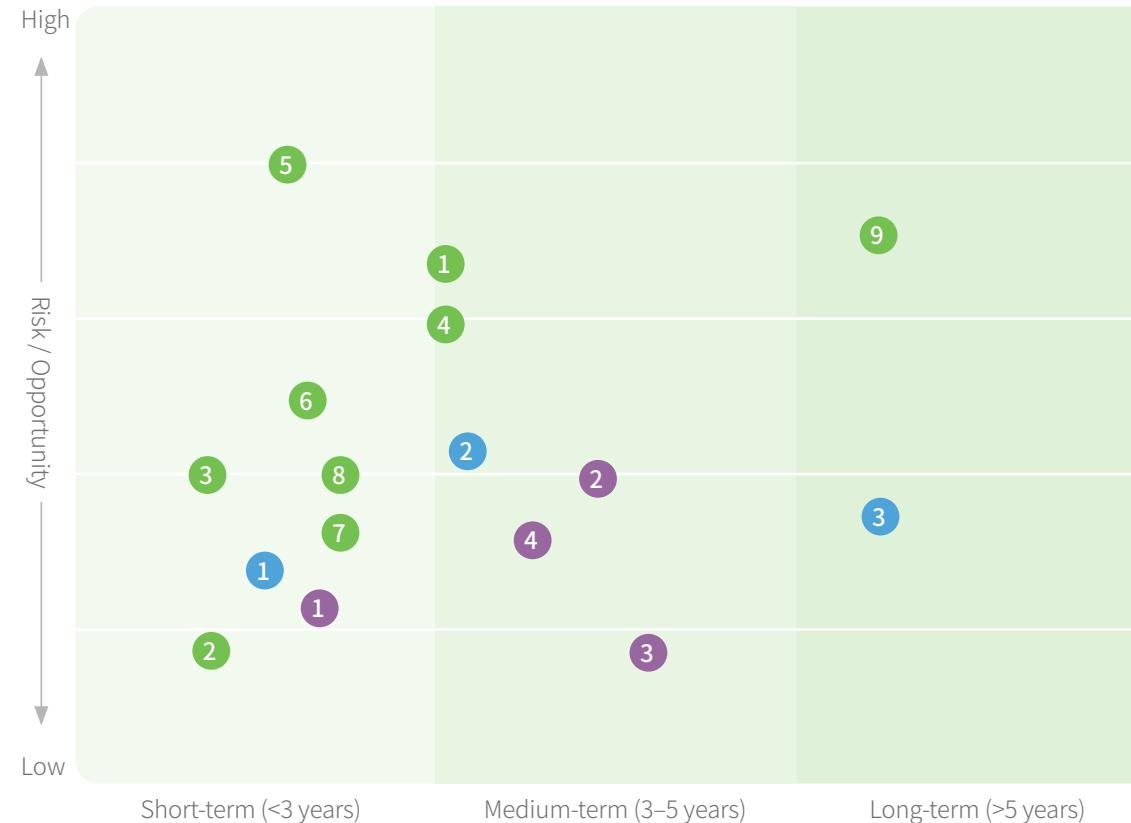
With the support of top management, TSMC has identified and ranked climate-related risks and opportunities by following the TCFD. The Company refers to international research reports on climate risks and opportunities and conducts

cross-organizational evaluations of climate change risks and response measures to identify potential risks and possible opportunities in response to climate change. TSMC has set policies and solutions that encompass economic development,

environmental protection, and sustainable development. The Company actively implements energy saving, carbon reduction, and water-saving plans; constructs green buildings, establishes CO<sub>2</sub> assets, develops energy-saving products

and services, strengthens climate resilience, and develops a culture of environmental sustainability.

## Climate Change Risk and Opportunity Matrix



### Opportunities

- 1 Participate in carbon trading/renewable energy market
- 2 Obtain government's cooperation and reward
- 3 Construct green buildings
- 4 Increase efficiency of water consumption and water recycling
- 5 Develop low-carbon products and serve the market
- 6 Increase investors' willingness for long-term investment
- 7 Strengthen resilience to natural disasters
- 8 Promote energy-saving and low-carbon production
- 9 Positive corporate image



### Physical Risks

- 1 Typhoon, flooding
- 2 Drought
- 3 Rising Temperature



### Transition Risks

- 1 Energy resources/greenhouse gas laws and regulations
- 2 Increase in Greenhouse gas emissions costs
- 3 Unstable energy supply
- 4 Impact on the Company's image



## Financial Impact Analysis of Climate Change

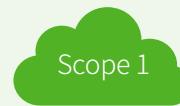
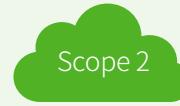
Climate Risks	Potential Financial Impact	Climate Opportunities	Potential Financial Impact	2019 Actions
<b>GHG Restrictions and Carbon Trading System</b>	Restriction on capacity expansion, increase in operation costs	<b>Participation in renewable energy plans</b> <b>Participation in carbon trading market</b>	Early purchases of renewable energy, successfully increasing manufacturing capacity	 Continued to negotiate the purchasing of additional long-term renewable energy in Taiwan ✓ 910 GWh of Renewable Energy, Renewable Energy Certificates (REC), and Carbon Credit purchased
<b>Increase in Greenhouse gas emissions costs</b>	Increased cost of installation and operation for carbon reduction facilities	<b>Obtain government's reward and cooperation</b>	Accumulate carbon credits in preparation for future expansion of manufacturing capacity	✓ Applied for fluorinated greenhouse gas and nitrous oxide reduction offset project to receive carbon credit
<b>Unstable Utilities (Water, Electricity)</b>	Impact on production, increase in operation costs	<b>Construct green buildings</b> <b>Increase water resource usage efficiency and use reclaimed water sources</b>	Lower utility costs Strengthen climate resilience, lower the impact of disasters on production	✓ Acquired four green building certificates ✓ Maintained water recycling rate greater than 85% while designing new fabs (Fab 18 Phase 2, Fab 15 Phase 7, and Fab 6 Phase 2)
<b>Cost of Developing Low-Carbon Energy Saving Products</b>	Increased cost of developing low-carbon energy saving products	<b>Develop or increase energy-saving products or services</b>	Satisfy customer demands for energy saving products, increase revenue	✓ Invested in the development of energy-saving products
<b>Impact on the Company's Image</b>	Unable to satisfy the expectations of stakeholders, impacting the Company's reputation or image	<b>Increase investors' willingness for long-term investment</b>	Stabilize stakeholder structure, lessen the risk of large stock fluctuations	✓ Boosted green production
<b>Typhoon, Flooding</b>	Production is affected, causing financial losses and a decrease in revenue	<b>Increase resilience against natural disasters</b>	Strengthen climate resilience and lower the risk of operation interruption and potential losses	✓ Raised the building base of Fab 18 Phase 2 two meters higher ✓ Fab 18 Phase 2 committed to using and developing reclaimed water ✓ Established a comprehensive water use monitoring system
<b>Drought</b>		<b>Driving low-carbon green manufacturing</b>	Save energy and cut cost	✓ Conserved 300 GWh of electricity through energy-saving projects
<b>Cost of Developing Low-Carbon Energy Saving Products</b>	Increase in energy demand, cost, and carbon emissions			



## Continue to Drive Low-Carbon Manufacturing

TSMC has long been committed to green manufacturing and aspires to be a world leader in low-carbon manufacturing. The Company performs yearly reviews of the overall effectiveness of carbon reduction based on third party-verified GHG inventory results. Because fluorinated greenhouse gas emissions and the indirect emission of GHGs due to power consumption are the two main sources of GHG emissions, TSMC has for many years continued to establish industry best-practice measures for GHG reduction, replacing and installing roughly 1,600 point-of-use abatement equipment for fluorinated GHGs and nitrous oxide in 2019. At the same time, the Company has continued to build green factories and constructed two additional facilities, acquired four green building certificates, and implemented energy-saving projects on production tools and utility facilities , while taking progressive steps to increase the use of renewable energy to effectively reduce the emission of GHG per unit of production.

## GHG Reduction Standard Practices

TSMC Standard Practices		2019 Implementation Status
 Scope 1 <b>Direct GHG Emissions</b>		
 Scope 2 <b>Indirect GHG Emissions</b>	• ISO 14064-1 inventory and third party verification	<b>100%</b>  All fabs and subsidiaries underwent inventory and third party verification
	• Optimization of gas quantity used in production	<b>100%</b>  100% introduced GHG-optimized process parameters in accordance with the manufacturing specifications of the <a href="#">Intelligent Engineering Center</a>
	• Substitute high global warming potential (GWP) fabrication gases	<b>100%</b>  All 12-inch fabs are now using optimized carbon reduction technology – remote plasma dissociation of nitrogen trifluoride ( $NF_3$ ), while 6-inch and 8-inch fabs are using nitrogen trifluoride( $NF_3$ )/octafluorobutane( $C_4F_8$ )
	• Install Point-Of-Use abatement equipment for fluorinated GHGs	<b>100%</b>  Installed 1,500 POU abatement equipment on new process tools using F-GHG in new and existing fabs (including subsidiaries)  Continued to replace and upgrade 111 POU abatement equipment in existing fabs, with installation rate increased to 90%
	• Continue to develop on-site nitrous oxide removal technology	<b>5</b>  Continued to develop removal technology, and types of certified equipment increased from 3 to 5  After inclusion as new standard equipment in 2018, new comprehensive equipment was installed in Fab 18
 Scope 2 <b>Indirect GHG Emissions</b>	• ISO 50001 energy management and third party verification	<b>100%</b>  The Company underwent ISO 50001 inspection and third party verification; 100% of facilities in Taiwan completed third party verification in 2019
	• Construct green buildings	<b>1</b>  The Company leads the global semiconductor industry with the largest LEED-certified building area and constructed two more fabs, which received LEED certification and EEWH green architecture certification. In total to date, 32 buildings have received LEED certifications and 23 buildings received EEWH certifications
	• Energy efficiency standards	<b>503</b>  Energy efficiency of advanced-technology fab tools leads industry peers, with 503 energy-saving measures implemented and 300 GWh saved
	• Next-generation fab tools use energy-saving, carbon-reducing designs	<b>1</b>  Launched an energy conservation project for next-generation fab tools, and in 2019, implemented 110 energy saving projects for 54 process tools. Four vendors completed energy-saving certification for 27 process tools
	• Introduce renewable energy	<b>910 GWh</b>  Leading semiconductor manufacturer in Taiwan, with 910 GWh of Renewable Energy, Renewable Energy Certificates (REC), & Carbon Credit purchased

Note: Data comparison with industry peers refers to the World Semiconductor Association Report

## Greenhouse Gases (GHG) Inventory

In 2019, TSMC continued to implement the standard practices of the manufacturing process gases by optimizing the amount of use, minimizing the global warming potential (GWP), and maximizing the removal rate in exhaust, and comprehensively adopted the best available technology. By taking concrete actions, the Company has effectively reduced 320 metric tons CO<sub>2</sub>e of direct emissions (Scope 1), of which fluorinated greenhouse gases emissions per unit of production were reduced considerably by 65%, achieving the 2020 reduction goal ahead of schedule. Indirect emissions

(Scope 2) due to energy consumption were also curbed as a result of increased use of renewable energy. Indirect emissions (Scope 3) of upstream and downstream value chains mainly involve raw material production and energy-related activities. Currently, TSMC has set energy conservation and carbon reduction goals with its suppliers to work together toward creating a sustainable supply chain. Because GHG emission reduction accounts for fluorinated greenhouse gases emissions, the term "GHG emission per unit of production" will be used as of 2020 to indicate future management performance.

TSMC pays close attention to the various climate actions following the Paris Agreement, including the science-based targets (SBT) of holding the increase in the global temperature to well below 2° C and the 100% renewable energy (RE100) initiative. TSMC is well aware that using renewable energy is the necessary and primary approach for existing companies to achieve the SBT reduction goal. TSMC has continued to grow its production capacity in recent years. Thus, its overall carbon emissions are still increasing, despite the Company's global efforts to implement best practices for energy conservation and

carbon reduction, and achieved the goal of reducing carbon emission per unit of production. Moreover, the renewable energy markets in TSMC's major production bases are not equipped to supply as much renewable energy as other European and American countries. In addition to constantly strengthening various green innovations, TSMC also actively promotes regional renewable energy development to identify potential opportunities for carbon reduction.

### Scope 1 – GHG Emissions

Unit: metric ton CO<sub>2</sub>e



GHG Emission of Taiwan Facilities

GHG Emission of Subsidiaries

GHG Emission Intensity (tCO<sub>2</sub>e / 8-inch equivalent wafer mask layer)

Note 1: The GHG Emission data of scope 1 and scope 2 included TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.

Note 2: The GHG Emission Intensity data of scope 1 and scope 2 included TSMC's wafer fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.

Note 3: Emission factor is based on data released in 2019 by the Bureau of Energy stating that 0.554 kg of CO<sub>2</sub> equivalent / kWh, where 1 kg of CO<sub>2</sub> equivalent equals 6,805 kilojoules.

### Scope 2 – GHG Emissions

Unit: metric ton CO<sub>2</sub>e



GHG Emission of Taiwan Facilities

GHG Emission of Subsidiaries

GHG Emission Intensity (tCO<sub>2</sub>e / 8-inch equivalent wafer mask layer)

### Scope 3 – GHG Emissions

Unit: metric ton CO<sub>2</sub>e



Purchased Services and Products (SimaPro model)

Fuel and Energy Related Activities (EPA CFP Database)

Downstream Logistics (EPA CFP Database)

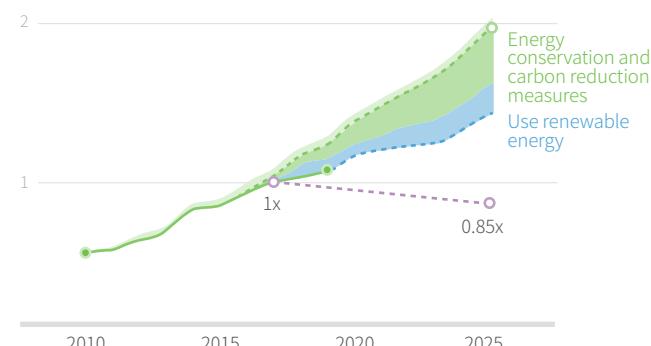
Employee Commute (EPA CFP Database)

Operational Waste Management (EPA CFP Database)

Upstream Logistics (EPA CFP Database)

Business Travel Abroad (Boustead model)

### Greenhouse Gas Emissions and Reduction Roadmap



Actual carbon emissions

Carbon emissions pathway with reduction plans

Carbon emissions pathway without reduction

Science-based targets

Note 1: Greenhouse gas emissions including Scope 1&2 are normalized on 2017 as baseline.

Note 2: TSMC began introducing Science Based Targets initiative (SBTi) in 2017, which is the base year for reduction.

## Increase Use of Renewable Energy

TSMC has been actively installing, using, and purchasing renewable energy in 2019. In addition to compliance with legal obligations, our aim is for 25% of power consumed by TSMC fabs to be supplied from renewable energy, and non-fab power consumption is 100% supplied from renewable energy by the end of 2030. Our long-term goal is to purchase renewable energy until it makes up 100% of TSMC's power consumption. Through purchasing of renewable energy and supporting the government's renewable energy policies, TSMC hopes to drive the application of renewable energy and development of related industries, and practice environmental sustainability.

### Renewable Energy Purchasing

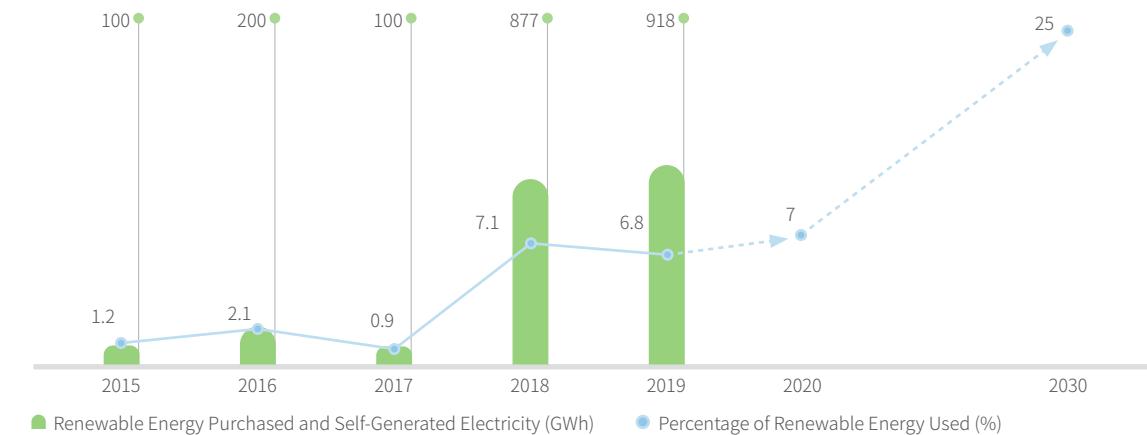
Starting in 2018, TSMC began to purchase renewable energy, RECs, and carbon credits in countries with comprehensive regulations and ample supply, aiming to completely 100% offset the carbon dioxide emissions from the power used in locations around the world such as the United States, Canada, Europe, China, and Japan. In 2019, TSMC's overseas sites have achieved the goal of zero carbon emissions from power consumption.

In 2019, TSMC developed strategies to increase the purchasing of renewable energy in Taiwan. Around 0.7GWh of renewable energy is currently under negotiation, which will be supplied to TSMC in the coming years. Since Taiwan's renewable energy development is still in its nascent phase, TSMC has

set up a Renewable Energy Development Task Force through which it closely communicates with government through the Allied Association for Science Parks and the Taiwan Semiconductor Industry Association (TSIA) to provide constructive suggestions regarding renewable energy development. For example, TSMC has advised the government to expand offshore wind farms and increase the supply from renewable energy trading platforms. With the collaboration between the Ministry of Economic Affairs, Taipower, Green energy companies and TSMC, renewable energy development in Taiwan has reached a key milestone. 90MW of renewable energy was officially provided to TSMC in early May 2020, making TSMC one of the first companies in Taiwan to purchase retransmitted renewable energy.

The highest governing body of TSMC—the Board of Directors—supports the UN SDGs of affordable and clean energy and climate action, pays attention to renewable energy purchasing issues, and requires the Corporate Social Responsibility Executive Committee to regularly provide reports on renewable energy purchase strategies and progress. TSMC believes that close communication with the government and cooperation with renewable energy providers will accelerate the growth of Taiwan's renewable energy industry, which in turn increases the purchasing of renewable energy and reduces the environmental impact of power consumption.

### Use of Renewable Energy and Percentage



### TSMC Renewable Energy Development Timeline



## Installing a Renewable Energy Power System

Apart from purchasing renewable energy, TSMC has also installed solar panels at its sites, providing zero carbon emission renewable energy for fabs. In 2019, 1,720kWp of solar panel capacity was installed, and has already provided 3.7 GWh, decreasing carbon emissions by 1,975 metric tons, or the annual carbon absorbed by 197,500 trees. In 2020, an additional 655 kWp in capacity of solar panels will be added, and this is expected to generate up to 5.27 GWh of power.

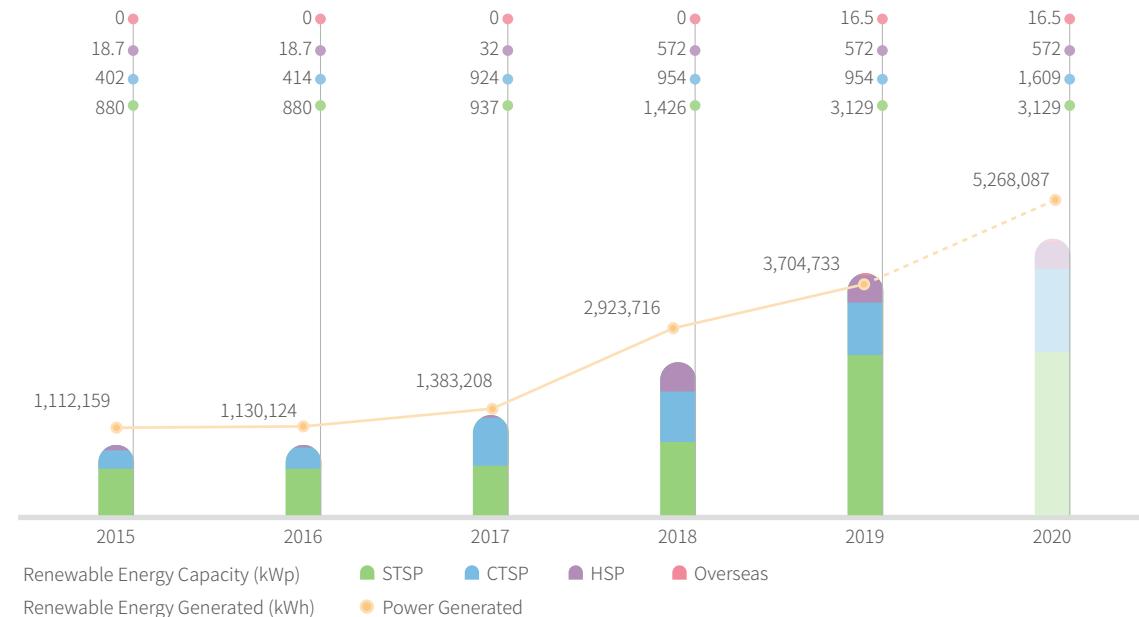
### Increase Energy Efficiency

In light of the continuous growth of production capacity and the development of complex advanced manufacturing processes, improving the efficiency of production energy is a longstanding commitment for TSMC. In addition to setting energy-saving goals in 2019, TSMC also responded to the seventh SDG of the UN: Affordable and

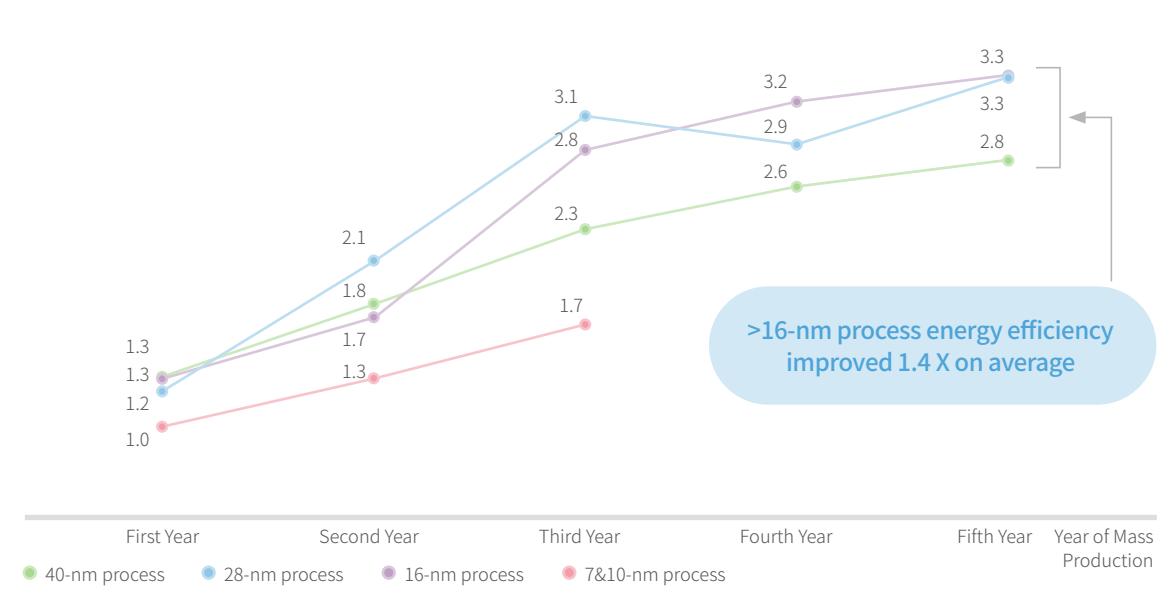
clean energy. To meet our goal of doubling energy efficiency by 2030, TSMC has developed the [Process Energy Efficiency Enhancement Plan](#), which aims to manage energy usage, increase power efficiency, and maximize production process efficiency to ultimately double the energy efficiency of each process technology

after its fifth year of mass production. In 2019, the energy efficiency of >16-nm process technology improved 1.4 times on average after five years of mass production, and the energy efficiency of 10-nm and 7-nm process technology also improved 0.7 times on average after three years of mass production, reaching their targets for the year.

### TSMC Renewable Energy Capacity & Generated



### Annual Improvement of Process Energy Efficiency



## Comprehensive Energy Inventory and ISO50001 Third-Party Verification

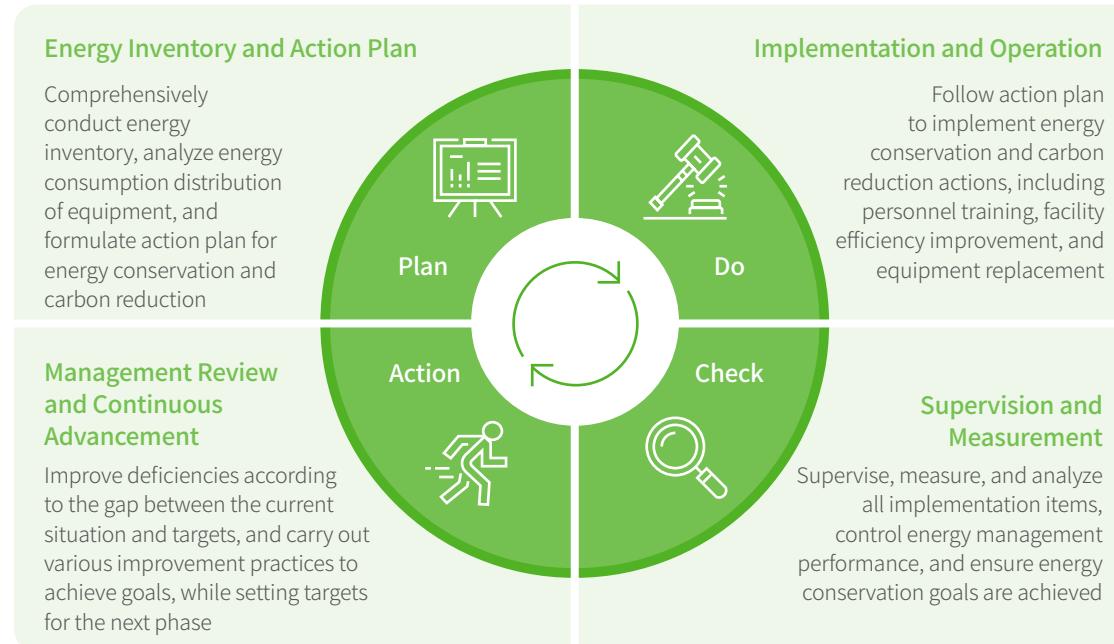
Energy management is an ongoing responsibility for TSMC. The Company is committed to systematically managing each kWh of power. All fabs in Taiwan have obtained ISO50001 energy management certification in 2019. Insisting on transparent and fair inspection and inventory, TSMC identifies improvement opportunities from its status quo; therefore, as of 2019 following a comprehensive GHG inventory

through ISO 14604 verification, TSMC requires all of its fabs to complete the ISO50001 energy management third party verification every year and follow the Plan-Do-Check-Act (PDCA) management model to strengthen their self-management mechanisms and continue to achieve energy conservation and carbon reduction targets.

In 2019, TSMC consumed a total of 14,327 GWh in energy; with electricity making up 94.8%, natural gas coming second at 5.2%, and diesel with less than 0.1%. Electricity is the main energy used to power TSMC's manufacturing equipment and fab systems. Natural gas is used in exhaust processing facilities to decrease the direct emission of fluorinated greenhouse gases and volatile organic compounds.

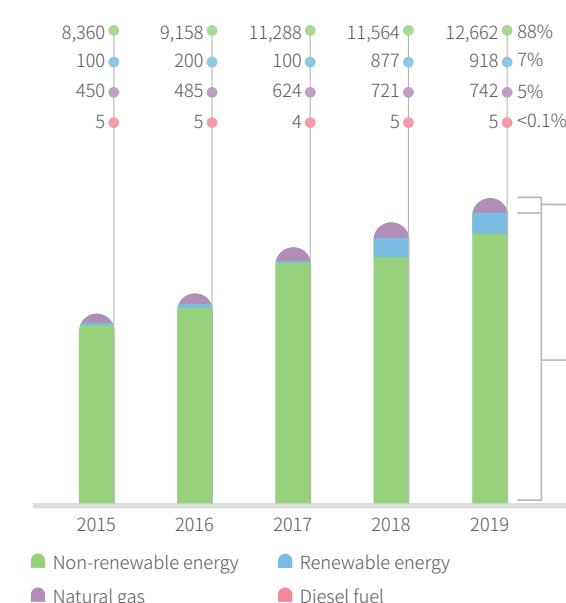
Diesel is not used directly in production, but to run power generators and fire pumps during emergencies, power outages, or during annual maintenance.

## Focus of PDCA Implementation for Energy Management System

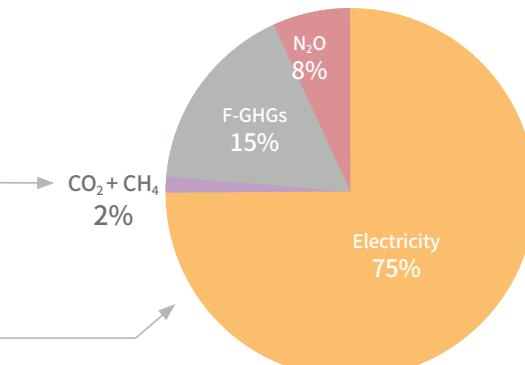


### Total Energy Consumption

Unit: GWh



### Greenhouse Gas Emission Distribution



Note 1: Data included TSMC's facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Note 2: 1 cubic meter of natural gas=10.5 kWh of electricity; 1 kWh= 3,600 kilojoules

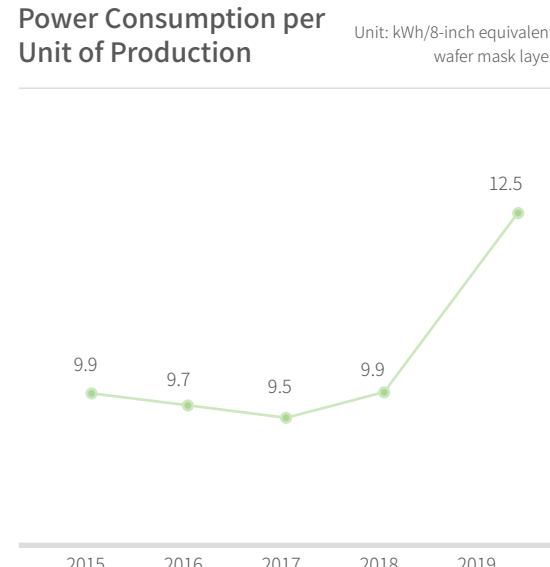
In 2019, increases in advanced process development and process complexity led to increased power consumption in new process equipment, raising the power consumption per unit of 10nm and 7nm production to double that of >16-nm process technologies. Consequently, the overall power consumption per unit of production in 2019 increased by 17.9% compared to the base year and therefore did not achieve the default reduction target of 11.5%. For this reason, TSMC has increased its use of renewable energy each year and also extended its technological innovation to sustainable equipment designs. In 2019, the Company invested resources and collaborated with more suppliers to introduce complete energy-saving plans in the

development of next-generation process equipment, with the goal of saving 5,000 GWh of electricity by 2030.

### Expanding Energy Saving Measures

At TSMC, the primary consumers of energy are production tools and fab facility systems. At the same time, the Company's Operations and Facilities organizations are the main advocates of energy conservation. TSMC's Energy Conservation and Carbon Reduction Committee has organized a comprehensive range of energy-saving activities in recent years, such as the cross-organizational [Energy-Saving Idea Competition](#), which encourages employees to integrate energy-saving concepts in manufacturing

facilities. In 2019, TSMC has carried out a total of 503 energy-saving measures spanning 8 different categories. These measures saved 300 GWh, which is equal to eliminating 160 thousand metric tons of carbon dioxide emissions, and saved NT\$750 million in utility fees. By cutting down on carbon dioxide emissions, [NT\\$240 million](#) was saved in potential external carbon costs. To further promote green innovation in the supply chain, TSMC has continuously worked with equipment suppliers to develop next-generation energy saving equipment. In 2019, 110 energy-saving projects were introduced to 54 equipment models, with 45 models reaching average energy savings of 12%, surpassing annual energy targets.

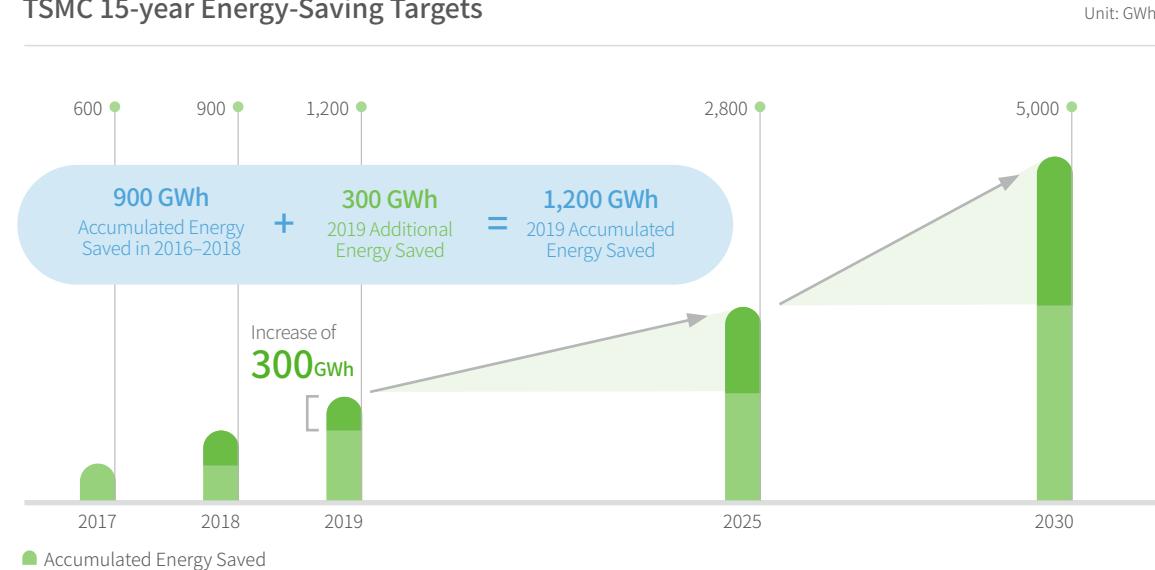


● Power Consumption per Unit of Production

Note 1: Data included TSMC's facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Note 2: Diesel and natural gas are excluded from calculations as they are not used for production

### TSMC 15-year Energy-Saving Targets



**16 Million Trees**



In 2019, TSMC conserved 300 GWh of energy, reducing carbon emissions by 160,000 metric tons, which is the yearly carbon sequestration rate of around 16 million trees



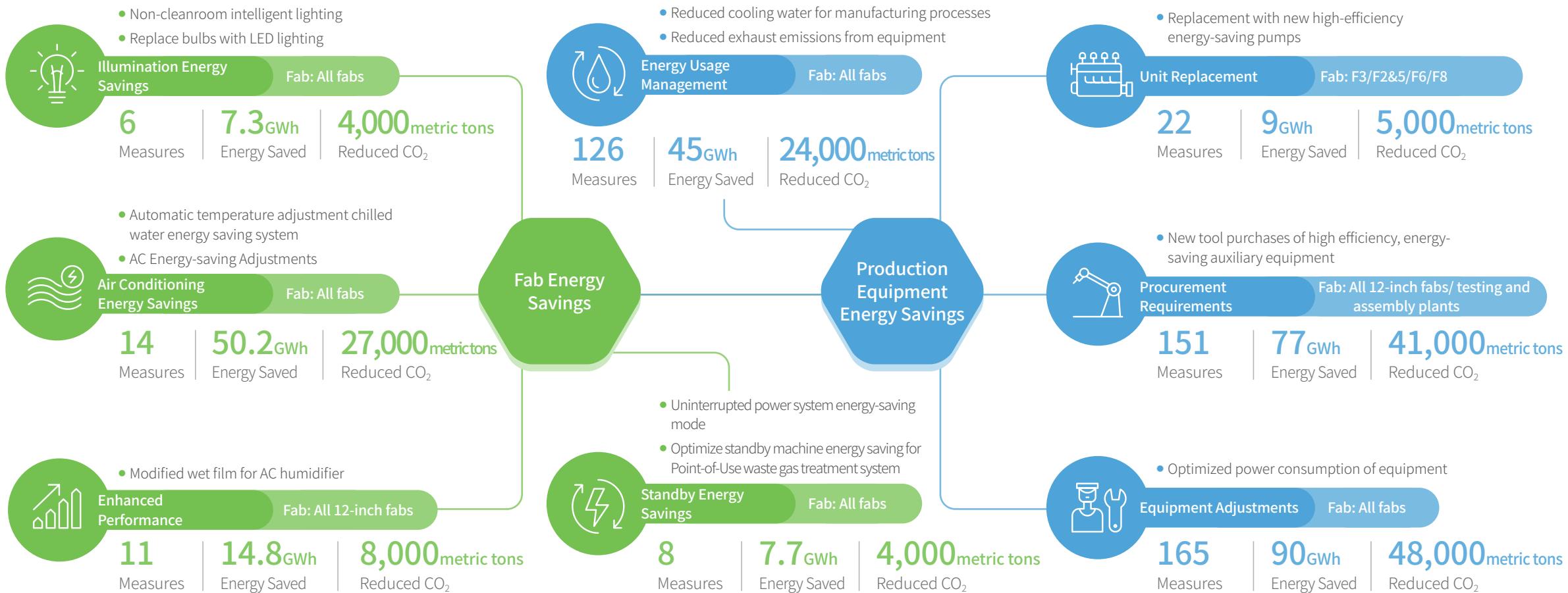
**5,000 GWh**

Accumulated Energy Saved by 2030



Vertical garden in TSMC Fab18

## TSMC Energy Conservation Measures



Note: Carbon dioxide emission is 0.533 kg CO<sub>2</sub>e/kWh; 1 kWh=3,600 kilojoules

## Strengthen Climate Resilience

Resilience to climate disasters is an integral part of corporate operations in an increasingly extreme climate environment. Using 2° C-global warming and worst-case disaster scenarios, TSMC identifies key factors from climate change and extreme weather each year that could affect operations such as droughts, high temperatures, power shortages, floods, and wind damage, and establishes standard guidelines for all fabs to strengthen operational resilience. The Company successfully achieved its target of undisrupted production in 2019, and successfully protected against possible natural disasters and business losses brought on by climate change.

By constructing fabs in compliance with international and domestic green building

<b>U.S. LEED Green Architecture</b>		<b>1</b> Number 1 in the global semiconductor industry with the largest LEED-certified building area, number 1 most LEED-certified company in Taiwan	<b>32</b> green buildings All 12-inch fabs are LEED certified
<b>Taiwan Green Architecture EEWH</b>		<b>1</b> Largest EEWH-certified building area in Taiwan	<b>23</b> green buildings All 12-inch fabs are EEWH certified
<b>Green Factory</b>		<b>1</b> Most green factory certifications in Taiwan	<b>12</b> green buildings Green Factory
<b>Exceptional Smart Building</b>		<b>1</b> Largest exceptional smart building-certified building area in Taiwan	

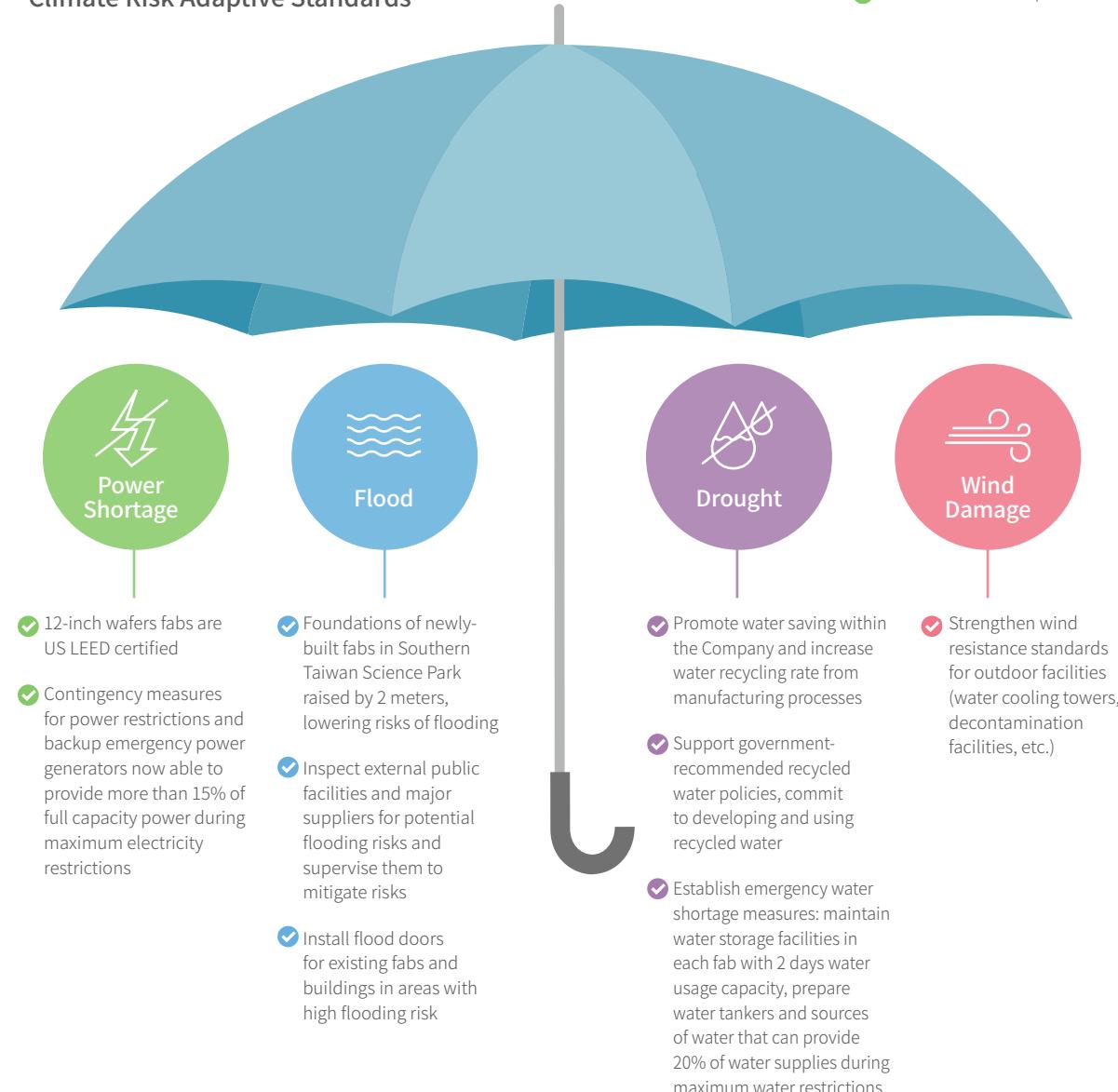
certifications, TSMC can not only reduce the consumption of water, electricity, and other resources during the construction and operation processes but also increase the climate resilience of buildings. Meanwhile, ecological operation features were incorporated in architectural designs to promote the co-existence of industrial production and ecological sustainability.

As of 2019, 32 fabs have received LEED gold international certifications and 23 fabs received EEWH certifications. TSMC is also leads the global semiconductor industry with the largest LEED-certified architectural area, and number one in Taiwan for largest green building-certified areas and certified green fabs.

For more details, please refer to the article titled [Bring Back the Environment- TSMC Ecological Sustainability Park that Technology and Ecology Co-exist](#) on the TSMC Corporate Social Responsibility website

## Climate Risk Adaptive Standards

✓ 2019 New Fabs in Compliance



## Setting an Example to Lead Industry Learning

TSMC's active energy-saving and carbon-reducing performance has been registered on the Voluntary Greenhouse Gases Emissions Reduction Platform of the Bureau of Industrial Development. Through the government's yearly verification, TSMC has been recognized as an Outstanding Manufacturer for Voluntary Greenhouse Gases Emissions Reduction by the Bureau of Industrial Development. TSMC has comprehensively adopted the industrial best practice measures of reducing fluorinated greenhouse gases used in production. This approach was verified by a third party in 2019,

making TSMC the first semiconductor company in Taiwan to receive carbon credits under the TM002 Method. In the future, the Company will fulfill its commitment to green manufacturing by using the carbon credits obtained from this reduction method to reduce greenhouse gas emissions from TSMC's manufacturing processes.



For more details, please refer to the article titled [Green Efforts Pay off as TSMC Becomes Taiwan's First Semiconductor Company to Receive Carbon Credits under the TM002 Method](#) on the TSMC Corporate Social Responsibility website



Fab 15 was recognized as an Outstanding Manufacturer for Voluntary Greenhouse Gases Emissions Reduction by the Bureau of Industrial Development



TSMC passed the third party certification under the TM002 Method

TSMC has spent years adjusting its operations to mitigate the impacts of climate change and is more than happy to share its environmental knowledge, experience, and optimization measures through public associations so that industry standards can be improved. These measures include six dimensions of eight energy-saving measures, such as the three energy-saving steps of intelligent chilled water system and energy-saving measures for uninterrupted power systems and wafer cleaning hot water recycling systems. In 2019, the TSMC-led Taiwan Semiconductor Industry Association (TSIA) Energy Committee established an energy-saving

task force. The task force regularly engages with members of 13 associations to share energy-saving experience and management practices, enabling an additional 200 GWh of electricity to be saved on top of the 300 GWh electricity saved by TSMC. Also in 2019, TSMC joined forces with flat panel display manufacturers and packaging/testing industries to host the High-Tech Energy Conservation and Carbon Reduction Forum. Together, they promised to create a sustainable industry by achieving the following energy management goals by 2025:

- Adopt ISO50001 in 80% of manufacturing facilities
- and reduce GHG emissions by 85%.



Mark Liu, the Chairman of TSMC, is the Chairman of the Taiwan Semiconductor Industry Association (TSIA). Chairman Liu and other semiconductor, panel display, and packaging/testing manufacturers, jointly declare their commitment to energy conservation and carbon reduction at the High-Tech Energy Conservation and Carbon Reduction Forum



## Case Study

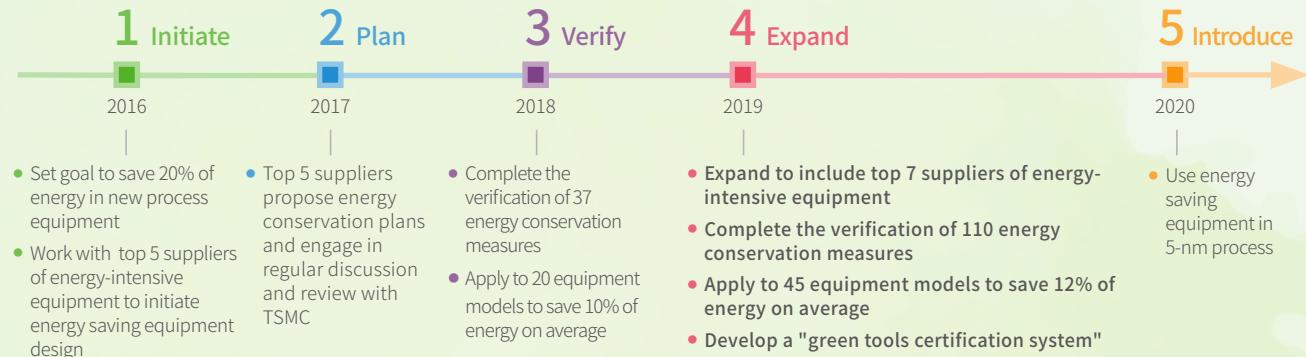
# Taking the Lead in Joining Forces with Suppliers to Develop World-class Semiconductor Green Tools

As the world's largest dedicated IC foundry company, TSMC is committed to creating a sustainable semiconductor supply chain. Because the power consumption of process equipment accounts for more than 50% of the company's energy use, and the number of advanced process equipment is increasing every year, TSMC has collaborated with equipment suppliers since 2016 to develop green tools for semiconductor manufacturing. Before these new tools were introduced, TSMC completed energy-saving design verification, installed energy-saving components, and expanded the energy-saving effects of advanced process equipment.

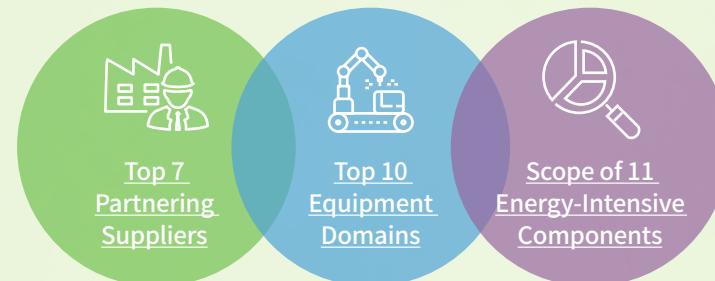
TSMC is the first semiconductor company in the world to ask its equipment suppliers to introduce energy-saving measures. Based on the assessments of the Energy and Carbon Reduction Committee, in 2018–2019 TSMC invited seven semiconductor manufacturers and suppliers around the world to host hundreds of discussion forums and extensively analyze the energy consumption parameters of all advanced fab tools, subsequently leading to the launch of the Energy Conservation Action Project for Next-Generation Fab Tools. From energy-saving ideas, planning, simulation testing to product verification, this process is continuously repeated, and energy-saving specifications are incorporated into new fab tool procurement standards, demonstrating TSMC's commitment to saving energy. TSMC expects that energy savings will be achieved to 20% by 2030 to drive the positive cycle of the industry and supply chain.

Thanks to the relentless efforts of more than 300 TSMC employees, 250 energy saving action plans were proposed in 2019, of which 110 plans were approved, verified, and applied to 54 types of 5-nm advanced process tools. High-efficiency parts and energy saving designs have been incorporated into 11 types of energy-intensive components. TSMC expects that 200 GWh of electricity will be saved in 2020 due to the use of 5-nm energy-saving fab tools. In addition, the Company developed the "green tools certification system" in 2019, and completed the green certification of 27 types of fab tools for four equipment suppliers.

## Milestones for Next-Generation Energy Saving Equipment



## Suppliers, Domain, and Scope of New Equipment Energy Conservation Cooperation





# Water Management

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Risk Management of Water Resources

Enforce climate change mitigation policies, implement water conservation and water shortage adaptation measures

- Reduce unit water consumption (liter/8-inch equivalent wafer mask layer) by 30% (Base year: 2010)

- Reduced water consumption per unit product by 5.2% (Base year: 2010)<sup>Note 4</sup>  
Target: 27%

- Reduce unit water consumption (liter/8-inch equivalent wafer mask layer) to 10% (Base year: 2010)

### Develop Diverse Water Sources

Integrate internal and external company resources to develop regenerated water technology; implement water conservation and the use of regenerated water in the manufacturing process

- Increase the replacement rate of regenerated water by more than 30%<sup>Note 1</sup>

- Saved an additional 3,280,000 metric tons of water through newly-adopted water conservation measures  
Target: 1.14 million metric tons

- Commence the TSMC Tainan Science Park Reclaimed Water Plant tender project and start supplying water in 2021

### Develop Preventive Measures

Improve the efficiency of water pollution prevention and removal of water pollutants<sup>Note 2</sup>

- Water pollution composite indicator 30% above effluent standards<sup>Note 3</sup>

- Average concentration of tetramethylammonium hydroxide (TMAH) in wastewater discharge was 7.86 ppm  
Average concentration of copper ions in wastewater discharge was 0.09 ppm  
Target: Tetramethylammonium hydroxide (TMAH) < 8 ppm; copper ion ( $Cu^{2+}$ ) < 0.15 ppm

- Discharge less than 6 ppm of tetramethylammonium hydroxide (TMAH)  
Water pollution composite indicator reduction rate of 20%

Note 1: Replacement rate of reclaimed water includes cumulative total of conserved water

Note 2: The scope of water pollution projects and data includes Taiwan facilities and VlsEra

Note 3: Water pollution composite indicator is an integration of TSMC's pollutants as compared to the average reduction rate of effluent standards: Including chemical oxygen demand (COD), villaumite, suspended solids, ammonia nitrogen, nitrate nitrogen, arsenic, boron, copper, NMP, and cobalt

Note 4: Due to test production in new fabs, water consumption per unit product did not meet standards. TSMC continues to commit to the development of water reclamation techniques. Its industrial water reclamation plant is expected to commence operation and supply water by 2021

● Exceeded   ● Achieved   ● Missed Target

Semiconductor processes have become complex as they advance from 2D structures to a 3D FinFET architecture, which in turn increases the types and quantity of the chemical materials used. Water is vital to cleaning wafers and maintaining a clean environment. TSMC has established various water recycling applications through water resource risk management, expansion of diverse water sources, and the development of pollution prevention techniques in order to maximize the efficiency water use throughout the water cycle in its facilities. In 2019, the Company took further steps to regulate the water management framework of its facilities to ensure the reasonable allocation of facility water resources in response to seasonal temperature changes.

### Water Resource Risk Management

### Comprehensive Information Network and Meticulous Water Balance Calculation

TSMC uses a comprehensive water reporting system for continuous monitoring of water levels in water reservoirs, and installs hundreds of water consumption monitoring points combined with water balance diagrams around its facilities to calculate process water consumption, recycled water, wastewater, and domestic water consumption in facilities, as well as to track the direction and quantity of water flow and water reclamation status. The data is used as the basis for calculating water recycling rates and water discharged rates, for estimating the volume of

water allocated to each water-consuming unit, and for establishing an effective index for monitoring water use.

### Smart Management of Recycled Water

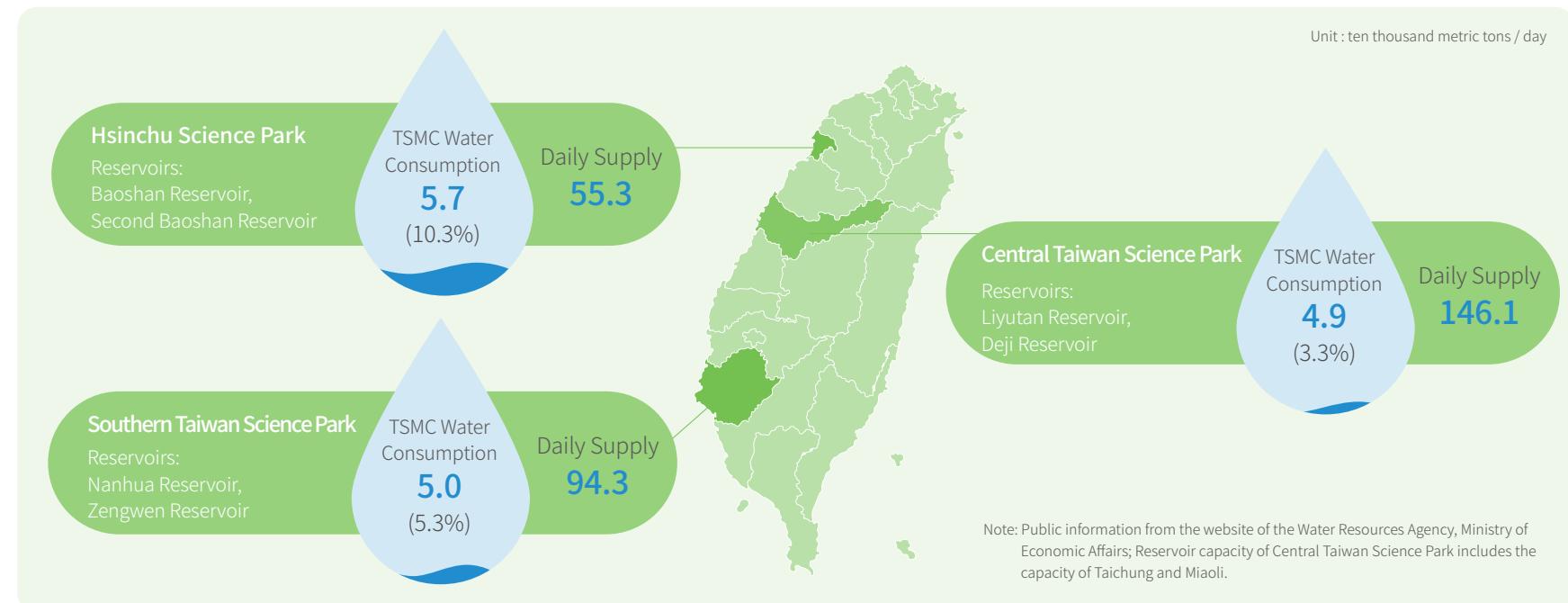
The key to successful water resources allocation is detailed classification and comprehensive water reclamation mechanisms. TSMC categorizes wastewater from purification and processing equipment according to purity so that the cleanest water is given priority to be purified and recycled for use in the manufacturing process, and the second cleanest water is treated in

water recycling facilities then supplied for use by water-consuming units other than production equipment. Finally, unrecyclable wastewater is discharged to an onsite wastewater treatment plant, where various wastewater recycling and treatment systems are used to enable continuous water purification and reuse in processes, cooling towers, and pollution prevention systems for better water resource efficiency.

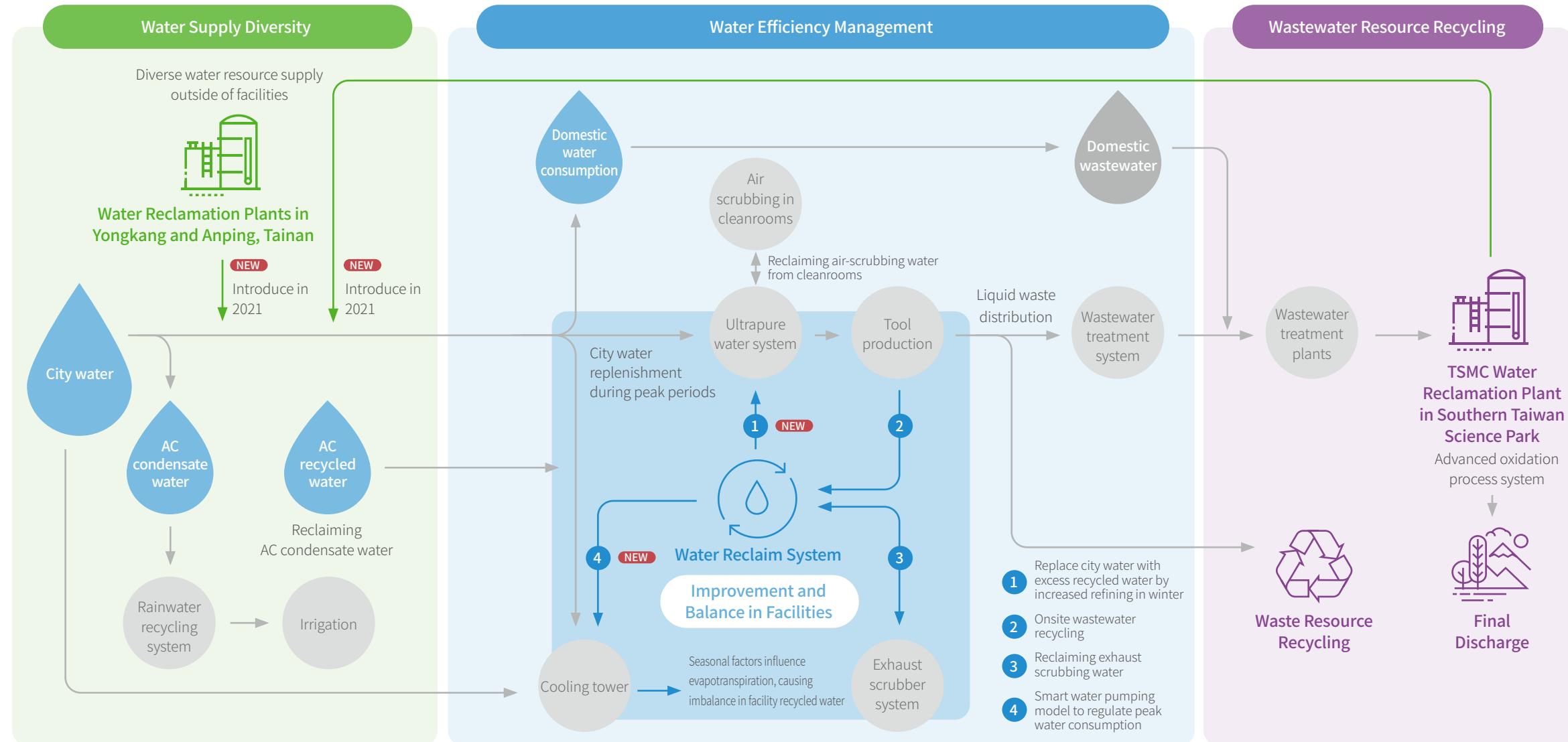
In 2019, TSMC took progressive measures to build smart mechanisms for managing recycled water. Based on seasonal changes and peak water consumption

predictions, TSMC refined water reclamation techniques such as reverse osmosis membranes, resin columns, and UV lights to improve the quality of recycled water. Recycled water with improved quality can replace city water. For example, when the use of air-conditioning systems is reduced in winter, cooling towers require less water, causing an excess of recycled water. A smart recycled water management mechanism can dynamically allocate and supply recycled water, instead of city water, to other production units

### TSMC Water Consumption Rate at Three Science Parks



## Main Water Cell and On-site Recycling System



## Improving Water Efficiency and Strengthening Facility Water Reclamation Measures

In 2019, TSMC has continuously increased the depth of its four water conservation measures: reduce water consumption by facility systems, increase wastewater recycling in facility systems, improve system water production rates, and decrease water discharge loss from the system. In addition

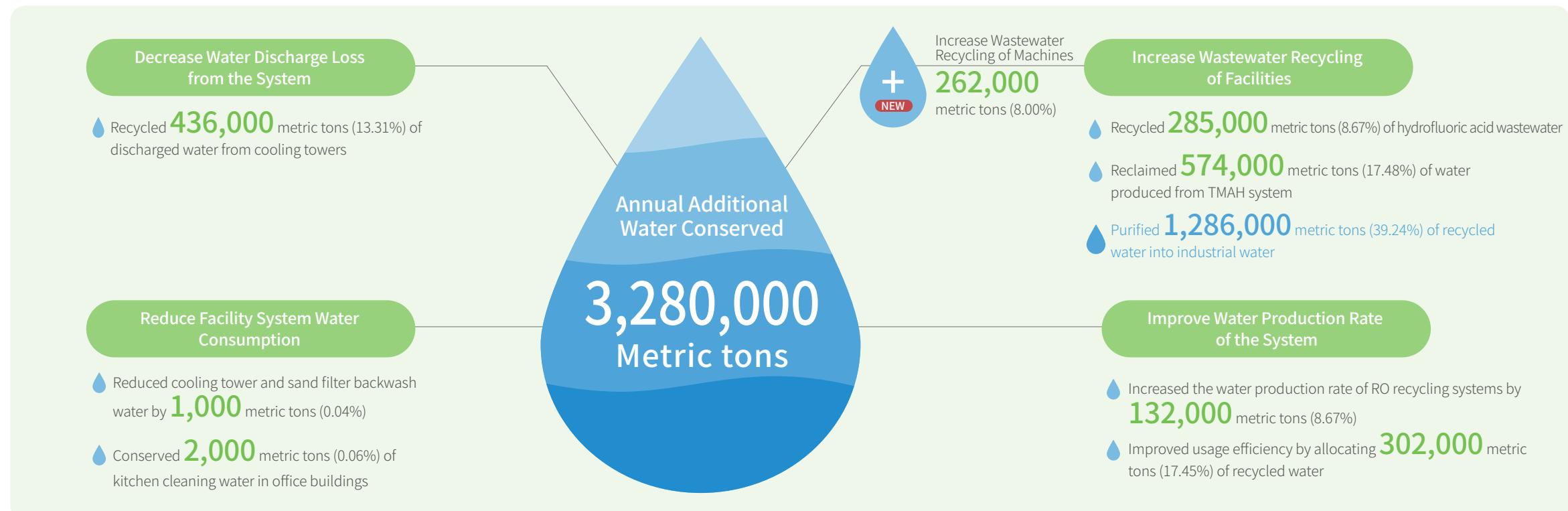
to continuously enhancing the effectiveness and expanding the scale of the eight existing water-saving measures, TSMC also introduced wastewater recycling machines and took comprehensive measures in five of its facilities to "purify recycled water into industrial water", effectively saving

1,286,000 tons of water. The annual additional water conserved reached 3,280,000 metric tons in total.

Many newly-built TSMC fabs (Fab 15 Phase 7 and Fabs 19 Phases 1 and 2) began operating in 2019. Due to increased demand for process cleanliness

and optimization of operating systems, unit water consumption was 59.3 (L/8-inch equivalent wafer mask layer) in 2019, a reduction of 5.2% as compared to the base year, which means the annual target was not achieved.

### Water Conservation Measures and Results in 2019



Wastewater discharge is closely related to city water consumption and recycled water. Unit wastewater discharge in 2019 was 39.8 (L/8-inch equivalent wafer mask layer), an increase of 22.1% as compared to last year. TSMC actively conducts inventory of various water saving

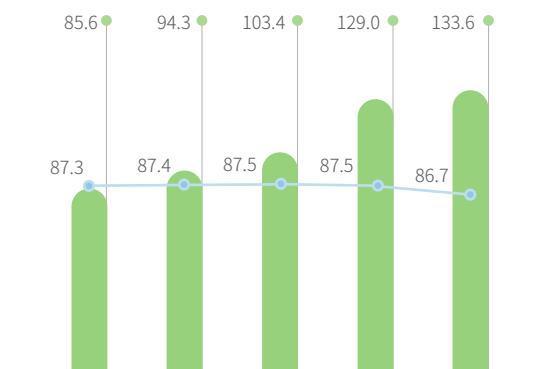
measures. By optimizing the water efficiency of advanced processes and introducing water reclamation techniques, the Company aims to improve the process water recycling rate, recycling volume, and use of reclaimed water and to reduce wastewater discharge.

#### Annual Water Conservation Unit: ten thousand metric tons



■ Annual Cumulative Water Conserved  
■ Annual Additional Water Conserved

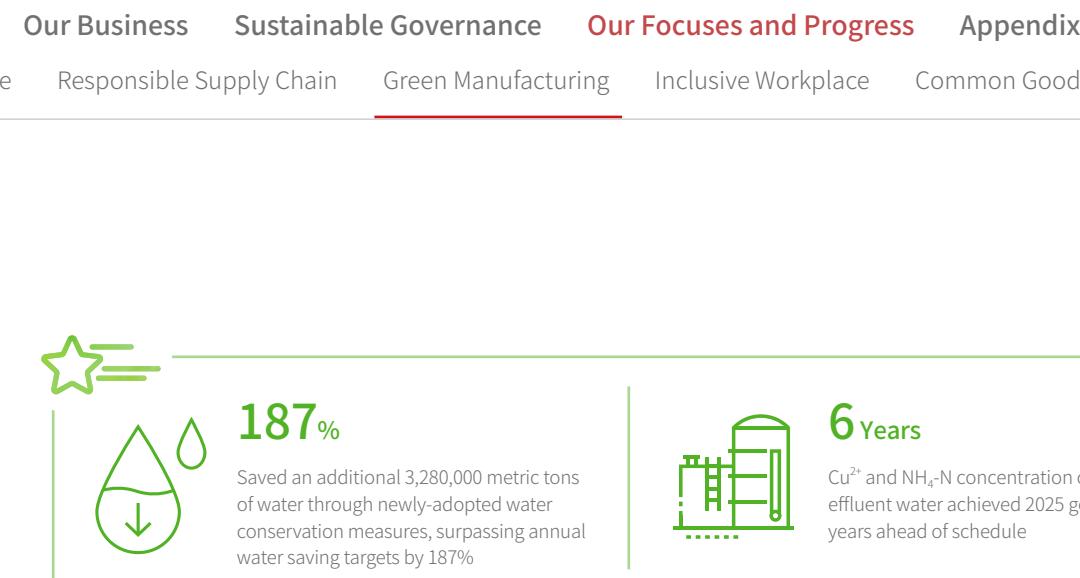
#### Water Recycling and Usage Efficiency



■ Total amount of water recycling (million metric tons)  
■ Average process water recycling rate (%)

Note 1: Total amount of water recycled includes numbers from manufacturing process water treatment and recycling as well as manufacturing process water recycling in scrubber towers

Note 2: Total volume of water recycled and average recycling rate of water for manufacturing processes are calculated with data from TSMC's facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra



#### City Water Consumption and Water Consumption per Wafer-Layer



■ Total city water consumption of Taiwan facilities (million ton)  
■ Total city water consumption of subsidiaries (million ton)  
■ Water consumption per wafer-layer (Liter / 8-inch equivalent wafer mask layer)

Note: City water consumption and unit water consumption intensity index are calculated with data from TSMC's facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

#### Wastewater Discharge per Product Unit



■ Wastewater discharge of Taiwan facilities (million metric tons)  
■ Wastewater discharge of subsidiaries (million metric tons)  
■ Discharge per product unit (Liter / 8-inch equivalent wafer mask layer)

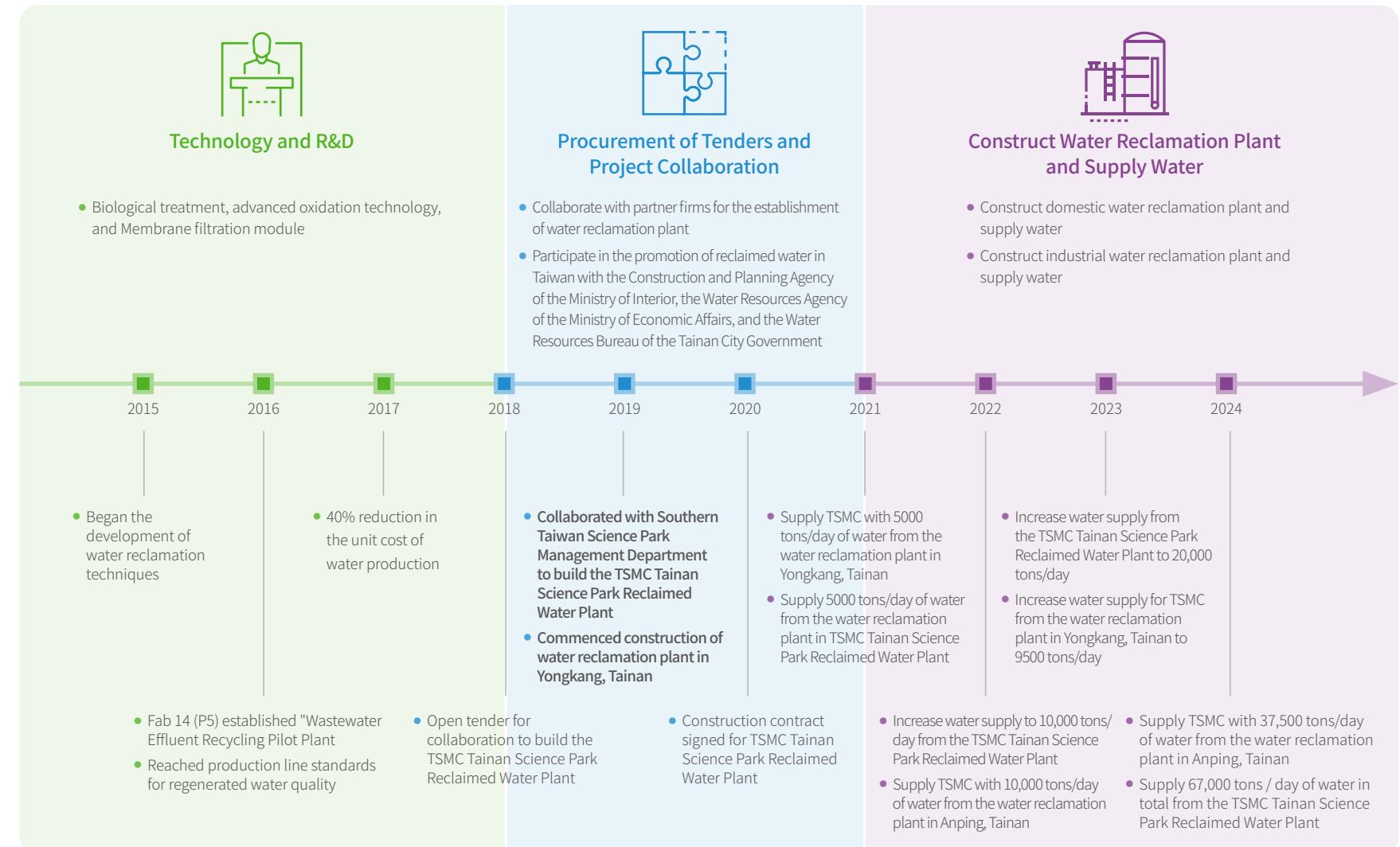
Note: Wastewater discharge and unit wastewater intensity index are calculated with data from TSMC's facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

## Develop Diverse Water Sources

### Adopting Domestic & Industrial Reclaimed Water to Reduce City Water Consumption

As a leading global semiconductor company, TSMC began developing water reclamation techniques in 2015 by coordinating with government departments to plan the construction of industrial recycled water facilities and use of recycled domestic water. In line with the reclaimed water pipeline configurations in science parks, bidding for TSMC's Tainan Science Park Reclaimed Water Plant was successfully launched in 2019. This operation represents a concrete action by TSMC to expand water resource diversity.

### Timeline of Highlights for Regenerated Water



Please refer to [TSMC Fulfils Green Manufacturing by Supporting the Establishment of First Private-owned Reclaimed Water Plant in Taiwan](#) on the TSMC Corporate Social Responsibility website for more details.

Note: Water supply schedule and water supply volume for 2021 and thereafter are calculated from reclaimed water consumption contracts between TSMC and government departments (Southern Taiwan Science Park Administration and Tainan City Government)

**Develop Preventive Measures****Effective Source Distribution Management and Treatment Facilities**

A total of 38 distribution systems have been established based on the composition and concentration of wastewater from manufacturing processes. TSMC has built a comprehensive wastewater classification and resourcing system integrated with treatment equipment to effectively decompose pollutants. Following this, wastewater is condensed and reclaimed through the recycling system to further reduce

the concentration of pollutants in line with the dual goals of pollutant reduction and reuse. In 2019, TSMC installed a new distribution and treatment system for wastewater containing high concentrations of cobalt and cobalt-containing CMP wastewater. Additionally, a cobalt-containing wastewater electroplating system was established to recycle cobalt-containing wastewater for making cobalt bars. In 2019, 150 kg of cobalt bars were produced.

**Wastewater Quality Improvement**

All TSMC fabs have installed equipment to continuously monitor water quantity and quality at effluent spouts of

wastewater treatment facilities. By closely monitoring and recording changes in water quality and quantity, TSMC can respond appropriately when abnormalities occur.

TSMC actively assesses manufacturing raw materials by referencing domestic and international studies on aquatic toxicity, placing focus on pollutants in the semiconductor industry, such as TMAH (strong base), copper ions (heavy metal) and ammonia nitrogen, as well as suspended solids and chemical oxygen demands that strongly impact marine life, setting these as five key targets to be improved in the first phase. The Company has carried out various improvement measures, and established the second-phase goal of reducing the water

pollution composite indicator of 10 substances by 30% by 2030, to demonstrate TSMC's determination to reduce the environmental impact of wastewater discharge. In 2019, TSMC enhanced distribution of copper-containing liquid waste and chemical dosage improvement, effectively reducing copper ions in discharged water by 0.09 ppm, which is far below the 1 ppm drinking water standard. The Company has reached the 2025 target ahead of schedule. The efficiency of ammonia nitrogen wastewater treatment was improved, as indicated by the reduction of discharge concentration to 17.31 ppm, which is better than the effluent standards.

**Preventive Techniques on Key Pollutants of Wastewater Quality and Improvement Achievements**

Unit: ppm

Item	Status in 2019	Standards Set by Science Park Administration	Targets in 2025	2019 Improvement Outcome (2014 as Baseline)	Preventive Techniques
TMAH	7.86	HSP: 30 CTSP: 20 STSP: 60	1.0	Reduced by <b>74%</b> from the previous year	<ul style="list-style-type: none"> <li>• Recycle low-concentration liquid waste</li> <li>• Establish anion exchange resin towers</li> </ul>
Copper ion	0.09	HSP: 1 CTSP: 0.8 STSP: 1.5	0.1	Reduced by <b>76%</b> from the previous year <span style="background-color: #2e6b2e; color: white; padding: 2px 10px;">Achieved 2025 goals ahead of schedule</span>	<ul style="list-style-type: none"> <li>• Distribute copper-containing liquid waste and electroplating</li> </ul>
NH <sub>4</sub> -N	17.31	HSP: 30 CTSP: 20 STSP: 60	20	Reduced by <b>89%</b> from the previous year <span style="background-color: #2e6b2e; color: white; padding: 2px 10px;">Achieved 2025 goals ahead of schedule</span>	<ul style="list-style-type: none"> <li>• Expand ammonia treatment systems</li> <li>• Upgrade treatment facilities and improve treatment efficiency</li> </ul>
Chemical oxygen demand	185.5	HSP: 500 CTSP: 500 STSP: 450	100	Reduced by <b>54%</b> from the previous year	<ul style="list-style-type: none"> <li>• Implement combustion treatment in strippers (Under assessment and planning)</li> <li>• Establish biological treatment systems (bioprocess) (Under assessment and planning)</li> </ul>

Note: Hsinchu Science Park (HSP), Central Taiwan Science Park (CTSP), Southern Taiwan Science Park (STSP)

Note 2: Suspended solids reduction achieved 2025 goals ahead of schedule in 2018



Ammonia Analyzer

## Wastewater Classification and Recycling System



Note 1: TMAH stands for tetramethylammonium hydroxide

Note 2: Among all recycled products, sulfuric acid and electronic grade coating copper are reused in TSMC sites, while the rest are reused externally by other industries

Note 3: Cobalt-containing electroplating wastewater recycling was introduced in 2019

## Case Study

## First Semiconductor Company to Receive Platinum Certification from the Alliance for Water Stewardship with the Highest Rating in History

To mitigate climate change, implement green manufacturing, and continue to improve water efficiency, TSMC has introduced the world's only AWS Standard in 2019, using Fab 6 and Fab 14 Phases 5/6/7 as the initial demonstration site. In December of the same year, TSMC was officially certified by AWS, becoming the world's first semiconductor company to receive AWS certification. TSMC's evaluation score of 114 points not only surpasses the Platinum-level threshold (80 points) but it is also the highest score on record.

TSMC is committed to managing its water resources in an effort to fulfill the sixth UN Sustainable Development Goal—Clean Water and Sanitation—and to be the first in the industry to comply with AWS standards. TSMC has established a comprehensive and systematic sustainable water management organization. The AWS team that came to inspect the entire catchment in the certification process has recognized and praised TSMC for implementing the industry-leading copper extraction from waste copper sulfate program, creating a high-tech green factory with firefly habitat restoration, planning the recycling and reuse of general wastewater in the site, and working with external units to create green energy smart water control gates that help improve efficiency in domestic irrigation.

In 2019, the AWS Task Force summarized their experiences with a demonstration site in the AWS Blue Book. The Blue Book serves as a guideline for promoting Fab matching, and Fab 15 is expected to complete certification in 2020, in hopes that the company's operations can co-exist and prosper with the environment.

- Continuous and Excellent Record of No Violations
- Active Participation in the Promotion of Governmental Policies

### Green Energy Smart Water Control Gates

- Provide the government with patented green energy smart water control gate technologies for free
- Assessments show that 10% irrigation water can be saved

### Copper Extraction System

- Establish copper wastewater recycling system that recycles and reuses copper sulfate-converted copper tubes and electronic-grade coating copper

### Use of Reclaimed Water in Facilities

- Industrial and domestic reclaimed water is reused in manufacturing processes and will be supplied starting in 2022

### The First "Firefly Enterprise" in Taiwan

- Build a world-class green factory and become the first facility in Taiwan to successfully restore firefly populations



Please refer to [TSMC Receives Alliance for Water Stewardship Platinum Certification; Achieves Record Point Total](#) on the TSMC Corporate Social Responsibility website for more details

- Excellent Management System
  - Comprehensive and continuous employee training mechanisms
  - Comprehensive processing procedures (risk assessment, system setup, operations, and emergency response standard operating procedures)
- Healthy Water Environment
  - Continuous monitoring and improvement of the environmental impact of sites on the water catchments
  - Conservation and rebuilding of biodiversity in catchment environment
- Sustainable Water Balance
  - Well-structured information platform
  - Open and measurable water operations standards
- Good Water Quality
  - The quality of discharged water is higher than the regulatory requirements, and is continuously improving
  - Creation of a sustainable cycle system to reduce the impact of operations on the water catchments
- Safe Drinking Water and Sanitation Environment
  - Provide employees in the areas near sites with safe and healthy environments and drinking water
  - Implementation of the commitment on drinking water and sanitation indicators for sites and catchments

## Case Study

## First Company to Recover Fireflies On-site

Dedicated to fulfilling our mission to strengthen environmental protection, we have adopted biodiversity conservation management and are the first business in Taiwan to successfully recover fireflies in our fab sites (For more detail, please go to "[Successful Recovery of Fireflies in TSMC's Tainan Fab](#)"). After four years of unremitting efforts, as of April, 2019, over 200 fireflies have been spotted in our Tainan Fab. The firefly habitat experience is now being replicated in our Hsinchu and Taichung fabs.

### Establishment of the Best Habitat Building Process

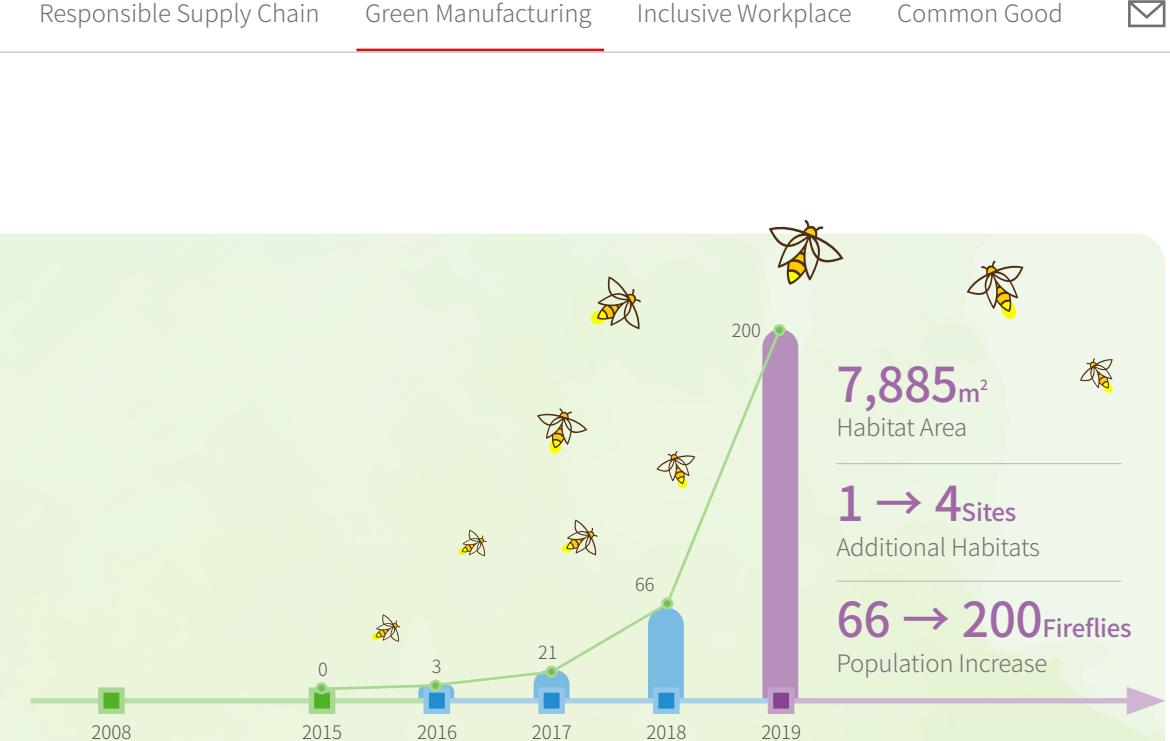
To ensure that the fireflies are breeding steadily, in 2019, we placed more focus on managing water quality and vegetation cover. We also monitored the quantity and growth of snail prey so that *Aquatica picta* larvae, which feed on snails, are able to enter the pupal stage. Moreover, we have always maintained our firefly habitats with minimal interference. Apart from simulating their natural habitat, we took further measures such as installing shorter street lights and LED 590nm firefly lamps to reduce light pollution and habitat disturbance.

### A Larger Fireflies Habitat to Light up TSMC Fabs

Seeking to set up an eco-friendly fab, we collaborated with ecologists to select potential locations for firefly habitats in September 2019. In the future, we will be recovering three species on three newly-selected sites according to the respective environment, and gradually build up a habitat for the fireflies. With each step we take, TSMC is becoming greener, and one step closer to reaching a balance between technology and ecology.



For more information, please visit our CSR website "[Bringing Back the Light-TSMC Firefly Habitat Restoration Initiative](#)"



#### Planning Phase

- Habitat site construction
- Habitat restoration planning
- Monitor the site's environmental ecology
- Manage the ecological pool's water quality

#### Habitat Building Phase

- Build a habitat that suits the fireflies' life cycle
- Maintain stable long-term water quality
- Cultivate prey for larvae, build a pupation platform
- Improve vegetation cover management to prevent invasion of exotic species, maintain multi-layer vegetation, and control vegetation density

#### Sustainable Management Phase

- Eco-friendly habitat management
- Focus on forming a firefly food chain
- Regularly change firefly lamps
- Select additional locations for new habitats



Firefly Pool in Fab14A



Firefly Pool in Fab14A



Habitat Investigation

# Waste Management

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Source Reduction

Promote waste reduction by waste source separation and require suppliers to provide low chemical consumption equipment

- Outsourced unit waste disposal per wafer (kilogram/8-inch equivalent wafer mask layer)  $\leq 0.22$

- Outsourced unit waste disposal per wafer (kilogram/8-inch equivalent wafer mask layer) 0.40 Note 1  
Target:  $\leq 0.34$

- Outsourced unit waste disposal per wafer (kilogram / 8-inch equivalent wafer mask layer)  $\leq 0.39$

### Circular Economy

Collaborate with business partners to develop new waste recycling technology in order to increase the amount of waste recycled and reused

- Develop multiple types of electronics-grade chemicals for TSMC's resource circulation

- Recycling rate of 96%. Percentage of waste sent to landfills  $\leq 0.25\%$   
Target: Recycling rate  $\geq 95\%$ ; Percentage of waste sent to landfills  $\leq 1\%$
- In-house reuse rate of resources 22% Note 2  
Target:  $\geq 30\%$
- Completed establishment of electronic-grade sulfuric acid recycling pilot plant  
Target: **NEW**

- In-house reuse rate of resources  $\geq 23\%$

### Audit and Guidance

Conduct joint evaluation and supervision based on standards of waste management firms in the high-tech Industry

- All waste treatment vendors acquire ISO14001 or other international EHS Management certifications Note 3

- Waste treatment vendors are 100% audited and given guidance  
Target: 100%
  - 70% of waste treatment vendors have acquired ISO14001 or other international EHS Management certifications  
Target: 70%
- Exceeded   ● Achieved   ● Missed Target

- 75% of waste treatment vendors have acquired ISO14001 or other international EHS Management certifications

Note 1: Please see section on "Source Reduction" for reasons why target was not achieved.  
Note 2: Please see section on "Circular Economy" for reasons why target was not achieved.  
Note 3: TSMC requires waste treatment vendors to at least acquire ISO14001 or ISO45001 certifications as the basis for standardized management. Vendors who are exempted from online reporting or are government-owned enterprises are excluded from the aforementioned vendors, including waste treatment and recycling vendors

TSMC's waste management strategies are primarily focused on source reduction. TSMC continuously minimizes resource consumption at the source, adjusts raw material usage parameters and technical solutions for process improvements, and collaborates with suppliers to achieve material optimization and minimization. After raw materials are used in production processes, on-site recycling is prioritized so that resources are sufficiently reused to delay the disposal of materials as waste.

TSMC has been implementing the concept of a circular economy to manage waste resources. First, waste resources are made into products by using facility resource renewal equipment. These products are provided for use in facilities or sold to other industries for use. For non-reusable resources that cannot be converted through resource renewal technology or reused, TSMC prioritizes recycling and recovery by sending them to certified waste disposal vendors. When all options have been exhausted, TSMC's final option is to dispose of waste by incineration and landfill. In 2019, the recycling rate

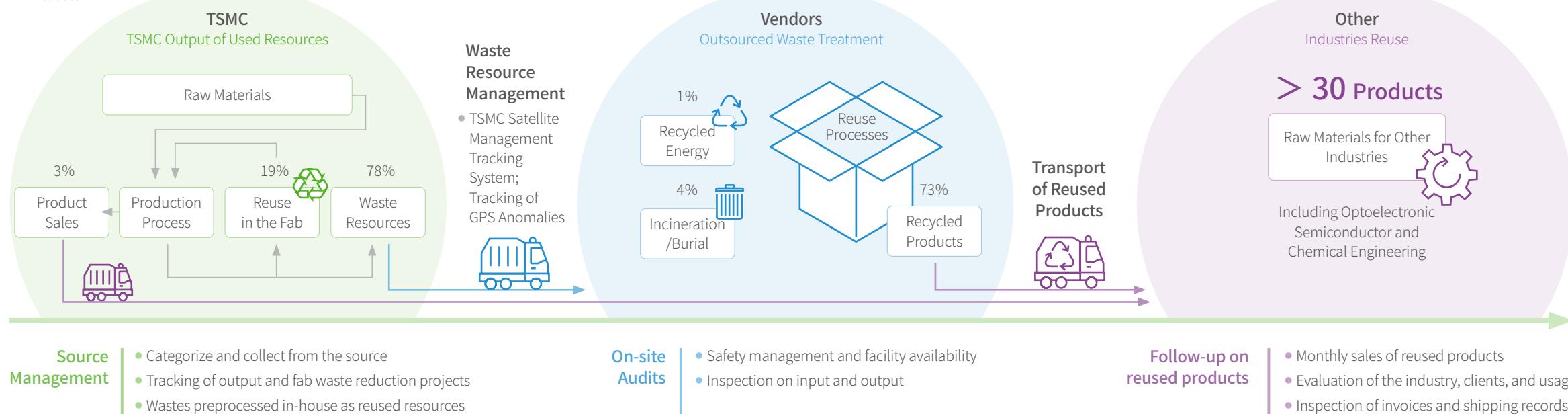
was 96% and has been 95% or above for five years in a row. The percentage of waste sent to landfills has been less than 1% for ten years in a row.

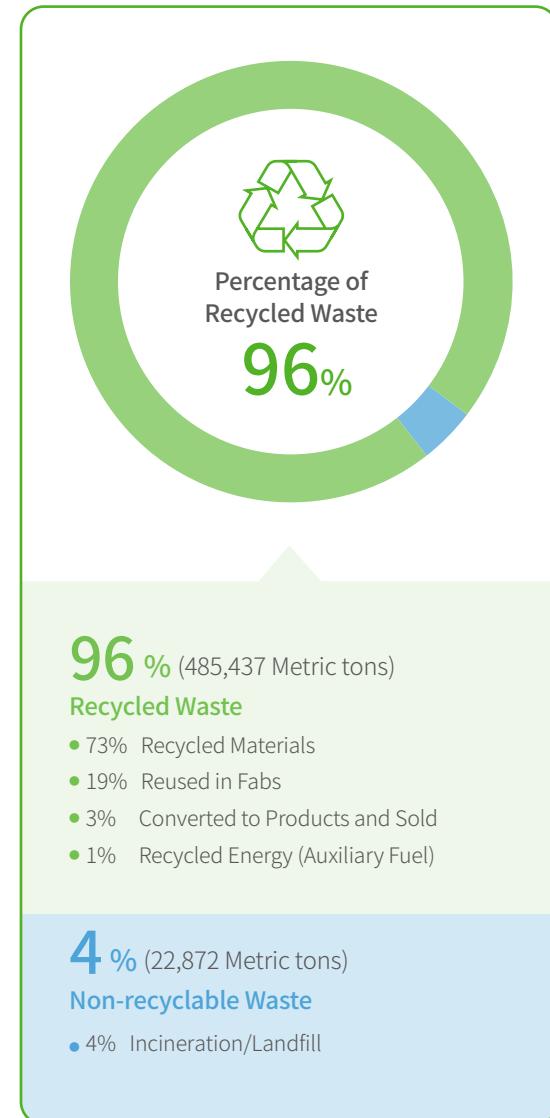
In addition to actively implementing the concept of a circular economy, TSMC has also established a "waste treatment vendor management procedure", promoted the "waste treatment vendor sustainability enhancement project", audited and guided waste treatment vendors onsite, and provided vendors with relevant management experience in environmental protection, safety and health. Through a

comprehensive inspection of environmental, safety, and health systems, TSMC continues to improve the effectiveness of environmental treatment facilities, organize and setup indoor waste storage areas, and conduct emergency response drills to improve capabilities to respond to abnormalities. Meanwhile, vendors are guided to acquire ISO14001 or other international EHS Management certifications, and operation management is strengthened through process documentation and standardization. Waste treatment vendors are encouraged to keep pace with TSMC in co-creating a path to environmental sustainability.

## Life Cycle and Management of Sustainable Resources in TSMC

Note: Data include Taiwan Facilities.





### Waste Quantity and Treatment Status Statistics

#### Waste from Outsourced Businesses



General Industrial Waste



Hazardous Industrial Waste



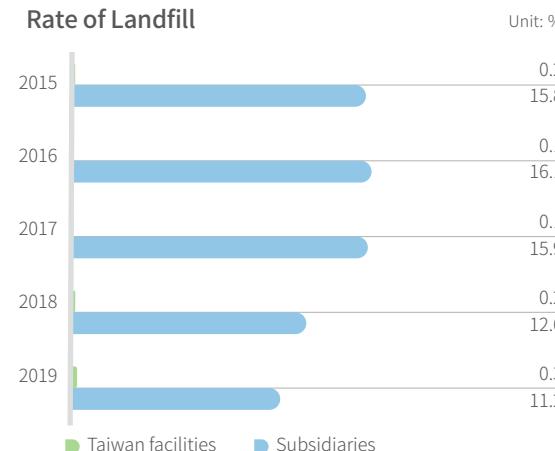
#### Reused Resources



#### Percentage of Recycled Waste



#### Rate of Landfill



Note 1: Data included TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), and subsidiaries (WaferTech, TSMC (China), TSMC (Nanjing), and VisEra).

Note 2: The amount of waste from outsourced businesses is determined by the sum of both general and hazardous Industrial Waste

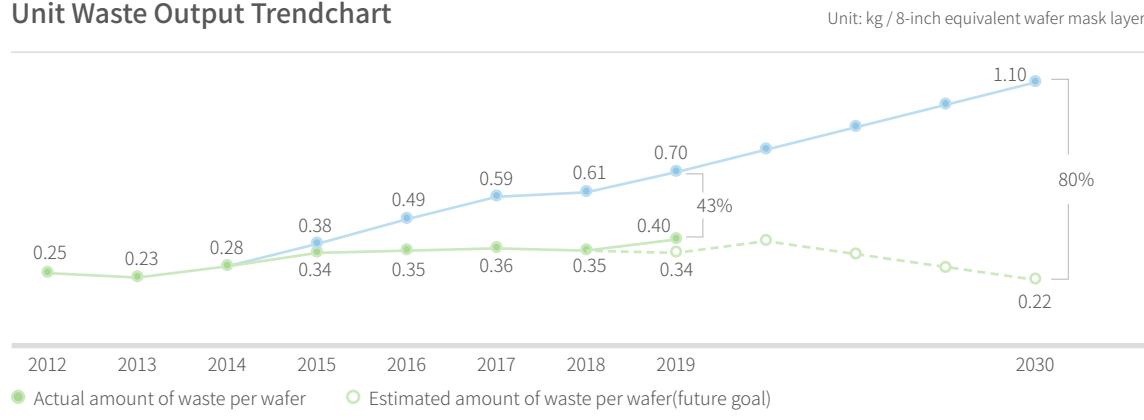
Note 3: The definition of waste from hazardous businesses is determined by local regulations

Note 4: Data for hazardous Industrial Waste in 2015 and 2016 has been corrected and recalculated

## Source Reduction

TSMC continues to expand the production capacity of advanced manufacturing processes. Consequently, demand for raw materials has increased correspondingly, increasing waste generation. To effectively inhibit waste generation and reduce environmental impact, TSMC established a "Waste Management Task Force", which integrates TSMC's Material Supply Chain Waste Resource Management Section, Facility Division, and Process Division. Within the committee, the Vice President of Operations designates inter-fab coordinators to set waste reduction plans with fab managers at the beginning of each year. Goals for 2019 include improving strategies for simplifying the manufacturing process, extending the life cycle of chemicals, recycling and reusing resources, exploring alternative chemical replacements, and introducing high-temperature production processes to reduce the use of chemicals and minimize material use and waste production from all aspects.

### Unit Waste Output Trendchart



● Actual amount of waste per wafer    ○ Estimated amount of waste per wafer(future goal)

● Estimated amount of waste per wafer(if no proactive measures are taken)

Note 1: Outsourced waste per wafer increased because of

(1) Increased wafer production

(2) TSMC lists its ammonia nitrogen in wastewater as waste in order to comply with new wastewater regulation beginning in 2015

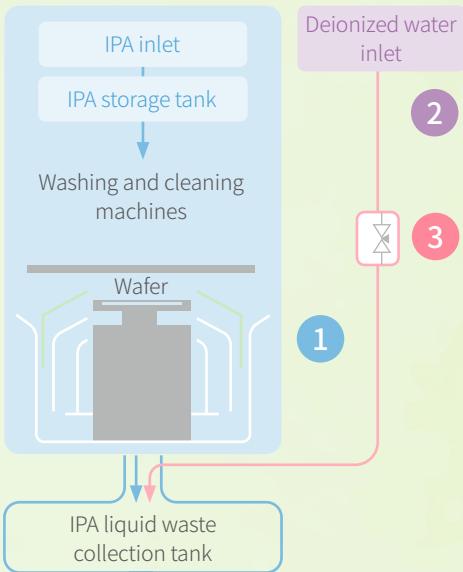
Note 2: Since 2015, TSMC has been promoting waste reduction and waste reuse. Projected amounts are based on 2014 as the base year before waste reductions

Note 3: Data include Taiwan Facilities.

## Case Study

### Minor Alterations Create Major Waste Reductions in IPA

TSMC capitalizes on its Waste Management Task Force and unit waste output management system to control its waste output and fulfill its commitment to source reduction. In 2019, TSMC identified a gradual increase in the output of IPA liquid waste from advanced manufacturing processes. An analysis of this liquid waste revealed a low concentration of IPA waste from advanced processes, and that the high water content was attributed to an increase in IPA waste output. Further inspection of 45 machines that produce IPA waste shows that IPA vapor easily adheres to pipeline walls, causing wafer surface defects. Advanced process wafer-cleaning machines were incorporated with a new design that uses deionized water to remove residual IPA, resulting in increased water content in IPA liquid waste and a dramatic increase in waste output. For this reason, TSMC immediately carried out an IPA waste reduction project and discussed improvement methods with equipment vendors. Water volume control valves were installed in wafer cleaning machines for advanced processes, and experimental designs were adopted to reduce water volume by 87%. This approach not only meets the quality requirements of advanced processes but also successfully reduced low-concentration IPA waste by 9,720 metric tons per year.



1 IPA vapor easily adheres to pipeline walls, causing small particles to form and causing wafer surface defects

2 Added a new design that uses ionized water to remove residual IPA in pipelines, causing increased volume of IPA liquid waste

3 Installed water volume control switch, achieving reduction of IPA liquid waste and water quality maintenance

## Circular Economy

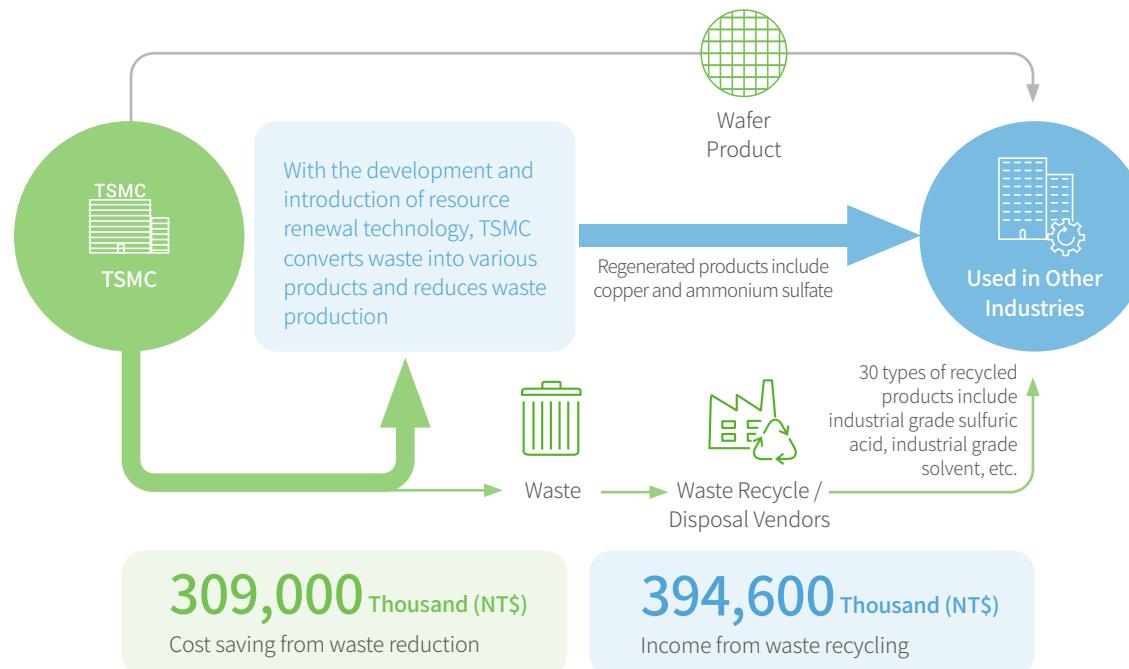
In addition to source reduction, TSMC is also taking actions to respond to the call for circular economy. To increase the feasibility of waste recycling, TSMC has reviewed the use of each chemical and classified the ultimate flows of chemicals inside the facilities. 38 types of liquid waste were distributed using a comprehensive plan and remade into 30 types of recycled products for circular use in other industries. To strengthen product

flow control and reduce the mishandling risks of outsourced vendors, TSMC has implemented the "Action Plans to Turn Waste into High-Value Products", which includes recycling waste sulfuric acid for internal use, electroplating copper-containing and cobalt-containing liquid waste into recycled products, and freeze-drying ammonium sulfate waste into recycled products. In 2019, TSMC recycled more than 110,000 tons of waste and reclaimed 360 tons of products for sale, bringing in more than NT\$300 million of economic value in recycled resources.

Reuse of facility resources is key to promoting the circular economy in TSMC. To improve the quality of ammonium sulfate treatment in line with the highest specification requirements in the industry, TSMC suspended its ammonium sulfate waste crystallization system in 2019 and engaged in a series of system modifications and process optimizations, in hopes of identifying the optimal operating process with maximum efficiency. Consequently, the company's production capacity based on in-house resource reuse rates did not achieve the original goal for 2019.

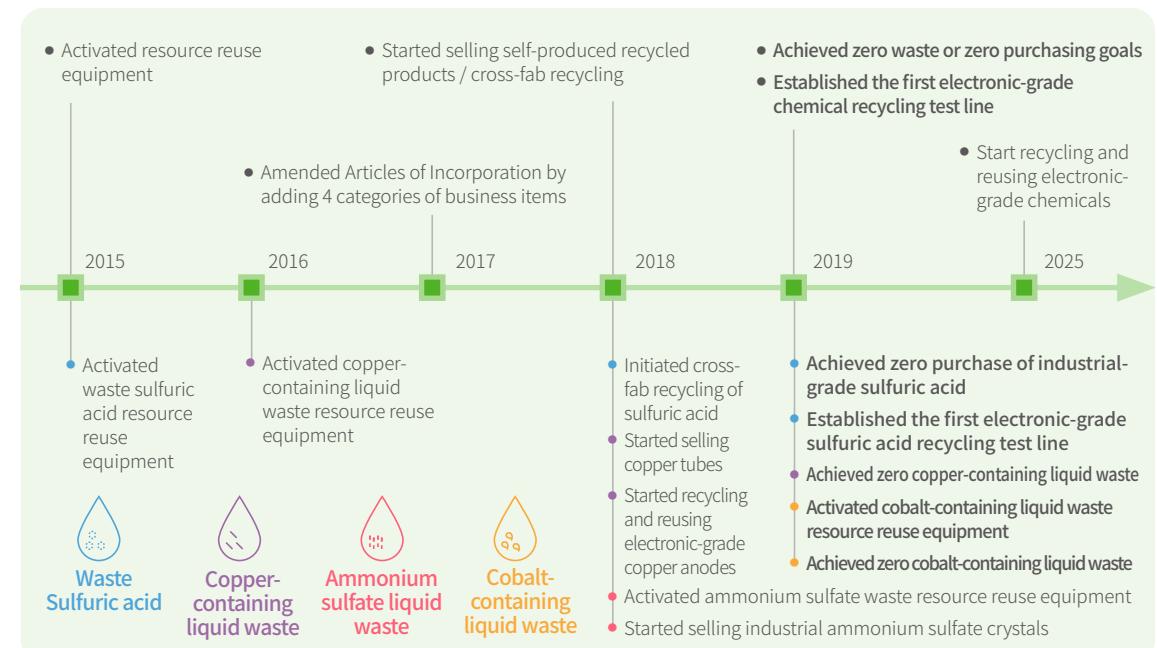
Operation at full capacity will be restored in 2020, with the expectation of achieving a 23% in-house resource reuse rate. Furthermore, to purify waste sulfuric acid, which is outsourced for treatment, into raw materials for reuse in semiconductor manufacturing processes, TSMC has completed establishing the first electronic-grade sulfuric acid recycling pilot plant in 2019. TSMC is transforming from a waste producer to an advocate for the circular economy and lessening environmental impact by reusing materials.

### TSMC Aspires to be a Practitioner of Circular Economy



Note: Statistics of economic value include Taiwan Facilities

### Timeline for the "Waste to Value" Action Plan



## Case Study

# Successful Implementation of the Circular Economy "Three-Zero" Project

With the expansion of production capacity, TSMC has expanded its circular economy actions to avoid the environmental burden caused by the corresponding increase in waste output. Concurrently, the Company has amended its Articles of Incorporation and introduced 4 additional business items, including chemical materials, to increase opportunities for recycling resources. TSMC's green manufacturing team in Facility Division constantly studies and evaluates the feasibility, operational safety, and economic benefits of various resource renewal technologies. In 2019, the "three-zero" project was successfully implemented, subsequently achieving the "three-zero" goals: zero outsourcing treatment of cobalt-containing liquid waste, zero outsourcing treatment of copper-containing liquid waste, and zero purchase of industrial-grade sulfuric acid.

## Zero Copper-Containing Liquid Waste Outsourced

Since 2016, TSMC has actively developed copper-containing liquid waste electroplating recycling systems and continued to extract copper from waste copper sulfate to directly convert copper-containing liquid waste into recycled copper tubes onsite in the facilities. In 2017, TSMC subsequently cooperated with raw material suppliers to research and develop purification procedures that remake pure reclaimed copper tubes into electronics-grade copper anodes. As of 2018, the Company began extending this recycling process to TSMC's manufacturing processes and succeeded in establishing a reclamation model for electronic-grade copper materials. In 2019, TSMC realized the goal of zero outsourcing treatment of copper-containing liquid waste in its mass-production facilities and recovered a total of 15,654 metric tons of copper-containing liquid waste, reclaiming 167 tons of recycled copper tubes and creating an annual benefit of over NT\$100 million from recycling and waste reduction.

15,000 Metric Tons  
of Copper-containing Liquid  
Waste Recycled

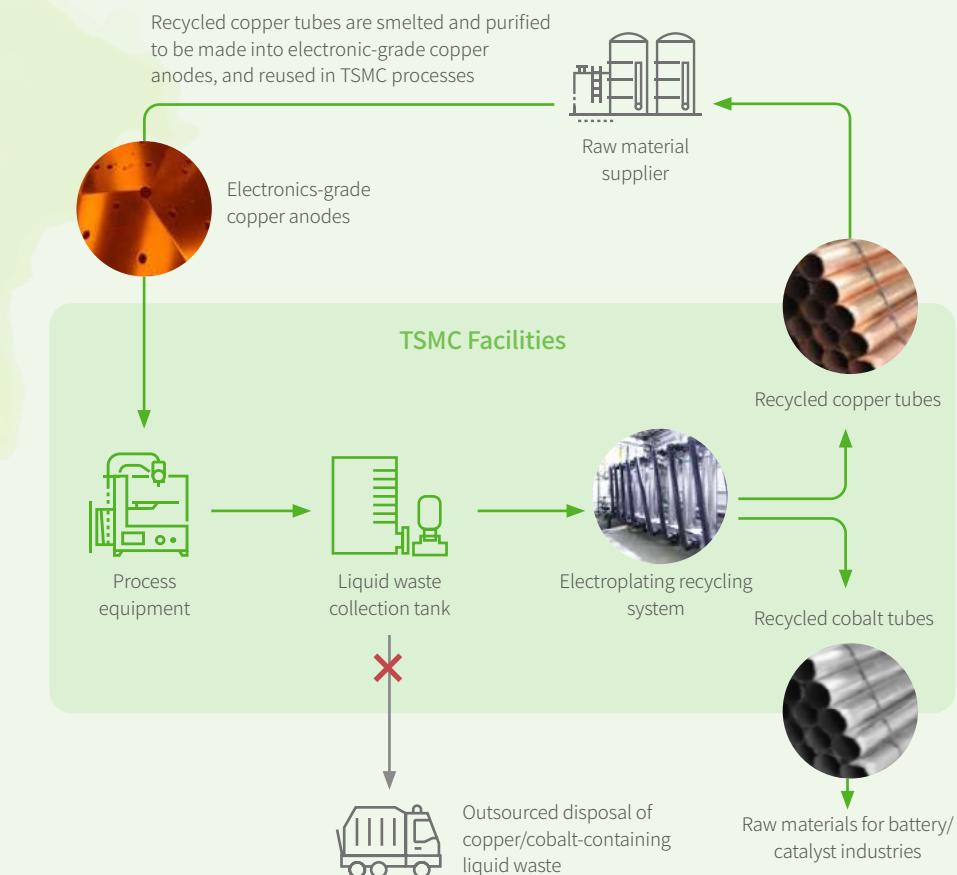
>100 Million (NT\$)  
Annual benefit of recycling  
and waste reduction

## Zero Cobalt-Containing Liquid Waste Outsourced

The development of semiconductor advanced manufacturing processes has resulted in the widespread use of cobalt as a conductive material. However, for this rare metal, there are no cobalt-containing liquid waste recovery technologies and treatment vendors in the market. Therefore, tapping into its successful experience with copper extraction systems, TSMC has installed in-house electroplating systems to completely recover cobalt-containing liquid waste and remake them into pure cobalt products. In addition to achieving zero outsourcing treatment of cobalt-containing liquid waste in its mass-production fabs, TSMC has also produced pure cobalt products that can be reused in the battery and catalyst industries. In 2019, TSMC reduced a total of 277 tons of cobalt-containing liquid waste, which were originally treated by outsourced vendors, and generated roughly 180 kg of pure cobalt products, creating an annual benefit of over NT\$10 million from recycling and waste reduction.

277 Metric Tons  
of Cobalt-containing  
Liquid Waste Recycled

>10 Million (NT\$)  
Annual benefit of recycling  
and waste reduction

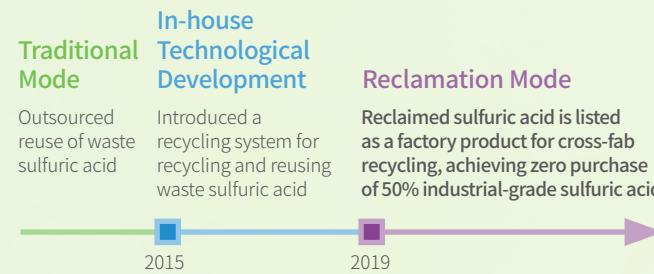


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## Zero Purchase of Industrial-Grade Sulfuric Acid

Adhering to the principle of "Minimizing Waste and Maximizing Resources," TSMC changed its traditional waste treatment approach in 2015 and successfully introduced a waste sulfuric acid recycling system that enables waste sulfuric acid from semiconductor manufacturing processes to be reused as additives for wastewater systems. In 2019, TSMC continued to hone its green innovation capability, effectively improve the production capacity and quality of reclaimed sulfuric acid, and achieved cross-fab recycling of reclaimed sulfuric acid, exempting the company from purchasing 50% industrial sulfuric acid. In total, TSMC recycled 96,081 metric tons of waste sulfuric acid, creating an annual benefit of over NT\$200 million from recycling and waste reduction.

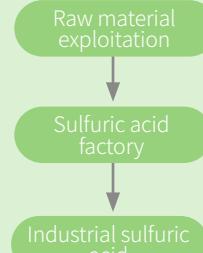
## Timeline of Sulfuric Acid Reuse in TSMC



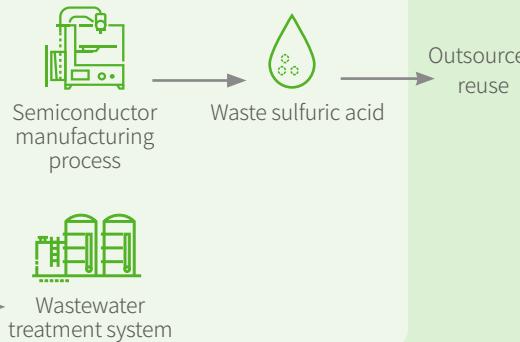
96,000 Metric Tons  
of Industrial Sulfuric Acid Recycled

>200 Million (NT\$)  
Annual benefit of recycling and waste reduction

### Traditional Mode

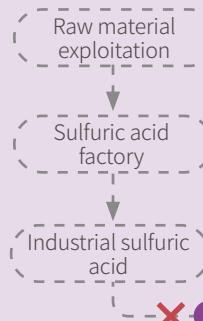


### TSMC Fabs

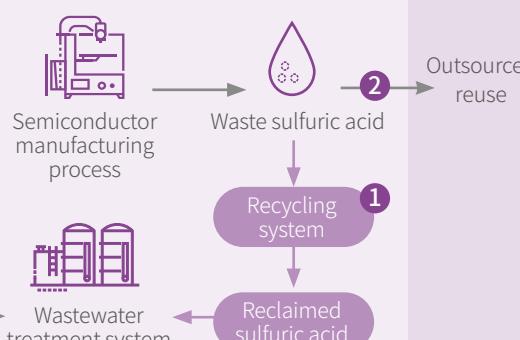


waste sulfuric acid produced from the semiconductor manufacturing process is entirely outsourced for reuse. Meanwhile, industrial-grade sulfuric acid must be purchased for use as a wastewater additive.

### Reclamation Mode



### TSMC Fabs



① Waste sulfuric acid reused in facility

② Waste sulfuric acid reduction

③ Stop purchasing 50% industrial sulfuric acid to reduce consumption of natural resources



Waste Sulfuric Acid Recycling System



Waste Sulfuric Acid Recycling System



## Audit and Guidance

TSMC is committed to implementing its waste disposal vendor sustainability enhancement project in an effort to verify the disposal of facility waste, strengthen the effectiveness of vendor inspection, and take responsibility for the outsourced cleaning and management of its waste. TSMC has a thorough procedure for choosing and introducing new business partners. A documentary review that includes business scale, risk assessment, and related certifications of its business partners is first conducted by a team of interdisciplinary experts from the company's Material Supply Chain Procurement and Waste Resource Management Section and Corporate Environmental Safety & Health Division. Next, TSMC conducts an onsite audit and carefully chooses outstanding vendors to work with.

Qualified vendors must be subject to weekly and monthly documentary reviews and quarterly and annual onsite inspections. A standard audit system encompassing eight dimensions and 166 inspection items is established in accordance with the "Waste Treatment Vendors Audit Plan." The audit form is revised on a yearly basis according to regulatory amendments to facilitate annual auditing and guidance counseling. In 2019, TSMC found that vendors were unaware of the need to stay up-to-date on laws and regulations. Subsequently, the risks of regulatory violations were redefined, and management of 113 provisions was strengthened to reduce the risks of vendor violation. TSMC conducted onsite inspections and audits on 54 vendors in 2019, completing improvements to 198 deficiencies.

At the same time, TSMC's Material Supply Chain Procurement and Waste Resource Management Section,

Corporate Environmental Safety & Health Division, and Legal Division use the three dimensions of the Annual Evaluation for Waste Treatment Vendors as the basis for vendor replacement. The percentage of vendors evaluated as "excellent" and "good" in the 2019 evaluation increased from 36% in 2015 to 74%. In addition, since 2016, TSMC has been pushing for vendors to gain ISO14001 certifications from third-party organizations recognized by TSMC. In 2019, the number of ISO-certified vendors increased from 23 to 38, accounting for 70% of all vendors.

In addition to working with vendors to control the quality of waste management, TSMC also acts as the representative of the Taiwan Semiconductor Industry Association (TSIA) in collaborating with the Environmental Protection Administration, Industrial

Development Bureau, MOEA, and Ministry of Science and Technology to establish the "High-Tech Industry Waste Treatment Platform." The objective of this cooperation between the government and corporations is to promote the circular economy, simplify waste reporting and reuse application procedures, and establish a more efficient and effective management system for the flow of waste and recycled resources. In 2019, TSMC cooperated with the Environmental Protection Administration through this platform to develop Taiwan's first highly efficient process for issuance of manifests for waste disposal and transportation. The original approach, which was time consuming because each item had to be entered manually, was optimized into a system batch upload mode. This new process not only increased data accuracy and convenience of waste reporting, but also created an excellent environment for waste management.

## 2019 Waste Treatment Vendors Audit and Guidance Outcomes

### Operating Management

- Acquired ISO14001 or other international EHS management certifications
  - 2 vendor** Solid waste
  - 1 vendor** Liquid waste
  - 1 vendor** Sludge waste
- Recipient of environmental protection awards from government or credible media/institutions
  - 1 vendor** Sludge waste

### Waste Management

- Established/improved waste storage area inspection systems
  - 3 vendor** Solvent waste
  - 2 vendor** Solid waste
  - 1 vendor** Sludge waste
- Established indoor waste storage area
  - 1 vendor** Liquid waste
- Amended waste disposal contract to comply with regulatory requirements
  - 6 vendor** Liquid waste
- Established waste disposal company audit regulations
  - 5 vendor** Liquid waste
  - 1 vendor** Solid waste

### Safety / Health Management

- Improved onsite chemical GHS labeling and compliance with SDS
  - 4 vendor** Liquid waste
  - 3 vendor** Solid waste
  - 1 vendor** Sludge waste

### Wastewater Management

- Improved onsite leak prevention facilities
  - 3 vendor** Liquid waste
  - 1 vendor** Sludge waste

### Air Pollution Prevention

- Established air pollution control equipment standard checkpoint procedures
  - 3 vendor** Liquid waste

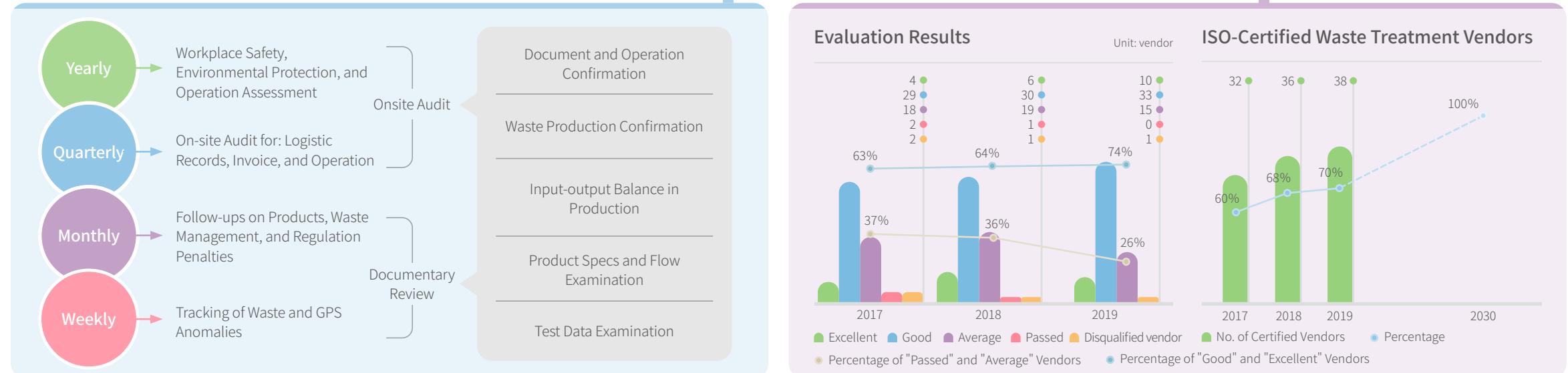
### Emergency Response

- Established emergency response procedures and regulations for environmental system abnormalities
  - 4 vendor** Liquid waste



Waste Treatment Vendors Audit

## Waste Cleanup and Disposal Vendor Management Process





# Air Pollution Control

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Use Best Available Technology

Adapt best available technology to deal with pollution caused by operations and mitigate environmental impact

- Reduce air pollutant emissions per unit of production by 45% (Base year: 2015)<sup>Note</sup>

- Reduced air pollutant emissions per unit of production by 30.3%

Target: 27%

- Reduction rate of volatile organic gases > 98%

- Reduction rate of volatile organic gases was 97.8%

Target: >90%

- Reduce air pollutant emissions per unit of production by 32%

- Reduction rate of volatile organic gases > 95%

### Strengthen Monitoring of Prevention Facilities

Leverage backup systems and dual-track management, along with pollutant monitors, to ensure that equipment functions as intended and prevent abnormal occurrences

- Reported <1 case of abnormal occurrences to supervising authorities

- Reported 0 cases of abnormal occurrences to supervising authorities

Target: <1

- Report <1 case of abnormal occurrences to supervising authorities

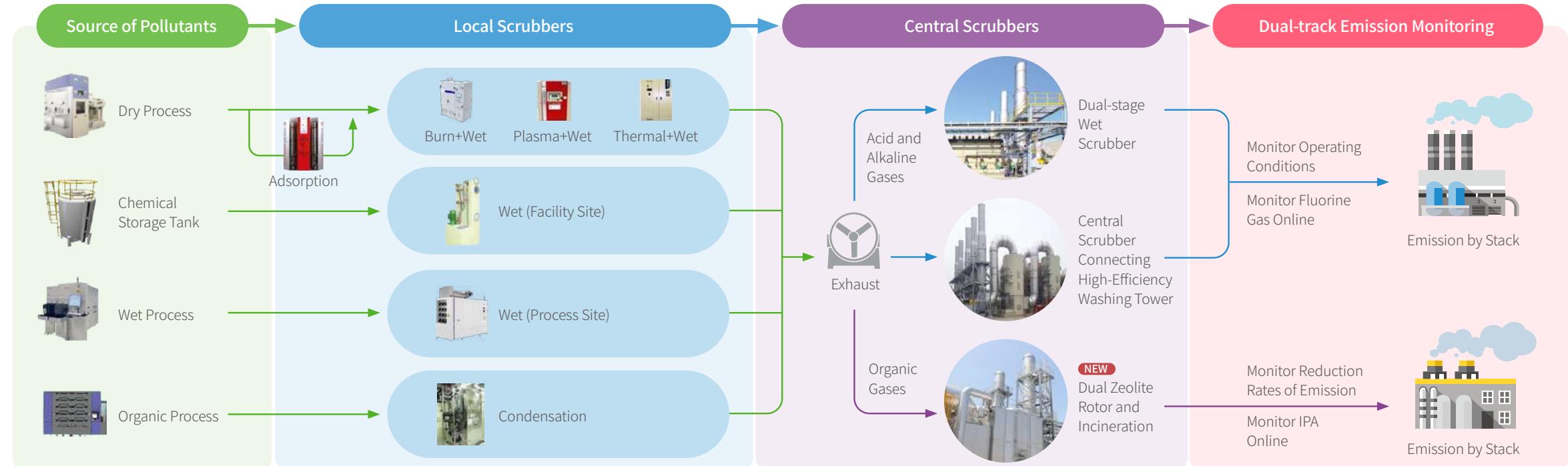
● Exceeded   ● Achieved   ○ Missed Target

Note: Air pollutant emissions data encompasses the total emissions of eight gases: hydrocarbons, sulfuric acid, hydrochloric acid, nitric acid, hydrofluoric acid, phosphoric acid, chlorine, and ammonia

TSMC is committed to reducing air pollution. In addition to compliance with the "Air Pollution Control and Emissions Standards for the Semiconductor Industry" and "Stationary Pollution Source Air Pollutant Emissions Standards" in Taiwan, TSMC's air pollution prevention practices include the adoption of best available technology, such as source categorization and multi-station treatment, as well as continuous collaboration with industry experts to improve the effectiveness of terminal prevention facilities so that concentrations of

pollutants emitted to the atmosphere can be equal to or less than governmental standards. With the concerted efforts of all facilities in 2019, TSMC reported 30.3% lower air pollutant emissions per unit of production compared to the base year of 2015, achieving the 2025 target of 30% ahead of schedule. Subsequently, TSMC aims to set its 2030 reduction target to 45% as testament to our determination to reduce air pollution and continuously strive toward the goals of pollution reduction.

## Air Pollution Prevention Treatment Procedures



## Use Best Available Technology

Best available technology (BAT) controls air pollution at the source. TSMC divides its prevention strategy into two phases: "effective reduction of emission from sources" and "strengthened management of terminal prevention facilities". In the first phase of source classification, manufacturing process air pollutants are classified according to their properties, and newly-installed high-efficiency local scrubbers will treat specific toxic gases, corrosive gases, flammable gases, and perfluorocarbon

greenhouse gases, while the remaining manufacturing process waste gases are also treated effectively through special facilities such as thermal-wet scrubbers, combustion-wet scrubbers, and plasma-wet scrubbers. Then in the second phase, waste gases containing low concentrations of inorganic acids or bases will be sent to the central scrubber for second-stage water rinsing and neutralization treatment. With complete multi-phase processing through effective classification and a two-phase treatment process, TSMC has significantly increased the treatment efficiency of air pollution emissions.

## Effective Reduction of Emission from Sources—Local Scrubbers

TSMC continues to develop advanced manufacturing processes and expand its production capacity, and works to prevent the possibility of air pollution emissions derived from new chemicals. When new chemicals are used, the "New Tool and New Chemical Review Committee", made up of the Company's industrial safety, environmental protection, facilities, equipment, and waste treatment organizations, must review and evaluate the safety and environmental impact of the new chemical before deciding whether to approve its use. The treatment effectiveness of local scrubbers is one of the key items to be reviewed.

Based on the different properties of pollutants in high-concentration waste gases emitted from fab equipment, TSMC performs preliminary treatments through seven types of local scrubbers: thermal, combustion, plasma, wet type in facility site, wet type in process



Dual Zeolite Rotor Concentrators

site, adsorption, and condensation. For every special gas or chemical used in fab equipment, the efficiency of each special gas treatment is certified by third-party institutions to ensure that the reduction rate of the target pollutant is 95% or more.

For effective removal of nitrous oxide ( $N_2O$ ), in 2019 TSMC introduced high-temperature thermal wet scrubbers that can operate at  $1000^\circ C$  or more. These scrubbers can reduce not only nitrous oxide by 90% or more but also fluorinated greenhouse gas (F-GHG) and ammonia  $NH_3$  by 99% or higher. Presently, for dry fab equipment that use  $N_2O$ , TSMC requires the comprehensive use of high-temperature thermal-wet scrubbers to improve the results of pollutant source reduction, thereby reducing the load of the central scrubber to effectively minimize the total emissions of air pollutants.

## Local Scrubber Categories

Process Type	Semiconductor Manufacturing Process	Target Pollutants	Technology	Equipment Pictures	Reduction Rates	Real-time Monitoring Parameters
	Epitaxial Dry Etching	Corrosive Gases PFCs	Burn-Wet		>99%	<ul style="list-style-type: none"> <li>• Natural Gas Flow</li> <li>• Oxygen Flow</li> <li>• Circulating Water</li> <li>• Inlet Pressure</li> </ul>
	Dry Etching	Corrosive Gases PFCs Combustible Gases	Plasma-Wet		>95%	<ul style="list-style-type: none"> <li>• Current Amperage</li> <li>• Circulating Water</li> <li>• Inlet Pressure</li> </ul>
	Thin Film Diffusion Sputtering	Corrosive Gases PFCs Combustible Gases	Thermal-Wet		>95%	<ul style="list-style-type: none"> <li>• Reactor Temperature</li> <li>• Circulating Water</li> <li>• PH Value</li> <li>• Inlet Pressure</li> </ul>
	Ion Implantation Sputtering Epitaxy	Toxic Gases	Adsorption		>95%	<ul style="list-style-type: none"> <li>• Pressure Difference In Scrubber</li> <li>• Inlet Pressure</li> </ul>
	Thin Film	<span style="background-color: red; color: white; padding: 2px 5px;">NEW</span> Nitrous Oxide ( $N_2O$ )	High-Temperature Thermal + Wet		>90%	<ul style="list-style-type: none"> <li>• Reactor Temperature</li> <li>• Circulating Water Flow</li> <li>• Inlet Pressure</li> </ul>
	Wet Etching	Corrosive Gases Organic Gases	Wet (Process Site)		>95%	<ul style="list-style-type: none"> <li>• Pressure Difference In Scrubber</li> <li>• Circulating Water</li> <li>• Inlet Pressure</li> <li>• PH Value</li> </ul>
	PR Stripping	High Boiling Point Organics	Condensation		>95% Specific High Boiling Point Organics	<ul style="list-style-type: none"> <li>• Pressure Difference In Scrubber</li> <li>• Condensation Temperature</li> </ul>
	Chemical Storage	Corrosive Gases	Wet (Facility Site)		>95%	<ul style="list-style-type: none"> <li>• Pressure Difference In Scrubber</li> <li>• PH Value</li> <li>• Circulating Water</li> <li>• Inlet Pressure</li> </ul>

## Strengthen Management of Terminal Prevention Facilities—High-Efficiency Central Scrubbers

After first-phase treatment, the processed waste gases containing low-concentration inorganic acids or bases are delivered to high-efficiency central scrubber for acid-base neutralization, while waste gases containing volatile organic components are delivered to zeolite rotor concentrators in terminal prevention facilities and exhaust to the atmosphere after condensation and combustion. In 2019, new plants (plants built after Fab 15 Phase 7) have introduced an independent central scrubber connecting washing towers for wet process equipment, which emits a large amount of acidic and caustic gas. The washing tower uses clean recycled water sources to increase the absorption of acidic and caustic gases. Measurements show that the reduction rate of hydrofluoric acid and nitric acid pollutants can be as

high as 94%. Existing facilities are not only continuously installing local scrubbers but also treat acidic pollutants by installing hydro-membranes as needed, in order to improve the acid and alkali removal performance of the central scrubber. With the robust efforts of all facilities in Taiwan, the emission of acidic and caustic pollutants by facilities in Taiwan in 2019 was reduced by 9% overall, compared to 2018. TSMC will continue to improve the removal performance of its central scrubbers.

TSMC not only adopts the most cutting edge and industry-suited pollution reduction technology but also continuously improves the treatment results of existing prevention facilities. Regarding volatile organic gas prevention technologies, TSMC uses high-efficiency

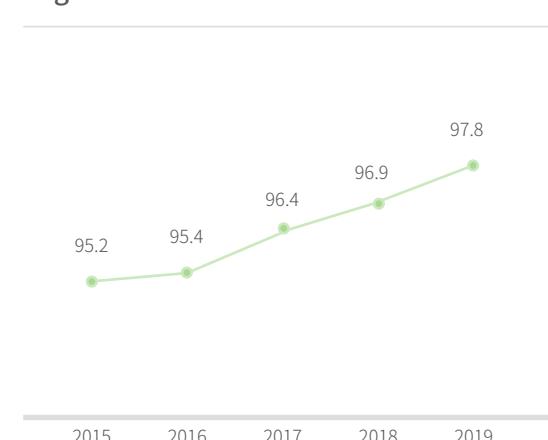
zeolite rotor concentrators to first concentrate volatile organic gases, burns them in thermal oxidizer, then merge with the clean gases after adsorption, before finally emitted into the atmosphere. After processing by the zeolite rotor concentrators, the reduction rate of organic waste gases can reach 95%, which exceeds the regulatory requirement of 90%. In 2019, parameter optimization of zeolite rotor concentrators was introduced, and zeolite rotor concentrators for facilities whose reduction rate was lower than 95% were replaced, thus effectively improving the reduction rate to 97% or higher. Newly-built facilities (plants built after Fab 15 Phase 7) adopted dual zeolite rotor concentrators, which can achieve a 99.5% reduction rate of volatile organic gases. TSMC's average reduction rate of organic waste gas emissions has surpassed

95% for five consecutive years since 2015. Due to the continuous increase in prevention efficiency, the total emission of volatile organic gases did not increase with new fabs coming into production.

Through continuous improvements in acidic, caustic, and organic gases, TSMC's air pollution emission per unit of production in 2019 was 0.28 (grams/8-inch equivalent wafer mask layer), compared to the 0.4 in base year of 2015 (grams/8-inch equivalent wafer mask layer), representing a decrease of 30.3%, achieving the 2025 goal of 30% ahead of schedule.

### Annual Reduction Rate of Volatile Organic Gases

Unit: %



● Average Reduction Rates of TSMC (including subsidiaries)

Note: Data includes TSMC's facilities in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra. Data excludes WaferTech as there is no total hydrocarbon monitor to provide any record of reduction rates.

### Total Emission and Air Pollutants Emissions per Unit of Production

Unit: metric ton



● Total Hydrocarbon    ● Ammonia    ● Chlorine Gas    ● Hydrofluoric Acid    ● Nitric Acid    ● Hydrochloric Acid

● Sulfuric Acid    ● Phosphoric Acid    ● Emission of Air Pollutants Per Unit of Production (g / 8-inch equivalent wafer mask layer)

Note 1: TSMC's air pollutant emissions were reported in accordance with local laws and regulations

Note 2: Air pollutant emissions include the total emissions of eight gases: hydrocarbons (THC), sulfuric acid ( $H_2SO_4$ ), hydrochloric acid (HCl), nitric acid ( $HNO_3$ ), hydrofluoric acid (HF), phosphoric acid ( $H_3PO_4$ ), chlorine ( $Cl_2$ ), and ammonia ( $NH_3$ )



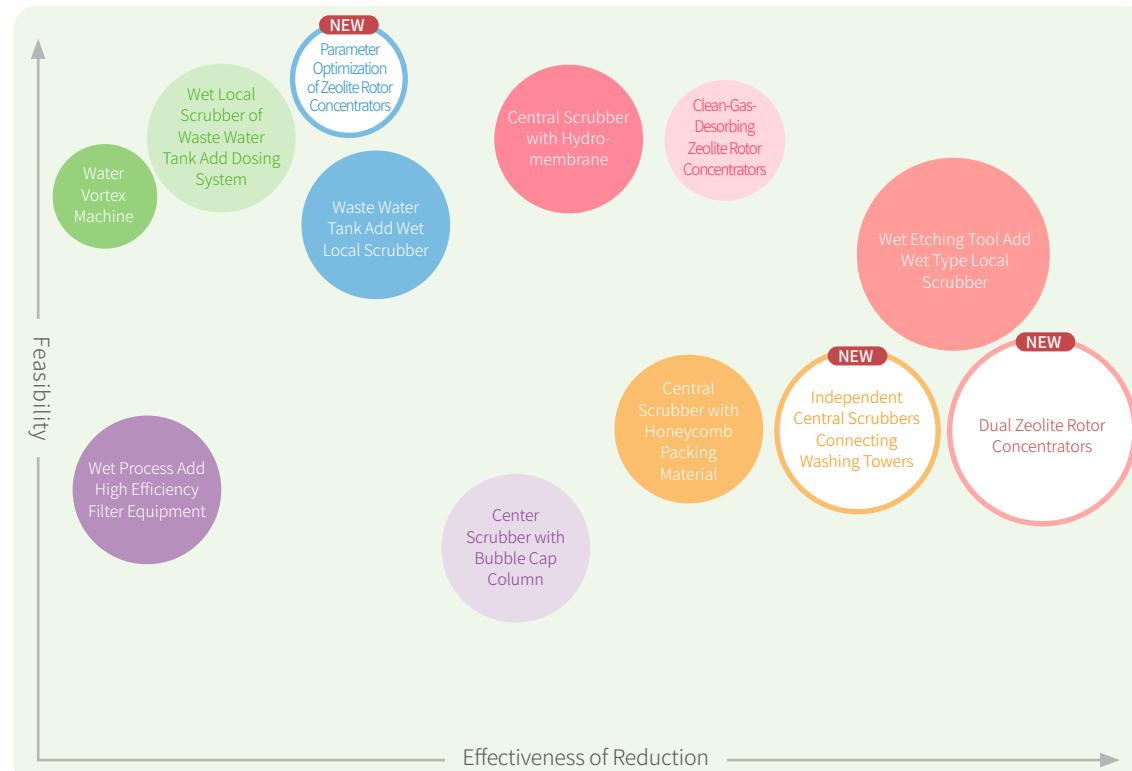
High-Efficiency Air Treatment Equipment (Local Scrubber) Dual Zeolite Rotor Concentrators

## Continuous Improvement of Prevention Technology

In order to improve the capabilities of air pollution prevention facilities, TSMC continuously strives to develop reduction technology, evaluates feasibility from factors such as fab space, technical safety, and economic interests, and considers the reduction effectiveness of prevention technology to make multi-

faceted, comprehensive assessments on whether to introduce such prevention technology. In 2019, three new technologies, namely, independent central scrubbers connecting washing towers, dual zeolite rotor concentrators, and parameter optimization of zeolite rotor concentrators, were incorporated in overall assessment.

## Graph of Prevention Technical Feasibility and Reduction Effectiveness Evaluation



Note: The size of circles represents the importance of the prevention technology. Higher emissions of pollutants have higher importance

## Strengthen Monitoring of Prevention Facilities

TSMC actively strengthens the capacity of its pollution prevention facilities and relevant monitoring and backup systems. The capacity of related prevention facilities in overseas subsidiaries complies with not only [Taiwanese regulations](#), but also local regulatory standards. To guarantee stable and optimal operating conditions all day and year round, and to ensure that all colleagues gain first-hand information on the operating parameters of prevention facilities and are aware of the reduction rate and pollutant emission situations, all prevention facilities are equipped with N+1 backup systems and real-time monitoring systems in order to ensure that prevention facilities can immediately switch to backup systems if any abnormalities occur, and are protected by an uninterrupted power supply system to reach the management goal of zero facility failures.

An air pollution prevention equipment operation status platform was established in 2019 to ensure immediate emergency response in the event of monitoring equipment failure. Furthermore, the Facilities Division and industrial Safety and Environmental Protection Department are able to submit online queries on the operation status and maintenance status of air pollution prevention facilities and keep apprised of whether relevant operation parameters match the facility's optimal values. Combined with the original abnormality reporting system, relevant monitoring results can be reported to the facility monitor control center and the industrial safety emergency response center. Thus, the dual-track independent monitoring system more comprehensively ensures that the gas emitted from stacks are in compliance with regulations. With the protection of an early warning system and real-time responses, no abnormal occurrences were reported to supervising authorities in 2019.



Industrial Safety Emergency Response Center



Facility Monitor Control Center

## Case Study

### Zeolite Rotor Concentrators Designed with Dual Rotors Achieve 99.5% Annual Reduction Rate of Volatile Organic Gas Emissions

TSMC utilizes zeolite rotor concentrators and thermal oxidizer to deal with the emission of volatile organic gases, and the removal rate can reach 95–97%, which exceeds than the 90% required by the "Air Pollution Control and Emissions Standards for the Semiconductor Industry". In particular, the volatile organic emissions make up the largest proportion of air pollutants. In an effort to achieve environmental sustainability, TSMC continues to employ new technologies to improve the effectiveness of central prevention facilities.

The zeolite rotor designs for volatile organic gases emitted by TSMC facilities feature single rotors. To continuously improve the reduction rate of zeolite rotors and reduce the emission of VOCs, TSMC has introduced dual zeolite rotor concentrators to the new Fab 15 Phase 7 facility in 2019. The rotor substrate adopts a new zeolite with wet-impregnation method, which can reduce rotor pressure drop by roughly 10% and enhance adsorption performance. At the same time, due to lower thermal capacity, the concentration factor can be increased from 15 times to 20 times or more, effectively

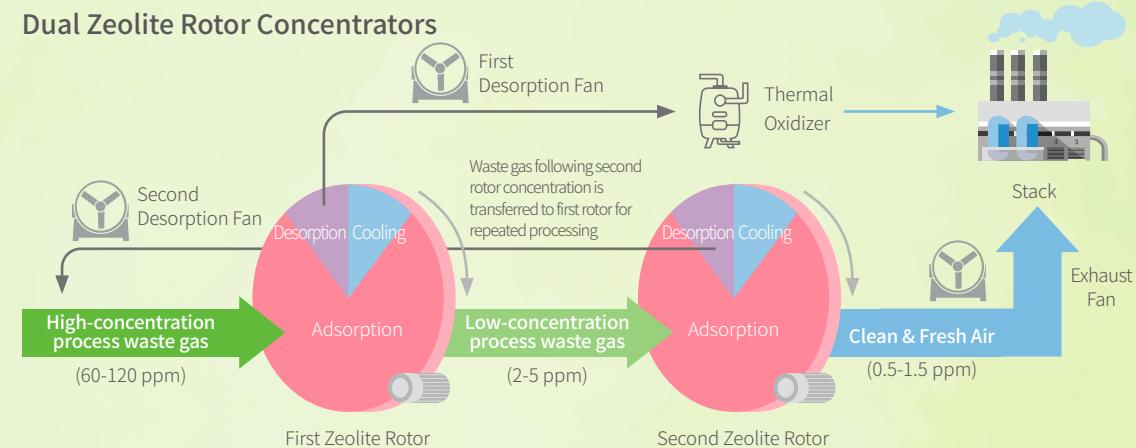
reducing energy consumed during operation. Dual rotors treat waste gas by transferring high-concentration process waste gas (60–120 ppm) from the first rotor adsorption process to the thermal oxidizer for combustion. Subsequently, the low-concentration waste gas (2–5 ppm), which was originally emitted, is concentrated in the second rotor and transferred back to the first rotor for repeated processing. Finally, the clean air (0.5–1.5 ppm) treated in the second rotor is emitted through the exhaust stacks.

Following the dual adsorption treatment of the dual rotor, the reduction rate of volatile organic gases was increased significantly to 99.5%, demonstrating an effective reduction of volatile organic gas emissions. In 2019, TSMC successfully adopted clean-gas-desorbing zeolite rotor concentrators in its existing facilities, and simultaneously introduced parameter optimization of zeolite rotor concentrators to ensure that the total emission of volatile organic gases in 2019 was unaffected by facility expansion, actively working to realize the corporate mission of green manufacturing.

#### The Evolution of Zeolite Rotor Concentrator Performance



#### Dual Zeolite Rotor Concentrators



## Focus 5

# Inclusive Workplace

## An Attractive Employer

Employees are the most important asset of TSMC. We deeply instill a people-oriented culture and value the mutual commitment between the Company and our employees, building a friendly workplace exceeding domestic and international standards in safety, health, regulations, and human rights. TSMC aims to build a challenging work environment where learning never stops, and pursues the goal of becoming an employer that all employees can be truly proud of.

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**> 109.9 Billion (NT\$)**

Total compensation expenses for all employees exceeded NT\$109.9 billion

**5,087 People**

Recruited 5,087 new employees globally and offered high quality jobs

**0**

Strengthened OHS control measures, with no reported cases of occupational diseases caused by chemical or physical exposure





# Talent Attraction and Retention

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Bolster Employee Commitment

Promote and fulfill TSMC's core values  
Provide competitive compensation packages  
Maintain a healthy turnover rate

- Conduct an Employee Core Values Survey every two years to advocate core values
  - Over 95% of employees are fully committed to their work
  - Over 95% of employees are willing to continue to work for TSMC in the next five years
- Continue to maintain a position in the 75<sup>th</sup> percentile among its industry peers in total compensation
- Total turnover shall be maintained at 5% to 10%
- Turnover for newly recruited employees within one year shall not exceed 10%

- Commitment to TSMC's core values is listed as one of TSMC's recruitment criteria. This requirement has been expanded to two TSMC fabs in China and applied to all job candidates  
Target: 100%
- According to the compensation survey report, the total compensation of employees in TSMC facilities in Taiwan is above the 90<sup>th</sup> percentile comparing with its industrial peer groups, whereas the total compensation of employees in Overseas Organization is above the 75<sup>th</sup> percentile  
Target: above the 75<sup>th</sup> percentile
- Total turnover stood at 4.9%  
Target: 5%-10%
- Turnover for newly recruited employees within one year of service stood at 13.4%  
Target: less than 15%

- Conduct an Employee Core Values Survey to advocate core values
  - Over 95% of employees are fully committed to their work
  - Over 95% of employees are willing to continue to work for TSMC in the next five years
- Maintain total compensation above the 75<sup>th</sup> percentile among high-tech industry peers
- Total turnover shall be maintained at 5% to 10%
- Optimize training programs for new employees and facilitate their integration into TSMC's corporate culture.  
Turnover for newly recruited employees within one year of service shall not exceed 13.5%

## Strengthen Industry-academia Collaboration Through TSMC Campus Programs

- Develop a series of campus programs to incubate over 5,000 undergraduate and graduate students worldwide, including comprehensive semiconductor programs on device/integration, process/module, and equipment engineering, internship, and contests

- In collaboration with National Tsing-Hua University, TSMC launched a semiconductor program and has attracted more than 200 students to enroll  
Target: **NEW**

- Develop a series of campus programs to incubate over 2,000 undergraduate and graduate students worldwide, including comprehensive semiconductor programs on device/integration, process/module, and equipment engineering, internship, and contests



In 2019, TSMC formulated its 2030 Goal for Inclusive Workplace: Talent Attraction and Retention. In the next decade, TSMC aims to maintain its status as one of the best employers and, through partnerships with academic institutions, cultivate new talents not only for its own growth but also for that of Taiwan's semiconductor industry. To these ends, TSMC will continue to enhance employees' commitment to the company's core values and engage with emerging talents through partnerships, such as the TSMC Education Program, with academic institutions.

## Shared Visions and Values

### Recruitment Criteria

"Putting right people with shared visions and values in the right positions" has always been TSMC's guideline for recruiting talents, designing compensation packages, managing employees' performance, and developing training programs. All employees at TSMC are treated equally regardless of gender, religion, race, nationality or political affiliation. With shared vision, we work toward a common goal under a common commitment. With shared values, we abide by a common set of values and a unified code of conduct. By putting the right person into the right position, TSMC enables its employees to contribute to the company where they are most needed and allows employees to develop with the company.

To hire people with shared visions and values, TSMC prioritizes character and capability over professional

skills when assessing candidates. Due to the Company's expansion and business needs, TSMC also considers mobility as an important criterion. To this end, TSMC has developed a number of selection criteria, including integrity, resilience, initiative, and innovation. Candidates shall be evaluated by selection criteria assessment and interviews.

Responding to technological changes and the rise of a new generation of talent, TSMC recognizes that only through proactive measures in talent incubation, recruitment, and retention, can the Company tap into employees' capabilities in R&D, manufacturing, and service, thereby sustain TSMC's long-term competitive advantages in face of global competition and challenges. Furthermore, aiming to develop high quality talent for Taiwan's semiconductor industry and enhance industry attraction, TSMC has cooperated with prestigious universities in Taiwan to design comprehensive semiconductor education program focusing on device/integration, process/module, and semiconductor equipment. Co-developed by TSMC and the university, the program combines theoretical lectures and practical training. In 2019, "TSMC-NTHU" Semiconductor Program was launched in partnership with National Tsing Hua University. In 2020, TSMC will continue to work with other universities, and has set up a goal to have over 5,000 undergraduate or graduate students worldwide to participate in TSMC's industry-academia programs.

Note: For more information on TSMC's partnership with universities, please refer to the "Innovation Management" section of this report.

### Workforce Structure

In 2019, there were a total of 51,297 employees at TSMC, including 34,137 managers, professionals and administration staff, and the remaining 17,160 were technicians on the production lines. As the semiconductor industry is both knowledge and technology-intensive, over 80% of our managers and professionals hold a Master's degree or higher.

Around 90% of TSMC's employees are based in principal place of business, Taiwan, with the remaining 10% in subsidiaries in China, North America, Europe, Japan, South Korea, and other countries.

### Diversity and Inclusion at TSMC

TSMC believes strongly in the value of a diverse workforce. Developing future semiconductor talents in an inclusive fashion allows the industry to unlock the full potential of the human resources available to the world. TSMC hires and promotes without regard to gender, religion, race, nationality, or political affiliation because we respect differences, and believe that equal employment opportunity strengthens our competitiveness.



In addition, TSMC believes the workforce should reflect society. Diversity among our management and employees gives us an advantage by enabling the Company to better understand all segments of society and the marketplace, and better address their needs and demands.



## Global Workforce Structure

Categories	Groups	Male		Female		Subtotal and Percentage by Groups	
		Number	Group Percentage	Number	Group Percentage	Number	Group Percentage
Position	Managers	4,684	87.3	680	12.7	5,364	10.5
	Professionals	19,950	81.7	4,466	18.3	24,416	47.6
	Assistant Engineers/ Clerical	3,556	81.6	801	18.4	4,357	8.5
	Technicians	3,722	21.7	13,438	78.3	17,160	33.5
Location	Taiwan	28,708	62.4	17,313	37.6	46,021	89.7
	Asia	2,127	57.3	1,586	42.7	3,713	7.2
	North America	1,046	69.1	467	30.9	1,513	2.9
	Europe	31	62.0	19	38.0	50	0.1
Age	18 - 20	19	54.3	16	45.7	35	0.1
	21 - 30	8,097	65.8	4,207	34.2	12,304	24.0
	31 - 40	15,541	63.3	9,003	36.7	24,544	47.8
	41 - 50	6,586	55.7	5,235	44.3	11,821	23.0
	51 - 60	1,523	63.7	869	36.3	2,392	4.7
	60+	146	72.6	55	27.4	201	0.4
Education	Ph.D	2,114	90.7	217	9.3	2,331	4.5
	Master's	18,615	81.1	4,333	18.9	22,948	44.7
	Bachelor's	8,062	62.0	4,935	38.0	12,997	25.3
	Other Higher Education	1,611	29.5	3,842	70.5	5,453	10.6
Employment Type	High School	1,510	20.0	6,058	80.0	7,568	14.8
	Regular	31,908	62.2	19,381	37.8	51,289	100.0
	Contractor	4	50.0	4	50.0	8	0.0
<b>Total</b>						51,297	

Note: Global Workforce Structure only includes regular employees and temporary employees expected to become regular employees. In addition to the two groups mentioned, TSMC employs 241 contract employees, who are not included in the figures listed in the Global Workforce Structure. Contract employees include employees with disabilities (221 individuals) and employees for special projects or short term support (20 individuals)

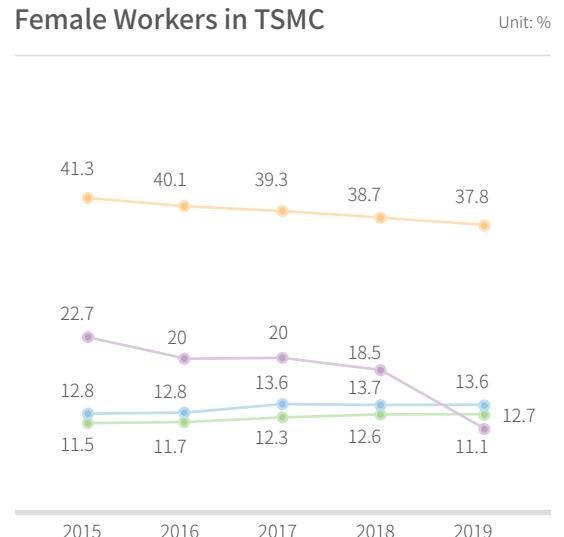
## Female Workers

All employees at TSMC are treated equally regardless of their gender, religion, race, nationality, or political affiliation. Due to the characteristics of the semiconductor industry and Taiwan's cultural environment, over 60% of our employees are male. Going into more specific details, over 80% of our managers, professionals, and assistants are male, and over 80% of technicians on the production lines are female. As TSMC's fabs become increasingly automated, there is a declining need for production line operators, a group consisting mainly of female employees, which is leading to a gradual drop in the total percentage of female employees at TSMC.

Despite the decline in the percentage of female employees in recent years, TSMC's female employees enjoy a similar promotion ratio with their male counterparts, at 0.97:1, an achievement facilitated by TSMC's proactive efforts in recruitment and retention. Female section managers or above are generally promoted more than their male counterparts at a ratio of 1.14:1. In addition, at TSMC, male and female employees enjoy the same compensation system, which does not discriminate based on gender.

In 2020, TSMC will continue to support its female employees by adopting all possible measures to retain as many female employees as possible, and provide them with the opportunity to live up to their full potential and to make valuable contributions to TSMC and society.

## Female Workers in TSMC



● Female Share of Total Workforce

● Females in Management Positions

● Females in Junior Management Positions

● Females in Top Management Positions (the Management Team)

Note 1: Junior management positions include first-line managers; top management positions include Vice Presidents and higher, excluding Chairman, board of directors, and CEO

Note 2: The figures were modified because junior-level and senior managers joined VisEra

Note 3: In 2019, three senior managers (from the management team) retired (B.J. Woo, N.S. Tsai, and Irene Sun), two of whom are female, hence the drastic drop in the percentage of females

## TSMC Compensation Ratio by Gender

Region/ Subsidiary	Position	Male	Female
Taiwan	Managers	1	0.95
	Professionals	1	0.93
	Assistant Engineers/Clerical	1	0.97
	Technicians	1	1.13
China	Managers	1	0.94
	Professionals	1	0.89
	Assistant Engineers/Clerical	1	0.88
	Technicians	1	1.05
North America, Europe, Japan, and South Korea	Managers	1	0.95
	Professionals	1	0.79
VisEra	Managers	1	0.72
	Professionals	1	0.86
	Assistant Engineers/Clerical	1	1.03
	Technicians	1	1.13
WaferTech	Managers	1	0.84
	Professionals	1	0.91
	Assistant Engineers/Clerical	1	0.91
	Technicians	1	0.99

## Talent Recruitment

Around 90% of employees at TSMC are based in Taiwan, while overseas employees are mostly based in Asia, accounting for 7.2% of total employees. Recruitments at global branches mainly focus on hiring local residents. Due to demand for research and development talent and a diversified talent pool, Taiwan has been targeting both new graduates and overseas professional. TSMC believes that recruiting professional talent from around the world will help enhance the Company's growth in the long-term.

## Campus Recruitment

TSMC's core values, corporate culture, and world leading business performance are highly recognized by residents in Taiwan, so TSMC has been voted as the best employer for domestic new graduates. The Company vigorously

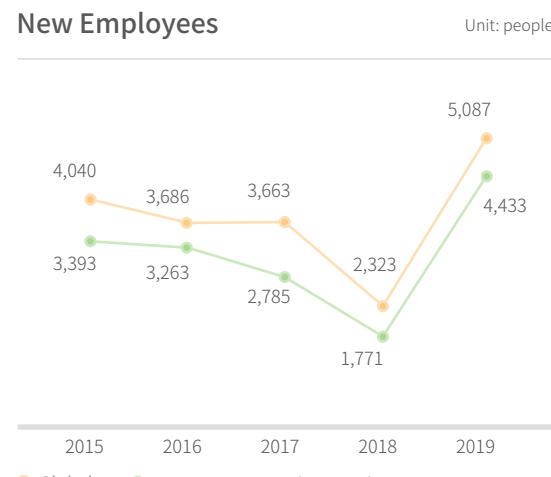
recruits talent with shared vision and values via our official website, campus recruitment, intern programs, JDP (Joint Development Program), RDSS (Research Development Substitute Services), social media, and more. In 2019, TSMC recruited 5,087 new employees, and 76.1% of them are younger generation under 30 years old.

Internship Program is a major annual program in Taiwan, and TSMC North America, TSMC (China), and TSMC (Nanjing) also offer internship opportunities in recent years. In addition to recruiting intern candidates through referrals by professors, campus department offices, and employees, as well as promotions through social media and face-to-face campus recruitment fairs. Through internship program, the Company is able to early engage

students in semiconductor research and manufacturing, and inspire young talent to join the semiconductor industry.

In 2019, a total of 240 interns were recruited in Taiwan. Among them, 69 interns were female, accounting for 29% of all interns. After the internship, 92 interns received advance offers after evaluation, accounting for 38% of total participants. Among them, 23% were female. The percentage of female students participating in the internship program, receiving advance offers, or joining TSMC are higher than the current percentage of female professionals at TSMC (18.3%). This shows that TSMC is committed to achieving gender equality in the workplace. In 2019, a total of 75 interns were recruited by TSMC's overseas subsidiaries and 9 of them were female.

## New Employees



## Interns Receiving Advance Offers or Hired





Through TSMC's internship program, students are able to familiarize themselves with the industry in advance. When they go back to campus, they could register for semiconductor-related courses, and are likely to better adapt to the industry in the future. As of 2019, an average of 40% of the interns from 2017 and 2018 have joined TSMC either through advance offers or regular recruitment, indicating that internship recruitment program is effective in attracting talent for TSMC at an early stage.

#### Oversea Hires - Taiwan Facilities

Unit: people



#### Overseas Talent Recruitment

To sustain the Company's diversified talent pool and recruit talent in special fields, TSMC has continuously make an effort to recruit overseas talent. Over the years, we have conducted joint development programs with prestigious universities such as MIT, Stanford University, and the University of California, Berkeley to incubate top research talent and have early engagement with students for future recruitment. In addition, TSMC recruits experienced semiconductor talent. The Company visits technological hubs in the U.S., and also searches for talent in India, Canada, and Europe.

#### Oversea Hires - VisEra

Unit: people



#### Case Study

## 2019 Large-scale Hiring Plan Attracts a Considerable Amount of Talent to Seize TSMC's Quality Job Offers

In July of 2019, TSMC fabs in Taiwan began mass recruitment for new positions in response to business growth, technology development, and advanced fab expansion. By the end of the year, approximately 3,500 people were recruited, including fresh graduates and experienced professionals. In comparison with recent years, 3,500 new hires is almost equivalent to the number of people recruited throughout the entire year. To achieve its recruitment goal, TSMC not only held interviews and recruitment events on weekdays but also organized six large scale job fairs on weekends in its Hsinchu, Taichung, and Tainan sites, allowing experienced job seekers to attend interviews at convenient time and locations. Furthermore, special bonus was provided as incentives to encourage newcomers to come onboard as early as possible.

TSMC considers its employees as its most important assets. As it is known that TSMC not only provides challenging job and diversified career path, but also offers employees highly competitive compensation packages and benefits, the Company is able to attract talent with shared value in a timely manner.

During large-scale recruitment period, TSMC firmly adhered to its principle of "Putting right people with shared visions and values in right position," and assess candidates by selection criteria and interview. At the same time, TSMC provides orientation, training programs, buddy program and more to help newcomers to adapt to work environment and role faster. These practices encourage employees to stay with TSMC to push the envelope of technology together.



From the questions asked by HR and hiring managers, I felt respect. They started by asking questions related to my character, past experience, my mindset, and how I deal with things, instead of throwing me difficult questions that made me feel incompetent.

A candidate at the weekend recruitment event in Hsinchu on September 1, 2019



## Disabled Workers Hired in Taiwan

According to Article 38 of the People with Disabilities Rights Protection Act in Taiwan, the number of disabled people with the capability to work shall be no less than 1% of a company's total employees, and when a company employs a person with severe disabilities, that person shall be calculated as two. In addition, companies that do not employ a sufficient amount of people with disabilities shall periodically pay subsidies based on the deficient amount to the Disabled Employment Funds. The amount of the subsidies is based on the deficient amount of employed disabled workers multiplied by monthly basic wage.

In line with the government's policies and regulations, TSMC endeavored to provide job opportunities to those with disabilities. In 2019, the Company continuously keep its partnership program with numerous universities in Taiwan to provide high quality working opportunities for disabled university students or graduates. Aside from regular openings, TSMC also developed suitable job positions such as "Campus Recruitment Representatives" for university and graduate students with disabilities.

In 2019, TSMC's fabs in Taiwan employed a total of 315 new employees with mild or moderate disabilities, and 79 with severe disabilities, with the weighted ratio reaching 1% of total employees. In 2019, VisEra also employed three disabled individuals as full-time regular employees. However, due to the nature of available job vacancies, VisEra received a dearth of suitable applicants, leading to its failure to meet the 1% requirement, and has paid subsidies according to legal requirements. VisEra will continue to open vacancies for people with disabilities and attract more suitable candidates to apply.

## Disabled Workers - Taiwan Facilities

Unit: numbers



## Disabled Workers - VisEra

Unit: numbers



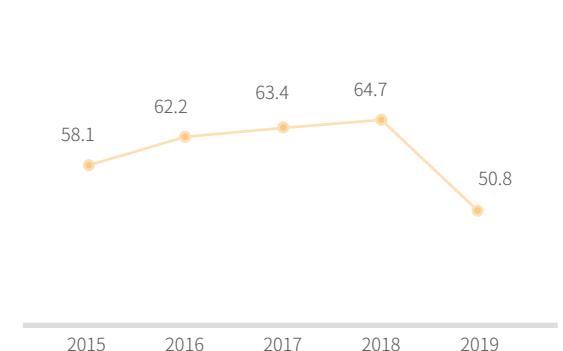
## New Employee Ratio

Unit: numbers



## Vacancies Filled by Employees

Unit: %



Note 1: The figures for 2015 - 2017 cover TSMC's Taiwan facilities, while those for 2018 - 2019 cover both TSMC's Taiwan facilities and its subsidiaries

Note 2: Due to a large number of new vacancies and external recruitment expansion projects, the percentage of vacancies filled through internal transfers was significantly lower in 2019 than it was in 2018

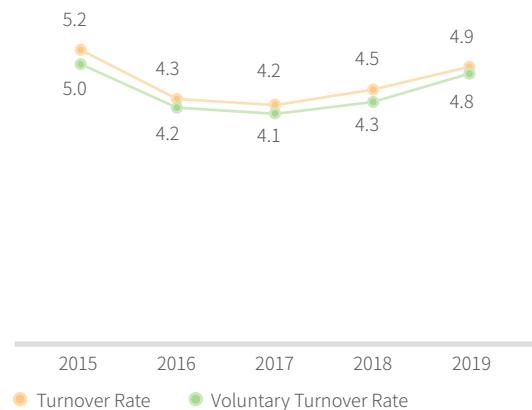


## Employee Turnover

To ensure talent mobility and long-term growth, TSMC firmly believes that a healthy employee turnover rate should be between 5% to 10%, which has thus become the company's long-term goal. In 2019, TSMC's employee turnover rate was 4.9%, slightly lower than what TSMC believes to be a healthy turnover rate. Fortunately, as the company continues to grow, it is joined by new employees, who play important roles in diversifying and invigorating the company.

### Turnover Rate

Unit: %



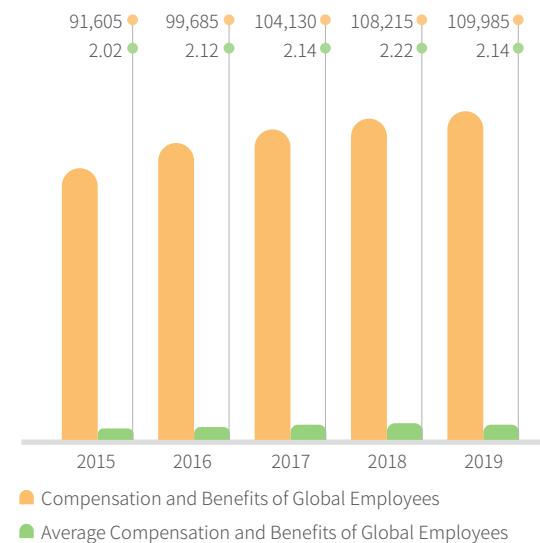
## Compensation and Benefits

### Competitive Compensation Packages

TSMC provides competitive compensation packages to attract and retain the best talent, and to reward employees' performance and encourage their long-term contribution, which include base salary, allowance, employees' cash bonus and profit sharing. The total compensation of an employee is determined basing on individual expertise, job responsibility, performance, commitment to long-term contribution, and the Company's operational achievement.

### Compensation and Benefits Expenses

Unit: NT\$ million



#### Salary Raise



- In order to maintain the competitiveness of our compensation, TSMC appropriately adjusts employees' salaries annually, taking into consideration of the results of global salary surveys, market salary scales, and economic indices.
- In April 2019, TSMC conducted salary raises for employees in Taiwan and overseas subsidiaries. The salary increase rate was 3%-5% for employees in Taiwan, 7% - 8% for employees in China, and 3% - 5% for employees in other regions.
- In addition to the salary raise mentioned above, VisEra, due to the different nature of the industry it belongs to and the need to attract valuable talents, raised the starting salary for newly recruited employees with no prior work experience in 2019. To ensure that its compensation remains competitive in the labor market, the company also announced a structural salary raise in average 3% for existing employees.

#### Bonus



- The employee incentive programs take into consideration of TSMC's financial and operational performance, future development and the operational performance of each subsidiaries, with linkage to employee's job responsibilities and performance. The programs are implemented with short-term and long-term incentive schemes according to local industry practices.
- The incentive program of TSMC fabs in Taiwan is implemented over a period of two years. Cash bonuses are paid quarterly to provide timely incentive, and profit sharing is paid annually to encourage long-term service and continuous contribution. The incentive programs of overseas regions are either by annual cash bonus or by 1 to 3 years of longterm scheme.
- In 2019, TSMC employees' compensation and benefits which include salary, allowances, cash bonus, profit sharing, pensions and other benefits, totaled NT\$109.9 billion.
- In 2019, the median of global employees' annual compensation (excluding pensions and benefits) was about NT\$1.63 million, and the ratio between the total annual compensation of the CEO and the median employee compensation was about 180:1. Considering the differences in compensation structure across countries, the data of median annual compensation is based on the actual amount paid to fulltime employees with full-year seniority.

With the continuous growth of the Company's revenue and profit, the expenses of overall compensation and benefits for employees provided by TSMC fabs in Taiwan increased from around NT\$91.6 billion to NT\$109.9 billion during the years from 2015 to 2019, and the average annual compensation and benefits per employee increased from NT\$2.02 million to NT\$2.14 million.

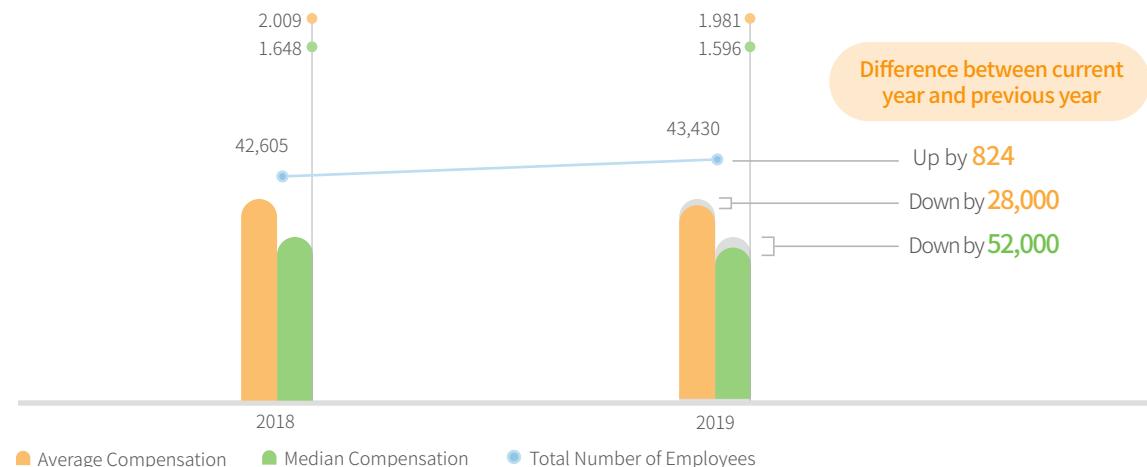
TSMC's revenue increased and profit decreased slightly in 2019. As a result, around NT\$46.3 billion of cash bonuses and profit sharing were granted to TSMC fabs in Taiwan, slightly lower than 2018. The total compensation of a fresh engineer with a master degree is about 31 months of base salary, including 12-month base salary, 2-month year-end bonus, as well as approximately 17 months of cash bonuses and profit sharing. The average total compensation of direct labor is about 26 months of base salary, and the

average monthly salary is three times higher than Taiwan's minimum wage. TSMC's total compensation for employees outperforms our industry peers.

In addition, in accordance with the law regulated by the Taiwan Stock Exchange, listed companies in Taiwan are required to disclose the number, the average compensation and the median compensation of full-time employees in non-executive positions, and the difference comparing to the previous year. The statistics are calculated in accordance with the regulations of the Taiwan Stock Exchange, which excludes executive officers and employees eligible for exemption. For those not employed with the Company for the entire year, the data is prorated. And the profit sharing amount is at profit-year basis therefore part of the compensation data is projected.

## Average and Median Compensation

Unit: NT\$ million



## Benefits that Are Better Than Statutory Regulations

To encourage employees in making contributions to the company's long-term development, TSMC offers employee benefits that are better than the statutory requirements and regulations, including holidays, insurance, pensions, financial assistance for emergencies, subsidies for marriage/ childbirth/ funerals, and discounts in designated shops. Furthermore, all TSMC facilities are equipped with 24-hour health centers, where healthcare management professionals and appointed on-site physicians provide quality services beyond those required by legal statutes. The centers work closely with partners such as hospitals and Hsinchu Lifeline to offer comprehensive care for employees' physical and mental well-being.

TSMC values the well-being of its employees. The company encourages employees to exercise regularly by subsidizing 67 sports clubs, improving exercise facilities, and holding regular sports events to help employees find peers with similar sports interests for balance between work and life. In 2019, TSMC was granted the Exercise Enterprise Certification Award by Sports Administration of the Ministry of Education.

TSMC is home to a number of vibrant sports clubs that consistently perform well in the Science Park Games, including tennis club, badminton club, basketball club, softball club, and volleyball club. As part of their efforts to fulfill corporate social responsibility, the Ballroom Dance club and popular music club took part in volunteer activities organized by the TSMC Charity Foundation, including visiting Veteran's Home to enjoy new year dinners with the elderly.

## Parental Benefits

To provide sufficient support in their life and work, TSMC offers employees parental leaves in accordance with local laws and regulations, sets up four kindergartens for fabs in Taiwan, and provides a well-organized leave management system. Employees have flexibility in making use of their leaves to take care of their children. When facing military service or major injuries which require a long period of time to heal, employees also can apply for unpaid leaves, and then apply for reinstatement after the expiration of the period, to fulfil both individual and family needs.

In 2019, a total of 582 employees in TSMC's Taiwan facilities and VisEra applied for unpaid parental leaves,



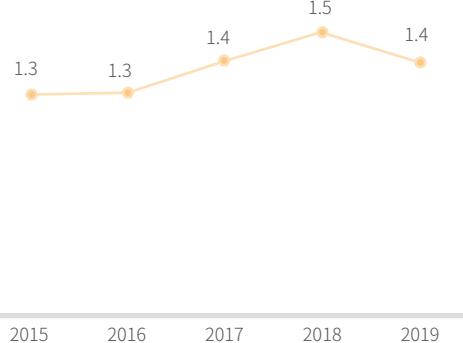
TSMC supported its employees in fulfilling their family needs through providing parental benefits

and a total of 505 employees were scheduled to return from unpaid parental leaves, of which 398 employees returned either as scheduled or ahead of schedule, leading to a return rate of 78.8%. The retention rate, on the other hand, was 77.9%, since 345 out of 443 employees who resumed duty in 2018 were still in service by the end of 2019. Such a high retention rate shows that TSMC provides effective support for employees who return from unpaid leaves.

In addition, the number of TSMC employees aged between 20 and 64 in Taiwan in 2019 accounted for 0.29% of Taiwan's population of the same age group. Meanwhile, the number of employees' newborns was 2,531, which was 1.4% of the total number of newborns in Taiwan. This is all thanks to a positive result achieved from TSMC's high-quality benefits system.

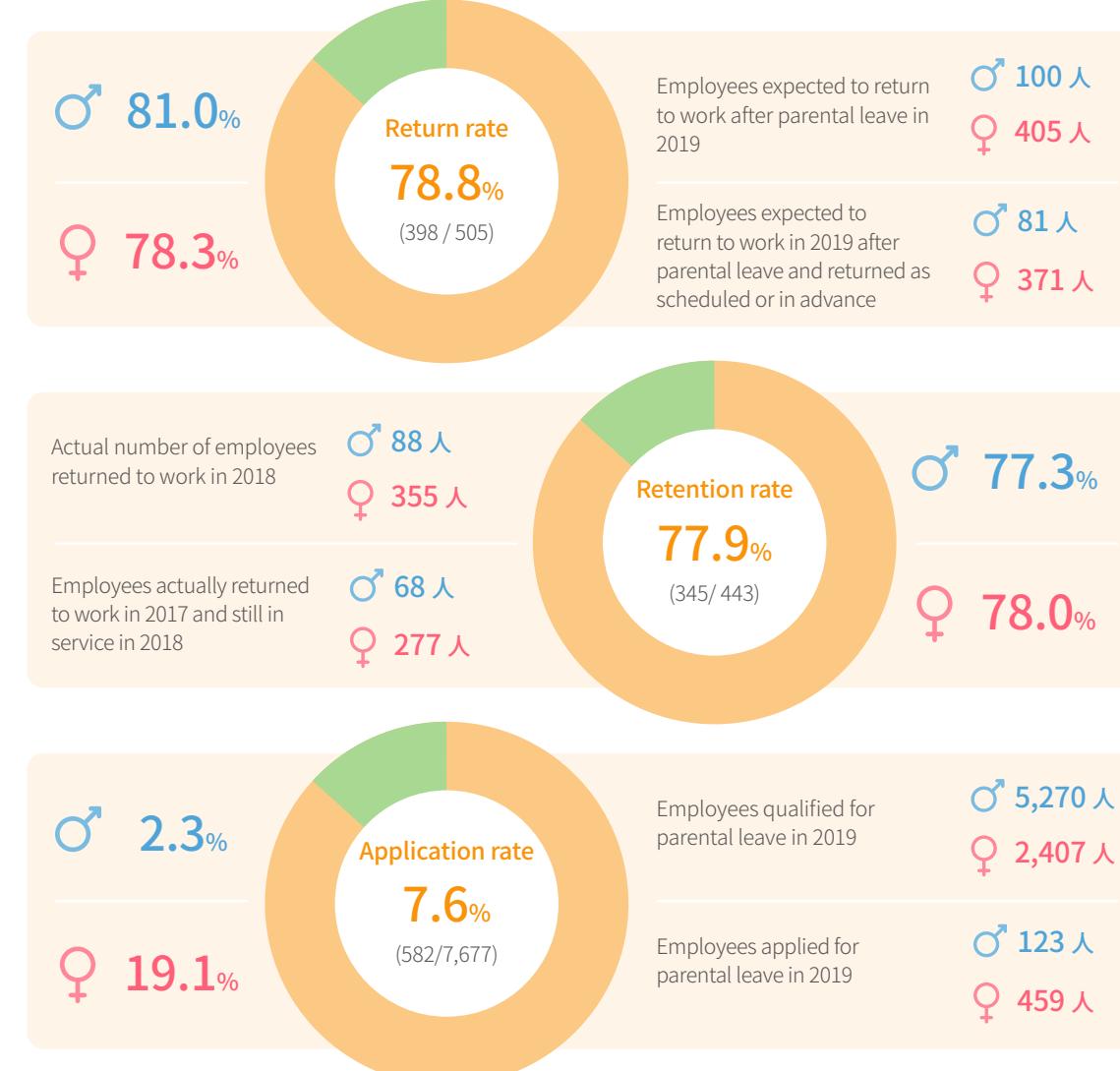
#### Newborn Babies in TSMC/ in Taiwan

Unit: %



Note: Data included Taiwan facilities and VisEra

#### Employees on Unpaid Parental Leave in TSMC's Taiwan Facilities and VisEra



#### Effective Time Management for Work-life Balance

To help employees have balance between work and life, TSMC enforces a legally compliant work hour management. Through training, advocacy, work hour management system for managers, and warning SMS or emails to employees who stay at company for unusually long hours, such measures may help employees work more efficiently and are thereby conducive to employees maintaining a work-life balance.



TSMC supported the physical and psychological well-being of employees, and the balance between work and personal life

## Solid Pension System

TSMC's employee pension system includes the Defined Benefit Plan under the Taiwan Labor Standards Act, the Defined Contribution Plan under the Taiwan Labor Pension Act, as well as the regulations of the labor law in overseas regions. In addition to statutory contributions, we invite professional accountants and consultants to

conduct precise calculations of our company's pension fund, so as to assure sufficient funding for employee pension payments in the future.

## Rewarding Excellence

TSMC recognizes and encourages employee performance through performance management, profit sharing bonus system, development system, and promotion system.

For outstanding technical talents, TSMC provides a dual career ladder system as an appropriate evaluation and recognition approach. For entry level employees, TSMC annually holds Excellent Labor Awards and invites the families of awardees to join the ceremony and banquet. In order to appreciate the commitment and contribution of senior employees to the Company, TSMC also provides service awards and retirement acknowledgments.

In addition, TSMC encourages employees to compete for distinguished talent awards offered outside of the company. In 2019, a number of TSMC employees received national awards, including the Model Labor Award of each Science Park, Outstanding Engineer Award, Excellent Young Engineer Award, and National Manager Excellence Award.

## Pension Allocation and Preparation

### TSMC's Practices

#### Defined Benefit Plans



- TSMC provides a defined benefits plan based on an employee's length of service and average monthly salary for the six-month period prior to retirement under the Labor Standards Act
- The money was administered by the Labor Pension Fund Supervisory Committee and deposited in the Committee's name in the Bank of Taiwan

#### Defined Contribution Plans



- In accordance with the Labor Pension Act in Taiwan, TSMC contributes to employees' personal accounts in Bureau of Labor Insurance
- TSMC's oversea subsidiaries also make monthly contributions to the pension management department at certain percentages of the basic salary of their employees

### Preparation in 2019

- TSMC contributes an amount equal to 2% of salaries paid each month and VisEra contributes a fixed amount to the pension fund
- The fair value of TSMC's planned assets in Taiwan was NT\$4,301,594,000 at the end of 2019. In accordance with the above provisions, the amount of recognized expenses of TSMC in 2019 was NT\$259,596,000. The amount of accrued pension liabilities to be contributed in accordance with the law was NT\$9,182,496,000 at the end of 2019
- VisEra's pension reserve amount was NT\$1,854,199
- TSMC in Taiwan makes monthly contributions equal to 6% of each employee's monthly salary to employees' pension accounts. The total amount of pension in 2019, including contributions from oversea subsidiaries, was NT\$2,609,733,000



TSMC hosted Excellent Labor Awards to recognize and praise the performance of entry level employees. The family members and friends of Awardees participated in the events to show support.

leadership continuously engages with managers and employees to communicate the company's vision, core values, and business philosophy as part of efforts to consolidate corporate culture, and deepen mutual commitment between the company and its employees.

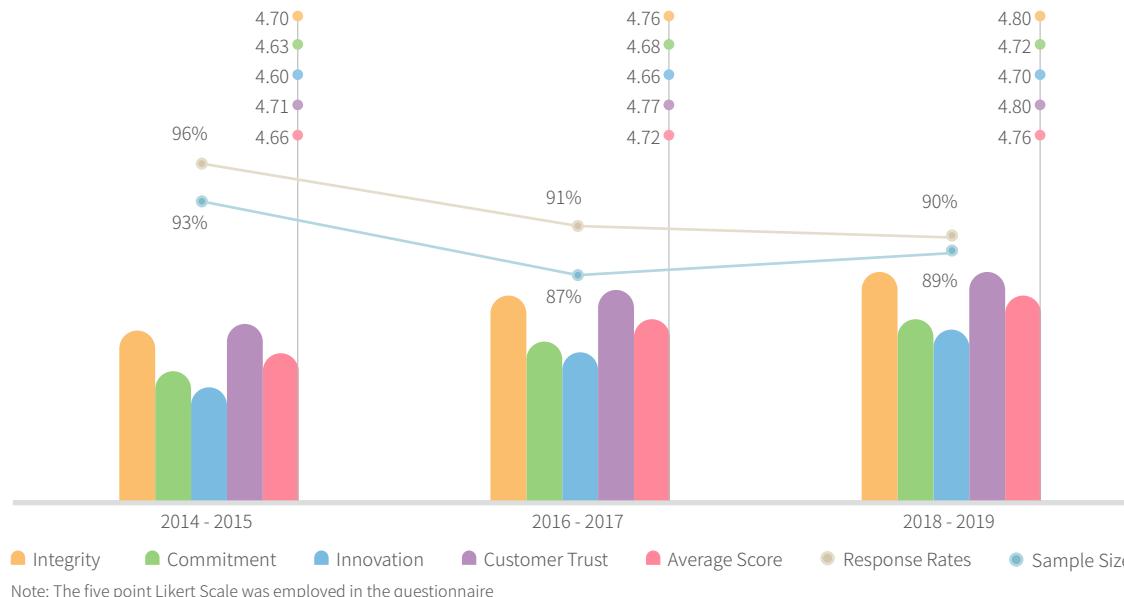
To monitor employees' commitment to TSMC's core values and to the company, TSMC conducts biennial surveys on how employees perceive the company's core values, covering 95% of all employees at TSMC and its subsidiaries, including TSMC's Taiwan facilities, TSMC

(China), TSMC (Nanjing), TSMC North America, TSMC Canada, TSMC Europe B.V, TSMC Japan, and TSMC Korea. WaferTech and VisEra are not included in the survey due to their different backgrounds.

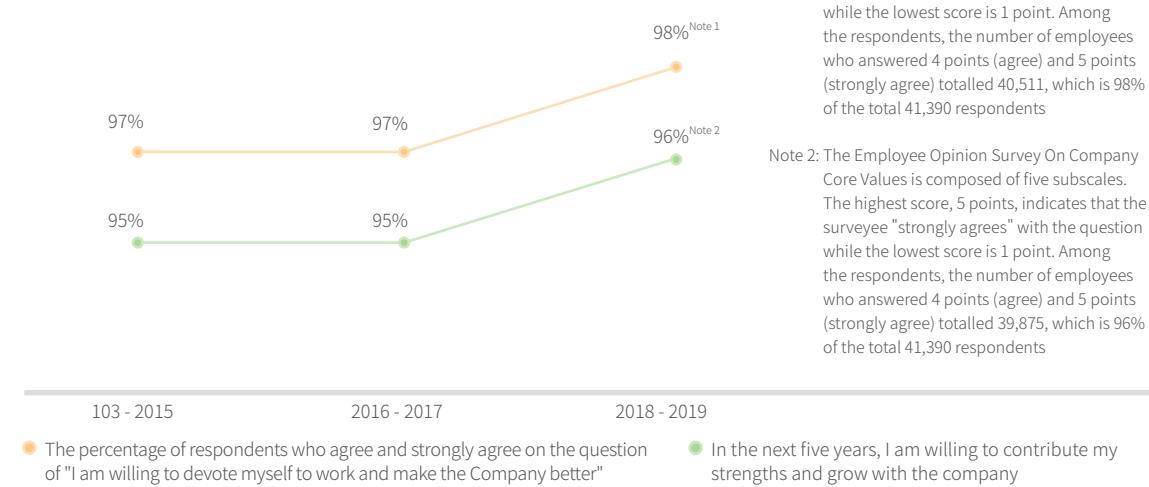
The results of the employee opinion survey on [core values](#) conducted in 2018 showed an overall average significant improvement compared with that two years ago. In terms of employee engagement, among the two questions in the "commitment" section, 98% of the staff expressed their willingness to devote themselves to work

and make the Company better. 96% of the staff expressed their willingness to grow with the company and show their expertise in the next five years. The results of the above two questions exceeded the expected target of 95%, indicating that the company's current policies and promotion programs have achieved positive results, and colleagues generally agree on the implementation of the company's core values. The next employee opinion survey on core values will be conducted in 2020.

## Survey Results on Employee Perception of Core Values



## "Commitment" Questions from the Employee Opinion Survey on Company Core Values



Note 1: The Employee Opinion Survey On Company Core Values is composed of five subscales. The highest score, 5 points, indicates that the surveyee "strongly agrees" with the question while the lowest score is 1 point. Among the respondents, the number of employees who answered 4 points (agree) and 5 points (strongly agree) totalled 40,511, which is 98% of the total 41,390 respondents

Note 2: The Employee Opinion Survey On Company Core Values is composed of five subscales. The highest score, 5 points, indicates that the surveyee "strongly agrees" with the question while the lowest score is 1 point. Among the respondents, the number of employees who answered 4 points (agree) and 5 points (strongly agree) totalled 39,875, which is 96% of the total 41,390 respondents



# Talent Development

## Strategies & 2030 Goals

### Encourage Job Rotation

Underscore on-the-job training with systematic job rotations to cultivate future talent

- No less than 50% of job vacancies shall be filled through internal transfers

- No less than 75% of manager positions shall be filled through internal promotions

## 2019 Achievements

- 50.8% of job vacancies were filled through internal transfers  
Target: No less than 50%

## 2020 Targets

- No less than 50% of job vacancies shall be filled through internal transfers

## Enable Self-directed Learning

Provide diverse learning resources and channels to encourage self-directed learning among employees. This will enhance individual performance and potential

- Non-required courses on the e-Learning Platform offered by the Self-Directed Learning Program shall register a usage rate of at least 60%

- Self-learning accounted for 66.3% of learning programs designed for the specific needs of organizations  
Target: No less than 50%
- Fab18's personnel were equipped with necessary skills to complete equipment installation in 2019 and prepare for mass production in 2020  
Target: Equip Fab18 personnel with necessary skills to complete equipment installation in 2019 and prepare for mass production in 2020

- Self-learning shall account for no less than 50% of learning programs designed for the specific needs of organizations

- New fab personnel shall be supported and trained with the completion rate of 100%

● Exceeded ● Achieved ○ Missed Target



In 2019, TSMC formulated its 2030 Goal for Inclusive Workplace: Talent Development to ensure that employees' skillsets remain relevant, to support the company's long-term growth, and to promote life-long learning among employees. In the next decade, TSMC will enhance on-the-job training, offer diversified learning resources, and build comprehensive self-learning programs to promote self-learning among employees, enhance the learning agility of organizations, and help employees grow. To these ends, TSMC has formulated two major strategies: encouraging job rotation and promoting self-learning. In addition to increasing the percentage of job vacancies filled through internal transfers, the Company has also set a target for the percentage of manager vacancies filled through internal promotions. Furthermore, since self-learning has accounted for more than 50% of learning programs, the Company has entered the next phase of self-learning advocacy by encouraging employees to take non-required online learning courses.

## Fulfill Talent Development

Encouraging job rotations and promoting self-directed learning are important strategies for talent development at TSMC. In terms of encouraging job rotations, TSMC has proactively implemented on-the-job training and certification systems, allowing employees to learn and improve their work performance in the workplace. The Company not only systematically designs job rotation programs to cultivate future talent, but also encourages its employees to complement their career plans with the Company's organization development, so as to increase internal talent mobility and allow them to utilize their talents and grow. TSMC's efforts have yielded

concrete results: in 2019, 50.8% of all job vacancies were filled through internal transfers, thereby achieving the Company's short-term target. As part of its long-term strategy for human resource development, TSMC has set another target: by 2030, no less than 75% of manager positions shall be filled through internal promotions.

TSMC promotes self-learning by cultivating a self-learning mindset in employees and offering diversified learning resources and learning tools. Employees are encouraged to engage in learning at all places, at all times, and in all forms in line with the company's direction of development, the specific needs of each organization, and personal requirements. A self-learning culture enhances work performance, facilitates corporate growth, and contributes to social progress.

## Transparent Framework for Employee Development and Job Rotation

To retain talents, TSMC offers a comprehensive framework for employee development, whereby a dual career ladder system covering both management and technical positions allows employees to explore their full potential in either of the two types of positions according to personal characteristics and skills.

Furthermore, the promotion system in the employee development framework is based on two major principles: transparency on internal vacancies and respect for employees' transfer decisions. It considers development potential as an important indicator for evaluating candidates for promotion. A handbook on promotion procedures and numerous relevant tools are offered to managers to help them assess candidate potential.

## Human Resource Development Strategies

### • Dual Career Ladder System

Develop a comprehensive employee development framework, strengthen HR-related systems and supplementary measures, and build an environment where each employee is put in the position that best suits their abilities

### • Talent Mobility

Facilitate talent mobility by ensuring transparency on internal vacancies, respecting employees' transfer decisions, and allowing employees to plan for their own careers

### • Promotion Indicators

Potential has been listed as one of the indicators for evaluating candidates for promotion

## Employee Development

Explore employees' potential and create an environment that encourages employees to pursue personal growth



## Learning Development

Help organizations and employees grow rapidly to adapt to changing environments and fulfill the organization needs

### • Promoting Corporate Culture

Enhance employees' commitment to TSMC's core values and strengthen TSMC's core values as the company expands

### • Enhancing Management Literacy

Enhance management literacy among managers at all levels, thereby strengthening employee commitment

### • Developing Capabilities

Provide R&D support and train personnel for new fabs, offering training courses on topics such as process and physics to ensure employee capabilities

### • Building a Customer-oriented Culture

Customer trust is one of the pillars that underlie TSMC's competitive edge. TSMC succeeds when customers succeed. Thus, TSMC is committed to helping customers excel and strengthen customer-oriented culture

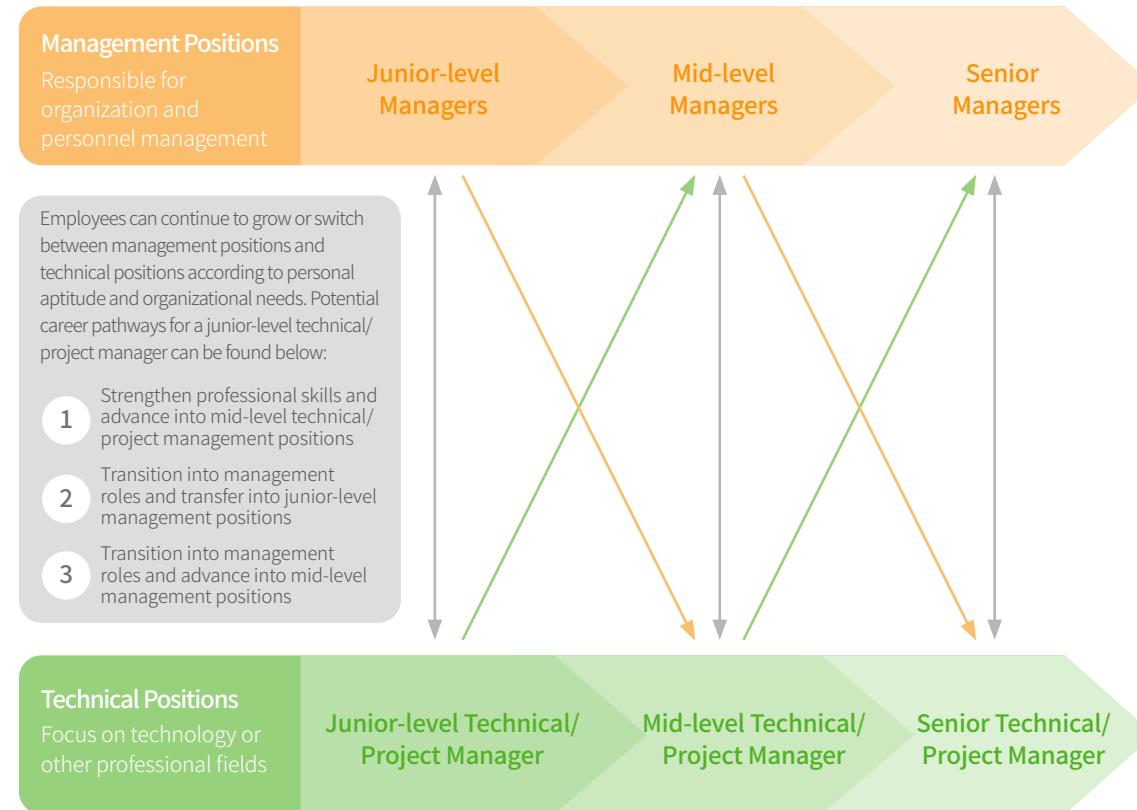
### • Improving Learning Systems and Resources

Encourage self-learning among employees by offering diversified learning channels and tools; enhance learning management system to facilitate knowledge sharing

In 2019, 38.2% of managers and 33.2% of professionals were transferred or rotated due to either individual or organizational development. Due to expansion projects, more new employees were recruited in 2019 than in the previous year, leading to a slight decrease in the percentage of vacancies filled through internal transfers compared with the previous year. However, the rate still reached 50.8%, a testimony to TSMC's commitment

to internal mobility and comprehensive leadership development. Going forward, TSMC will continue to improve the dual career ladder system of employee development and, by enhancing internal transfer management, ensure that no less than 50% of vacancies are filled through internal transfers, a strategy that drives both organizational and personal development.

## Employee Development Framework — Dual Career Ladder System



## Diverse and Equal Opportunities for Learning and Development

Given that the Company's growth is closely related to employees' personal learning and development, TSMC designs employee learning and development programs based on three key elements: goal, plan, and discipline. The company is committed to building a diverse and

equal learning environment that encourages continuous learning and offers rich content. It has also formulated the TSMC Employee Training and Education Procedures to integrate internal and external resources, enhance employee capabilities, and help employees grow with the company.

## Key Objectives of Personnel Development





TSMC's employees set individual development plans according to personal requirements, mid-year and year-end performance review, and career development goals. Employees' personal development plans form one of the bases on which the company's annual training program is designed. In 2019, employee performance assessment registered a completion rate of 100%. In 2019, TSMC provided over 740,000 hours of training programs and

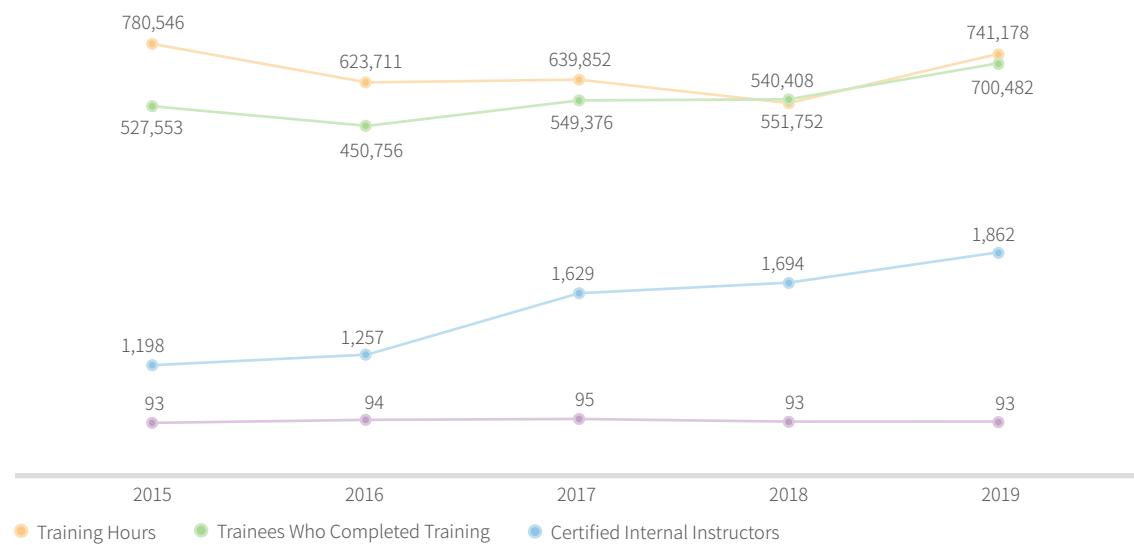
activities for learning and development to over 700,000 participants. Each employee received, on average, over 14 hours of training. The total expense on training reached NT\$59 million.

To ensure the effectiveness of training programs, TSMC measures the outcome with four levels of evaluation - reaction, learning, behavior, and results - based on

the theory proposed by American scholar Donald L. Kirkpatrick. In 2019, all open courses were evaluated on the reaction level, including contents, instructor, administration, and satisfaction scores. The courses received an overall satisfaction score of 93. A total of 584,749 participants completed 3,534 online courses and learning evaluations. 5% of the open courses and customized courses were further evaluated on

the behavioral level. Most on-the-job training offered by internal organizations were further evaluated at the learning and behavioral level, and evaluations at the results level have been built into the employee performance management and development system.

## Historical Training Index



● Training Hours ● Trainees Who Completed Training ● Certified Internal Instructors

● Average Evaluation Score of Course Satisfaction

Note: Due to the design differences between training systems, the average evaluation score excluded data from TSMC North America

## Average Hours of Training per Employee



Unit: hour

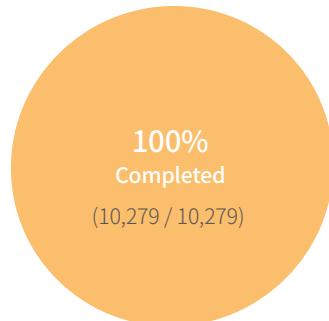
## 2019 Key Objectives for Learning and Development Programs

**Professional Training for Engineers/  
Junior-level Managers**  
Technical Depth Enhancement Project

## ● Objectives

Deepening engineers' / junior-level managers' domain knowledge in front-end and back-end processes

## ● Completion rate among participants



## ● Status

A devolved three-phase training program executed by fab-level managers  
(1) **Training on wafer processes**  
(2) **Professional development for process engineers**  
(3) **Study group presentation sessions**

Through lectures, self-study sessions, group study sessions, and practice, the program aimed to refine engineers' professional skills and domain knowledge in production processes

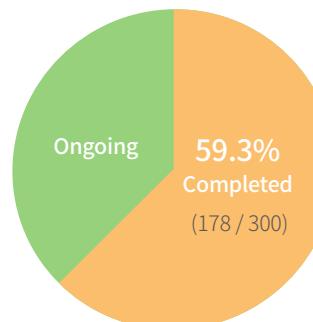
Offered in 13 fabs with a completion rate of 100%

**Management Training in Operation  
Organizations**  
A Program for Mid-level Management

## ● Objectives

Equip managers with the ability to foster a work environment conducive to mutual respect and high employee commitment, thereby building an open communication environment

## ● Completion rate among participants



## ● Status

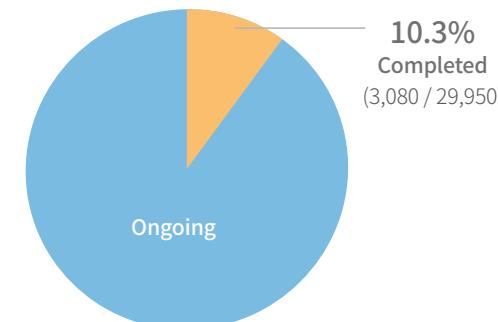
Three major learning objectives  
(1) **Empathy and respect**: managers must be empathetic and respect individual differences  
(2) **Effective communication**: managers must be open-minded and able to listen and ask the right questions, thereby communicating effectively with employees  
(3) **Conflict management**: managers must adopt conflict management strategies to address conflicts and exert positive influence

**Encourage Self-learning**  
"All You Can Learn!"

## ● Objectives

Encourage the use of online learning resources and promote self-learning concept among employees

## ● Completion rate among participants



## ● Status

Introduce the concept of and methods for self-directed learning  
Offer online courses on **eight major** topics, each of which comes complete with a variety of learning resources including online lectures, articles on professional knowledge from internal and external sources, video clips, and books. Online courses received 11,958 clicks



# Human Rights

Strategies & 2030 Goals

2019 Achievements

2020 Targets

Enforce TSMC Human Rights Policy, Responsible Business Alliance Code of Conduct, and United Nations Guiding Principles on Business and Human Rights.

No material regulatory violation (where fines exceed NT\$1 million)

● No material regulatory violation  
Target: No material regulatory violation

● E-voting system was adopted for the election of new labor representatives in one of TSMC's Taiwan facilities  
Target: Adopt e-voting system for the election of new labor representatives in any one of TSMC's facilities

● No material regulatory violation

● All of TSMC's Taiwan facilities shall adopt an e-voting system for the election of new labor representatives and list e-voting systems as the only voting method for all future elections of the same kind

● Exceeded ● Achieved ● Missed Target



In 2019, TSMC formulated its 2030 Goal for Inclusive Workplace: Human Rights to continue to live by its commitment to human rights. Guided by the core value of Commitment, TSMC considers employees as its most important asset, offering them meaningful job responsibilities, a safe and healthy work environment, and rewarding compensations and benefits. At the same time, TSMC encourages employees to achieve work-life balance by engaging with family, friends, and personal interests. In the future, TSMC will continue to enforce its [human rights policy](#) in accordance with the United Nations Guiding Principles on Business and Human Rights and [Responsible Business Alliance Code of Conduct](#).

## Human Rights Risk Mitigation

As the largest dedicated semiconductor foundry in the world, TSMC is committed to building a safe work environment for its employees and in its supply chain, respecting and protecting the dignity of its employees, protecting the environment, and enforcing strict ethical standards. To these ends, TSMC has become a full member of the Responsible Business Alliance (RBA), the largest electronics business alliance in the world, conducting due diligence to ensure that its code of

conduct complies with or outperforms the Responsible Business Alliance Code of Conduct.

Using RBA's self-assessment questionnaire (SAQ), TSMC conducts annual assessments to identify internal operations bearing the highest social, environmental, and moral hazards. In 2019, TSMC's headquarters and all facilities worldwide scored over 90 on SAQ, thus classifying TSMC facilities as low risk. Between 2016

and 2018, TSMC commissioned a third-party institute trained in social and environmental audit to conduct RBA's Validated Assessment Program (VAP) on all fabs in addition to TSMC's annual SAQ assessment. Of the 16 fabs, 14 scored full marks. In 2019, TSMC, responding to customer demand, conducted VAP audits on seven fabs, six of which scored full marks again. TSMC's customers can access a complete audit report on RBA-Online.

### Risk Assessment

#### SAQ Assessment Scores (2019)

- Low risk ( $\geq 85$ )
- ▲ Medium risk ( $\geq 65 \& < 85$ )
- ▲ High risk ( $< 65$ )

#### VAP Assessment Scores (2019)

#### VAP Assessment Scores (2016-2018)

Full marks = 200

Note: Advanced Backend Fab3 and VisEra are expected to be included in the 2020 SAQ assessment

	Taiwan			Overseas		
	SAQ	VAP	VAP	SAQ	VAP	VAP
Corporate Headquarters	● 95.6	-	-	Fab14A	● 92.6	-
	● 93.6	-	200	Fab14B	● 92.4	200
	● 93.6	200	200	Fab15A	● 93.0	200
	● 93.4	200	200	Fab15B	● 93.4	-
	● 93.1	200	200	Advanced Backend Fab1	● 94.7	-
	● 92.9	-	200	Advanced Backend Fab2	● 94.5	-
	● 93.3	200	193.3	Advanced Backend Fab3	● 94.7	-
	● 93.1	-	200			



## Human Rights Policy Concerns and Practices

### Safe & Healthy Workplace

● People Affected: All Employees  
● Number of Employees Under High-risk Conditions: 4,146 employees were under Special Health Examination Management (Please refer to Occupational Safety and Health)

#### Targets and Actions

- Implement occupational disease prevention and promote physical and mental health of employees

#### Risk Assessment

- Record whether any occupational diseases were caused by chemical exposure
- Self-help participation rate indicates the effectiveness of promoting employee health

#### Risk Reduction Measures

- Quarterly meetings on occupational health management are convened by vice presidents. Participating members include ESH, fab directors, the Department of Industrial Safety and Environmental Protection, the Legal and Human Resources functions, and the Wellness Management Section
- Allocate exemplary-qualified medical personnel to provide a wide spectrum of 24/7 health services, including special protection, healthcare services, health promotion, and employee assistance services

#### Remedies

- Immediate Removal from current position
- Provide adequate medical assistance
- Provide compensatory leave and subsidies according to laws and regulations
- Prevent disease recurrence

#### Internal Communication Channels for Employees

- Occupational Disease Investigation Committee

### Non-discrimination & Equal Employment Opportunity

● People Affected: Newcomers  
● Number of Employees Under High-risk Conditions: 0

#### Targets and Actions

- Strictly comply with government labor laws, international labor standards, and the "TSMC Human Rights Policy" to implement relevant internal rules and regulations
- Promote and implement internal control procedures by making known the non-discrimination policy in the TSMC Candidate Interview Process - one does not and shall not discriminate on the basis of race, social class, language, belief, religion, political preference, nationality, birth place, gender, sexual orientation, age, marital status, pregnancy, physical appearance, facial expressions, or disability
- Make necessary adjustments according to findings from internal control and inspections
- Include the non-discrimination policy in training courses for Human Resources managers
- In notifications for internal interviews in TSMC, interviewers will be explicitly reminded not to ask applicants about any personal information that is not job-related during the interview

#### Risk Assessment

- From the beginning of recruitment, TSMC follows internal control procedures to eliminate discrimination. Additionally, TSMC will not ask applicants for any information that are not related to their jobs when applicants submit their resumes through the Company's resume system

#### Risk Reduction Measures

- From the beginning of recruitment, all TSMC hiring procedures are to comply with the law and eliminate illegal discrimination
- No action needed by TSMC

#### Internal Communication Channels for Employees

- External people can file a report or complaint through the "[Irregular Business Conduct Reporting](#)" on TSMC's official website

### Prohibit Child Labor

● People Affected: Newcomers  
● Number of Employees Under High-risk Conditions: 0

#### Targets and Actions

- In line with the "TSMC Human Rights Policy," the company amended and implemented the "TSMC Internal Control Procedures for Conducting Interviews." In compliance to the procedures, TSMC only accepts applicants over 18 years old and will double check the age of new employees to avoid any mistakes or omissions

#### Risk Assessment

- Applicants are required to provide identity documents, such as a National Identification Card, driver's license, National Health Insurance Card, or a diploma, to prove they are over 18 years old

#### Risk Reduction Measures

- From the beginning of recruitment, all TSMC hiring procedures are to comply with the law and eliminate child labor issues

#### Remedies

- No action needed by TSMC

#### Internal Communication Channels for Employees

- External people can file a report or complaint through the "[Irregular Business Conduct Reporting](#)" on TSMC's official website

### Prohibit Forced Labor

● People Affected: All Employees  
● Number of Employees Under High-risk Conditions: 0

#### Targets and Actions

- In strict compliance with government labor laws, international labor standards, and the "TSMC Human Rights Policy," TSMC will not force nor threaten any non-willing personnel to carry out work-related tasks
- Work regulations stipulate that should the need for overtime work arise, employee consent must be received. Following overtime work, overtime pay or compensatory leave must be provided to employees

#### Risk Assessment

- In addition to using internal systems to control and monitor working hours, TSMC has established internal communication channels and convened communication meetings in all fabs to raise awareness and inspect for any forced labor

#### Risk Reduction Measures

- Set a reminder function in both time clock and overtime systems. Conduct monthly inspections of working hours in company facilities

#### Remedies

- If there is any evidence of forced labor, supervisors will be required to make the necessary improvements and restore the rights to which employees are entitled

#### Internal Communication Channels for Employees

- Internal communication channels include the Employee Opinion Box and the Ombudsman System. There are also regular communication meetings for employees to report any issue

### Physical & Mental Health and Work-life Balance in Employees

● People Affected: All Employees & Employees in Need  
● Number of Employees Under High-risk Conditions: 0, 0

#### Targets and Actions

- Provide a variety of activities, including art activities, sports events, family activities, and parent-child activities. Provide opportunities for community involvement to help broaden interpersonal interactions among colleagues and enrich their work-life balance

#### Risk Assessment

- Examine participation rates
- Increase the quota on company-owned child care facilities

#### Risk Reduction Measures

- Collaborate with members of the TSMC Employee Welfare Committee and activity organizers to promote activities and encourage participation

#### Remedies

- Conduct questionnaires after each activity to make improvements in the future
- Move up the date to draw lots for the use of child care facilities. This will allow those who did not draw a slot to have adequate time to find other child care facilities

#### Internal Communication Channels for Employees

- Internal communication channels include the Employee Opinion Box and Ombudsman System. There are also regular communication meetings for employees to report any issues

## Human Rights Protection Training Practices



### Promote Regulatory Compliance in New Employee Orientation

Contents include prohibition on forced labor and child labor, anti-discrimination, anti-sexual harassment, working hours management, and humane treatment



### Provide E-learning Courses for Sexual Harassment Prevention

Contents include the definition and prevention of sexual harassment and approaches to deal with sexual harassment



### Promote Prevention of Workplace Bullying

Help employees understand what workplace bullying is and how to avoid any form of it in order to create a friendly, bully-free work environment

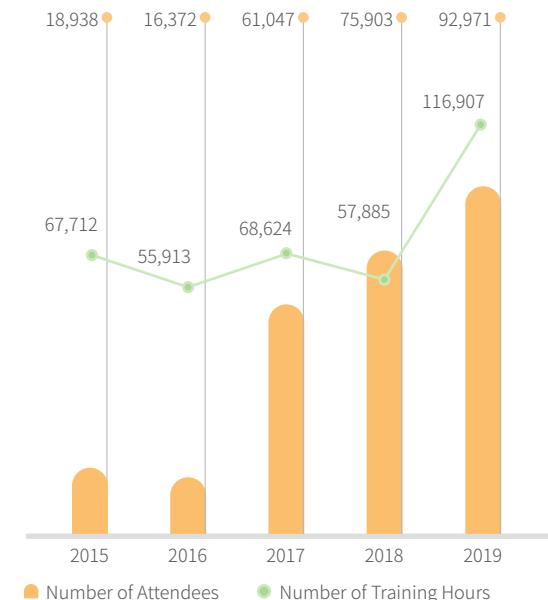


### Provide Comprehensive Occupational Safety Training

Provide employees with training for different work situations. Training includes fire safety, emergency response, first-aid, general safety and health education, fab safety, and safety training for newly-promoted managers

In 2019, TSMC provided employees with a total of 116,907 hours of human rights protection training. In total, 48,763 employees (92,971 training attendances) completed the training program, accounting for 95% of TSMC's total employees. Going forward, TSMC will continue to focus on human rights protection and offer training programs to raise awareness of human rights among employees to minimize risks.

## Human Rights Protection Training and Participation



## Employee Communication

TSMC highly values employee opinions and rights, and provides several communication channels. The highest-level executives of the HR organization are responsible for many of the channels, ensuring that employee opinions

## TSMC Internal Communications Structure



are handled in an efficient and confidential way to ensure open and transparent communications between managers and employees. Furthermore, TSMC respects employees' right to take part in collective bargaining and peaceful rallies. In accordance with legal requirements in Taiwan, the company holds labor-management meetings periodically to brief employees on corporate operations

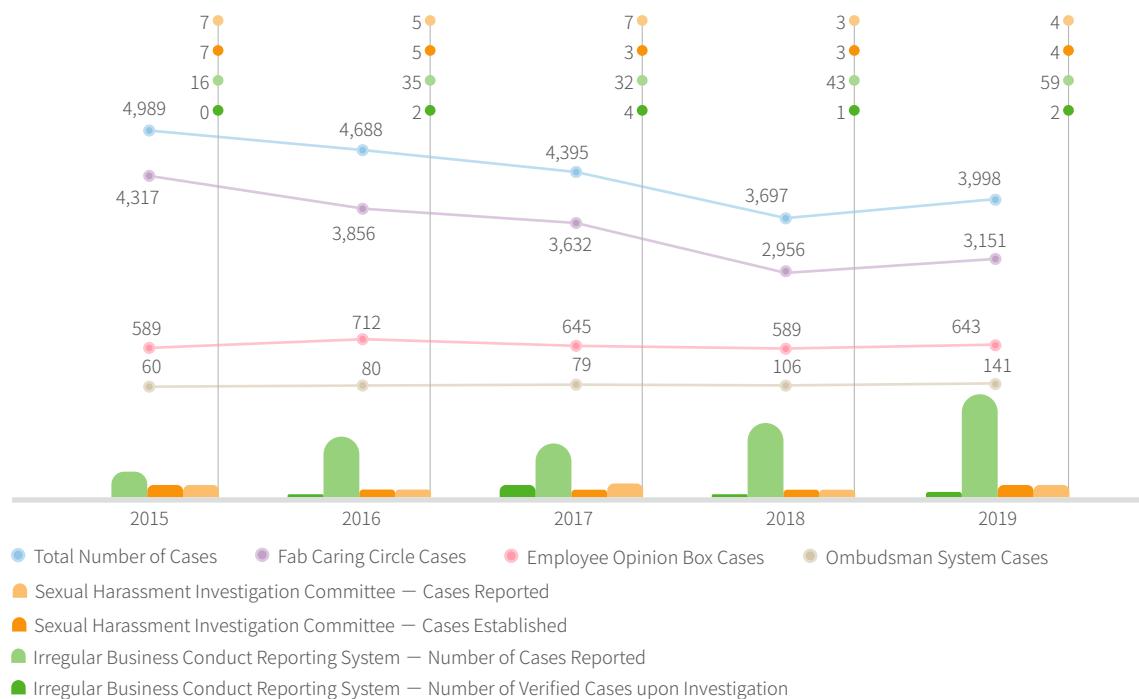
and discuss with employees on issues such as working conditions and benefits. To facilitate labor-management communication, TSMC's plants in the Central Taiwan Science Park adopted an e-voting system for the election of new labor representatives in 2018. In 2019, TSMC's Longtan plant also adopted an e-voting system for the election of five labor representatives, thereby expanding employee participation.

In 2019, TSMC's internal communication channels handled a total of 3,998 cases of employee opinions and complaints, including four through the Sexual Harassment Investigation Committee, 141 through the Ombudsman System, 643 through the Employee Opinion Box, 3,151 through the Fab Caring Circle, and 59 cases through the Irregular Business Conduct Reporting System. All reported cases have been processed and addressed by competent organizations. Cases reported through the Sexual

Harassment Investigation Committee and the Ombudsman System were investigated and reviewed by committee members. Cases reported through the Employee Opinion Box were handled by responsible persons, who would then communicate with employees about the solutions and outcome. Employees can access these internal communication channels via the internal employee portal. These channels are also introduced to new employees to ensure that all employees are well-informed.

With these effective internal communication channels, the relationship between the management level and employees has been harmonious over the years. TSMC has always respected employee rights to form a labor union, but so far none have been formed.

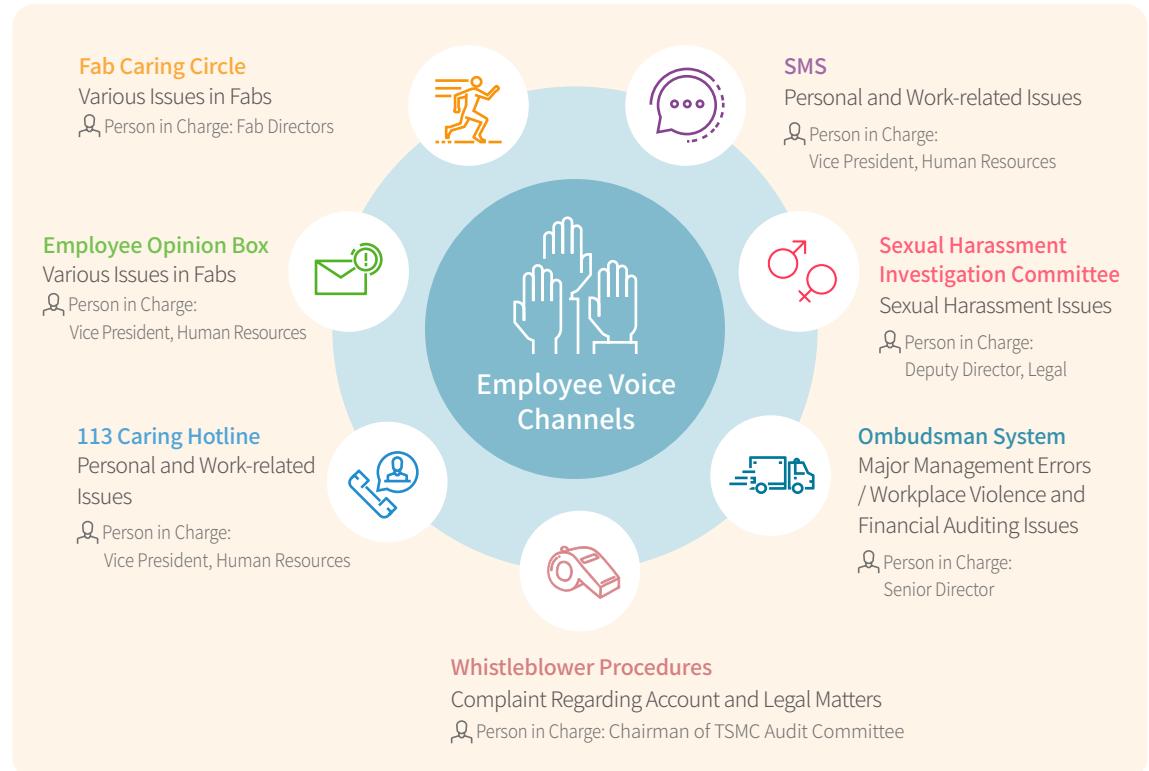
### Number of Cases Reported Through Internal Communication Channels



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 facilities

Note 2: Cases reported through the Irregular Business Conduct Reporting System were included for the first time in 2019, thus increasing the total number of cases reported

### Employee Voice Channels



Note: Cases reported via 113 Caring Hotline and SMS are handled by designated people and directed to other voice channels



# Occupational Safety and Health

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Build a Safety Culture

Deeply instill a people-oriented safety culture, manage safety risks, and establish an intrinsically safe working environment

- Incident Rate per 1,000 employees < 0.20<sup>Note 1</sup>
- Disabling Injuries Frequency Rate (FR) <0.45<sup>Note 2</sup>
- Disabling Severity Rate (SR) <6

### Comprehensive Health Management

Safeguard the physical well-being of employees by preventing occupational diseases

- Zero cases of occupational disease caused by exposure to chemicals
- Health Program Participation Rate  $\geq 55\%$

### Internal-External Alliance

Collaborate with external parties to establish safer working environments in our supply chain

- Completion rate of providing consultation to all vendors with high risk operations and auditing health and safety standards in their facilities: 100%<sup>Note 3</sup>
- Assist all contractors with high risk operations in obtaining ISO 45001 certification for occupational health and safety management system<sup>Note 4</sup>

Note 1: Beginning in 2020, all TSMC employees and contractors will be included in the calculation of incident rate per 1,000 employees

Note 2: Beginning in 2020, Disabling Injuries Frequency Rate (FR) and Disabling Severity Rate (SR) will include both work-related and non-work related injuries; See [Statistical Analysis of Disabling Injuries](#) for detailed information

Note 3: Vendors with high risk operations include vendors who scored lower than 70 in the last annual audit, new vendors, and vendors covered by the annual coaching project (e.g. parts cleaning service providers). Since the portfolio changes year from year, TSMC continues to coach and audit those identified as such

- Incident Rate per 1,000 Employees: 0.425<sup>Note 5</sup>  
Target: <0.20
- FR: 0.84; Work-related Disabling Injuries Frequency Rate: 0.48<sup>Note 6</sup>  
Target: < 0.45 ; < 0.3
- SR: 13; Work-related Disabling Severity Rate: 8<sup>Note 6</sup>  
Target: < 6 ; < 3.1

- Incident Rate per 1,000 Employees < 0.20
- FR < 0.45
- SR < 6

- Zero cases of occupational disorders caused by exposure to chemicals  
Target: 0
- Health Promotion Program Participation Rate: 52.79%  
Target:  $\geq 52.5\%$

- Zero cases of occupational disorders caused by exposure to chemicals
- Health Promotion Program Participation Rate  $\geq 53\%$

- Provided coaching to all vendors with high risk operations and audited health and safety implement status in their facilities  
Target: 100%
- Assisted 50% of our contractors engaged in high risk operations in obtaining ISO 45001 certification for occupational health and safety management system  
Target: 50%

● Exceeded   ● Achieved   ● Missed Target

- Provide coaching to all vendors with high risk operations and audit health and safety implement status in their facilities
- Assist 60% of our contractors engaged in high risk operations in obtaining ISO 45001 certification for occupational health and safety management system

Note 4: Contractors with high risk operations include those engaged in confined space work, live-line work, hot work, or gas/chemical tubes cutting.

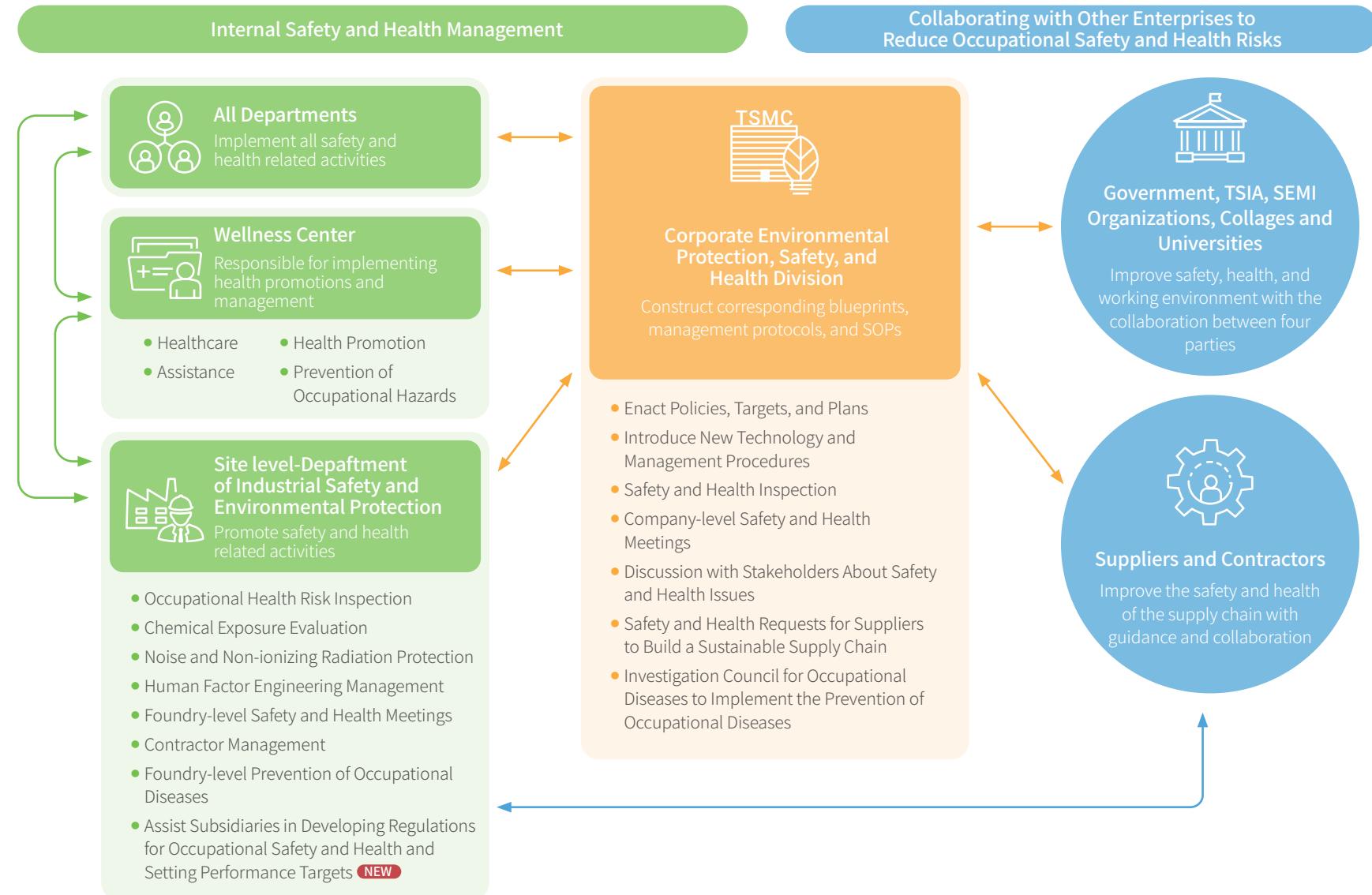
Since new contractors are recruited every year, TSMC continues to coach and audit those identified as such

Note 5: The target for Incident Rate per 1,000 Employees was missed. Please see [Safety Performance Index](#) for details on corrective measures

Note 6: The targets for Disabling Severity Rate (SR) and Disabling Injuries Frequency Rate (FR) were missed. Please see [Statistical Analysis of Disabling Injuries](#) for reasons identified

To ensure occupational safety and health implementing, TSMC established an organization with a clear division of roles and responsibilities to meet the needs and expectations of internal and external stakeholders. In 2019, TSMC continued to promote safety culture and improve risk management procedures. Due to expansion projects, TSMC premises were visited in 2019 by an average of 32,168 contractors staff each day. Therefore, TSMC published [The Blue Book on Environmental Safety and Health for Contractors](#)<sup>Note</sup> to strengthen safety management and create a safe and friendly environment together with its contractors. To help TSMC (China) and TSMC (Nanjing) build healthy and safe workplaces, TSMC launched in 2019 a special project on environmental safety and health for businesses, which is responsible for conducting regular reviews on relevant regulations and communicating with stakeholders about the feasibility of regulations, thereby helping TSMC's subsidiaries optimize their workplaces.

Note: The Blue Book on Environmental Safety and Health for Contractors by TSMC covers 6 major categories in 73 chapters: guidelines for contractors entering TSMC premises, regulations on the handling of proprietary information, emergency response, rules on cleanrooms, regulations on applying for construction permits, and regulations on general operations. This guide book uses visual illustrations in lieu of written descriptions to allow for easier comprehension and stricter adherence, thereby better ensuring the safety of TSMC's operations





## Promote a Safety Culture

A comprehensive safety culture lies at the foundation of a healthy workplace. TSMC promotes safety culture in three aspects—people, environment, and behavior—by encouraging employees to proactively raise suggestions on improving safety at work. By starting from minutiae, TSMC seeks to nip potential threats in the bud and build a people oriented safety culture.

## Safety and Health Measures

Following the Company's Safety and Health Policy, TSMC implemented the following measures and used the Safety Performance Index (SPI) to track performances to build a safety culture and manage risks.

## Safety and Health Efforts in 2019



### 2019 Safety and Health Measures

Approaches	Specific Measures	SPI	Taiwan Facilities	Overseas Facilities <sup>note 1</sup>	VisEra
Regulation Inspection	<ul style="list-style-type: none"><li>Relevant regulations and the compliance of all facilities were reviewed on a regular basis. A total of four safety and health related regulations were amended</li></ul>	✓	✓	✓ <sup>Note 2</sup>	✓
Standardized Management Procedures	<ul style="list-style-type: none"><li>A total of 54 documents on safety and health management procedures were standardized, and 46 documents were amended after review</li><li>In 2019, all Taiwan facilities obtained ISO 45001 certification on occupational health and safety<sup>Note 3</sup></li></ul>	✓	✓	✓	✓
Training Programs on Safety and Health	<ul style="list-style-type: none"><li>Training programs on safety and health were offered to employees and contractors to reinforce compliance and enhance emergency response capabilities<sup>Note 4</sup></li><li>Occupational health and safety specialists were invited to provide professional training to a total of 154 participants in order to better prevent occupational hazard</li></ul>	✓	✓	✓	✓
Hazard Identification	<ul style="list-style-type: none"><li>A total of 6,966 operation environments and operation procedures were reviewed to identify potential hazards</li></ul>	✓	✓	✓	✓
Change Management	<ul style="list-style-type: none"><li>A total of 2,997 cases of change management were completed with zero related incidents</li></ul>	✓	✓	✓	✓
Chemicals Management	<ul style="list-style-type: none"><li>A total of 175 chemicals were introduced with zero related incidents</li></ul>	✓	✓	✓	✓
Contractor Management	<ul style="list-style-type: none"><li>Contractors engaged in a total of 24,563 high risk operations with zero related incidents</li></ul>	✓	✓	✓	✓
Execution Review	<ul style="list-style-type: none"><li>A total of 1,581 improvements were suggested after internal audit. All improvements were addressed within the timeframe specified</li></ul>	✓	✓	✓	✓
Emergency Response	<ul style="list-style-type: none"><li>To enhance the company's capacity to respond to compound disasters, regular drills began to cover major disasters, and results were used as a basis for amendment to 108 drill scripts.</li></ul>	✓	✓	✓	✓
Occupational Accident Prevention	<ul style="list-style-type: none"><li>To reduce and improve the number of occupational injuries, ad hoc meetings on employee injuries were convened on a regular basis to analyze the underlying causes and promote improvement measures in all facilities.</li></ul>	✓	✓	✓	✓
Job Observation Safety Analysis <span style="background-color: #e6f2ff; border-radius: 10px; padding: 0 2px;">NEW</span>	<ul style="list-style-type: none"><li>Employees were encouraged to proactively raise suggestions for possible improvements to their own work environment. A total of 1,611 suggestions for improvements were raised, and all were addressed with responsive measures</li></ul>	✓	✓	✓	✓

Note 1: Includes TSMC (China) and TSMC (Nanjing)

Note 2: A regulation review platform that covers TSMC's Taiwan facilities, TSMC (China), and TSMC (Nanjing) was scheduled to be launched in 2019 to address discrepancies in legal regulations in different jurisdictions where TSMC operates. The launch was postponed to 2020 due to problems in the setup of domain firewalls.

Note 3: TSMC (China) and TSMC (Nanjing) are scheduled to be certified in 2020.

Note 4: [2019 Training Program Statistics](#)

## Case Study

## Encourage Employees to Speak Up; Ensure Both TSMC & Our Employees Safeguard a Culture Safety

As part of its effort to build a safety culture mutual protection between both the company and its employees, TSMC aims to reduce the number of incidents and the rate of repeated injuries. In 2019, jobs observation safety analysis was included in the Safety Performance Index. Employees were encouraged to observe their own working area

and proactively raise suggestions for possible improvements. Safety and health management specialist will work together with employees to identify opportunities for improvement, and confirm the validity of the improvement. In 2019, a total of 1,611 job observation analysis were raised and were classified into three risk levels: A, B, and C.



Level	Definition	Suggestions in 2019
A	Able to prevent incidents or significantly reduce the risk of major injuries that require hospitalization. E.g. crush injuries/exposure to chemicals/occupational diseases	<ul style="list-style-type: none"> <li>Improvement projects shall specify aims, approaches, and budgets</li> <li>Project closure reports shall provide evidence of improvement</li> </ul>
B	Able to significantly reduce potential safety and health risks of equipment of the same type and to be applied in all facilities	<ul style="list-style-type: none"> <li>Improvement projects shall specify aims, approaches, and budgets</li> <li>Project closure reports shall provide evidence of improvement</li> </ul>
C	Able to significantly reduce the chance of injury among personnel in a specific functional unit.	<ul style="list-style-type: none"> <li>Project closure reports shall provide evidence of improvement</li> </ul>

340

309

757

### Employee Suggestions



85%  
Reduced Operation Time



100%  
Manual Workload Reduced

### Before Improvement

Operators had to carry the maintenance tools onto the top of the tank when performing quarterly pump oil change for the waste water and pure water system.



### After Improvement

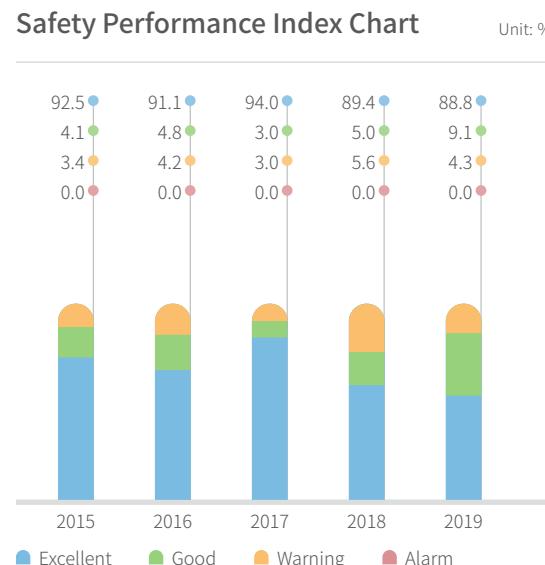
The operators designed a special jig. By injecting air into the system, the jig automatically pushes out the residual oil, which then flows through a tube into the waste bucket. The time needed for the operation was thus reduced to 1 hour.



## Safety Performance Index

TSMC's Safety Performance Index (SPI) were classified into four levels and two subtypes—active index and passive index. The active index encourages employees to participate in safety and health programs and raise suggestions for safety improvements, while the passive index shows the number of safety related defects, false alarm incidents. In 2019, the "blue light" indicator appeared slightly less frequently than the previous year, from 89.4% to 88.8%. The decline was mainly caused by the increase of the number of near miss, and false alarm incidents from 10 to 21, 11 of which were personal injuries, 6 of which were fire false alarms, and 4 of which were gas false alarms.

## Safety Performance Index Chart

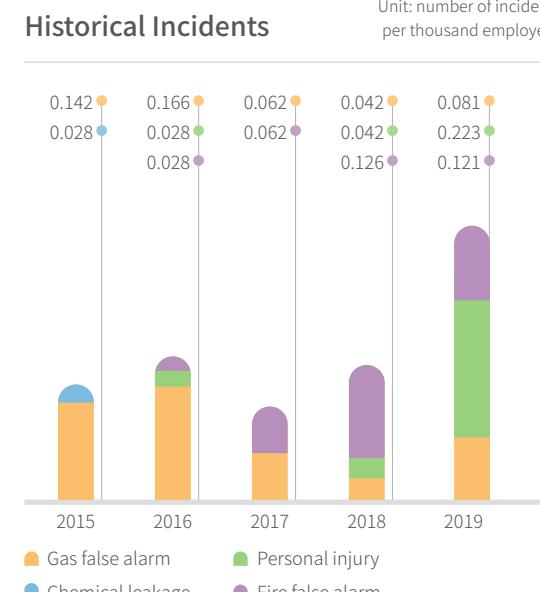


Note: The index covers TSMC's Taiwan facilities, TSMC (China), and TSMC (Nanjing)

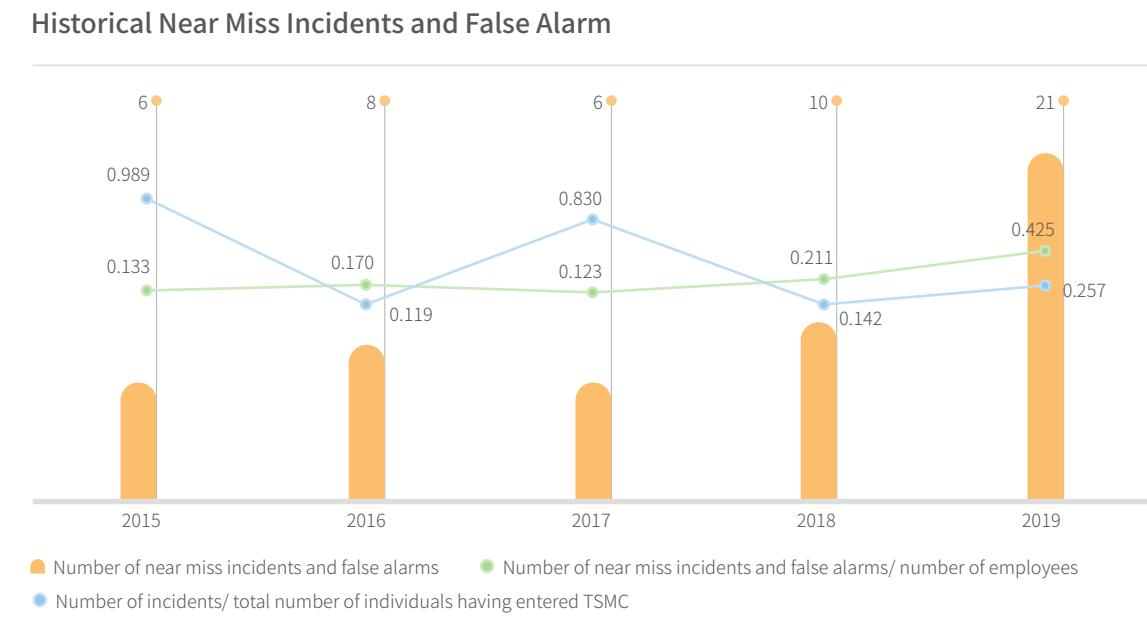
## SPI Index

Active Indicators		Passive Indicators	
● Number of Changed Safety Management within Foundries		● Number of False Alarm Incident	
● Safety and Health Program Targets <b>NEW</b> (Set annual targets, and execute job observed analysis and complete implement)		● Number of Self-evaluated Safety and Health Errors	
● Completion Rate of Safety and Health Trainings		● Completion Rate of Legal Inspection Implementation	
● Number of Safety and Health Promotion Activities		● Number of Errors Found During Safety and Health Inspections	
● Improving Measures of Occupational Hazards <b>NEW</b>		● Contractor Management (incl. numbers of errors, miss operations, and improving measures)	
● Share Improving Actions of Safety and Health with Other Foundries <b>NEW</b>		● Number of Work-relative Occupational Injury	

## Historical Incidents

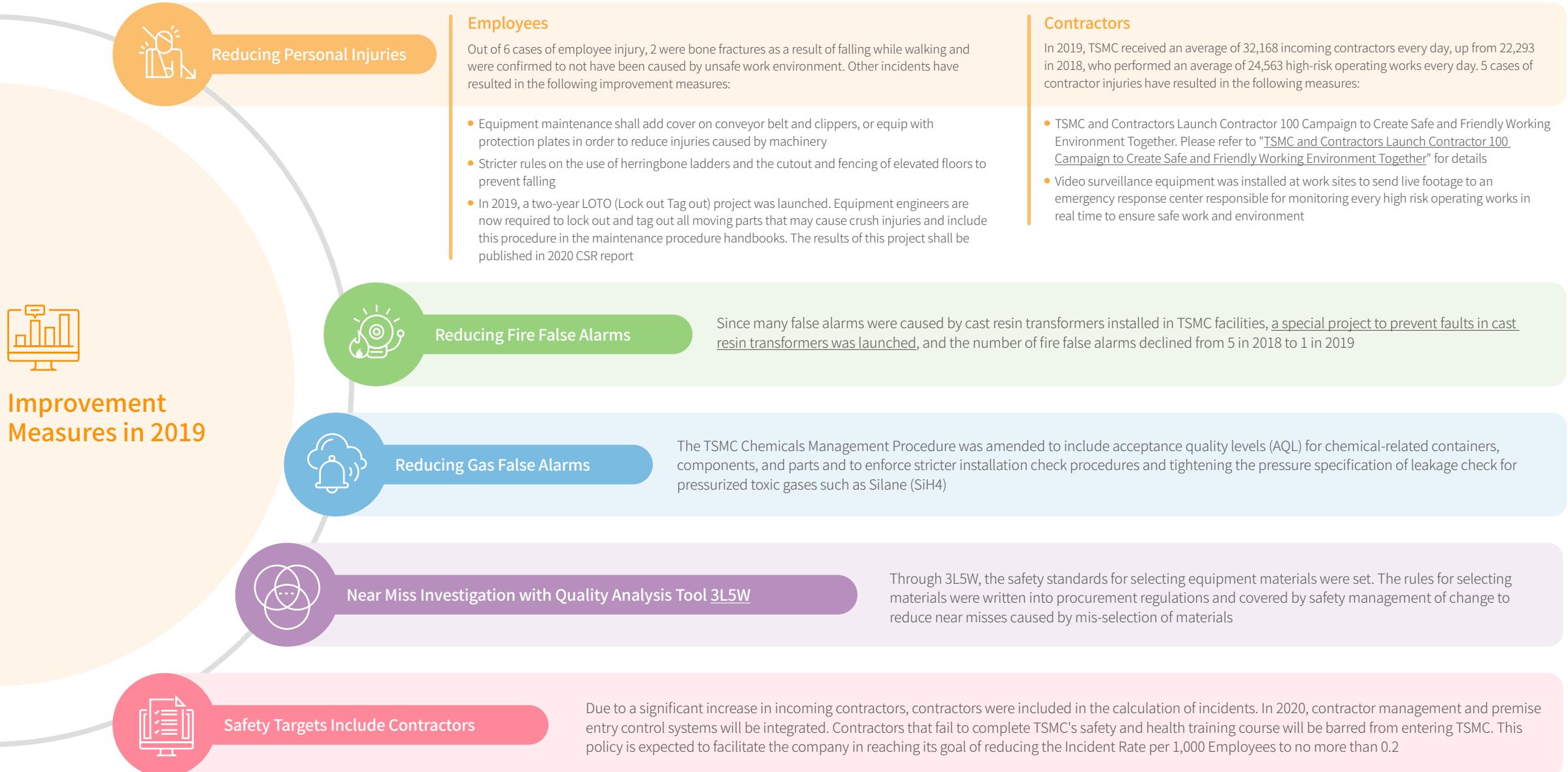


## Historical Near Miss Incidents and False Alarm



Note 1: The figures include TSMC's Taiwan facilities, TSMC (China), and TSMC (Nanjing)

Note 2: Beginning 2020, the Incident Rate per 1,000 Employees shall be calculated with the total number of individuals entering TSMC companies as the denominator, including employees and contractors.



## Statistical Analysis on Disabling Injuries

Occupational injuries were calculated according to important indicators determined by the Ministry of Labor and GRI Standards. The Disabling Injuries Frequency Rate (FR) and the Disabling Severity Rate (SR) served as the main indicators, while at-work or off-work road traffic incidents were not included. In 2019, a total of 78 occupational injuries transpired in TSMC facilities, resulting in

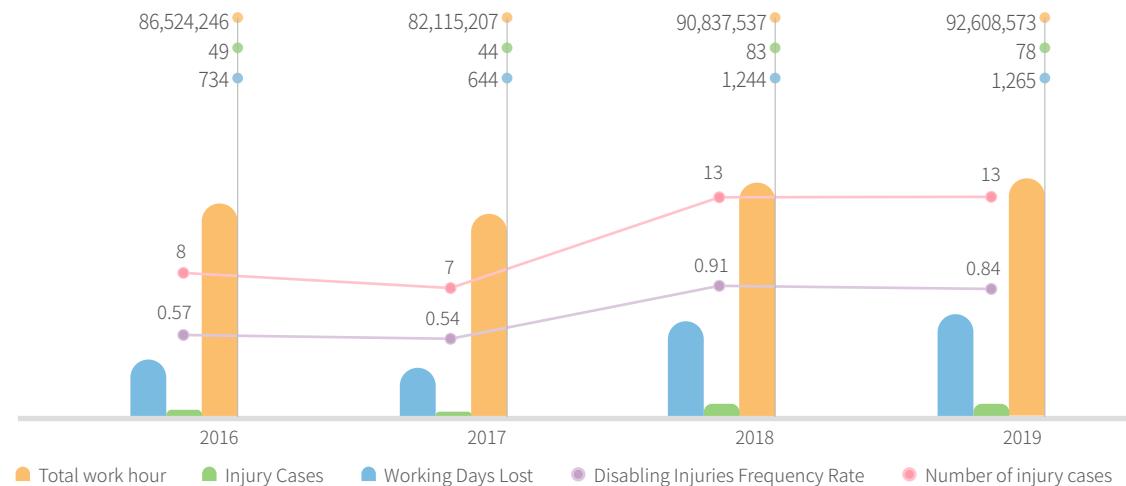
1,265 work days lost. Specifically, the Disabling Injuries Frequency Rate (FR) and Disabling Severity Rate (SR) for females were significantly higher than those for males.

Fall-related injuries were the most common, accounting for 32% of the cases and 49% of work days lost. To be specific, fall-related injuries and

the resultant work days lost were significantly higher for females than males. Females accounted for 95% of fall-related injuries and 91% of work days lost. Among injured females, 71% were technical staff aged 45-55 years. Investigations and interviews revealed that the main causes of fall were distracted walking and loss of balance while turning. Time to recovery averaged 15-60 days.

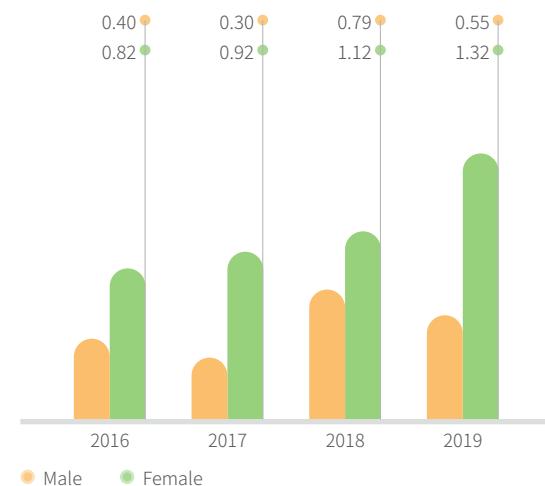
In addition to posters, safety officers conducted regular inspections on collision-prone and fall-prone environments, included lighting in operation environment checks, and added osteoporosis prevention and treatment to the 2020 health education program.

## Total Working Hours, Injury Cases, and Working Days Lost



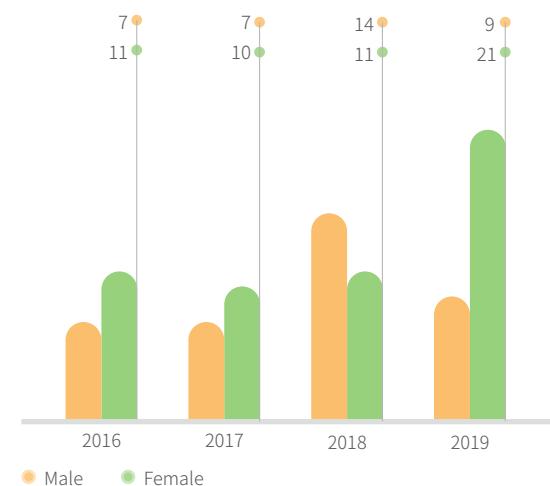
Note: The figures cover TSMC's Taiwan facilities, TSMC (China), TSMC (Nanjing), and VisEra

## Disabling Injuries Frequency Rate by Gender



Note: The figures cover TSMC's Taiwan facilities, TSMC (China), TSMC (Nanjing), and VisEra

## Disabling Severity Rate by Gender



Note: The figures cover TSMC's Taiwan facilities, TSMC (China), TSMC (Nanjing), and VisEra

The Disabling Severity Rate (SR) and the Disabling Injuries Frequency Rate (FR) slightly increased in 2019 compared to 2018 mainly due to larger staff size. The main types of injury remained the same as last year: bone fractures and sprained ankles caused by falls and collisions. Time to recovery lengthened, resulting in a significant increase in work days lost.

To prevent fall accidents in 2020, reflector stickers and warning signs will be installed in fall-prone stairways.

### Preventative Measures for Falls and Collisions

#### Raise staff awareness through warning posters and announcing measures in meetings

- Refrain from using the phone and talking on the phone in stairways
- Refrain from wearing high heels and slippery footwear
- Follow instructions when using trolleys
- Non work-related operations banned in aisles **NEW**
- Improved lighting and enforced speed limits in parking lots



#### Safety Committee regularly convenes for injury cases

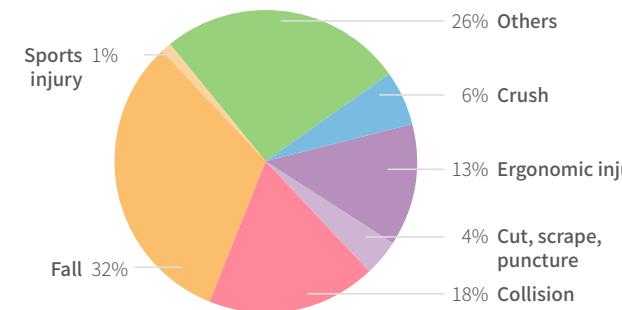
- Injury frequencies were calculated monthly and sent to the highest-ranking managers at each facility
- Materials for annual safety and health education were amended to include new regulations **NEW**
- Maintained a reporting system

#### Create a safer workplace to prevent falls and collisions

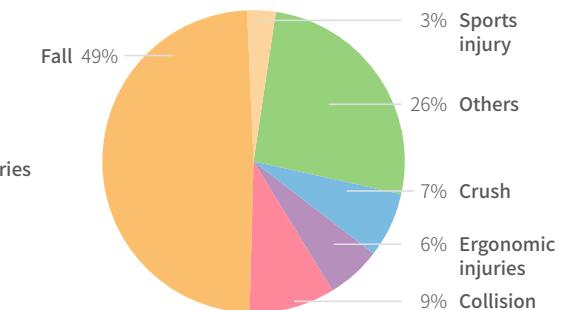
- Fall-prone areas improved
- Reflector labels installed **NEW**
- Equipment maintenance zones and temporary storage zones reorganized and renovated **NEW**
- Lifting and carrying automated **NEW**

Weekly poster campaigns will be launched to promote awareness among employees. To reduce work-related injuries, equipment maintenance zones and temporary storage zones will be reorganized and renovated. Manual carrying of items will be automated, and impact protection strips will be installed on the sides of trolleys. In 2020, TSMC will continue to put in place measures to prevent falls and collisions, raise safety awareness among employees, and review results through the Safety and Health Committee.

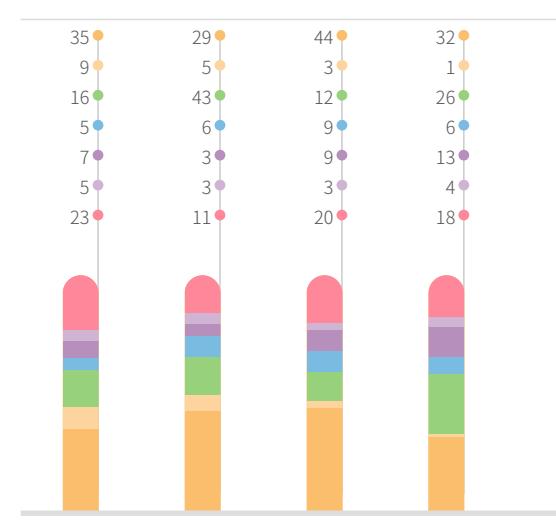
### Disabling Injuries Frequency Rate by Types of Injuries in 2019



### Disabling Severity Rate by Types of Injuries in 2019

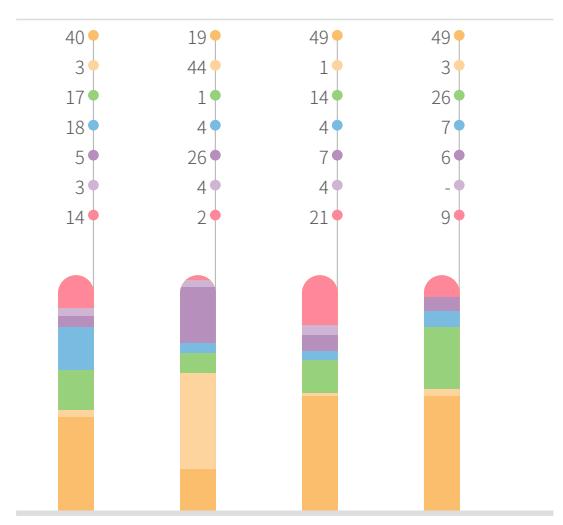


### Disabling Injuries Frequency Rate



Unit: %

### Disabling Severity Rate



Unit: %

## Comprehensive Health Management

Work-related diseases and personal health issues undermine productivity and may significantly impact the company's operation. A comprehensive health management plan identifies health risks posed by work environments, takes responsive measures, prevents occupational diseases, and promotes physical and mental well-being among employees.

## Occupational Disease Prevention

Moving beyond traditional approaches to occupational health, TSMC has been committed to building a safe and healthy work environment, where each work item is assessed to identify 5 major potential risks, including chemical, physical, ergonomic, biological, and social/psychological risk factors, and to design preventive measures accordingly. To build a healthy workplace, TSMC enlisted external assistance in 2019 by inviting Professor Yi-Wen Luo from China Medical University and Peng-Chi Tsai from National Cheng Kung University to assess ergonomics risks and conduct chemicals analysis at working environments.

### Preventative Measures & Efficacy against Occupational Disease



#### Ergonomic Risk Factors

TSMC worked with experts to enhance its digital ergonomic risk identification system

#### New Measures Taken in 2019

- ✓ An ergonomic risk assessment system was created for office and equipment maintenance staff
- ✓ The ergonomic risk assessment form was streamlined to ensure instant risk level assessment
- ✓ The risk of lifting and carrying heavy loads and equipment were proactively assessed to ensure the physical well-being of employees in the Operations organization. Every single high-risk operation was covered

#### Permanent Measures

- Computerized ergonomic risk assessment systems are used to identify operations with high-ergonomic risks. Health centers conduct questionnaire surveys, keep track of employees who apply for pain relief patches, and provide necessary support to employees requesting leave due to soreness and pain and arrange interviews with occupational physicians.

#### Achievements

- Computerized assessments were conducted on 18 employees with above-average or below average heights ( $> 190$  cm or  $< 150$  cm). Office chairs were raised and foot mats were provided to maximize their comfort. Target employee satisfaction rate stood at 100%
- Ergonomic risk assessment form received 100% user satisfaction rate
- 6 operations with high ergonomic risks were identified and addressed
- Manual lifting and carrying in 6-inch facilities, 8-inch facilities, and back-end processes were automated, with satisfaction rate reaching 100%



For further information, please refer to the official website of TSMC: [TSMC Introduces Ergonomics Engineering E-System to Build a Safe Workplace](#)



#### Chemical Risk Factors

An exposure assessment model was created to control and manage the use of chemicals

#### New Measures Taken in 2019

- ✓ Preventive measures against arsenic exposure were launched.
- ✓ A "Toxicological assessment System for Unknown Substances" was built in collaboration with the National Health Research Institutes.
- ✓ A digital health risk assessment system was created.
- ✓ A chemical exposure assessment system was created.

#### Permanent Measures

- Operations involving group 1 carcinogenic substances, teratogenic substances, and substances that induce germline mutation are inspected by occupational physicians, who provide suggestions for improvements.
- The use of hazardous substances is rigorously controlled and managed.

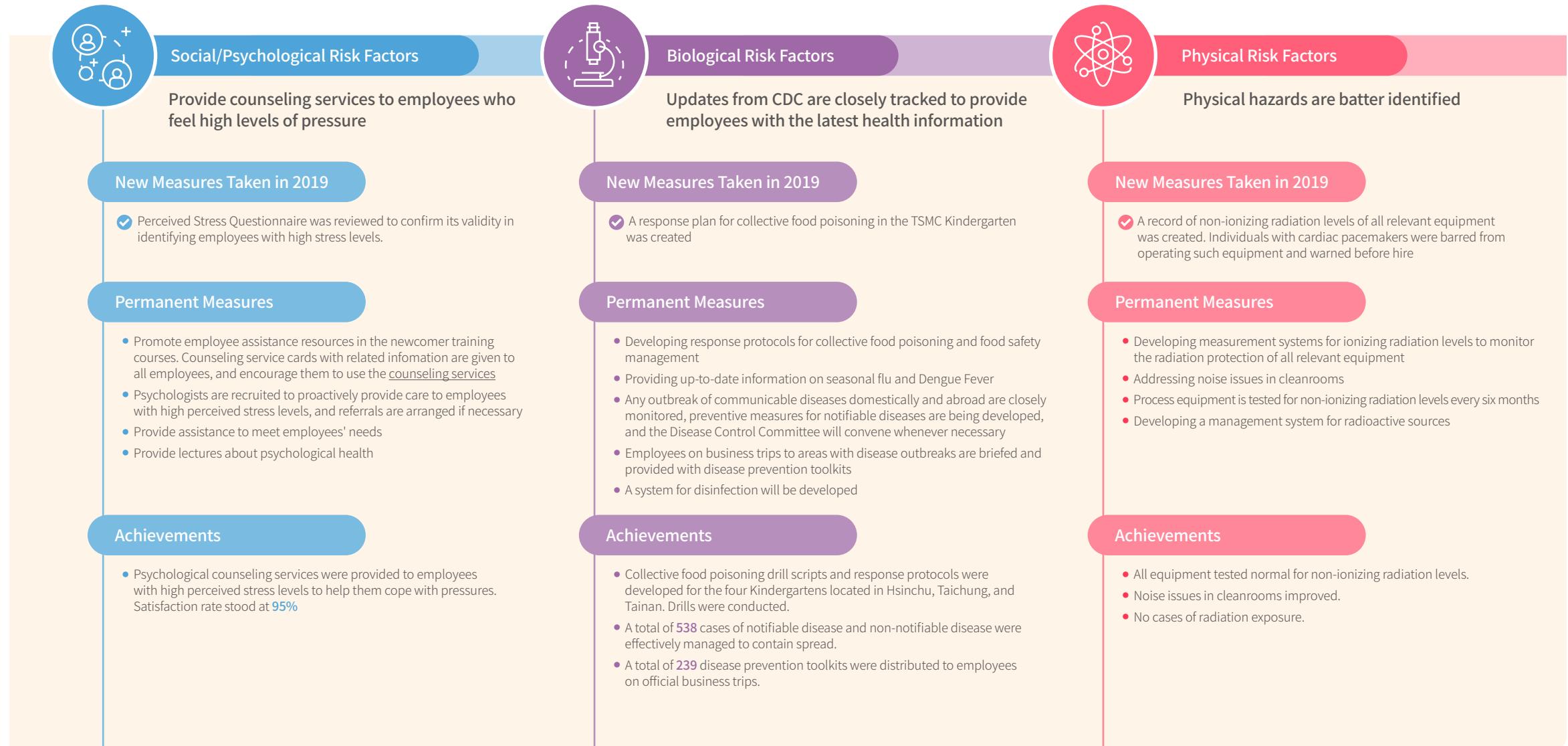
#### Achievements

- Arsenic-exposed work zones were renovated and improved.
- Chemical exposure risks in abrasive-blasting rooms were mitigated by requiring that the fume hoods shall draw air at 36,000 liters per minute in addition to operating at a wind speed of 0.5 meters per second.
- Toxicological assessments of unknown substances were conducted in collaboration with the National Health Research Institutes to provide valuable data for the development of new processes, and create a standardized method for toxicological assessment and testing to effectively mitigate health risks
- Similar Exposure Groups (SEGs) were identified. The properties, storage locations, amounts, and equipment safety mechanisms of the chemicals they use were identified, recorded, and put under risk assessment. Results showed low risk for all groups

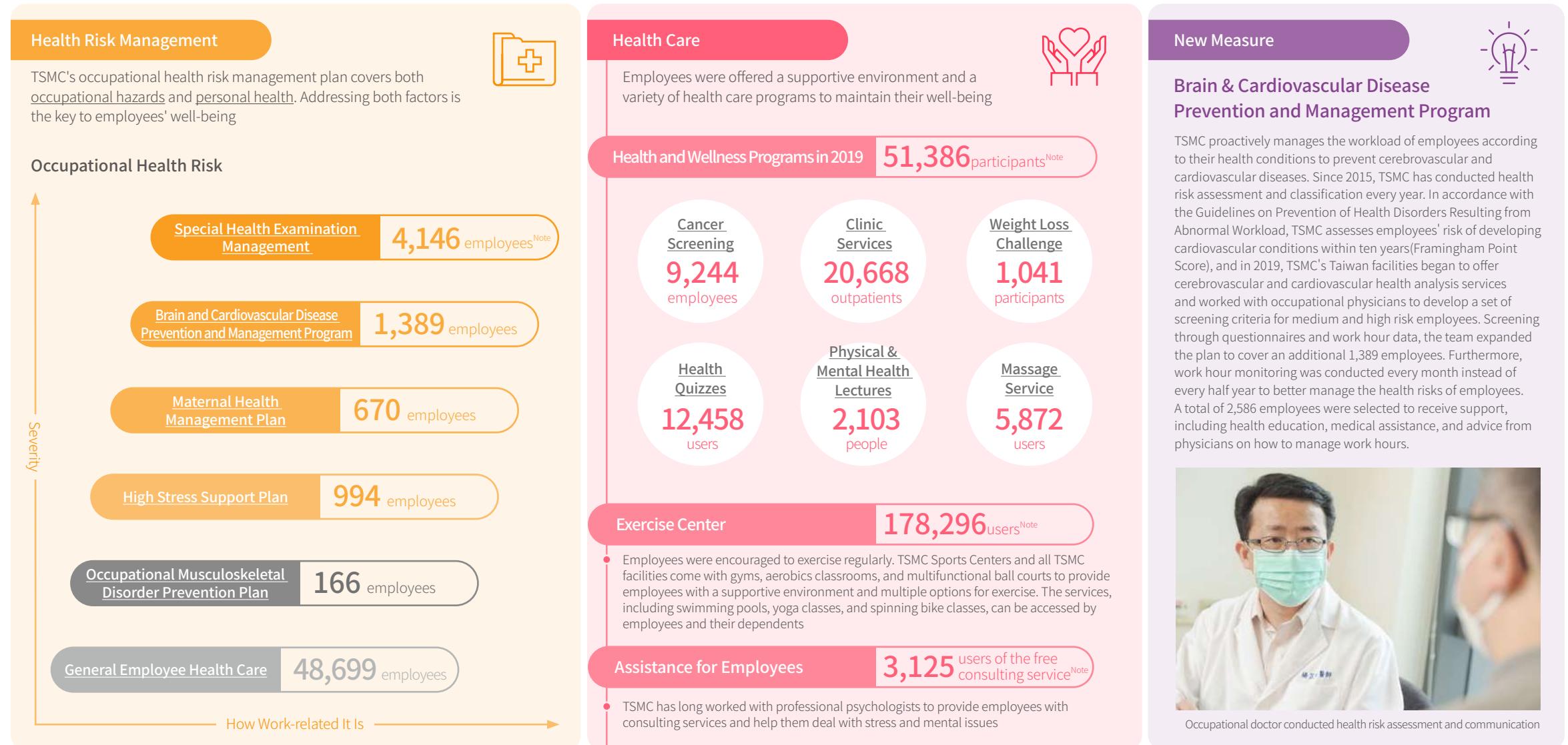
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## Assisting Employees in Health Management: Health Risk Management and Health Care



Note: The figure for special health examination management covers TSMC's Taiwan Facilities, TSMC (China), TSMC (Nanjing), VisEra, and Wafertech, while the remaining statistics cover only some of TSMC's subsidiaries

Note: The figures for Sports Centers and employee assistance program cover TSMC's Taiwan facilities, TSMC (China), TSMC (Nanjing), VisEra, and Wafertech, while the remaining statistics cover only some of TSMC's subsidiaries

## Internal-External Alliance

As it grows, TSMC exerts an ever greater influence on societies and industries. Therefore, TSMC recognizes its obligations in creating a healthy workplace together with its vendors and contractors. Working proactively with external parties in 2019, TSMC learnt from others and shared its own experience in promoting safety and health in the workplace by offering a variety of training programs. Through collaboration with partners in

academia, the public sector, and the private sector, TSMC spares no effort in reducing safety and health risks at workplaces in its supply chains and of its contractors.

### Working with External Parties to Optimize Work Environment

Using the Taiwan Semiconductor Industry Association as a platform, TSMC shares with other actors in the industry its experience in managing safety and health

risks at the workplace. It also regularly attends the Joint Steering Committee ESH Working Group of the World Semiconductor Council on behalf of Taiwan's semiconductor industry to conduct exchange with overseas peers on occupational safety and health. In 2019, TSMC worked with the Occupational Safety and Health Administration and the Institute of Environmental and Occupational Health Sciences of National Yang-Ming University to create capacity-building programs for TSMC's occupational health officers. Focusing on

chemical and ergonomic risk factors, the program developed advanced materials for on-the-job training and offered practical courses in north, central, and south of Taiwan to enhance occupational health officers' capability to identify hazards and address problems, thereby building a safe and healthy workplace.



#### Management Measures

WSC

- Enforce rigorous management of hazardous substances and help amend SEMI Standards
- Take part in the WSC's hazard substitution plan

TSIA

CNFI

- Advise the government on behalf of CNFI, including passing laws that require raw material suppliers to fully disclose the health hazards of their substances to the user
- Work with OSHA to clarify regulations for work environment evaluation
- Work with OSHA to require raw material suppliers to fully disclose information on carcinogenic, teratogenic, and reprotoxic substances
- Work with OSHA to enhance safety standards for robots, visit work environments where robots are deployed, and conduct on-site testing of the safety of robots

OSHA

SAHTECH

- Take part in government forums, including ones on occupational health risk assessment
- Take part in seminars held by the industry and share with industry peers TSMC's experience in managing chemical substances
- Accept invitation by APOSFO, National Yang Ming University, Chung Shan Medical University, and Yuanpei University of Medical Technology to share TSMC's experience in health risk management, strengthening safety in the supply chain, ergonomic and exposure risk management, and chemicals management
- Offer training programs on workplace safety to supply chain partners

APOSFO

SIPA



#### Suggestions for the Industry



#### Sharing Experiences



I would like to express my sincere gratitude to TSMC for sharing with us their experience in protecting the well-being of employees and promoting active management of chemicals in Taiwan's businesses. During the course of our joint project, I was deeply impressed by TSMC's commitment to the safety and health of its employees.

**Mei-Lien Chen**

Distinguished professor at the Institute of Environmental and Occupational Health Sciences of National Yang-Ming University and chairperson of Taiwan Occupational Hygiene Association

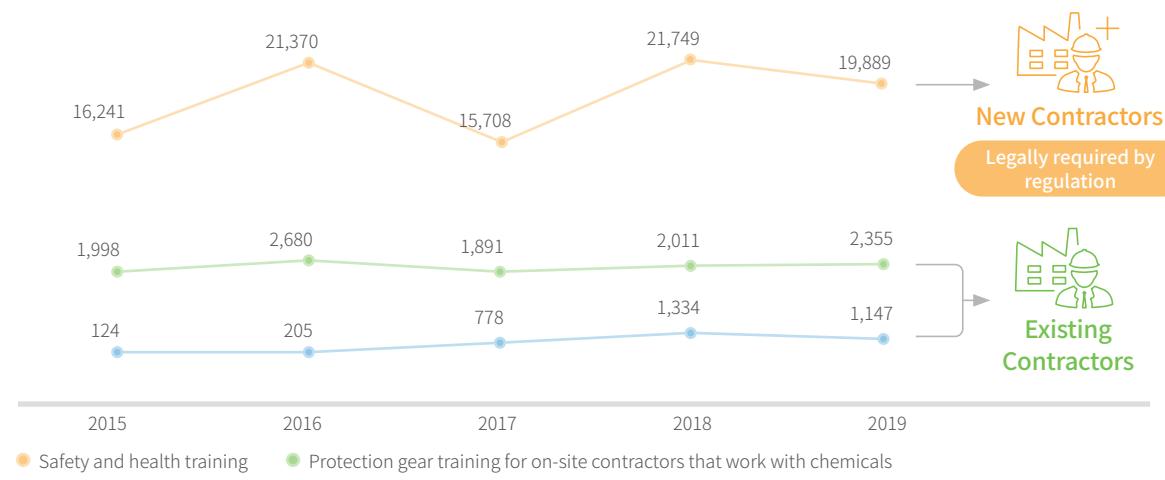
## Raise Contractors' Awareness on Health Risk through Better Hazard Notices

Contractors under high risk of chemical exposure were identified through analyses on risks of chemical exposures and the frequency and nature of their operations. 3% of contractors were identified as high risk bearers, and TSMC has been committed to reducing their risks of developing occupational diseases as a result of exposure to chemicals. In 2019, contractors registered higher Disabling Injuries Frequency Rate (FR) and Disabling Severity Rate (SR) than the previous year because two contractors were injured by electrical shocks, resulting in a total of 462 work days lost. In the aftermath of the

incident, TSMC enhanced preventive measures against electrical shocks and included operations with risks of electrical shocks into the category of high risk operations. Following the US National Electrical Code, the company developed rules for the use of protective gears in operation involving arc flash and live-line, and incorporated those rules into The Blue Book on Environmental Safety and Health for Contractors. In addition, a security guard died on duty due to cerebrovascular and cardiovascular conditions, resulting in 6,000 work days lost. TSMC has thoroughly investigated the incident and found

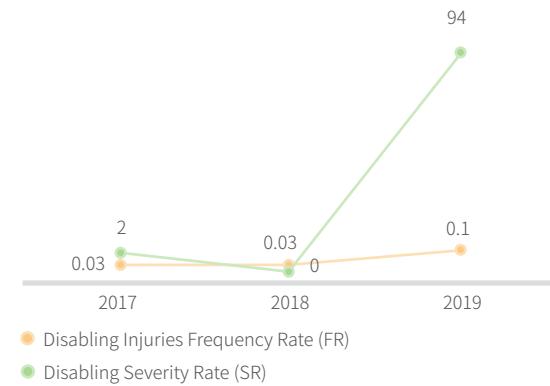
that the work hours of TSMC's security personnel are in compliance with government regulations. However, in response to the incident, TSMC will further strengthen training and occupational safety awareness for security personnel working in factories. We hope to remind our security personnel to look out for any signs of fatigue and take necessary precautions. Starting in 2020, we will also be launching a Care Program to support TSMC's cleaning staff, canteen workers, truck drivers, and other employees from contractors.

## Education Programs for Contractors



Note: The figures cover TSMC's Taiwan Facilities

## Disabling Injuries in Contractors



Note: The figures cover TSMC's Taiwan Facilities

### New Measures in 2019

- ✓ Reporting of abnormal results from special health examinations: Contractors are required to report to TSMC any abnormal results from special health examinations that can be attributed to work-related causes according to the Labor Health Protection Act.
- ✓ TSMC dispatched its occupational physicians to inspect the operations on on-site contractors and analyze their risks of chemical exposure.
- ✓ The Blue Book on Environmental Safety and Health for Contractors was created

### Permanent Measures

- The Disabling Injuries Frequency Rate (FR) and Disabling Severity Rate (SR) of contractors are analyzed to inform responsive measures. Safety training and outreach for contractors are being improved. Contractors are required to follow standard protocols and procedures.

### Achievements

- Zero reported cases of abnormal health examination results.
- On-site contractors are guaranteed zero risk of chemical exposure in TSMC premises.
- Contractors are ensured easy access to safety and health management procedures.

## Working with Supply Chain Partners to Achieve Sustainable Development

TSMC has conducted safety and health on-site inspection on suppliers and offered guidance whenever needed. During 2017 and 2019, TSMC worked with the Occupational Safety and Health Administration and Associate professor Yu-Wen Lin from the Department of Public Health of the Medical College of Fu-Jen Catholic University in carrying out the Supply Chain Occupational Health Promotion Program. The joint task force co-inspected 37 TSMC suppliers in fields including parts/wafer cleaning, pump repair, chemicals supply, and recycling, and provided instant feedback for improvements. Common challenges faced by similar businesses were identified, and their solutions, including ventilation system maintenance, respiratory protection plan, and dermal protection practices, were incorporated into education programs. Furthermore, TSMC sought to enhance the capabilities of safety officers to identify and address problems. In education programs, therefore, lectures were gradually replaced with interactive discussions to help vendors develop the capacity to proactively improve their environments.

In addition, TSMC organized in 2019 a conference on ISO 45001 Certification for Occupational Safety and Health Management System in collaboration with the Industrial Technology Research Institute to help vendors and contractors alike improve their management of occupational safety and health. In the conference, high risk contractors were introduced to management strategies, aided in conducting self-inspections on their work environments, and instructed to become ISO 45001 certified by 2021.

## Enhancing Safety Management at Construction Sites Managed by Contractors

Construction firms under contract with TSMC for fab construction are fully responsible for managing the construction site. To ensure the safety of the workforce, TSMC works with contractors to build a safe working environment and strengthen the management of construction sites. Thus, a three level management system by builders, the Construction Site Safety Committee, and TSMC is in place to ensure the safety of workers on site.

Based on the occupational hazards specified in Article 6 of Occupational Safety and Health Act, TSMC identified 34 high-risk construction contractors and conducted "Safety

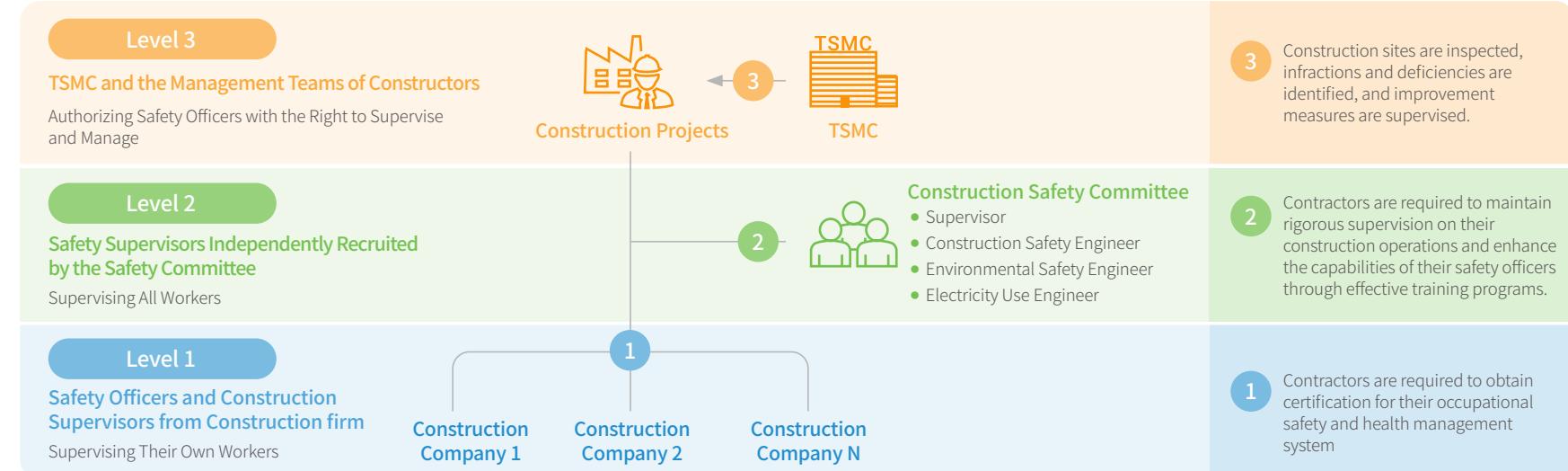
management Assessment for High Risk Constructors" on all of them. Then, TSMC interviewed the management of each of those contractors to ensure that they understood their responsibilities as specified by Occupational Safety and Health Act, and oversaw their improvement by requiring them to sit on the Safety and Health Committee. At the same time, on-site workers were granted the right to suspend work if necessary.

Furthermore, contractors are required to obtain [ISO 45001 Certification for Occupational Safety and Health Management System](#). Of the contractors identified as high risk bearers, 33 have become certified, and all

will be certified by the end of 2020. In 2020, TSMC will enlist the support of external experts and launch an incentive program for construction safety. Experts will be invited to inspect the safety policies, oversight, and auditing systems of TSMC's contractors and provide constructive suggestions for improvement. A monetary incentive award will be offered to encourage firm execution of safety policies and enhance contractor's ability to self-manage.

 For further information, please refer to the official website of TSMC: [To Ensure Construction Safety, TSMC Enhances Construction Contractors' Capability for Autonomous Management of Safety and Health](#)

## Construction Safety Management



## Measures for Construction Safety and Results in 2019

## Measures



## Achievements



## Requiring Contractors to Develop Occupational Safety and Health Management System

- 34 construction firms in contract with TSMC identified as high risk bearers were required to gain ISO 45001 certification



## Ensuring Rigorous Oversight of Construction Operations and Enhancing the Capabilities of Safety Officers

- Construction personnel were required to undergo safety training before being granted work permits.
- Personnel who violate safety protocols will have their work permit suspended or revoked. In the latter case, workers must pass safety training again before their permit can be restored.
- Facial recognition systems were installed to record the identities, numbers, and duration of stay of all incoming personnel.



## Inspecting Construction Sites Managed by Contractors, Supervising Improvement Measures, and Implementing Preventive Practices

- The number of safety supervisors were increased >1/15
- Contractors were inspected on 9 major categories. Penalties and deadlines for improvement were set in a manner consistent with the levels of infractions.



97%

## Certified Contractors

The rest expected to become certified in 2020



100%

## All Relevant Personnel Underwent Construction Safety Education

If construction personnel were found overworking, contractors were asked to improve their compliance with the Labor Standards Act



## Infraction Rate



## Safety Training for Construction Workers



Fall prevention training for personnel working in elevated environments



Head impact simulation



Double hook safety harness training



Daily toolbox safety meeting—announcing safety regulations



Facial recognition system and entry control

## Focus 6

# Common Good

## Power to Change Society

To pursue the goal of building a better society, the TSMC Education and Culture Foundation and TSMC Charity Foundation serve as focal points for funds, materials, and people from inside and outside TSMC to devote resources towards cultivation of youths, culture and arts, environmental awareness, caring for the disadvantaged and rural education. We hope to drive the development of society with kindness, passing on the power of love and prospect.

### 42,462 People

Hosted 61 TSMC Hsinchu Art Festivals, with a total of 42,462 participants

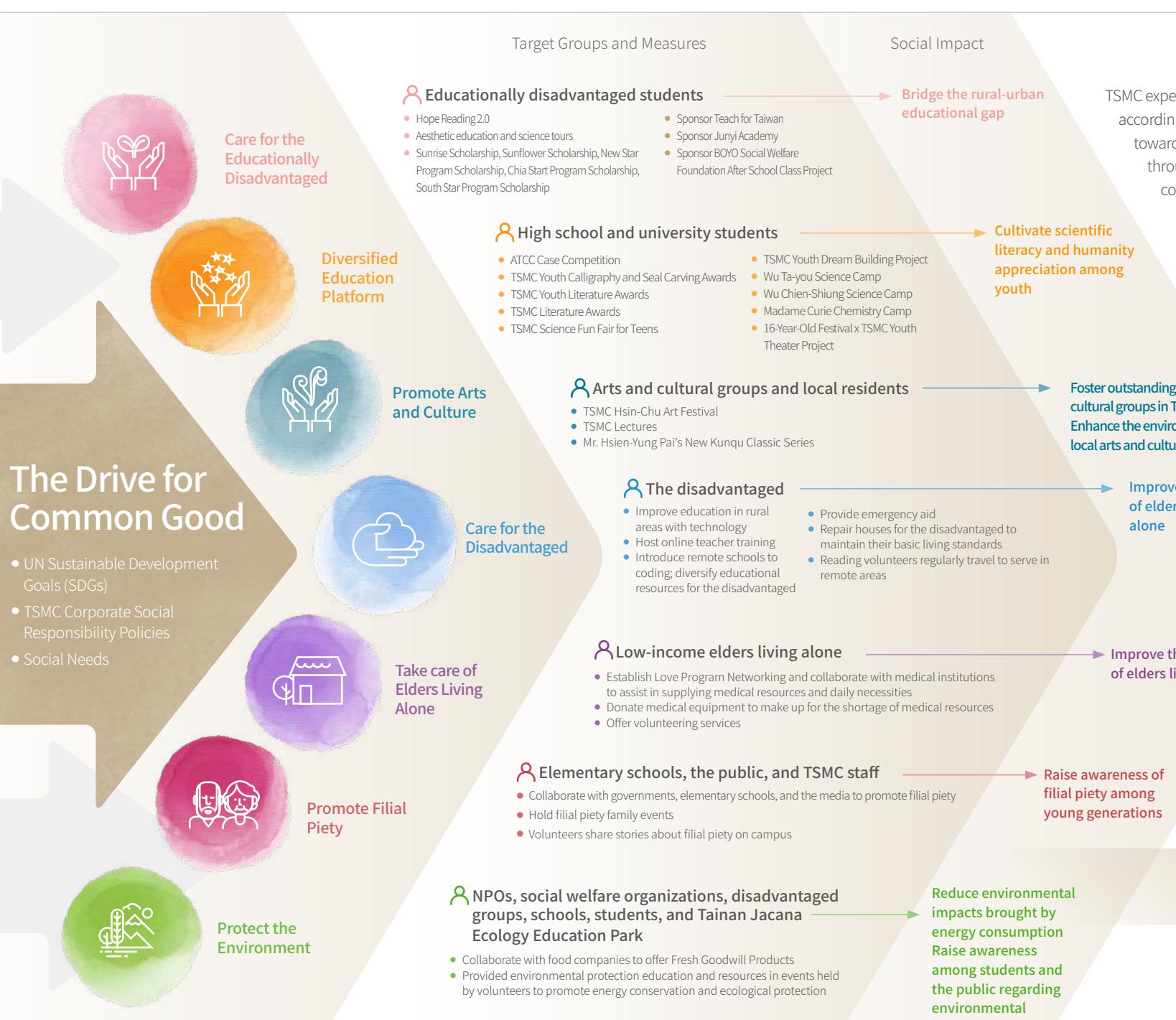
### 5,152 Million (NT\$)

Invested NT\$51.52 million to inspire youth's interest in humanities and science

### 9,527 Services

Offered 9,527 services to elder people living alone through the Network of Love, and taught filial piety at 37 educational institutions





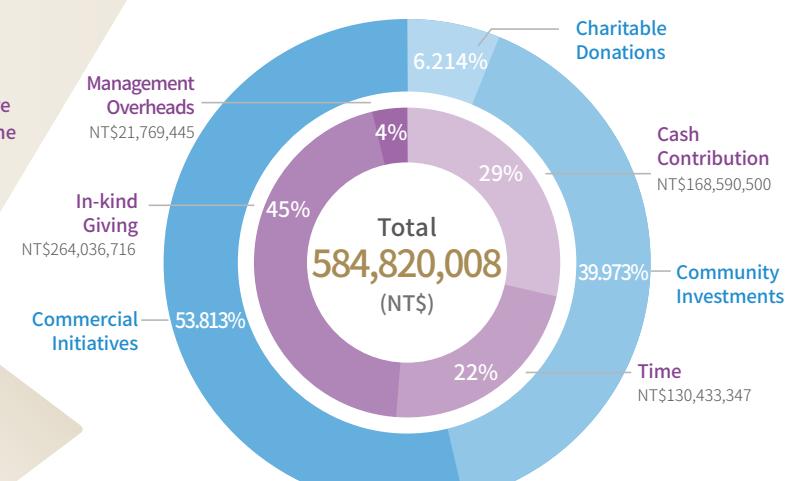
TSMC expects itself to be a driver for social progress. To achieve this goal, TSMC operates according to its CSR Policy and aligns its core business with SDGs. In addition, TSMC is attentive towards society's needs and works to reduce resource gaps between rural and urban areas through public welfare activities, aiming to give back to society and achieve the goal of common good.

The TSMC Education and Culture Foundation promotes diversified education by focusing on education for disadvantaged youth and providing students with various platforms outside of the formal education system. TSMC is also sowing the seeds of culture and humanities so that a love for the arts can take root in society, working towards the goal of SDG 4 – Quality Education.

Moreover, the TSMC Charity Foundation is committed to long-term volunteer service. In order to realize the targets of SDG 1, 3 and 4, which cover No Poverty, Good Health and Well-being, and Quality Education respectively, the foundation serves the disadvantaged as well as seniors living alone, promotes filial piety and values environmental protection.

### Our Social Investments

- Motive for Contribution
- How We Contributed



Note: Our social investments include endeavors made by the Company (e.g. University Collaboration Programs, etc.), TSMC Education and Culture Foundation, TSMC Charity Foundation, TSMC employees (volunteer service and charity donations) and the Employee Welfare Committee



# TSMC Education and Culture Foundation

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Care for the Educationally Disadvantaged

Cooperate with educational organizations from both the public and the private sectors, aiming to narrow the gap in education resources between urban and rural areas

- Continuously collaborate with public and private educational organizations and provide no less than NT\$12 million in resources annually

- In addition to the Sunrise Scholarship at the National Tsing Hua University and the Sunflower Scholarship at the National Central University, the TSMC Foundation increased the scholarship to three more universities in Southern Taiwan and providing a total of NT\$5.5 million in scholarship to 55 underprivileged students in 2019. The newly added Universities are National Cheng Kung University, National Sun Yat-sen University, and National Chung Cheng University in 2019

Target: three additional universities

- Offer scholarships for underprivileged students to five universities

### Diversified Education Platform

Continue to hold humanities and science events so as to provide youth with various platforms outside the educational system

- Collaborate with educational organizations to hold humanities and science competitions, with at least 600 participants each

#### Youth events and competitions

- TSMC Youth Calligraphy and Seal-Carving Competition with total of 695 participants
- Hosting the Youth Literature Award for 16 consecutive years and has received 704 submissions in total
- Sponsored the 17<sup>th</sup> ATCC Case Competition entitled "Usage 100%" as the topic of the competition , attracting 540 groups of students from 52 universities to register **NEW**

Target: Increase the number of youth event participants each year

- Held the fifth TSMC Novella Award and received 150 submissions
- Held the fourth TSMC Youth Dream Building Project entitled "Cities applied with the Waste Reduction Formula". The event focused on environmental issues and attracted 89 groups of students from 21 universities from the Taoyuan, Hsinchu, Miaoli and Tainan areas to participate

- Ensure the number of youth event participants is higher than the previous year
- Hold at least three popular semiconductor science activities and semiconductor science camps

### Promote Arts and Culture

Periodically hold art festivals at TSMC's fab sites in Hsinchu, Taichung and Tainan, so as to foster talented local art groups and promote exquisite fine arts in the community

- Sponsor 10 outstanding local artists or groups

- The TSMC Hsin-Chu Art Festival held 61 performances, inviting seven local groups and two foreign musicians, attracting 42,462 participants in total

Target: five groups or artists

TSMC Lectures held four humanities lectures themed the Past and Present of Ethnic Minorities in China

Target: Organize at least four TSMC Lectures

- Continuously Organize the TSMC Hsin-Chu Art Festivals and sponsor at least five talented local artists or groups annually
- Organize at least 15 humanities lectures in college
- Continuously organize at least four TSMC Lectures

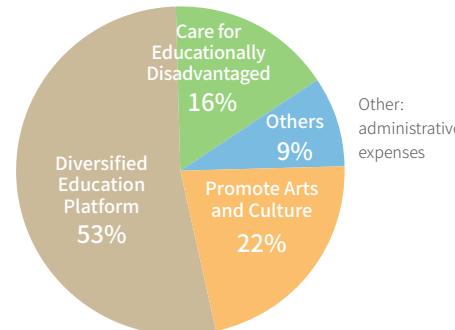
In 2019, the TSMC Education and Culture Foundation contributed over NT\$96.99 million into three main areas: Care for Educationally Disadvantaged, Diversified Education Platform, and Promote Arts and Culture. The contribution amount has increased 26% compared to 2018. In addition to cooperate with schools and NGOs to narrow the urban-rural gap in educational resources, in 2019, the Foundation have focused on creating diversified education platforms and hoping to cultivate young talent for the future.

At the meantime, the Foundation also organized and sponsored various art events to provide a stage for talented artists and outstanding art groups, and hoping to enrich the local communities' spiritual life toward a good and better society.

 For further information about the events and the implementation status of sponsorships, please refer to the [official website of the TSMC Education and Culture Foundation](#)

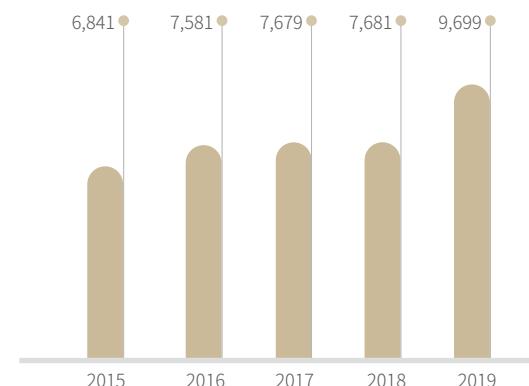
### Sponsorship by the TSMC Education and Culture Foundation in 2019

Total: **96.69** Million (NT\$)



### Sponsorship from the TSMC Education and Culture Foundation between 2015 and 2019

Unit: NT\$ ten thousand



## 台積電文教基金會

### Core Services



#### Care for the Educationally Disadvantaged

- [Initiated a Media Survey for Taiwan's New 12-year Compulsory Education Curriculum](#)
- [Additional Scholarships for Educationally Disadvantaged College Students](#)
- [Continuously Supporting Hope Reading 2.0](#)



#### Diversified Education Platform

- [Sponsored ATCC Case Competition](#)
- [TSMC Youth Dream Building Project](#)
- [Calligraphy and Literature Contests](#)
- [Sponsored Renovations for the World of Semiconductors at the National Museum of Natural Science](#)



#### Promote Arts and Culture

- [Invigorating the Arts Environment and Providing a Platform for Exhibits and Performances](#)
  - TSMC Hsin-Chu Art Festival
  - Sponsored the Formosa New Year's Concert
- [Promoting Humanities Classics](#)
  - TSMC Lectures
  - Sponsored Mr. Hsien-Yung Pai's New Kunqu Classic Series

## Care for Educationally Disadvantaged

TSMC Education and Culture Foundation

### How We Respond

- [Media Survey Initiative for the New 12-year Compulsory Education Curriculum](#)
- [Expand Scholarships for Disadvantaged College Students](#)
- [Continuously Supporting Hope Reading 2.0](#)

The Foundation has long been caring for educational issues since its establishment. In 2019, TSMC contributed **NT\$15.63 million** and collaborated with educational organizations from both the private and public sectors, aiming to increase interest in learning for educationally disadvantaged students and improve their studies. In addition, with scholarships, the Foundation has successfully assisted outstanding but disadvantaged students in pursuing higher education in universities to shorten the gap in educational resources between urban and rural areas.



### What We Want to Solve

A widening academic achievement gap between rural and urban students due to the urban/rural divide, social structures, and disparities in educational resources

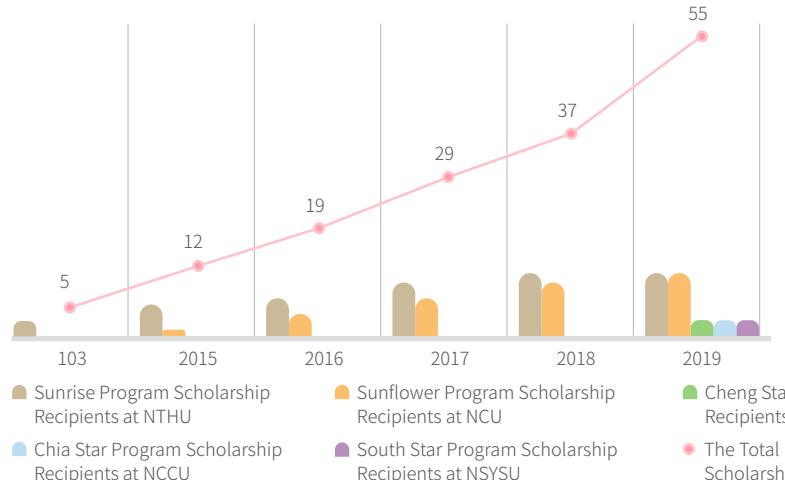
### Our Actions

### Media Survey Initiative for the New 12-year Compulsory Education Curriculum

The New 12-year Compulsory Education Curriculum took effect in the 2019 academic year, the Foundation, having long cared for technology and rural education, launched a media survey with the United Daily News-Vision Project targeting teachers and students from 1,500 junior and senior high schools to understand teacher's needs and offer advice for government policies. Designed to understand teachers, teaching materials, and software & hardware, the sampling survey also included industry insight from our R&D vice president and information department directors. Conducted through phones, the internet, and fax, the survey received 830 valid questionnaires from 1,033 schools and revealed two major challenges in most schools: (1) cultivating and recruiting science & technology teachers and; (2) procuring classrooms and hardware. Future literacy programs will be based on survey results.

### Recipients of the TSMC Education and Culture Foundation Scholarships

Unit: Recipients



### Expand Scholarships for Disadvantaged College Students

In 2019, we sponsored the NTHU Sunrise Scholarship and the NCU Sunflower Scholarship but expanded to sponsor the NCKU New Star Scholarship, the NSYSU South Star Scholarship, and the CCU Chia Star Scholarship. A total of NT\$5.5 million scholarship has been offered to 55 college students, and was increased 82% compared to last year. Our scholarships ease financial burdens, offer life & academic support, and help students focus in school. Such students are also invited to our art events to nurture art literacy.



I would like to thank the Foundation for the South Star Scholarship, through reducing my family's financial burdens, I have been allowed to focus in school instead of taking part-time jobs. It motivates me to work harder to enrich myself and strive to help students-in-need.

**Mr. Chen**

A South Star Scholarship recipient from the Oceanography Department at National Sun Yat-sen University



## Continuously Supporting Hope Reading 2.0

In 2019, the Foundation worked with the CommonWealth Education Foundation on the Hope Reading Program. Each year, 100 best books are recommended and donated to 200 elementary and junior high schools in rural areas. The program also includes an Elementary School Writing Contest, a Middle School In-Depth Report Contest, an International Reading Education Forum and a Reading Mobile Library & Cloud Professor Project. Up to 15,641 people have been benefited from the program.



### The Young Authors Writing Contest for Elementary School Students

Encourages students to make a habit out of reading, writing and public speaking. The 2019 contest entitled *I really want to tell you* received 225 submissions, which was 114 more than last year. There were 30 students receiving awards



## 15,641 People

benefited from the Hope Reading program



### The Junior High School Feature Article Competition

Encourages junior high school students to learn ways of collecting, interpreting and analyzing data. Through this experience, they can eventually present their research results with their team members. The 2019 competition entitled *I really want to tell you* attracted students from 11 junior high schools in rural areas to participate. The event lasted for 2 days and included an eco-tour of Tamsui River



### International Reading Education Forum

The forum entitled Reading and the Future invited experts from Taiwan and abroad to share how to increase students' digital reading ability through education and attracted 516 participants of teachers from elementary schools, junior high schools and senior high school



## 200 Schools

100 best books are recommended and donated to 200 elementary and junior high schools in rural areas



### Reading Mobile Library & Cloud Professor Project

features four vans carrying selected new books and the Acer Cloud Professor IoT Starter Kit. The Mobile Library went to 103 elementary schools in Taiwanese rural areas, benefiting around 6,100 students



“

We can feel that the Foundation works hard on promoting local cultures and civic values. Before participating in the event, students seldom expressed what they were thinking. However, because of this competition, they know they can be stars if they work hard enough. Therefore, I want to thank the foundation for providing this opportunity.

Ms. Hsu Shu-Hui

Supervisor of Bei-Mei Junior High School in Nantou

“

We don't have a lot of books at our school. However, because of the reading mobile library , students have more books and they like reading more than ever.

Ms. Huang Yu-Han

Section Director of Tan Nan Elementary School



## Diversified Education Platform

TSMC Education and Culture Foundation

### What We Want to Solve

Help Young People with literature in the humanity and sciences;  
Provide Opportunities to Young People and Broaden Their Horizons

### Our Actions

- [ATCC Case Competition Sponsor](#)
- [TSMC Youth Dream Building Project](#)
- [Calligraphy and Literature Contests](#)
- [Renovation Donations to the World of Semiconductors at the National Museum of Natural Science](#)

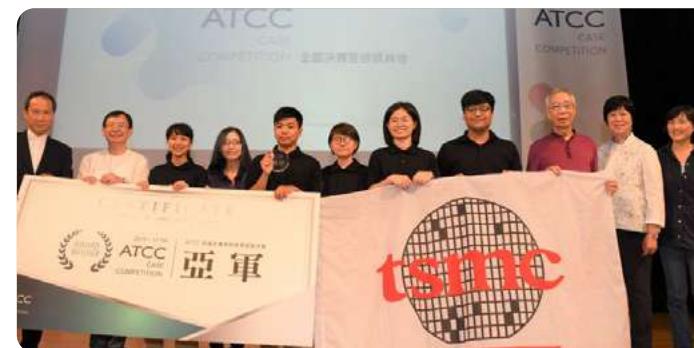
### How We Respond

In 2019, TSMC had contributed **NT\$51.52 million** on diversified contests, camps, scholarships and guidance services for students, which aim to help students to explore their life paths and pursue their dreams

### ATCC Case Competition Sponsor

In 2019, the TSMC Education and Culture Foundation represented TSMC to support the [ATCC Case Competition](#) entitled Usage 100%, which called on young people to care for society by encouraging them to put forward original ideas and business models related to reducing tangible and intangible waste. The competition attracted 540 groups of students from 52 universities and 51 groups were selected to be on the TSMC Team. The team was led by TSMC staff who shared their first-hand experiences with the team. These students were trained on presentation skills, proposal writing, financial plans, and implementation plans. In the end, the Package Plus team was selected to represent TSMC to attend the final round of competition and won second place. Team leader of [Package Plus](#), Allen Yeh, a graduate student from the Department of International Business, National Chengchi

University, further established a social enterprise based on this proposal, helping drive a positive social change through executing their innovation and ideals.



TSMC Representative Team "Package Plus" Won Second Place in the ATCC Competition



ATCC Camp with more than 1,000 participants

## TSMC Youth Dream Building Project

The fourth Youth Dream Building Project was held in 2019 and students from Tainan were invited to submit their projects for the first time. To attract more students, The Foundation held 3 campus introductory meetings at Yuan Ze University, National Tsing Hua University, and National Cheng Kung University, and invited winning teams from the past to share their experience to inspire innovation in students. The competition was divided into an Open Group and a Theme Group. There were 89 groups of students from 21 universities from the Taoyuan, Hsinchu, Miaoli, and Tainan regions participating in this competition and 7 of them were selected into the final. Their topics covered independent media, academic blockchains, international affairs, caring for the educationally disadvantaged, plastic reduction, and more. Total awards reached NT\$3 million.

For more details, please refer to TSMC CSR website:  
[Team Fabridge of TSMC Youth Dream Building Project Shows Creativity, Reusing 1,645 Yards of Leftover Fabrics](#)

Click to Watch Videos of the third Youth Dream Building Project

21 Universities

participated in the TSMC Youth Dream Building Project

3 Million (NT\$)

TSMC Youth Dream Building Project Scholarship

In order to expand the scope of influence of their projects, the TSMC Foundation invited previous winners of the Youth Dream Building Project to the TSMC Sports Day for further interaction with TSMC employees. From using waste fabric to make the relay team uniform by Team "Fabridge", the Indigo dying DIY activities by Team "Hakka Blue", the Dough figurine craft for finger rehabilitation by Team "Angles" and shopping bag transformed from old clothes and waste fabric by Team "The Bag master", the TSMC Foundation provided these youths the opportunity to realize their dreams but also offered our employees the chance to experience the creativity and energy of a younger generation.

“

With the Youth Dream Building Project, we had the opportunity to contribute to society and the environment. Fabric that would have been thrown away was repurposed into team uniforms at the TSMC Sports Day. Fashion design students were also able to practice with waste fabric. We've truly experienced the positive impacts on society that this project holds.

Joyce Tsai

CFO of Team "Fabridge"



Rebag, previous winner of the Youth Dream Building Project, advocating for shopping bags made from old clothes and waste fabric at the TSMC Sports Day



Fourth Youth Dream Building Project Finals

Calligraphy Awards – Professor Chi'an-lang Lee Explaining the Character "Longevity" on a Carved Window

**695 Participants**  
The 12<sup>th</sup> TSMC Youth Calligraphy and Seal-Carving Competition

## Calligraphy and Literature Contests

The TSMC Foundation organized diversified contests in the liberal arts to encourage young children to study literature and calligraphy, offer a stage for them to shine, and enrich artistic and cultural literacy.

In 2019, the TSMC Foundation organized the following contests:

- The fifth TSMC Novella Award to encourage participating writers to compose Chinese novellas and attracting over 150 manuscripts from writers in Taiwan, Mainland China, Hong Kong, and Malaysia.
- The 16<sup>th</sup> TSMC Youth Literature Award with the theme "A Dialogue with the Future" and receiving over 740 submission In addition to the contest, 14 Literature Award winners were invited to share the stories of their first encounters with works of three Taiwanese poets – Yu Kwang-chung, Luo Fu, and Chou Meng-tieh and their own creative journey.
- The 12<sup>th</sup> TSMC Youth Calligraphy and Seal-Carving Competition with the theme "Architecture and Chinese Characters", and receiving 695 participants in total. An Opening walking tour event- "Historical House Tour – the Beauty of Words" was organized, to show our young friends a different way of appreciating architectural beauty through calligraphy.

Calligraphy Workshop at Pingtung Girls' High School

## 2019 Events and Contests

### TSMC Youth Literature Award

Encourage young students to write short stories, new poetry, and prose

Annual

Senior high school and senior vocational school students

### TSMC Novella Award

Encourage young writers in Taiwan and Mainland China to write novellas

Biannual

Chinese resided in Taiwan or abroad below the age of 40

### TSMC Calligraphy and Seal-Carving Competition

Encourage high school students to learn calligraphy and seal-carving

Annual

Category including: Seal Script , Clerical Script, and Regular Script

Category including: Semi Cursive Script & Cursive Script

Qualification: Senior high school students, senior vocational school students, and freshmen, sophomores, and juniors in five-year junior colleges

#### Seal-carving Category

Qualification: Students from senior high schools, senior vocational schools, colleges, and universities; and contestants below the age of forty

#### Calligraphy Imitation Category

Qualification: Students from middle schools, senior high schools, senior vocational schools, colleges, and universities

### Youth Dream Building Project

Encourage students to act on their creativity and pursue their dreams

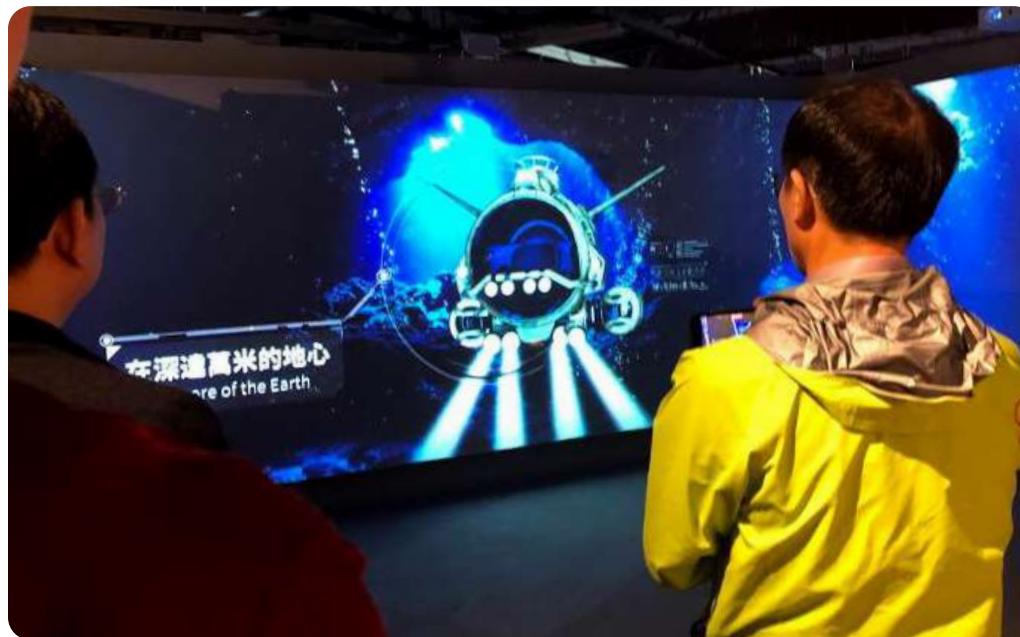
Annual

Students (graduate students included) of colleges and universities from Taoyuan, Hsinchu, Miaoli, and Tainan

181

## Renovation Donations to the World of Semiconductors at the National Museum of Natural Science

To promote popular science education and cultivate future talent for the semiconductor industry, the TSMC Foundation sponsored the National Museum of Natural Science in setting up the World of Integrated Circuits in 1997. The exhibit was renamed in 2011 to the World of Semiconductors. In order to keep up with rapidly-changing technologies and ensure that the exhibit is up-to-date, the TSMC Foundation donated NT\$40 million in 2019 to renovate the exhibit into five sections – *Introduction to Semiconductors*, *Applications of Semiconductors*, *Progression of Semiconductors*, *Innovative Semiconductors*, and the *Future of Semiconductors*. The updated exhibit will employ new techniques such as gesture interaction and a mix of the real and virtual. Volunteers from the TSMC Charity Foundation will also offer tour services, introducing the public to the science behind semiconductors and industry trends while inspiring interest among young students.



Introduction to Semiconductors – Introduction Video Semiconductors Everywhere

40 Million (NT\$)

TSMC Foundation donated  
NT\$40 million in 2019 to  
renovate five sections of the  
exhibit





## Promote Arts and Culture

TSMC Education and Culture Foundation

### What We Want to Solve

Given the performing environment for art and culture, support local art and cultural groups, and enrich the spiritual life of residents in the community

### Our Actions

- Supporting & Creating a Space for the Arts
  - TSMC Hsin-Chu Art Festival
  - Sponsored the Formosa New Year's Concert
- Promote Humanities Classics
  - TSMC Lectures
  - Sponsored Mr. Hsien-Yung Pai's New Kunqu Classic Series

### How We Respond

Committed NT\$21.63 million in 2019 to organize high-quality art & culture exhibits and performances such as Chinese opera and concerts

### Supporting & Creating a Space for the Arts

#### TSMC Hsin-Chu Art Festival

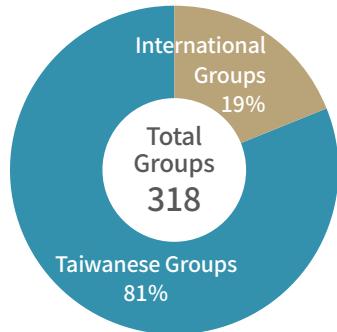
The TSMC Foundation has been holding the Hsin-Chu Art Festival for 17 consecutive years, with each year revolving around a different theme. Major art events are held regularly in Hsinchu, Taichung, and Tainan to help the public experience the beauty of art and make a tangible contribution to the community's spiritual life.

The theme for 2019 was *Listen to the Muses*, featuring three series of arts and cultural performances – *Poetry*, *Music*, and *Theater*. The TSMC Foundation sponsored 7 local art groups and 2 international musicians in a total of 61 performances that attracted over 42,462 participants. Programs included an exhibit on the works of Yu Kwang-chung, Luo Fu, and Chou Meng-tieh as part of *Poetry*; beautiful musical performances by world-famous Polish pianist, Krystian Zimmerman, and legendary blind Japanese pianist, Nobuyuki Tsujii, as part of *Music*; and a spiritual feast for our community with the GuoGuang Opera Company's *The Painting of 18 Arhats* and Taipei Quyituan's *Crazy about Xiangsheng* as part of *Theater*.

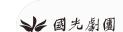


Art-sharing at Hui-ming School (A special school for visually impaired students)

**TSMC Education & Culture Foundation**  
Supports Local & International Art Groups



Note: Data from 1998 to 2019



國光劇團  
GuoGuang Opera Company  
一道彩霞分畫表  
似離而合 墨相牽  
一心事難藏隱  
此情密意在筆鋒



Poetry – Students and Teachers from the Taichung Municipal Special Education School for the Hearing Impaired Visit the Promise 2061 Art Installation Exhibit



## Formosa New Year's Concert Sponsor

In 2019, the TSMC Foundation sponsored the One Song Orchestra for its first ever major outdoor concert, the 2019 Formosa New Year's Concert. The concert included Taiwanese opera, Hakka songs, aboriginal music, campus folk songs, Taiwanese pop songs, and also witnessed collaborations with many famous performers, creating a new year's feast that is uniquely in Taiwan. With melodies well-known to the Taiwanese public, the concert attracted an audience of 3,000 and the feed was viewed over 800,000 times.



Formosa New Year's Concert Live

800 Thousand  
Online Views

Formosa New Year's Concert

## Promote Humanities Classics

### TSMC Lectures

Since 2014, the TSMC Foundation has held the TSMC Lectures to promote humanities classics from the East and West. The theme for 2019 was Eastern Civilization and Dr. Ming-Ke Wang, a Fellow of Academia Sinica, was invited to speak on Ethnicity, Myth, and History: the Past and Present of Ethnic Minorities in China using archaeological and anthropological studies to detail how the Yi, Rong, Man, and Di peoples became ethnic minorities in present day China. The four lectures were well-received and all welcomed a full audience.



TSMC Lectures held in the TsingHua Hall of Fame

### Sponsor to Mr. Hsien-Yung Pai's New Kunqu Classic Series

The TSMC Foundation is devoted to promote traditional arts and culture. In 2019, the Foundation sponsored famed author, Mr. Hsien-Yung Pai, for a tour of his new Kunqu series including The Story of Golden Lotus and The Jade Hairpin. Kunqu, a form of traditional Chinese Opera, is recognized by UNESCO as an Intangible Cultural Heritage of Humanity. In order to help preserve the precious cultural asset and allow it to grow, the Foundation is sponsoring performances and also offering Kunqu lectures in schools. 450 students from Hsinchu and Taichung, where TSMC facilities are located, were invited to enjoy the performances to introduce the younger generation to the beauty of Kunqu.

450 Students

from Hsinchu and Taichung  
enjoyed the Kunqu performance



台積電經典傳承饗宴  
白先勇 崑曲



# TSMC Charity Foundation

## Strategies & 2030 Goals

## 2019 Achievements

## 2020 Targets

### Care for the Disadvantaged

We offer living and educational support to the disadvantaged through book reading, community , and corporate volunteers  
We care about inequality of educational resources & emergency aid in Taiwan and offer support when necessary

- Provide more than 10,000 hours of reading service each year
- Donate at least NT\$18 million to the disadvantaged each year
- Help over 10,000 children in remote areas New NEW

- Reading service exceeded 8,400 hours  
Target: 8,000 hours
- Donated NT\$13.21 million to the disadvantaged  
Target: NT\$10 million
- The remote education program helped over 1,400 children  
Target: NEW

- Provide more than 8,500 hours of reading service
- Donate at least NT\$11 million to the disadvantaged
- Help over 2,000 children with the remote education program

### Take Care of Elder People Living Alone

We work with hospitals across Taiwan through the Network of Love system and provide a variety of medical resources to support medical care for elder people living alone

- Provide 12,000 service visits to elder people living alone through Network of Love

- Offered 9,527 services to elder people living alone  
Target: 9,000 services

- Offer 10,000 services through the Network of Love

### Promote Filial Piety

We collaborate with the Ministry of Education, schools, media, and other enterprises to promote filial piety education at schools

- Promote filial piety education in 120 educational institutions

- Promoted filial piety education in 37 educational institutions  
Target: 35

- Promote filial piety education in 50 educational institutions

### Environmental Protection

We aim to reduce waste through the Cherish Food Program. We also promote environmental protection and energy conservation through our energy-saving volunteers, eco-volunteers, and corporate volunteers

- Over 50,000 annual cumulative beneficiaries of the Cherish Food Program each year NEW

- Over 21,791 cumulative beneficiaries of the Cherish Food Program  
Target: NEW

- Over 25,000 cumulative beneficiaries of the Cherish Food Program

- Environmental protection volunteers provide over 1,200 services each year

- Environmental protection volunteers provided 770 services<sup>Note</sup>  
Target: 1,000 person-times

- Environmental protection volunteers provide 1,000 person-time services

● Exceeded   ● Achieved   ○ Missed Target

Note: The focus of volunteers in 2019 was on Caring for the Disadvantaged and Taking Care of Elder People Living Alone. Volunteer service related to environmental protection did not meet the 2019 targets. TSMC intends to recruit more eco-volunteers and arrange more activities in order to meet the annual targets



In 2019, the TSMC Charity Foundation continued to focus on four major areas: Caring for the Disadvantaged, Taking Care of Elder People Living Alone, Promoting Filial Piety, and Environmental Protection. Caring for the Disadvantaged was the main direction, with Education in Remote Areas and Disadvantaged Aid as the two primary focuses in 2019. Onsite visits to disadvantaged families helped ensure that resources are being devoted to those in need. Through our efforts, we hope to narrow the gap between the rich and poor, and balance the inequality in educational resources in remote areas. TSMC strives to drive positive change through actual actions.

8,174  
Volunteers

83,797  
Service Hours

17,593  
Times of Volunteer Service

64,715  
Beneficiaries

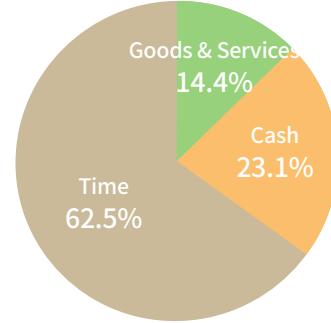
26,205  
Donations

52.69 Million (NT\$)

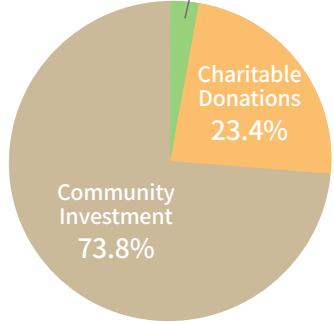
Donated over NT\$52.69 million (including cash donations, goods donation, repair services or other indirect donations)



## Donations by the TSMC Charity Foundation

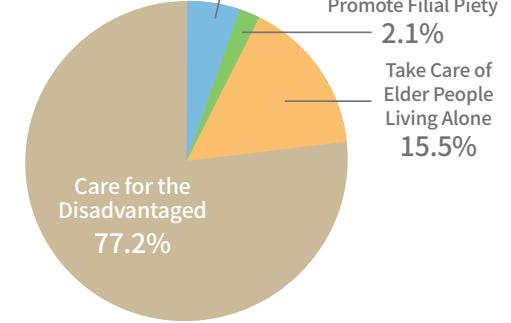
What We Donated<sup>Note 1</sup>

Total: NT\$ 140,677,203

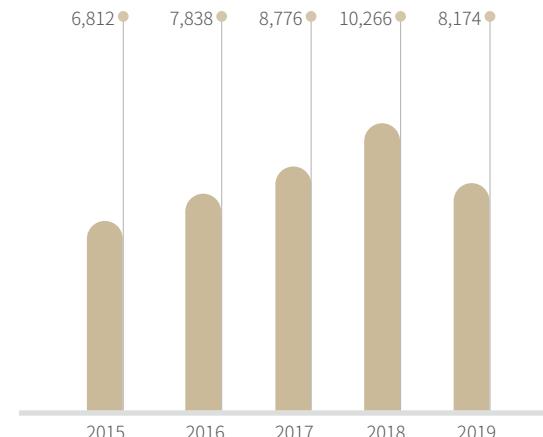
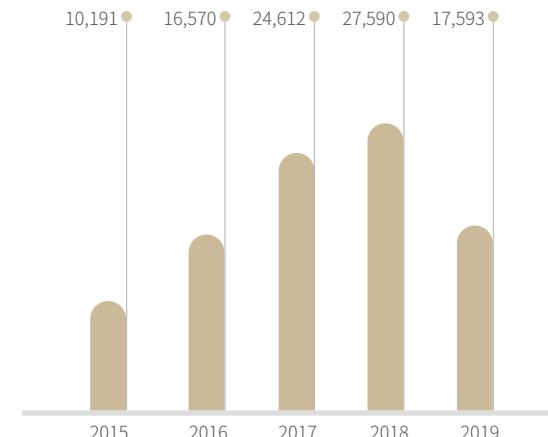
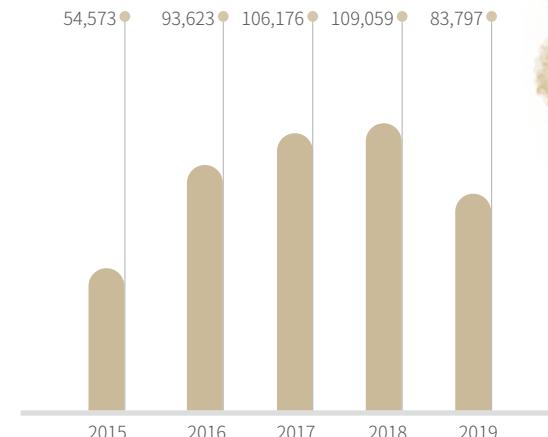
How We Donated<sup>Note 2</sup>

Total: NT\$ 140,677,203

## Projects We Supported



Total: NT\$ 140,677,203

Accumulated Volunteer Headcount<sup>Note 3</sup>Accumulated Volunteer Service<sup>Note 3</sup>Accumulated Volunteer Service Hours<sup>Note 3</sup>

Note 1: Classify all activities into cash, time, goods and services according to DJSI's definition, and calculate the ratio of each category's investment by monetary value (NT\$). Time: volunteer service hours\* average hourly wage. Goods and services: the dollar amount of the Company offering of such goods and services

Note 2: Classify all activities into charitable donation, community investment, and commercial initiatives according to DJSI's definition, and calculate the ratio of each type's investment by monetary value (NT\$)

Note 3: Volunteer headcount, person-time, and service hours in 2019 all decreased from 2018 because (1) volunteer service increased to meet demands for emergency relief during the Hualien earthquake in February of 2018, and (2) The World of Semiconductors exhibition hall at the National Museum of Natural Science was under maintenance in 2019, resulting in a temporary decrease in tour volunteer service





## Care for the Disadvantaged

TSMC Charity Foundation



The TSMC Charity Foundation strives to care for people locally, and is devoted to narrowing the gap between the rich and poor, and resolving the uneven distribution of educational resources. In 2019, the foundation targeted Rural Education and Disadvantaged Aid, assisting the disadvantaged in improving living conditions and quality of education through the donation of cash, goods, and volunteer service.

### Our Actions

- [Close the Urban/Rural Divide with Empowerment Projects for Education in Remote Areas](#)
- [No More Regrets with the Ten Thousand Dollars Per Household Program & Emergency Aid for the Disadvantaged Program](#)
- [Book-reading Volunteers Regularly Visit Remote Areas](#)
- [Community Volunteers in Action](#)

### What We Want to Solve

According to the 2018 statistics from the Ministry of Finance, the highest average household income in Taiwan doubled from that of the lowest household income. The gaps between the rich and poor, and between cities and rural areas lead to disparities in education resources and living standards, which is an underlying issue for our society.

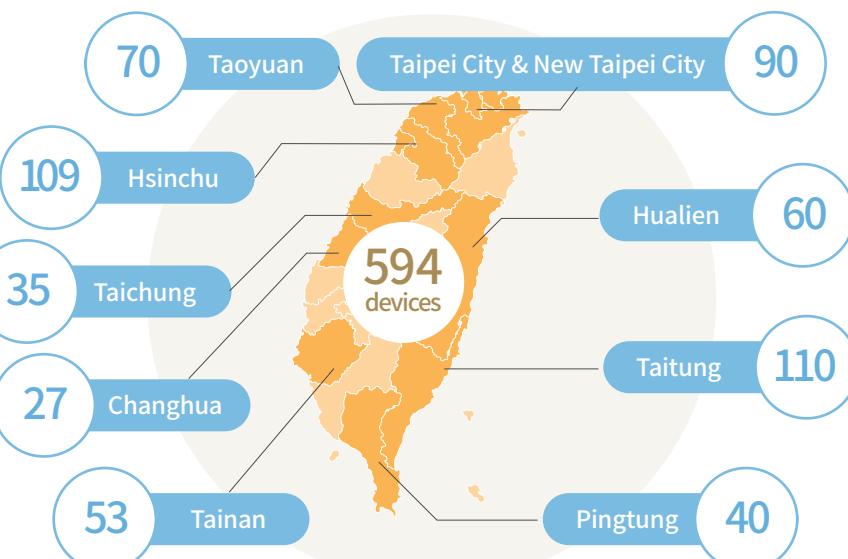
### Close the Urban/ Rural Divide with Empowerment Projects for Education in Remote Areas

In order to provide children in remote areas with more comprehensive educational resources, the TSMC Charity Foundation has donated hardware equipment, hosted teacher training programs for online teaching, and attempted to fill the resource gap between urban and rural areas so we can expand the students' learning capacities.

### Better Hardware Resources for Remote Areas

The TSMC Charity Foundation has donated tablet PCs and secondhand computers to educational institutions for the disadvantaged and improved their network environments. The devices will allow children in remote areas to enjoy educational resources that are diverse and more fitting for their own pace and interest. In 2019, the charity foundation delivered 480 tablet PCs and 114 secondhand computers to 25 institutions, and established two network environments.

### Send Love Across Taiwan with Technology Devices



We are grateful that TSMC introduced the Junyi Academy, allowing teachers to offer teaching materials based on each student's level and also allowing children to learn more confidently.

Chen, Mei-ju  
CEO of Taiwan Association of Paying Love Forward

## Host Online Teaching Training

The TSMC Charity Foundation worked with the Junyi Academy to help introduce online teaching resources to remote areas, offer funding for volunteer training and digital tools training for teachers, and alleviate the challenges faced by the lack of teachers in remote areas. The volunteers from [Advanced Packaging Technology and Service Organization, Intelligent Manufacturing Center, Corporate Planning Organization, Fab 12 A, Fab 12B, and Fab 15B](#) co-hosed or attended teacher trainings to form a strong support system for education in remote areas. In 2019, TSMC hosted a total of 11 teacher training sessions where 264 teachers and volunteers participated.

Please refer to [TSMC Volunteers Incorporate Online Teaching Materials into Services to Strengthen Education Resources in Rural Areas](#) on the TSMC Corporate Social Responsibility website for more details

**594** Tablet PCs/  
Computers

were delivered to 25 institutions in remote areas, more than 1,400 children benefited



The TSMC Charity Foundation helped introduce online teaching resources to remote areas

## Work with Microsoft Taiwan to Introduce Coding as Part of the Curriculum

Students in remote areas rarely get a sense of achievement from learning which demotivates them from learning. The TSMC Charity Foundation worked with Microsoft Taiwan to introduce remote schools to coding. Students learn programming languages through games and develop their own games using their creativity, helping to build confidence and a sense of achievement in students. In 2019, the first group of 32 volunteers completed their training and hosted three courses at Hexing Elementary School in the Hsinchu County, with a total of 54 students (person-time) benefitting from the courses.



## Establish After-school Class in Changhua

In 2019, the TSMC Charity Foundation offered training funds, hardware equipment, and repair services to the after school location in Changhua. We worked with the BOYO Social Welfare Foundation, which is equally concerned with education, to establish a location for After-school Classes in Changhua. The location was completed and opened in September of 2019, assisting disadvantaged children with their homework and offering additional after school services. TSMC is working with outside charities to further devote more diverse resources into education in remote areas.

## Repair or Rebuild After-school Classrooms for Disadvantaged Children

- [Repair the Xizhi After School Classroom in New Taipei City](#)

In 2019, the TSMC Charity Foundation, along with fund-raising through the [Sending Love charity platform](#), donated NT\$1.68 million and worked with TSMC's [Facility Division](#) to assist in repairing the After-school Classroom, offering children a safe learning environment after school.

- [Rebuild the 530 After-school Program in Luanshan, Taitung](#)

In 2019, the TSMC Charity Foundation worked with TSMC's [Facility Division](#) to have our fab architects and structure technicians find a new location for the After-school program. The new location was rebuilt within 30 days, ensuring that the 530 After-school Program will not have to take a break from serving students.

**260** Teachers

participated in the Online  
Teaching Training



## No More Regrets with the Ten Thousand Dollars Per Household Program & Emergency Aid for the Disadvantaged Program

In 2019, the TSMC Charity Foundation extended the Ten Thousand Dollars Per Household and Emergency Aid for the Disadvantaged Program by visiting disadvantaged families across Taiwan to help those most in need. The Foundation worked with the Sending Love platform to find social resources for these households and to offer them basic necessities. In addition to the ongoing support to Hsinchu City, Taichung City, Tainan City, Kaohsiung City, and Hualien County, the Foundation began providing service to Hsinchu County, Changhua County, Taitung City, and Chiayi City in 2019. As of the end of 2019, the Foundation has visited a total of 165 disadvantaged households and established case files for 65 households.



TSMC Charity Foundation visited disadvantaged families across Taiwan to help those most in need

### TSMC Volunteers Join in Support

The TSMC Charity Foundation is spearheading a team that includes volunteers from **Intelligent Manufacturing Center, Advanced Packaging Technology and Service Organization, Corporate Planning Organization, Fab 8, Fab 14, Fab 15A, and Fab 15B** to help seek cases most in need and expand the scope of service.



165  
Disadvantaged  
Households TSMC Charity  
Foundation Has Visited

### Rigorous Oversight

In addition to finding the best fit for social resources, the Foundation tracks how donations are used to prevent cases from misappropriating welfare. In 2019, funding was terminated for a total of 4 households because of other funding or misuse of funds.

Welcome to the official website for Sending Love and join us in our efforts at <https://www.520.org.tw/>



### Comprehensive Care with New Donation Function

The TSMC Charity Foundation continues to develop more services to support the disadvantaged. In 2019, it established a donation platform that matches supply with demand through logistics companies. Generous people can donate money and necessary actual goods to the disadvantaged.



Please refer to [TSMC Calls on Society to Put Love Together and Send It Out](#) on the TSMC Corporate Social Responsibility website for more details

We are happy to be working with TSMC to ensure that resources are delivered to those actually in need. The criteria for disadvantaged case files established by TSMC is very rigorous and is able to really understand local needs to offer necessary support and assistance.

**Lin, Chia-wei**  
Director of the Social Affairs Bureau,  
Chiayi City Government



## Book-reading Volunteers Regularly Visit Remote Areas

Book-reading volunteers regularly go to elementary schools in remote areas of Hsinchu, Taichung, and Tainan to read stories and teach English & math. We hope that the volunteers' company and diverse teaching materials can increase student's interest in learning. We also offer scholarships to motivate students to learn and read. In 2019, book-reading volunteers served a total of 1,696 times with 8,400 service hours.

The [Legal Organization](#) regularly goes to the Yuandong Elementary School in Hsinchu to teach English, using teaching materials close to the daily life and competitive games to think outside of the box and trigger interest among children in learning English. The [Advanced Packaging Technology and Service Organization, Intelligent Engineering Center](#), and [Product Development Organization](#) continued to work with the Ruei Yuan Elementary School in Taoyuan City, the Anding Elementary School in Tainan City, the Meihua Elementary School in Hsinchu County, and the Hexing Elementary School in Hsinchu County through book-reading services and scientific experiments to narrow the gap between these students and science.



## Community Volunteers in Action

Community volunteers regularly visit the Veteran's Home and Teresa Children's Home to accompany senior citizens and children, connecting them with events and activities as well. In 2019, community volunteers serviced a total of 840 times with over 6,000 service hours.

In 2019, [Fab 8 and the Quality and Reliability Organization](#) provided support to the St. Francis' Maiden's House, Renai Children's Home in Hsinchu City, and St. Francis' Nursery in Miaoli. The goal was to "Explore Skills for New Career Possibilities", hoping to inspire confidence and interest in career development among students through career day and DIY activities. The [Facility Division](#) serves at the Hualien District Haili Holiday School every Saturday, with about 550 volunteers providing services in 2019 to teach students and make sure that they are enjoying the learning process.

## Repairing the Hualien Kaige Garden Halfway House

The Hualien Kaige Garden Halfway House was old and ran down. The structure of the Halfway House was also a serious concern after the earthquake in 2019. The [Facility Division](#) therefore donated around NT\$1 million and assisted in repairing cracked walls and reinforcing the structure to provide children with a safer and more comfortable environment for living and learning.

“

The TSMC Charity Foundation has lent their support during our time in need. We were afraid of earthquakes before because the halfway house would shake violently but with TSMC's structural reinforcement, we haven't felt any of the past few earthquakes and we feel much safer now.

**Chang, Li-ying**  
Director of the Hualien Kaige Garden Halfway House





## Eyes on Us

Photography volunteers from [Fab 2](#) and [Fab 5](#) continued to accompany students at the Yufeng Elementary School and the Shilei Elementary School in Hsinchu County. In 2019, they not only called on their colleagues to donate 108 secondhand cameras but also taught the children photography techniques. Exhibitions were held to showcase the children's works and they were encouraged to attend national photography competitions to boost confidence and improve each year.

## 5,250 People

Benefitted from the three concerts

## Co-hosting Charity Concerts with Other Charities

[Fab 14](#), [the Advanced Packaging Technology and Service Organization](#), Junyi Academy (which proactively promotes education in remote areas), and Teach for Taiwan co-hosted the Charity Concerts, using music as a vessel to raise awareness and attract more sponsors. Disadvantaged children were also invited to the concerts, and a total of 5,250 people benefitted from the three concerts.

## Happy Learning with Board Games

The [Intelligent Manufacturing Center](#) is introducing an interactive design between teamwork and ecosystem through board games and its volunteers. The goal is to help the students at the After School Association of Taiwan improve reactive capabilities, logic, social interactions, and learn resource and environmental sustainability.



## 400,000 (NT\$)

was raised to help San Goodman Special Education Center

## Sponsoring Social Welfare Agencies

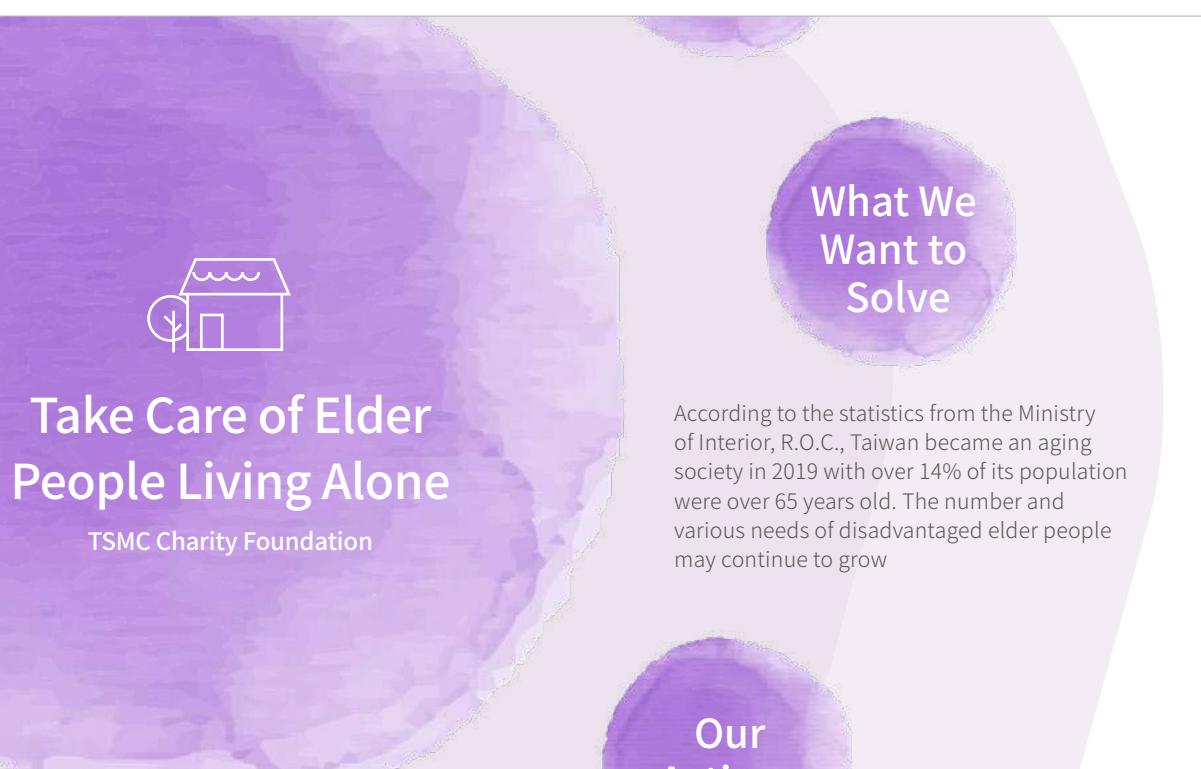
Volunteers from [Fab 6](#), [Fab 8](#), [Fab 12A](#), [Fab 12B](#), [Fab 14](#), the [Intelligent Manufacturing Center](#), [Product Development Organization](#), etc. assisted the Luway Opportunity Center, Syin-Lu Social Welfare Foundation, Taiwan Fund for Children and Families, Shandao College, and other social welfare agencies in raising funds, participating in fairs, collecting donations for after school programs, etc. to ensure that all charities and social welfare agencies that genuinely want to improve education for children can continue to do so. The [Product Development Organization](#) helped raise nearly NT\$400,000, purchased four electric shower gurneys, and improved facilities for the San Goodman Special Education Center.



## Helping Disadvantaged Farmers

With aging people and insufficient labors in remote areas, most elder farmers are no longer able to take care of their farms by themselves. Volunteers from [Human Resources](#), [Fab 2](#), [Fab 5](#), and [Fab 12B](#) have launched a program to help the farmers harvest their fruits. The program not only emphasizes on cherishing foods and preventing food waste but also allows TSMC employees to experience the difficulties of being a farmer.





## How We Respond

The TSMC Charity Foundation will continue to devote its volunteers and resources to our medical and care partners from the Network of Love across Taiwan. We offer resources and platforms for interaction to provide elder people living alone with quality, convenient, and comprehensive care in an attempt to meet their demands.

## Network of Love Partners Work Together to Better Serve Elder People Living Alone

In 2019, the TSMC Charity Foundation worked with partners of the Network of Love to connect medical care and service providers, giving out warm items in winter before the Lunar new year and mooncakes before the Mid-autumn festival. Over 1,700 seniors benefitted from the program. The Foundation also regularly hosts sharing sessions with its partners to share service methods.

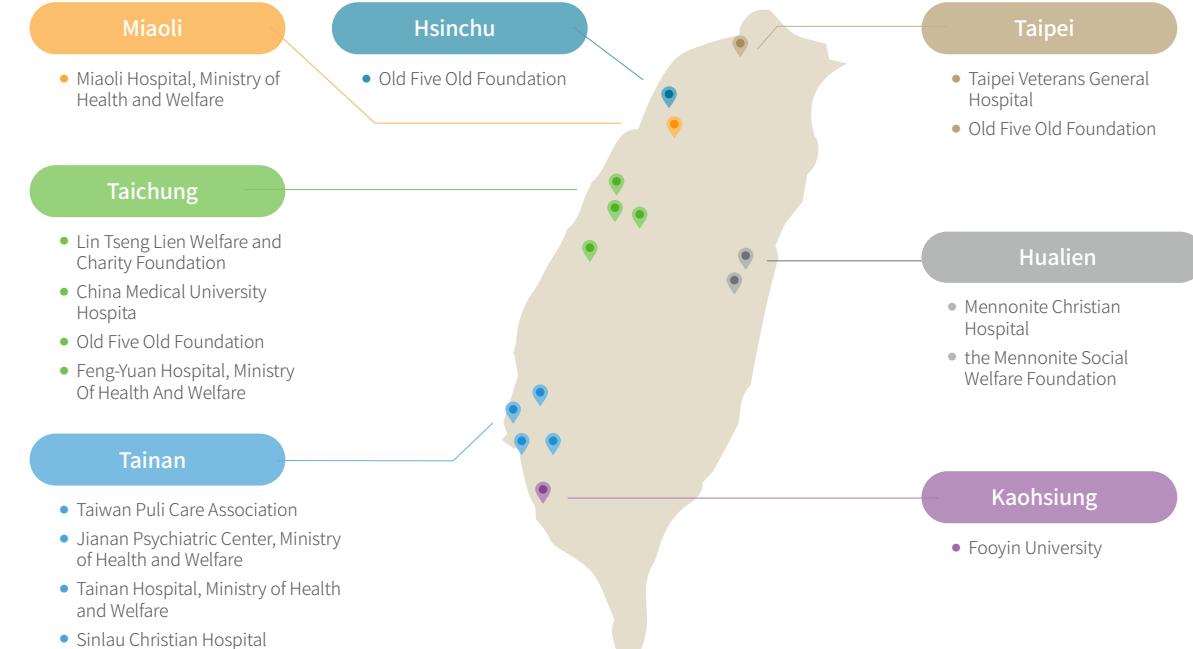
We would like to thank the TSMC Charity Foundation for connecting love and energy across Taiwan to help everyone and make Taiwan a better place!

Chiu, Yen-yin  
CEO at the Mennonite Social Welfare Foundation

We appreciate TSMC for working with us and guiding us in our charitable ventures and in creating a warm and caring society.

Lee, Pei-yu  
Director of the Fooyin University Office of Student Affairs Service-Learning Center

## Network of Love Across Taiwan



## Closing the Medical Resource Gap

### Set Up Intelligent Management Systems in Nursing Homes

In 2019, the TSMC Charity Foundation visited nursing homes in Hsinchu to understand their needs and subsequently helped set up intelligent management systems as well as purchased additional medical equipment for daily use. The system has an indoor GPS that ensures the safety of elder people and it can also help reduce the administrative workload of care providers, allowing elder people to receive better care. Around 140 people benefitted from this project.



### Ultrasound Probe Donations to the Iron Doctor of Taitung - Dr. Lu Ke-fan

Dr. Lu Ke-fan, nicknamed the Iron Doctor by local people, received the 28<sup>th</sup> Medical Contribution Award and has served at the Dawu Township Public Health Center, Taitung County for the past 10 years, traveling between downtown Taitung to the health center every day. In 2019, the TSMC Charity Foundation conducted onsite visits and found that the Dawu Township Public Health Center lacked cardiac care equipment. To improve the quality of medical care in remote areas, the Foundation decided to donate high-end cardiac and vascular ultrasound probes to assist Dr. Lu in offering more precise medical treatments to local elder people.



2  
Nursing homes were helped to set up intelligent management system



12  
Medical care & service partners

### Develop & Donate Shower Gurneys for Elderly Care

Elder people who have lain in bed for a long time are often unable to shower and bathe because of limited mobility or the lack of appropriate showering equipment. TSMC's **Facility Division** developed a shower gurney that can meet such a demand. It can prevent water from clogging and subsequently resulting in injuries to the users. It is also great for helping those with limited mobility to bathe and clean, thus improving their quality of life. In 2019, TSMC donated 21 shower gurneys to related social welfare groups.



9,527 Services  
were provided to elder people living alone through Networking of Love system

## TSMC Volunteers Accompany Elder People Living Alone

### New Years Celebration with Gifts

In 2019, volunteers from **Fab 3**, **Fab 12A**, **Fab 12B**, **Fab 15A**, and **Fab 15B** purchased and donated new year food to institutions that offer geriatric care such as the Hsinchu Social Service Center, the Huashan Foundation, and the Old Five Old Foundation to celebrate the new year with elder people.

### Mother's Day, Dragon Boat Festival & Christmas Services

Volunteers celebrated festivals with elder people living alone. In 2019, **Fab 15A volunteers** accompanied elder people living alone to celebrate Mother's Day, and called for their colleagues to donate a large AC unit to the Huashan Foundation so elder people can enjoy a more comfortable living environment. **Fab 15B volunteers** wrapped rice dumplings with elder people living alone during the Dragon Boat Festival and gave them blood pressure monitors and handmade cards. **Fab 8 volunteers** interacted and had fun with elder people at the Miao-Li Elders' Nursing Center during Dragon Boat Festival and Christmas.

### Encouraging Elders to Attend Outdoor Activities

**Fab 3 volunteers** collaborated with the Hsinchu Welfare Center to hold a hiking event at the 18 Peaks Mountain Park. The event included some game challenges along the route that raised awareness for dementia, aging, energy conservation, etc., helping elder people have closer social interaction with volunteers. **Fab 15B volunteers** accompanied elder people living alone to shop daily necessities, helping them interact with the outside world and get out of the house.



Volunteers accompanied elder people living alone to shop daily necessities

“

Walking with elder people of our community isn't just about walking and talking with them. In activities that raise awareness on aging, we can experience the problems we may face when we begin to age, allowing us to offer these elder people with more practical and realistic help.

Lily Chu  
Volunteer from **Fab 3**

Volunteers celebrated festivals with elder people living alone



## Promote Filial Piety

TSMC Charity Foundation

### How We Respond

The TSMC Charity Foundation believes that we can soften the blow from an aged society through diverse events for filial piety, promoting family relationship filled with understanding and care, increasing awareness on filial piety among our youth, and caring for the elder people



### Our Actions

- [Filial Piety Workshops](#)
- [Filial Piety Story Reading](#)
- [Introduce Filial Piety into Sponsored Activities](#)

### What We Want to Solve

According to the statistics from the Ministry of Health and Welfare, Taiwan's society is now an aging society and the percentage of elder people living alone continues to rise. Considering the limited social resources, the TSMC Charity Foundation is hoping to strengthen concepts of filial piety and family values to tackle the challenge from the root



Company Events



### Collaboration with the Central Government

The Ministry of Education Will Implement the New Filial Piety Project

Continued to Work with the Filial Piety Resource Center of the State Education Department of the Ministry of Education



### Collaboration with Locals/Groups

Hosted Filial Piety Training Workshop with the After School Association of Taiwan

83 Participants  
Seed Classrooms

30 people  
Parents & Children Joined

Jamm Active Educational Foundation Filial Piety Workshop

30 people  
Parents & Children Joined

Published the Filial Piety X Ecology Picture Book Jointly with Global Kids Books

5,000  
Picture Books to be Published

1

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### Filial Piety Volunteers in Action

104  
Filial Piety Volunteers

### Filial Piety Workshop

120  
Enjoyed Parents & Children





## Filial Piety Workshops

In 2019, the TSMC Charity Foundation and the Filial Piety Resource Center of the K-12 Education Administration, the Ministry of Education co-hosted 6 filial piety workshops to encourage parents and children to share their feelings and thoughts through drawing and talking. This is to strengthen and raise awareness for filial piety in the families. A total of 180 company employees and external parties participated in the workshops.

The Intelligent Manufacturing Center worked with the After School Association of Taiwan to introduce the filial piety workshop model into trainings for after school teachers. Three trainings were hosted in 2019 with over 83 seed teachers participating in the trainings. The influence could extend to around 2,700 students.



**37** Educational Institutions  
Promoted filial piety education in 37 educational institutions

**2,700** Students  
were benefited through workshop help by TSMC Intelligent Manufacturing Center and After School Association of Taiwan

## Filial Piety Story Reading

In 2019, TSMC's filial piety volunteers read stories on filial piety at schools, organized activities revolving around filial piety, and prepared fun, interactive lessons to imbue teachings of filial piety into the curriculum so as to sow the seeds of filial piety. We are currently working with 12 schools through 204 filial piety volunteers.

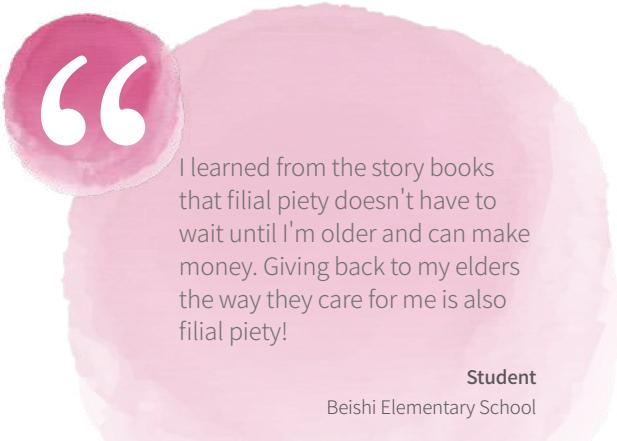
**Fab 2, Fab 5, and Fab 15B** have been promoting filial piety at the Fuxing Elementary School and the Beishi Elementary School through interactions, stories or worksheets, encouraging students to give gifts with love to elders in their families to enhance the concept of filial piety. In 2019, over a total of 2,000 children listened to stories of filial piety, helping strengthen the relationship with elders in their families.



The TSMC Charity Foundation collaborated with Global Kids Books, a publishing company known for its books for children, to publish Father's Secret Base, a book on filial piety and the environment

## Introduce Filial Piety into Sponsored Activities

The **Corporate Planning Organization** has included elements of filial piety into activities sponsored by TSMC. In 2019, TSMC provided resources to children for a bike tour around Taiwan and filmed The Declaration of Filial Piety, hoping to slowly promote concepts of filial piety and deliver the message of appreciation through filial piety.



I learned from the story books that filial piety doesn't have to wait until I'm older and can make money. Giving back to my elders the way they care for me is also filial piety!

Student  
Beishi Elementary School



**>2,000** Children  
listened to stories of filial piety

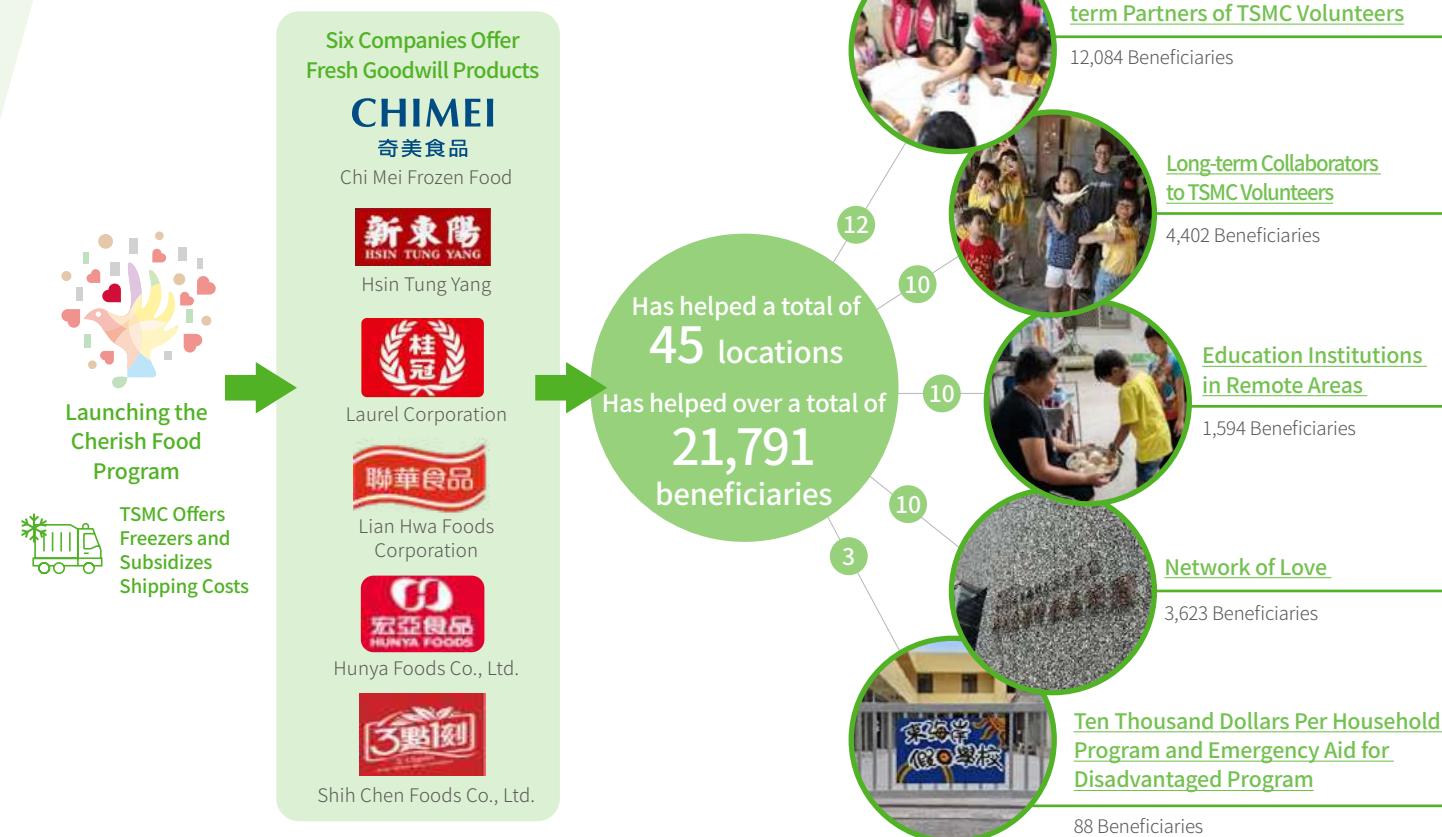


## Cherish Food Program 2.0 — Expanding Our Scope and Getting More Partners

In 2019, the TSMC Charity Foundation expanded the scope of the Cherish Food Program. In addition to donating 6 freezers to institutions that serve the disadvantaged and working with Chi Mei Food, the Foundation added five new food partners including Laurel Corporation, Hsin Tung Yang, Hunya Foods Co., Ltd., Lian Hwa Foods Corporation, and Shih Chen Foods Co., Ltd. The Foundation regularly sent goodwill foods to 45 places that serve the disadvantaged, helping over a total of 21,791 beneficiaries in 2019.

The **Intelligent Manufacturing Center** hosted four educational workshops on cherishing foods, cooking with goodwill vegetables and fruits and encouraging teachers from the After School Association of Taiwan to take this lesson into their own classrooms. Over 144 participants attended the event.

## Distributing Goodwill Food to Locations Across Taiwan



## Energy-Saving Volunteers

TSMC's energy-saving volunteers have strong know-how on electrical engineering and are capable of assessing and improving the efficiency of energy as well as ensuring energy security. In 2019, energy-saving volunteers from [Fab 6](#) offered three services in Tainan, assessing and improving water and energy conservation at schools. Through the project, TSMC also hopes to offer students hands-on lessons and raise awareness for energy conservation. In 2019, energy-saving volunteers served a total of 238 times with over 2,400 hours of energy-saving services.



>2,400 Hours  
Energy-saving Services



## Ecology Volunteers Deliver Green Message

TSMC pays attention to environmental protection and is actively creating a factory ecosystem that is conducive to biodiversity. TSMC creates three green sustainable parks throughout Taiwan including Fab 12B in Hsinchu, Fab 15 in Taichung, and Fab 14 in Tainan. Technology and ecology coexist in the three parks which will also be open to students from remote areas to tour, experience cleanroom suits, engage in DIY activities, and conduct scientific experiments. Ecology volunteers from TSMC also serve regularly at the Shuihu Ecological Education Park to share the environmental knowledge and the beauty of nature with the public and students alike, strengthening their understanding and participation in environmental protection. In 2019, ecology volunteers served a total of 533 times, providing over 2,100 hours in ecological tours.



>2,100 Hours  
Ecological Tours

## Solar Panels Installation for the Hualien Kaige Garden Halfway House

In 2019, the [Facility Division](#) donated over NT\$900,000 to set up solar panels for the Hualien Kaige Garden Halfway House. The donation was to support renewable energy and environmental protection, and help the Halfway House receive monthly financial support from the sale of green energy.

>900,000 (NT\$)  
were donated to set up solar panels

## Beach Clean-up Activity on Earth Day

In 2019, the [Advanced Packaging Technology and Service Organization](#) encouraged its employees and families to participate in a beach clean-up activity in Xinwu of Taoyuan as part of the Earth Day campaign



## Tour Volunteers Show the Public the Latest Technology Applications

TSMC believes that sharing technology knowledge is one of the most important ways to give back to society. TSMC provides tour services to The World of Semiconductors at the National Museum of Natural Science and TSMC's Museum of Innovation for the general public to better understand the semiconductor industry and its applications. In 2019, TSMC devoted resources to help renovate The World of Semiconductors exhibition hall to ensure that all the information is comprehensive and up-to-date. In 2019, tour volunteers served a total of 500 times, providing over 2,000 hours of tour services.



# Appendix

- About This Report
- Participation in Industry Associations and Non-profit Organizations
- CSR Performance Summary
- GRI Standards Comparison Table
- Independent Third Party Assurance Statement
- Contact Information



# About This Report

As a responsible corporate citizen, TSMC strives for a better future along with its employees, shareholders and investors, customers, suppliers and contractors, the government, society, and all other stakeholders. TSMC has issued non-financial reports for 21 consecutive years. In accordance with the standards set by the Global Reporting Initiative (GRI), the reports present the expectations and feedback given by various stakeholders regarding the Company's daily operations. The reports have become an important way to further promote TSMC's sustainable management.

TSMC issues its Corporate Social Responsibility (CSR) Report every year as an important tool for managing internal sustainability performance. The reports are able to transparently reveal the Company's sustainability plans, performance process, and achievement status, encouraging the Company to be a force for driving positive social development.

## The Primary Changes Disclosed in 2019 CSR Information



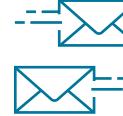
### Long-term Goals

The timeline of major topics extends from 2025 to 2030



### Full Disclosure

Information on sustainability regarding new fabs and more subsidiaries is included



### Efficient Communication

Issue a summary of the CSR Report



### Dynamic Updates

Weekly updates on highlight cases of corporate sustainability to provide the latest information

## Reporting Scope

This report has included TSMC's facilities in Taiwan (corporate headquarters, wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing), VisEra and other subsidiaries. Compared to last year, Fab18 P1 and P2, Fab15 P7, and Fab6 P2 have expanded their facilities in Taiwan and started operation. If the scope of reporting is different from the above statements, a note will be added to explain any difference in that paragraph.

## Reporting Period

The reporting period is between January 1 and December 31, 2019. The report is published in June, 2020 in both English and Chinese, and is available on TSMC's CSR website. It mainly covers the major topics of interest to stakeholders as well as TSMC's practices in the economic, environmental, and social dimensions. Visit the following links for more data and information.



CSR Performance  
Summary



CSR Website



CSR Newsletter



TSMC LinkedIn



## Data Collection Boundaries for Sustainable Development Issues

● Collect complete data

○ Collect partial data

- The issue lacks materiality to the institution and is not included in the boundary of data collection.

Issue	Boundary	Taiwan Facilities <sup>Note 1</sup>	WaferTech	TSMC (China)	TSMC (Nanjing)	VisEra	Other Subsidiaries <sup>Note 2</sup>
Ethics and Regulatory Compliance	●	●	●	●	●	●	●
Innovation Management	●	-	-	-	-	○	-
Product Quality	●	●	●	●	●	○	-
Customer Service	●	●	●	●	●	●	●
Supplier Sustainability Management	●	○	○	○	○	○	-
Climate Change and Energy Management	●	●	●	●	●	●	-
Water Management	●	●	●	●	●	●	-
Waste Management	●	●	●	●	●	●	-
Air Pollution Control	●	●	●	●	●	●	-
Talent Attraction and Retention	●	○	●	●	●	○	●
Talent Development	●	●	●	●	●	●	○
Human Rights	●	●	●	●	●	●	●
Occupational Safety and Health	●	●	●	●	●	●	-
Social Participation	●	-	-	-	-	-	-

Note 1: TSMC's facilities in Taiwan include corporate headquarters, wafer fabs, testing and assembly plants

Note 2: TSMC subsidiaries or offices in North America, Europe, Japan, South Korea, and other countries

## Reporting Guidelines and Principles



### Sustainability

#### Standard

- GRI Standards: Comprehensive Option
- AA 1000 Accountability Principle

#### Certification Organization

- DNV GL Business Assurance



### Financial

#### Standard

- IFRSs approved and issued by the Financial Supervisory Commission (FSC)
- Regulations Governing the Preparation of Financial Reports by Securities Issuers

#### Certification Organization

- Deloitte & Touche



### Environmental

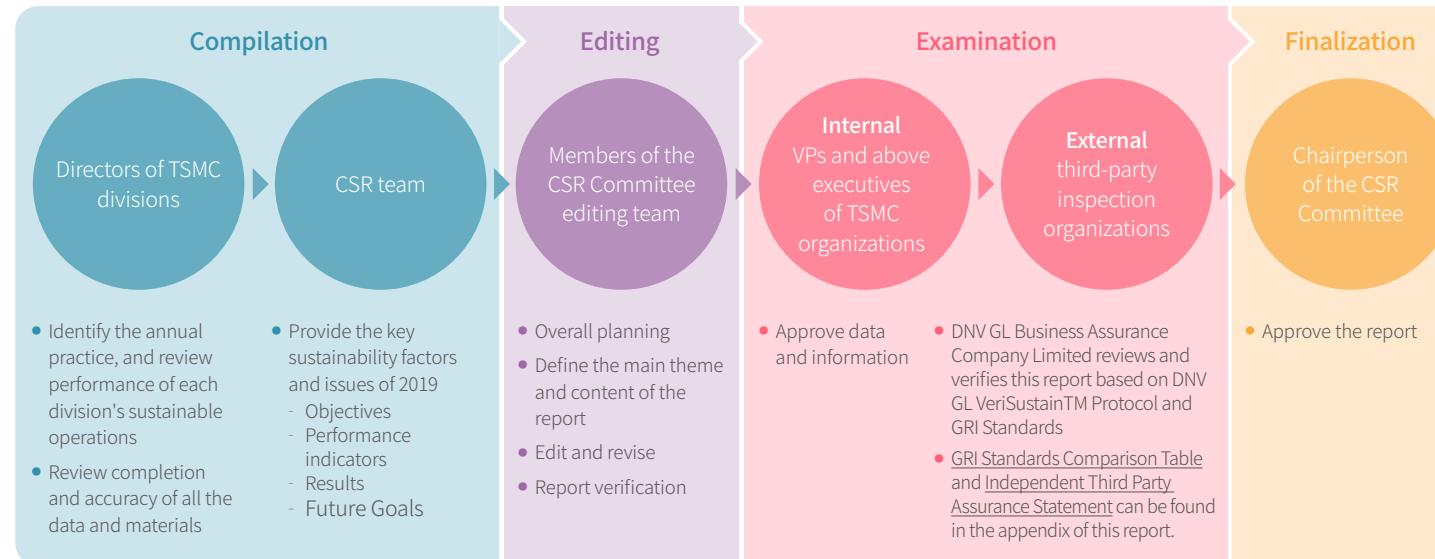
#### Standard

- ISO 14001 Environmental Management System
- ISO 14064 Greenhouse Gas Inventory

#### Certification Organization

- DNV GL Business Assurance

## Reporting Writing and Quality Management Process



Note 1 DNV GL VeriSustainTM Protocol is consistent with AA 1000 Accountability Principles (AA1000AP) and ISAE 3000

Note 2 For United Nation Global Compact Comparison Table and other related certification and verification documents, please visit [TSMC's CSR website](#)

## Feedback

If you have any feedback, advice or suggestion on this report or TSMC's sustainable development, please feel free to [contact us](#). For more information on the latest actions of TSMC's sustainability project, please [subscribe](#) TSMC's CSR Newsletter.

Responsible Unit: CSR Committee

CSR Website: <http://www.tsmc.com.tw/csr/en/index.html>

Email: [csr@tsmc.com](mailto:csr@tsmc.com)

Phone: +886-3-5636688

Address: 8, Li-Hsin Rd. 6, Hsinchu Science Park, Hsinchu 30078



# Participation in Industry Associations and Non-profit Organizations<sup>Note 1</sup>

TSMC's Corporate Social Responsibility vision is to uplift society, and our mission is integrity, strengthening environmental protection, and caring for the disadvantaged. Under this vision and mission, TSMC participates in a variety of industry associations and non-profit 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<sup>Note 2</sup>. In 2019, TSMC participated in more than 100 industry associations and non-profit organizations at home and abroad, with expenditures of over NT\$20.3 million<sup>Note 3</sup>. Total expenditures in the past five years (2014~2018) were about NT\$120 million<sup>Note 4</sup>.



## Industry Dialogue and Development

TSMC strives for the development of the global and domestic semiconductor industry. In addition to participating in the main industry associations in the field of semiconductors, the Company also 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 in the area of industry development include:

- The Semiconductor Industry Association (SIA)
- The Taiwan Semiconductor Association (TSIA)
- Semiconductor Equipment and Materials International (SEMI)
- The Allied Association for Science Park Industries
- Taiwan IC Industry & Academia Research Alliance
- The Chinese National Association of Industry and Commerce, Taiwan
- Chinese Association for Industrial Technology Advancement
- Taiwan IOT Technology and Industry Association
- Taiwan Electrical and Electronics Manufacturers' Association
- Global Semiconductor Alliance

TSMC Chairman Mark Liu has served as Chairman of The TSIA since 2019, Senior Vice President J.K. Wang currently serves as chairperson of TSIA's energy committee, and Director Fung Han-Wen currently serves as chairperson of TSIA's environment, safety and health committee. Senior Director Tuan Hsiao-Chin currently serves as chairperson of SEMI's MEMS & Sensors committee, and Director John Lin currently serves as chairperson of SEMI's IC committee. Senior Vice President Rick Cassidy currently serves as a Board of Director at GSA. Senior Vice President Y.P. Chin currently serves as a standing director of The Allied Association for Science Park Industries, and Vice President Connie Ma currently serves as a standing controller of The Allied Association for Science Park Industries.



## Technology Innovation

Technology innovation is the key driving force moving the technology industry forward. TSMC not only cares for and invests in technology innovation and participates in the definition of technical standards, it 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. Industry associations that TSMC participates in in the area of technology innovation include:

- The Epoch Foundation
- The Taiwan Association for Trade Secrets Protection (TTSP)
- The Peripheral Component Interconnect Special Interest Group (PCI SIG)
- JEDEC

TSMC Vice President and General Counsel Sylvia Fang jointly founded the Taiwan Association for Trade Secrets Protection (TTSP) in 2015, and served as its Chairman for the first two terms to help promote legal reform of Taiwan's trade secret laws and regulations. Currently she is a standing executive director of the TTSP.



## Corporate Governance

The robustness of a company's corporate governance not only affects that company's development, it can also affect the economic stability of a region. TSMC places great importance on corporate governance, and has received invitations to speak on our principals and methods for corporate governance, as well as discuss the results of TSMC's 32 years of corporate governance. Industry associations that TSMC participates in in the area of corporate governance include:

- The Asian Corporate Governance Association (ACGA)
- The Taiwan Corporate Governance Association (TSGA)



## Environmental Sustainability

As TSMC's business continues to grow, its requirements for sustainable measures such as energy conservation, carbon reduction, water saving, and waste reduction all continue to increase as well, and the company devotes much attention to its participation in the associations and organizations related to the issue of environmental sustainability. In addition to sharing our experiences with the organizations below, TSMC has appointed more than 10 internal experts to serve as committee members and committee chairman in the TSIA and the Allied Association for Science Park Industries to set standards in energy, water, environmental protection, and occupational health, and meet these standards together. The industry associations and non-profit organizations that TSMC participates in in the area of environmental sustainability include:

- The Science and Technology in Society Forum
- The Taiwan Institute for Sustainable Energy/The Taiwan Center for Corporate Sustainability
- The Business Council for Sustainable Development of Taiwan

TSMC Senior Vice President Lora Ho currently serves as member of the Taiwan Center for Corporate Sustainability board of directors.



## Human Rights and Supply Chain Management

TSMC is an official member of the Responsible Business Alliance, and in addition to meeting the alliance's requirements in auditing suppliers regarding labor, health and safety, environment, ethics, and management systems, we have also led our suppliers to join this alliance to expand its effectiveness. TSMC also requires all suppliers to commit to the "Assurance to Comply with TSMC's Code of Ethics and Business Conduct" and the "TSMC's Supplier Code of Conduct" ensuring that TSMC employees and suppliers follow high ethical standards. Industry associations that TSMC participates in in the area of human rights and supply chain management include:

- The Responsible Business Alliance (RBA)
- The Responsible Minerals Initiative

Notes 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 173 to 199 of this report

Note 2: By law, TSMC is not permitted to make political donations in Taiwan 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 descending order, are:

1) Taiwan Semiconductor Industry Association/NT\$5,114,747

TSMC participates in the TSIA to support Taiwan's semiconductor industry and develop consensus on the development of the industry through the association's activities and promote healthy growth for the sector through cooperation amid competition

2) Semiconductor Industry Association/NT\$4,936,960

The United States is one of TSMC's primary markets. 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

3) The 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

4) Responsible Business Alliance (formerly Electronics Industry Citizenship Coalition)/NT\$1,354,140

TSMC is a member of the RBA, and follows the guidelines set by the alliance for the supply chain to ensure a safe working environment, respect and dignity for workers, environmentally sustainable business operations, and compliance with business ethics

5) JEDEC/NT\$757,320

JEDEC is an international organization of developing technology standards, and its defined open standards are broadly adopted as common standards in the semiconductor industry. TSMC participates in JEDEC to understand the most updated technology standards, so the Company's relative research, development and manufacturing can be based on the common standards

Note 4: TSMC's expenditures of membership and donation for industry associations and non-profit organizations between 2014 and 2018 were NT\$18,225,979, NT\$22,807,227, NT\$36,296,334, NT\$21,176,571, and NT\$21,735,668, respectively



# TSMC CSR Performance Summary

Key Indicators		2015	2016	2017	2018	2019
Economic	Revenue (NT\$ billion)	843	948	977	1,031	1,070
	Net Income (NT\$ billion)	307	334	343	351	345
	Income Tax Expense (NT\$ billion)	44	52	53	46	45
	R&D Expenditures (NT\$ billion)	66	71	81	86	91
	Capital Expenditures (NT\$ billion)	258	328	331	316	460
Environmental	Greenhouse Gas Emission (Metric Ton - CO <sub>2</sub> equivalent) (Scope 1 and Scope 2)	6,670,291	7,413,953	8,156,140	8,475,367	8,769,614
	Scope 1 (Metric Ton - CO <sub>2</sub> equivalent)	2,027,645	2,035,510	2,075,928	2,125,725	2,071,743
	Taiwan Sites	1,566,662	1,648,268	1,640,532	1,705,746	1,678,754
	Subsidiaries <sup>Note 2</sup>	460,983	387,242	435,396	419,979	392,989
	Scope 2 (Metric Ton - CO <sub>2</sub> equivalent)	4,642,646	5,378,443	6,080,212	6,349,642	6,697,872
	Taiwan Sites	4,315,766	5,030,647	5,702,511	6,325,931	6,673,235
	Subsidiaries <sup>Note 2</sup>	326,880	347,796	377,701	23,711	24,637
	Scope 3 (Metric Ton - CO <sub>2</sub> equivalent)	3,446,447	3,767,411	4,242,521	4,315,497	5,307,028
	Fluorinated Greenhouse Gas Emission (Metric Ton - CO <sub>2</sub> equivalent)	1,331,467	1,259,527	1,194,136	1,185,433	1,081,212
	NOx Emissions (Metric Tons)	54.42	60.54	82.5	118.92	116.67
Operational	SOx Emissions (Metric Tons)	32.55	33.08	43.87	39.71	32.18
	VOC Emissions (Metric Tons)	129.4	163.6	170.8	168.4	102.1
	Energy Consumption (GWh)(Including electricity, nature gas and diesel)	8,915	9,848	12,016	13,167	14,323
	Direct Energy Consumption (GWh)(Including nature gas and diesel)	455	489	628	726	747
	Indirect Energy Consumption (GWh)(Electricity)	8,460	9,358	11,388	12,441	13,576
	Water Consumption (Million Metric Tons)	37.5	42.0	48.9	56.8	64.3
	Taiwan Sites	34.0	38.6	45.2	51.0	58.0
	Subsidiaries <sup>Note 2</sup>	3.5	3.4	3.8	5.7	6.3
	Process Water Recycling Rate (%) <sup>Note 3</sup>	87.3	87.4	87.5	87.5	86.7
	Total Water Saving (Million Metric Tons) <sup>Note 3</sup>	85.6	94.3	103.4	129.0	133.6
Social	Ultra-Pure Water Usage (Million Metric Tons)	61.0	68.8	79.7	85.1	90.1
	(Continue on next page)					



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	Key Indicators	2015	2016	2017	2018	2019
Environmental	Tetramethylammonium hydroxide (TMAH)	19.1	16.3	12.9	13.1	7.9
	Copper ion (Cu <sup>2+</sup> )	0.23	0.19	0.22	0.18	0.09
	Waste Generated (Metric Tons)	273,096	298,761	369,745	393,784	416,715
	General Waste Generated (Metric Tons)	137,524	163,584	201,114	213,840	219,584
	Taiwan Sites	132,427	158,899	196,077	208,340	212,465
	Subsidiaries <sup>Note 2</sup>	5,097	4,685	5,037	5,501	7,119
	Hazardous Waste Generated	135,572	135,177	168,631	179,944	197,131
	Taiwan Sites	133,360	133,085	165,891	169,427	183,015
	Subsidiaries <sup>Note 2</sup>	2,212	2,092	2,740	10,516	14,116
	Waste Recycling Rate (%)	95	95	95	95	96
	Taiwan Sites	95	95	95	95	96
	Subsidiaries <sup>Note 2</sup>	79	79	80	83	74
Social	ISO 14001 Certified Sites	16	18	20	22	22
	% Sites Certified	100	100	100	100	100
	Numbers of Employee	45,272	46,968	48,602	48,752	51,297
	Employee Training Hours	780,546	623,711	639,852	540,408	741,178
	Women in Workforce (%)	41.3	40.1	39.3	38.7	37.8
	Females in Management (%)	11.5	11.7	12.3	12.6	12.7
	Females in Junior Management (%)	12.8	12.8	13.6	13.7	13.6
	Females in Top Management (%)	22.7	20.0	20.0	18.5	11.1
	Turnover Rate (%)	5.2	4.3	4.2	4.5	4.9
	Voluntary Turnover Rate (%)	5.0	4.2	4.1	4.3	4.8
	Safety - Injury Frequency Rate <sup>Note 4</sup>	0.47	0.54	0.56	0.88	0.93
	Safety - Injury Severity Rate <sup>Note 5</sup>	5	7	7	13	15
Economic	Fatalities - Employees	0	0	0	0	0
	Fatalities - Contractors	0	0	0	0	0
	Cash Donation (NT\$ million) <sup>Note 6</sup>	64.8	89.1	301.2	199.0 <sup>Note 7</sup>	163.5

Note 1: Data includes all Taiwan sites and subsidiaries of TSMC.

Note 2: The scope of subsidiaries in Environmental parts includes WaferTech, TSMC China Company Limited, TSMC Nanjing Company Limited and VisEra.

Note 3: Data includes all Taiwan fabs of TSMC.

Note 4: Safety - Injury Frequency Rate=Injury Number x 1,000,000/ Total hours worked

Note 5: Safety - Injury Severity Rate= Lost Work Days x 1,000,000/ Total hours worked

Note 6: Cash donation is the amount of cash donations by TSMC, TSMC Education and Culture Foundation, TSMC Charity Foundation, TSMC employees and TSMC Employee Welfare Committee

Note 7: In response to the government's renewable energy policy, TSMC purchased 100 GWh green power in 2017, which was the main reason for the higher amount of annual cash donations. The government's green power purchase plan was terminated at the end of 2017. TSMC is proactively searching for renewable energy.



## GRI Standards Comparison Table

Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 102 : General Disclosures			
102-1	Name of the organization	Our Business: About TSMC	<u>10</u>
102-2	Activities, brands, products, and services	Our Business: About TSMC	<u>10</u>
102-3	Location of headquarters	Our Business: About TSMC	<u>10</u>
102-4	Location of operations	Our Business: About TSMC	<u>10</u>
102-5	Ownership and legal form	Our Business: About TSMC; TSMC; Please refer to <u>2019 TSMC Annual Report (II) Financial Statements</u>	<u>10</u>
102-6	Markets served	Our Business: About TSMC	<u>10</u>
102-7	Scale of the organization	Our Business: About TSMC; TSMC; Please refer to <u>2019 TSMC Annual Report (II) Financial Statements</u>	<u>10</u>
102-8	Information on employees and other workers	Please refer to Inclusive Workplace: Talent Attraction and Retention - Right People with Shared Vision and Values - Workforce Structure All employee number has been disclosed in "Workforce Structure", the number of contractors has also disclosed in the note. In 2019, there were 2,415 non-employee workers conducted preventive maintenance tasks for facility systems.	<u>137</u>
102-9	Supply chain	Responsible Supply Chain: Sustainability Risk Control and Local Supply Chain Optimization	<u>81</u>
102-10	Significant changes to the organization and its supply chain	Our Business: About TSMC; TSMC; Please refer to <u>2019 TSMC Annual Report (II) Financial Statements</u>	<u>10</u>
		Responsible Supply Chain: Strategy and Long Term Goals	<u>81</u>
102-11	Precautionary Principle or approach	The risk management organization periodically briefs the audit committee on the ever-changing risk environment facing TSMC, the focus of the Company's enterprise risk management, and risk assessment and mitigation efforts. The audit committee's chairperson also reports on the risk environment and risk mitigation actions to be taken. TSMC and its subsidiaries are committed to proactively and cost effectively integrating and managing strategic, operational, financial and hazardous risks together with potential consequences to operations and financial results. TSMC operates an enterprise risk management (ERM) program and apply a risk map considering likelihood and impact severity to identify and prioritize corporate risks. Various risk treatment strategies are also adopted in response corporate risks as they are identified.  Refer section <u>6.3 Risk Management</u> of TSMC Annual Report for details of implementation of ERM (Eneterprise Risk Management)	-
102-12	External initiatives	Responsible Business Alliance (RBA, the previous EICC) and Responsible Minerals Assurance Process (RMAP, the previous Conflict-free Smelter Program)	-
102-13	Membership of associations	Appendix: Participation in Industry Associations and Non-Profit Organizations	<u>204</u>
102-14	Statement from senior decision-maker	Letter from the CSR Executive Committee Chairperson; Letter from the CSR Committee Chairperson	<u>4, 5</u>
102-15	Key impacts, risks, and opportunities	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<u>20</u>
102-16	Values, principles, standards, and norms of behavior	Ethical Management: Ethic and Regulatory Compliance  Please refer to <u>2019 TSMC Annual Report</u> : 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance	<u>38</u>



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-17	Mechanisms for advice and concerns about ethics	Ethical Management: Ethic and Regulatory Compliance  Please refer to <a href="#">2019 TSMC Annual Report</a> : 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance 5.5.6 Employee Engagement - Employee Communication	<a href="#">38</a>
102-18	Governance structure	Sustainable Governance: Corporate Governance, CSR Management  Please refer to <a href="#">2019 TSMC Annual Report</a> : 2.3.1 Organization Chart 3 Sustainable Governance: Corporate Governance	<a href="#">16, 17</a>
102-19	Delegating authority	Sustainability Governance	<a href="#">14</a>
102-20	Executive-level responsibility for economic, environmental, and social topics	Letter from the CSR Executive Committee Chairperson; Letter from the CSR Committee Chairperson Sustainable Governance: CSR Management	<a href="#">4, 5</a> <a href="#">17</a>
102-21	Consulting stakeholders on economic, environmental, and social topics	Sustainable Governance: Materiality Analysis and Stakeholder Communication Sustainable Governance: Corporate Governance  Please refer to <a href="#">2019 TSMC Annual Report</a> : 3.4 Taiwan Sustainable Governance: Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission/Assessment Item 5	<a href="#">20</a> <a href="#">16</a>
102-22	Composition of the highest governance body and its committees	Sustainable Governance: Corporate Governance TSMC's Board of Directors consists of distinguished members with a great breadth of experience as world-class business leaders or professionals. All of them have management experience and competency in economic, environmental and social topics  Please refer to <a href="#">2019 TSMC Annual Report</a> : 2.4.1 Information Regarding Board Members 3 Sustainable Governance: Corporate Governance	<a href="#">16</a>
102-23	Chair of the highest governance body	The Chair of the highest governance body is not an executive officer	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-24	Nominating and selecting the highest governance body	<p>In 2019, TSMC established "Guidelines for Nomination of Directors", which describes the procedures and criteria for the nomination, qualification and evaluation of candidates for Directors. <a href="#">Please refer to our website.</a></p> <p>We envision the membership of its esteemed Board of Directors to be composed of highly ethical professionals with the necessary knowledge, experience and understanding from diverse backgrounds. TSMC envisions its Board to be composed of as many independent directors as possible, and the independence of each independent director candidate is also considered and assessed under relevant laws. Therefore, TSMC composes its Board with world-class candidates who are/were international or local business leaders in the high-tech industry, prestigious academics or other professionals excelling in their chosen field of expertise, all of them have management experience and competency in economic, environmental and social topics.</p> <p>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 independence of each independent director candidate is also considered and assessed under relevant law such as the Taiwan "Regulations Governing Appointment of Independent Directors and Compliance Matters for Public Companies". Under R.O.C. law, in which TSMC was incorporated, any shareholders holding one percent or more of our total outstanding common shares may nominate their own candidate to stand for election as a Board member. This democratic mechanism allows our shareholders to become involved in the selection and nomination process of Board candidates. The final slate of candidates are put to the shareholders for voting at the relevant annual shareholders' meeting.</p> <p>There are no limits on the number of terms that a director may serve. We believe the Company benefits from the contributions of directors who have over their years of dedicated service acquired unique insights into the operations and financial developments of the Company. The Company reviews the appropriateness of each director's continued service to ensure there are new viewpoints available to the Board.</p>	-
102-25	Conflicts of interest	<p>The avoidance of conflicts of interests is governed by several corporate processes. First, any director or executive officer who, for him/herself or on behalf of another, wishes to engage in any business activity that overlaps with TSMC's business must obtain the prior approval of our shareholders' meeting or Board of Directors respectively in accordance with relevant laws. Second, each board member and executive officer must complete an annual declaration on related party transactions which is reviewed by our Audit Committee. Third, we are subject to strenuous reporting requirements on reporting any related party transactions under both R.O.C. and U.S. security rules.</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>2.4.1 Information Regarding Board Members 4.1.4 Major Shareholders 4.1.8 Related Party Relationship among Our 10 Largest Shareholders 5.3.4 Raw Materials and Supply Chain Management-Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement 5.4 Customer Trust-Customers that Accounted for at Least 10% of Annual Consolidated Net Revenue 8.1 Subsidiaries</p> <p>Please refer to Consolidated Financial Statements for 2019: Note 38: Additional Disclosures Table 6 - Total Purchases from or Sales to Related Parties of at Least NT\$100 Million or 20% of the Paid-in Capital</p>	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-26	Role of highest governance body in setting purpose, values, and strategy	<p>Sustainable Governance: Corporate Social Responsibility Policy &amp; Matrix CSR Management</p> <p>TSMC established the Corporate Social Responsibility Executive Committee in 2019. TSMC's Chairman chairs the CSR Executive Committee, and the Chairperson of the CSR Committee serves as Executive Secretary. The Chairperson of the CSR Committee reports annually to the Board of Directors on implementation results of the prior year and the work planned for the upcoming year (the report includes economic, environmental and social topics). In addition, the Board of Directors also review the annual plan and the donations of the "TSMC Education and Culture Foundation" and "TSMC Charity Foundation".</p> <p>TSMC's Board of Directors consists of distinguished members with a great breadth of experience as world-class business leaders or professionals. All of them have management experience and competency in economic, environmental and social topics.</p>	<u>15</u> <u>17</u>
102-27	Collective knowledge of highest governance body	<p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3. Sustainable Governance: Corporate Governance "Continuing Education/Training of Directors" in 2019.</p> <p>Through quarterly management report and annually CSR report to develop and enhance the Board of Directors' collective knowledge of economic, environmental and social topics.</p>	-
102-28	Evaluating the highest governance body's performance	<p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.2 Board of Directors</p> <ul style="list-style-type: none"><li>• 2019 Sustainable Governance: Corporate Governance Awards and Ratings</li><li>• Directors' Compensation</li></ul> <p>3.2.2 Compensation Committee</p> <ul style="list-style-type: none"><li>• Board of Directors Meeting Status</li></ul> <p>3.4 Taiwan Sustainable Governance: Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission/Assessment Item 5</p> <p>7 2019 CSR Awards, Recognitions and Ratings</p>	-
102-29	Identifying and managing economic, environmental, and social impacts	<p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.2 Board of Directors</p> <ul style="list-style-type: none"><li>• The Board of Directors considers economic, environmental and social topics and their impact, risks and opportunities, and stakeholder opinions, when resolving important company matters, for example, when approving capital appropriations. The Board will also review the corporate strategies proposed by TSMC management, evaluate the prospects of these strategies, review their progress, and provide guidance to TSMC management when needed.</li><li>• Audit Committee</li><li>• Compensation Committee</li></ul> <p>3.4 Taiwan Sustainable Governance: Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission/Assessment Item 5</p> <p>6.3 Risk Management</p> <p>7 Corporate Social Responsibility</p> <ul style="list-style-type: none"><li>• CSR Management</li><li>• Stakeholder Engagement</li></ul>	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-30	Effectiveness of risk management processes	<p>The risk management organization periodically briefs the audit committee on the ever-changing risk environment facing TSMC, the focus of the Company's enterprise risk management, and risk assessment and mitigation efforts. The audit committee's chairperson also reports on the risk environment and risk mitigation actions to be taken. TSMC's risk management organization is composed of RM Steering Committee, RM Executive Council, and RM Program. Refer section <a href="#">6.3.1 Risk Management Organization</a> of TSMC Annual Report for details.</p>	-
102-31	Review of economic, environmental, and social topics	<p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3. Sustainable Governance: Corporate Governance 6.3 Risk Management</p>	-
102-32	Highest governance body's role in sustainability reporting	<p>Sustainable Governance: Corporate Governance</p> <p>This report is reviewed and approved by the Company's functional heads and Chairperson of the Corporate Social Responsibility Committee (Chief Financial Officer)</p>	-
102-33	Communicating critical concerns	<p>In addition to holding regular meetings, TSMC management will regularly provide to the Board of Directors material company reports and information:</p> <ul style="list-style-type: none"><li>• Accounting department: monthly financial information and quarterly financial statements;</li><li>• Internal Audit department: the quarterly internal audit report; and</li><li>• Public Relations department: press release</li></ul> <p>In addition, the Board maintains a regular line of communication with TSMC management, which will remain open if an event of critical concerns occurs.</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.2 Board of Directors</p> <ul style="list-style-type: none"><li>• Audit Committee Meeting Status</li></ul>	-
102-34	Nature and total number of critical concerns	<p>Please refer to the material information the Company has disclosed on TWSE website, which indicates the total number and nature of critical concerns.</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>6.3 Enterprise Risk Management Framework:</p> <p>TSMC and its subsidiaries adopt risk management strategies corresponding to risk level through implementing an enterprise risk management system that weighs strategic, operational, financial and hazardous risks that may disrupt the Company's operations or financial results. If any events of critical concerns occur, the Company can resolve the event by using existing risk management mechanisms.</p>	-
102-35	Remuneration policies	<p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>2.4.2 Remuneration Paid to Directors 2.5.2 Compensation Paid to CEO and Vice Presidents 2.5.3 Employees' Profit Sharing Bonus Paid to Management Team</p> <p>And also, 2019 CSR Report:</p> <p>Inclusive Workplace: Talent Attraction and Retention - Competitive Compensation Program - Benefit program, Solid Pension System. Our compensation is above the industry peers, and our benefit program also exceed the statutory requirements.</p>	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-36	Process for determining remuneration	Inclusive Workplace: Talent Attraction and Retention - Competitive Compensation Program  Please refer to <a href="#">2019 TSMC Annual Report</a> : 3.2.2 Compensation Committee 3.2.4 Director and Committees Members'Attendance/ Compensation Committee Meeting Status	<a href="#">137</a>
102-37	Stakeholders' involvement in remuneration	TSMC devotes to strengthening Sustainable Governance: Corporate Governance, keep communication channels open to every stakeholder, and fully collected the suggestions and take them into operational considerations. We believe "Talent is the most important asset of the Company" and the concept of balancing employee's welfare and shareholder's right. Upon this, we provide competitive total compensation to attract and retain our talents. Over the years, the Company has performed well and not only the shareholders have earned a return on investment above the industry average, but also our employees' total compensation has been better than other industry peers and most of the local enterprises based in Taiwan.	-
102-38	Annual total compensation ratio	Inclusive Workplace: Talent Attraction and Retention - Competitive Compensation Program Median of global employees annual total compensation Annual total compensation ratio between CEO and median	<a href="#">137</a>
102-39	Percentage increase in annual total compensation ratio	Inclusive Workplace: Talent Attraction and Retention - Competitive Compensation Program Headcount, average annual compensation, and median annual compensation of non-corporate executive full-time employees, and year-over-year difference.	<a href="#">137</a>
102-40	List of stakeholder groups	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<a href="#">20</a>
102-41	Collective bargaining agreements	Inclusive Workplace: Human Rights - Internal Communication Channels for Employees  TSMC strives to create harmonious employee relations, values two-way communication and fosters open communication channels for management levels, subordinates and peers. The Company provides a number of voice channels with handling the cases in a fast and confidential manner. Among them, people in charge are the highest executives of human resources organizations, demonstrating our emphasis on employee opinions. Effective communication between the Company and employees creates a high-involvement working environment. Employees are also highly engaged and willing to make commitments to TSMC. In addition, TSMC abides by regulations to hold Labor-Management Meeting periodically, summarizes and publishes business updates, labor conditions, and employee welfare activities for employees.	<a href="#">153</a>
102-42	Identifying and selecting stakeholders	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<a href="#">20</a>
102-43	Approach to stakeholder engagement	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<a href="#">20</a>
102-44	Key topics and concerns raised	Sustainable Governance: Materiality Analysis and Stakeholder Communication	-
102-45	Entities included in the consolidated financial statements	Our Business: About TSMC; Please refer to <a href="#">2019 TSMC Annual Report (II) Financial Statements</a>	<a href="#">20</a>
102-46	Defining report content and topic Boundaries	Sustainable Governance: Materiality Analysis and Stakeholder Communication Appendix: About this Report	<a href="#">201</a>
102-47	List of material topics	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<a href="#">20</a>
102-48	Restatements of information	No significant changes	-
102-49	Changes in reporting	Appendix: About this Report	<a href="#">201</a>
102-50	Reporting period	Appendix: About this Report	<a href="#">201</a>
102-51	Date of most recent report	June, 2019	-
102-52	Reporting cycle	Appendix: About this Report	<a href="#">201</a>



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-53	Contact point for questions regarding the report	Appendix: About this Report	<a href="#">201</a>
102-54	Claims of reporting in accordance with the GRI Standards	Appendix: About this Report	<a href="#">201</a>
102-55	GRI content index	Appendix: GRI Standards Comparison Table	<a href="#">207</a>
102-56	External assurance	Appendix: Independent Third Party Assurance Statement 203	<a href="#">221</a>
GRI 103 : Management Approach			
103-1	Explanation of the material topic and its Boundary	Sustainable Governance: Materiality Analysis and Stakeholder Communication	<a href="#">20</a>
103-2	The management approach and its components	Please refer to the contents of related topics	-
103-3	Evaluation of the management approach	Please refer to the contents of related topics	-
GRI 201 : Economic Performance			
201-1	Direct economic value generated and distributed	Our Business: Financial Performance, Tax Policy Sustainable Governance: Sustainable Value Creation Appendix: CSR Performance Summary Inclusive Workplace: Talent Attraction and Retention, Compensations and Benefits Please refer to <a href="#">2019 TSMC Annual Report (II) Financial Statements</a> for detailed information.	<a href="#">11, 13</a> <a href="#">31</a> <a href="#">205</a> <a href="#">137</a>
201-2	Financial implications and other risks and opportunities due to climate change	Green Manufacturing: Climate Change and Energy Management TSMC TCFD framework Climate Risks Matrix Climate Financial Risk Analysis Purchasing Green Power	<a href="#">95</a> <a href="#">98</a> <a href="#">99</a> <a href="#">100</a> <a href="#">103</a>
201-3	Defined benefit plan obligations and other retirement plans	Inclusive Workplace: Talent Attraction and Retention - Pension Plan - Pension Plan and Pension Allocation in TSMC TSMC defined contribution plan recognized expenses of NT\$2,609,733 thousand for the years ended December 31, 2019. TSMC makes monthly contributions equal to 6% of each employee's monthly salary in Taiwan. TSMC's oversea subsidiaries also make monthly contributions at certain percentages of the basic salary of their employees in accordance with local practices.	<a href="#">137</a>
201-4	Financial assistance received from government	Financial assistance received from the R.O.C. government: In 2019, TSMC enjoyed a tax benefit of NT\$29.4 billion from five-year tax exemption for capital investments made in previous years, and tax credits of NT\$5.9 billion for research and development expenditures. (Our wafer fabs in China received subsidies from the local government, but according to the agreement, TSMC can not disclose the content and amount.)	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 202 : Market Presence			
202-1	Ratios of standard entry level wage by gender compared to local minimum wage	<p>Inclusive Workplace: Talent Attraction and Retention - Compensation Ratio between Male and Female - The ratio of annual total compensation between female and male employees in each region of TSMC</p> <p>The total compensation of a newly-graduated engineer with a Master's degree in Taiwan in year 2019 would be equal to 31 months' salary, including 12 months' base salary, 2 months' year-end bonus and around 17 months' employees' cash bonus and profit sharing bonus; the total compensation of a direct employee would be equal to 26 months' salary and the monthly wage is around 3 times of base wage in Taiwan.</p> <p>For the non-TSMC employee workers, TSMC requests their companies that the compensation paid to their workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits.</p>	<a href="#">137</a>
202-2	Proportion of senior management hired from the local community	<p>In <a href="#">2019 TSMC Annual Report</a>, 2.5.1 Information Regarding Management Team, we've disclosed that we hire 18 out of 23 local people, accounting for 78.3%.</p> <p>Definition: Senior management: In <a href="#">2019 TSMC Annual Report</a>, 2.5.1 Information Regarding Management Team, we've disclosed our management team. Local: define by nationality</p> <p>Important base: mean where the headquarter located and where the majority of employees work.</p>	-
GRI 203 : Indirect Economic Impacts			
203-1	Infrastructure investments and services supported	Please refer to the Corporate Social Responsibility Report, Social Participation part, TSMC Charity Foundation chapter. Contents including donation, in-kind giving, construction services, repair services, volunteers services, etc.	<a href="#">185</a>
203-2	Significant indirect economic impacts	<p>Today, TSMC is the world's largest semiconductor foundry, manufacturing 10,761 different products using 272 distinct technologies for 499 different customers in 2019.</p> <p>Output Value Driven by the Supply Chain</p>	-
GRI 204 : Procurement Practices			
204-1	Proportion of spending on local suppliers	Responsible Supply Chain: Continue Driving Local Supply Chain Upgrade	<a href="#">81</a>
GRI 205 : Anti-corruption			
205-1	Operations assessed for risks related to corruption	<p>TSMC assesses anti-corruption risk based on function rather than geographical region. Please refer to the corresponding sections in this report for risk assessment approaches. Based on 2019's employee ethics survey, supplier survey, CSA Reports received from each division, and a review of the incidents received through the reporting channels and the results of investigations conducted accordingly, the corruption risk is appropriately controlled and no significant corruption risk was identified.</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.5 Code of Ethics and Business Conduct</p> <p>3.6 Regulatory Compliance</p>	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
205-2	Communication and training about anti-corruption policies and procedures	<p>Integrity is the most important value of TSMC's culture. In 2019, TSMC publishes the "TSMC Anti-Corruption Commitment" to reiterate that TSMC takes a zero-tolerance approach toward corruption, meanwhile elaborating the regulations regarding avoiding conflicts of interest, political and charitable contributions, and whistleblower channel. Please refer to our website: <a href="https://www.tsmc.com/download/ir/majorInternalPolicies/TSMC_Anti-Corruption_Commitment_e.pdf">https://www.tsmc.com/download/ir/majorInternalPolicies/TSMC_Anti-Corruption_Commitment_e.pdf</a></p> <p>TSMC provides anti-corruption and ethics training when each new colleague. For the current colleagues, TSMC provides a variety of training courses in the form of face-to-face courses, communication meetings, online compulsory and elective courses, and provides regulatory compliance guidelines and FAQs through the factory posters, company's internal website, internal e-mails, and education propaganda articles, etc., to ensure colleagues access to new knowledge of regulations and deepen their knowledge of various issues.</p> <p>Ethical Management: Ethic and Regulatory Compliance</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance</p>	-
205-3	Confirmed incidents of corruption and actions taken	<p>Ethical Management: Ethic and Regulatory Compliance</p> <p>Please refer to <a href="#">2019 TSMC Annual Report</a>:</p> <p>3.5 Code of Ethics and Business Conduct</p>	38
GRI 206 : Anti-competitive Behavior			
206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	"Please refer to <a href="#">2019 TSMC Annual Report</a> : 6.3.3 Operational Risks/Risks Associated with Litigious and Non-litigious Matters"	-
GRI 302 : Energy			
302-1	Energy consumption within the organization	Green Manufacturing: Climate Change and Energy Management: Improve energy efficiency	104
302-2	Energy consumption outside of the organization	Green Manufacturing: Climate Change and Energy Management: Greenhouse Gas Inventory for Upstream and Downstream Supply Chain	102
302-3	Energy intensity	Green Manufacturing: Climate Change and Energy Management: Improve energy efficiency	104
302-4	Reduction of energy consumption	Green Manufacturing: Climate Change and Energy Management: Improve energy efficiency	104
302-5	Reductions in energy requirements of products and services	More Advanced and More Energy Efficient Electric Products	50
GRI 303 : Water			
303-1	Water withdrawal by source	Risk Management of Water Resources	112
303-2	Water sources significantly affected by withdrawal of water	Risk Management of Water Resources	112
303-3	Water recycled and reused	Risk Management of Water Resources	112



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 305 : Emissions			
305-1	Direct (Scope 1) GHG emissions	Green Manufacturing: Climate Change and Energy Management: Greenhouse Gas Inventory	<a href="#">102</a>
305-2	Energy indirect (Scope 2) GHG emissions	Green Manufacturing: Climate Change and Energy Management: Greenhouse Gas Inventory	<a href="#">102</a>
305-3	Other indirect (Scope 3) GHG emissions	Green Manufacturing: Climate Change and Energy Management: Greenhouse Gas Inventory	<a href="#">102</a>
305-4	GHG emissions intensity	Green Manufacturing: Climate Change and Energy Management: Greenhouse Gas Inventory	<a href="#">102</a>
305-5	Reduction of GHG emissions	Green Manufacturing: Climate Change and Energy Management: Best Mitigation Results in the Industry	<a href="#">109, 102</a>
305-6	Emissions of ozone-depleting substances (ODS)	TSMC doesn't use Montreal Protocol Class I & II ODS	-
305-7	Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	Green Manufacturing: Air Pollution Control Air emissions in 2019, VOC: 108.1metric tons, NOx: 116.67 metric tons, SOx:32.18 metric tons	<a href="#">130</a>
GRI 306 : Effluents and Waste			
306-1	Water discharge by quality and destination	TSMC (China): On-site treated water discharges to Industrial District Wastewater Treatment Plant (IDWWPT). Discharge destination of IDWWPT treated water is Youdun Harbor. TSMC (Nanjing): On-site treated water discharges to Industrial District Wastewater Treatment Plant (IDWWPT). Discharge destination of IDWWPT treated water is Yangtze River. US WaferTech: On-site treated water discharges to the City of Camas Publicly Owned Treatment Works (POTW). Discharged destination of POTW treated water is Columbia River.	-
306-2	Waste by type and disposal method	Green Manufacturing: Waste Management	<a href="#">121</a>
306-3	Significant spills	There were no significant spills in all TSMC fabs in 2019.	-
306-4	Transport of hazardous waste	In 2019, TSMC exported 3.388 tons cadmium battery, which was 0.0009% of total disposed wastes.	-
306-5	Water bodies affected by water discharges and/or runoff	TSMC's treated wastewater is discharged to the Science Park wastewater treatment plant, and there is no significant environmental impact	-
GRI 307 : Environmental Compliance			
307-1	Non-compliance with environmental laws and regulations	Company has no significant fines and non-monetary sanctions for non-compliance of environmental laws and regulations 2019.	-
GRI 308 : Supplier Environmental Assessment			
308-1	New suppliers that were screened using environmental criteria	Responsible Supply Chain: 2019 Goals and Achievements 100% new suppliers compliant and signed "TSMC ethics and supplier code of conduct"	<a href="#">81</a>
308-2	Negative environmental impacts in the supply chain and actions taken	Please refer to the "sustainable risk assessment" method in the "Responsible Supply Chain" chapter. TSMC requires suppliers to meet the sustainability standards through the "TSMC Supplier Code of Conduct", which includes environmental impact issues, and requires Tier 1 suppliers to implement sustainable According to the questionnaire, a total of 1,226 questionnaires (including operating units in Taiwan and China) were collected in the 2019. If the supplier has potential risks, it will be continuously to request improvement.	<a href="#">81</a>



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 401 : Employment			
401-1	New employee hires and employee turnover	Inclusive Workplace: Talent Attraction and Retention - Recruitment - Campus Recruitment Talent Attraction and Retention - Recruitment - Campus Recruitment TSMC has approximately 90% of employees located in Taiwan. Overseas employees are mostly located in Asia, which is merely 7.6% of all employees; the proportion of other regions is lower.  In 2019, TSMC (Taiwan area) has 5,087 new hires, including 76.1% of young generation which is below 30-years old.	<a href="#">137</a>
401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	Inclusive Workplace: Talent Attraction and Retention - Benefit program  Note: TSMC provide the localized leave and insurance programs to employees in overseas regions. We grant additional days of annual leave to employees in China, North America and Europe. As for insurance program, the comprehensive life and medical insurance program are also designed in consideration of the local regulations, industry practices and local conditions for each overseas region.	<a href="#">137</a>
401-3	Parental leave	Inclusive Workplace: Talent Attraction and Retention - Competitive Compensation Program - Benefit program	<a href="#">137</a>
GRI 402 : Labor/Management Relations			
402-1	Minimum notice periods regarding operational changes	Inclusive Workplace: Human Rights - Internal Communication Channels for Employees  If the Company terminates employment, the Company will notify employees in advance abide by the law	<a href="#">153</a>
GRI 403 : Occupational Health and Safety			
403-1	Workers representation in formal joint management-worker health and safety committees	Corporate Level Safety and Health Committee is hosted by Corporate ESH Director, percentage of total workforce represented is 57%.	-
403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Occupational Safety and Health: Occupational Injuries	-
403-3	Workers with high incidence or high risk of diseases related to their occupation	TSMC's critical health risk operations include operations involving noise, ion-radiation, lead, dimethylformamide, n-hexane, arsenic, manganese and its compounds, dust, chromic acid and its salts, nickel and its compounds, mercury and its inorganic compounds. Fab ISEPs report workers engaged in related operations for special annual health exams and categorized health management if necessary. In 2019, complying with occupational safety and health regulation, there were 3,966 participants for special hazardous health check, 100% completion rate.  For high risk groups, such as those at risk for work-induced cerebral and cardiovascular diseases, ergonomic hazards, and maternal health, TSMC institutes hierarchical management measures in order to minimize or eliminate the risks.	-
403-4	Health and safety topics covered in formal agreements with trade unions	No related agreements.	-



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 404 : Training and Education			
404-1	Average hours of training per year per employee	Inclusive Workplace: Talent Development  1.The current design of the training system does not include the average hours of training per employee per year based on gender 2. Reveal the average hours of training per employee each year 3. Reveal the average hours of training by different categories of employees per year(manager, non-manager indirect employee, and direct employee)	<a href="#">148</a>
404-2	Programs for upgrading employee skills and transition assistance programs	Inclusive Workplace: Talent Development  1. Expose annual key annual projects to enhance employees' capability, such as Technical Depth Project to improve capabilities of engineers / supervisors 2. There is no related transition assistant programs for career endings resulting from retirement or termination of employment	<a href="#">148</a>
404-3	Percentage of employees receiving regular performance and career development reviews	Inclusive Workplace: Talent Development  Based on individual job requirements, performance assessment results (The performance appraisal was conducted in the middle of the year and at the end of the year, and the assessment rate was 100% in 2019), and career development needs, the employees of TSMC set up their own individual development plans (IDP), which are one of the basis of the company's annual training plan.	<a href="#">148</a>
GRI 405 : Diversity and Equal Opportunity			
405-1	Diversity of governance bodies and employees	Sustainable Governance: Corporate Governance  Please refer to <a href="#">2019 TSMC Annual Report</a> : 2.4.1 Information Regarding Board Members TSMC's Board is comprised of a diverse group of professionals from different backgrounds in industries, academia, law, etc. These professionals include citizens from Taiwan, Europe and the U.S. with world-class business operating experience, two of whom are female (the ratio is 22.22%).  Inclusive Workplace: Talent Attraction and Retention - Recruitment  In 2019, TSMC has 5,087 new hires, including young generation, female interns, overseas talents hired in Taiwan area, and disabled workers.  1. In 2019, 240 interns have joined tsmc internship program, including 69 female students (29% of all interns). After internship, 92 well-performed interns (38% of all interns) were given advanced offer; Among them, 23% are female students. Rates of all female interns, female interns who receive advanced offers, and female interns who have joined tsmc are higher than 18.3%, the rate of female professions in TSMC.  2. The table of "Overseas talents hired in Taiwan area".  3. Disabled workers: In 2019, TSMC fabs in Taiwan has hired 315 employees with moderate and mild disability, and 79 profound and severe disability. The total number of disabilities hires is 1%, compliance with government regulation. In addition, TSMC subsidiary - VisEra has provided permanent jobs to people with disability and has 3 disabled employees in 2019. The total number of VisEra's disabilities hires is lower than 1%, the main reason is that manpower allocation has caused hiring people with disabilities a big challenge, and there is shortage of those applicants. VisEra has paid to local employment funds to meet compliance, and continuously provide suitable job opportunities to people with disabilities and looking forward to more applicants with disabilities.	<a href="#">137</a>
405-2	Ratio of basic salary and remuneration of women to men	Inclusive Workplace: Talent Attraction and Retention - Compensation Ratio between Male and Female - The ratio of annual total compensation between male and female employees in each region of TSMC	<a href="#">137</a>



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 406 : Non-discrimination			
406-1	Incidents of discrimination and corrective actions taken	<p>Inclusive Workplace: Human Rights - Internal Communication Channels for Employees</p> <p>In 2019, there were 3,998 cases being raised through internal communication channels in TSMC, including 4 sexual harassment cases from sexual harassment investigation committee, 141 cases via ombudsman system, 643 cases via employee opinion box, 3,151 cases via fab caring circle, and 59 cases via ethic report system and all these cases were well-handled by the designated team. All sexual harassment and ombudsman cases were investigated and reviewed by committee members. As for the employee opinion box, all cases were dispatched and replied by the people in charge based on the questions. Employees can easily access these internal communication channels via myTSMC (an internal employee portal). Internal communications channels were also introduced toward new comers during the orientation to ensure all Taiwan employees could be well-informed of the channels since very beginning.</p>	<a href="#">153</a>
GRI 407 : Freedom of Association and Collective Bargaining			
407-1	Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	<p>TSMC abides by local laws and regulations, and take actions according to "TSMC Human Rights Policy" and "Responsible Business Alliance Code of Conduct". We treat all workers, including regular, contract, and temporary employees, and interns, with dignity and respect, and reduce every kind of risk to protect our employees. More details on "<a href="#">TSMC Human Rights Policy</a>"</p> <p>Please refer to the "sustainable risk assessment" method in the "Responsible Supply Chain" chapter. TSMC requires suppliers to meet the sustainability standards through the "TSMC Supplier Code of Conduct", which includes workers' freedom of association or group consensus, and requires Tier 1 suppliers to implement sustainable According to the questionnaire, a total of 1,226 questionnaires (including operating units in Taiwan and China) were collected in the 2019. If the supplier has potential risks, it will be continuously to request improvement.</p>	<a href="#">81</a>
GRI 408 : Child Labor			
408-1	Operations and suppliers at significant risk for incidents of child labor	<p>"TSMC abides by local laws and regulations, and take actions according to "TSMC Human Rights Policy" and "Responsible Business Alliance Code of Conduct". We treat all workers, including regular, contract, and temporary employees, and interns, with dignity and respect, and reduce every kind of risk to protect our employees. More details on "<a href="#">TSMC Human Rights Policy</a>"</p> <p>Please refer to the "sustainable risk assessment" method in the "Responsible Supply Chain" chapter. TSMC requires suppliers to meet the sustainability standards through the "TSMC Supplier Code of Conduct", which includes no child labor policy, and requires Tier 1 suppliers to implement sustainable According to the questionnaire, a total of 1,226 questionnaires (including operating units in Taiwan and China) were collected in the 2019. If the supplier has potential risks, it will be continuously to request improvement."</p>	<a href="#">81</a>
GRI 409 : Forced or Compulsory Labor			
409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	<p>TSMC abides by local laws and regulations, and take actions according to "TSMC Human Rights Policy" and "Responsible Business Alliance Code of Conduct". We treat all workers, including regular, contract, and temporary employees, and interns, with dignity and respect, and reduce every kind of risk to protect our employees. More details on "<a href="#">TSMC Human Rights Policy</a>"</p> <p>Please refer to the "sustainable risk assessment" method in the "Responsible Supply Chain" chapter. TSMC requires suppliers to meet the sustainability standards through the "TSMC Supplier Code of Conduct", which includes no bonded labor policy, and requires Tier 1 suppliers to implement sustainable According to the questionnaire, a total of 1,226 questionnaires (including operating units in Taiwan and China) were collected in the 2019. If the supplier has potential risks, it will be continuously to request improvement.</p>	<a href="#">81</a>



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 412 : Human Rights Assessment			
412-1	Operations that have been subject to human rights reviews or impact assessments	<p>Inclusive Workplace: Human Rights - Human Rights Policy</p> <p>TSMC abides local laws and regulations in all countries and regions where we operate, as well as upholds the Human Rights of workers, including regular, contract and temporary employees, interns, etc. We treat them with dignity and respects as understood by the international Human Rights standards such as The International Bill of Human Rights, The International Labour Organization's Declaration on Fundamental Principles and Rights at Work, and Ten Principles of The United Nations Global Compact. We also align our actions with the Responsible Business Alliance (RBA) Code of Conduct.</p> <p>We also establish TSMC's Supplier Code of Conduct and require our suppliers to adopt the same policy.</p>	<a href="#">153</a>
412-2 Employee training on human rights policies or procedures			
412-2	Employee training on human rights policies or procedures	<p>Inclusive Workplace: Human Rights - Human Rights Risk Mitigation Measures</p> <p>Disclose the total training hours, total number of employee and employee training percentages related to human rights policies.</p> <p>In 2019, TSMC provided employees with a total of 116,907 hours of Human Rights protection training. In total, 48,763 employees (92,971 person-time employees) completed the training program, accounting for 95% of TSMC's total employees.</p>	<a href="#">153</a>
412-3	Significant investment agreements and contracts that include human rights clauses or that underwent Human Rights screening	In 2019, TSMC continued to construct new facilities in Taiwan. Taiwan has a high evaluation of international human rights appraisal, and has no significant issues on this topic.	-
GRI 414 : Supplier Social Assessment			
414-1	New suppliers that were screened using social criteria	<p>Responsible Supply Chain: 2019 Goals and Achievements</p> <p>100% new suppliers compliant and signed "TSMC ethics and supplier code of conduct"</p>	<a href="#">81</a>
414-2	Negative social impacts in the supply chain and actions taken	Please refer to the "Human Rights" action plan in the "Responsible Supply Chain" chapter, TSMC take actions to supplier employees working in TSMC's factory area in Taiwan, through reminders, audits, contracts and penalties related actions to guard aspect such as working hours / safety / labor.	<a href="#">81</a>
GRI 416 : Customer Health and Safety			
416-1	Assessment of the health and safety impacts of product and service categories	There is no significant health and safety impacts for the products and services that TSMC provided to customers.	-
416-2	Incidents of non-compliance concerning the health and safety impacts of products and services	Not applicable	-
GRI 418 : Customer Privacy			
418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data	Innovation and Service: Customer Service - Customer's Virtual Fab (no customer complains in information leakage)	<a href="#">72</a>
GRI 419 : Socioeconomic Compliance			
419-1	Non-compliance with laws and regulations in the social and economic area	Company has no significant fines and non-monetary sanctions for non-compliance of social and economic area in 2019.	-



# Independent Third Party Assurance Statement

**Independent assurance statement**

**Scope and approach**

Taiwan Semiconductor Manufacturing Company Ltd. ("TSMC" or "the Company") commissioned DNV GL Business Assurance Co. Ltd. ("DNV GL") to undertake independent assurance of the 2019 Corporate Social Responsibility Report (the "Report") for the year ended 31 December 2019.

We performed our work using DNV GL's assurance methodology VeriSustain<sup>TM</sup>, 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.

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 CSR issues and the 2030 sustainability commitment and the topics set forth in the GRI standards.

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 GL was not involved in the preparation of any statements or data included in the Report except for this Assurance Statement.

DNV GL provides a range of other services to TSMC, none of which constitute a conflict of interest with this assurance work.

DNV GL'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 GL 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 the Principles;
- Interviews 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 energy, air emission, water resource, chemical and waste

<sup>1</sup> The VeriSustain protocol is available on [dnvgl.com](http://dnvgl.com)

**management), human resource, safety, procurement, wellness, human resource, product development, and TSMC cultural and educational foundation were chosen to interview;**

- Site visits to HQ and 1 production sites in Taiwan, remote meeting with other production sites, one of them is in China, 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 consolidated corporate level;
- 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 GL, 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 and that this was considered;
- An independent assessment of TSMC's reporting against the Global Reporting Initiative (GRI) Standards (Comprehensive Option).
- There was a confidential issue that we cannot assess the salary data. The verification was conducted based only on the Chinese version Report.

**Opinion**

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 CSR performances. In accordance with DNV GL 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.

**Observations**

Without affecting our assurance opinion, we also provide the following observations.

The following is an excerpt from the observations and opportunities reported back to the management of TSMC.

- The management approach can be improved involving with topics of human right, talent attraction and retention. It is suggested the long terms and short terms objectives/ targets should be consistent and progressive.
- To positively demonstrate the risk of human right of TSMC and TSMC's supply chain and state the preventing commitment and actions.

**Sustainability Context**

Corporate Social Responsibility Report provides an accurate and fair representation of the level of implementation of related Corporate Social Responsibility (CSR) policies, and meets the content requirements of the GRI Standards.

**Materiality**

The materiality determination process was validated 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.

**Completeness**

The Report has fairly attempted to disclose the generic disclosures and management approaches and performances of identified material topics for GRI Standards "Comprehensive option". 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 time lines for disclosure.

**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 for correction.

**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 CSR issues identified through this process are reflected in the Report.

**Responsiveness:**

TSMC 2019 Corporate Social Responsibility Report meets the content requirements of the GRI Standards. The report provides an accurate and fair representation of the level of implementation of related Corporate Social Responsibility (CSR) policies.

The Company has adequately responded to stakeholder concerns through its policies, CSR Committee, and quarterly / annual financial report, and this is reflected in the Report.

**Neutrality**

The disclosures related to sustainability issues and performances are reported in a neutral tone, in terms of content and presentation, however Report could further bring out responses related to the challenges faced during the reporting period at various geographical locations of operations in terms of disclosure of all identified material aspects, sustainability goals and targets etc.

**For and on behalf of DNV GL Business Assurance Co. Ltd.**  
22 April, 2020

Wu, Johnny  
Lead Verifier  
DNV GL – Business Assurance  
Statement Number: 00001-2020-ACSR-TWN

Lin, Chun Nan  
Reviewer  
DNV GL – Business Assurance

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# Contact Information

## Wafer Fabs in Taiwan

### Corporate Headquarters & Fab 12A

8, Li-Hsin Rd. 6, Hsinchu Science Park, Hsinchu 30078, Taiwan, R.O.C.

Tel: +886-3-5636688 Fax: +886-3-5637000

### R&D Center & Fab 12B

168, Park Ave. II, Hsinchu Science Park, Hsinchu 30075, Taiwan, R.O.C.

Tel: +886-3-5636688 Fax: +886-3-6687827

### Fab 2, Fab 5

121, Park Ave. 3, Hsinchu Science Park, Hsinchu 30077, Taiwan, R.O.C.

Tel: +886-3-5636688 Fax: +886-3-5781546

### Fab 3

9, Creation Rd. 1, Hsinchu Science Park, Hsinchu 30077, Taiwan, R.O.C.

Tel: +886-3-5636688 Fax: +886-3-5781548

### Fab 6

1, Nan-Ke North Rd., Tainan Science Park, Tainan 74144, Taiwan, R.O.C.

Tel: +886-6-5056688 Fax: +886-6-5052057

### Fab 8

25, Li-Hsin Rd., Hsinchu Science Park, Hsinchu 30078, Taiwan, R.O.C.

Tel: +886-3-5636688 Fax: +886-3-5662051

## Backend Fabs

### Advanced Backend Fab 1

6, Creation Rd. II, Hsinchu Science Park, Hsinchu 30077, Taiwan R.O.C

Tel: +886-3-5636688 Fax: +886-3-5773628

### Advanced Backend Fab 2

1-1, Nan-Ke North Rd., Tainan Science Park, Tainan 74144, Taiwan R.O.C

Tel: +886-6-5056688 Fax: +886-6-5051262

### Fab 14A

1-1, Nan-Ke North Rd., Tainan Science Park, Tainan 74144, Taiwan R.O.C.

Tel: +886-6-5056688 Fax: +886-6-5051262

### Fab 14B

17, Nan-Ke 9th Rd., Tainan Science Park, Tainan 74144, Taiwan, R.O.C.

Tel: +886-6-5056688 Fax: +886-6-5055217

### Fab 15A

1, Keya Rd. 6, Central Taiwan Science Park, Taichung 42882, Taiwan R.O.C

Tel: +886-4-27026688 Fax: +886-4-25607548

### Fab 15B

1, Xinken Rd., Central Taiwan Science Park, Taichung 40763, Taiwan R.O.C

Tel: +886-4-27026688 Fax: +886-4-24630372

### Fab 18

8, Beiyuan Rd. 2, Tainan Science Park, Tainan 74543, Taiwan, R.O.C.

Tel: +886-6-5056688 Fax: +886-6-5050363

## Subsidiary

### TSMC North America

2851 Junction Avenue, San Jose, CA 95134, U.S.A

Tel: +1-408-3828000 Fax: +1-408-3828000

### TSMC Europe B.V.

World Trade Center, Zuidplein 60, 1077 XV Amsterdam, The Netherlands

Tel: +31-20-3059900 Fax: +31-20-3059911

### TSMC Japan Limited

21F, Queen's Tower C, 2-3-5, Minatomirai, Nishi-ku Yokohama, Kanagawa, 220-6221, Japan

Tel: +81-45-6820470 Fax: +81-45-6820673

### TSMC China Company Limited

4000, Wen Xiang Road, Songjiang, Shanghai, China Postcode: 201616

Tel: +86-21-57768000 Fax: +86-21-57762525

### TSMC Nanjing Company Limited

16, Zifeng Road, Pukou Economic Development Zone, Nanjing Jiangsu Province, China

Postcode: 211806

Tel: +86-25-57668000 Fax: +86-25-57712395

### TSMC Korea Limited

15F, AnnJay Tower, 208, Teheran-ro, Gangnam-gu, Seoul 06220, Korea

Tel: +82-2-20511688

### TSMC Design Technology Japan, Inc.

10F, Minatomirai Grand Central Tower, 4-6-2, Minatomirai, Nishi-ku, Yokohama, Kanagawa 220-0012, Japan

Tel: +81-45-6644500

### TSMC Design Technology Canada Inc.

535 Legget Dr., Suite 600, Kanata, ON K2K 3B8, Canada

Tel: +613-576-1990 Fax: +613-576-1999

### TSMC Technology, Inc

2851 Junction Avenue, San Jose, CA 95134, U.S.A

Tel: +1-408-3828000

### WaferTech L.L.C.

5509 N.W. Parker Street, Camas, WA 98607-9299 U.S.A.

Tel: +1-360-8173000 Fax: +1-360-8173590

### VisEra Technologies Company Limited

12, Dusing Rd. 1, Hsinchu Science Park, Hsinchu City 30078, Taiwan R.O.C.

Tel: +886-3-666-8788 Fax: +886-3-666-2858





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