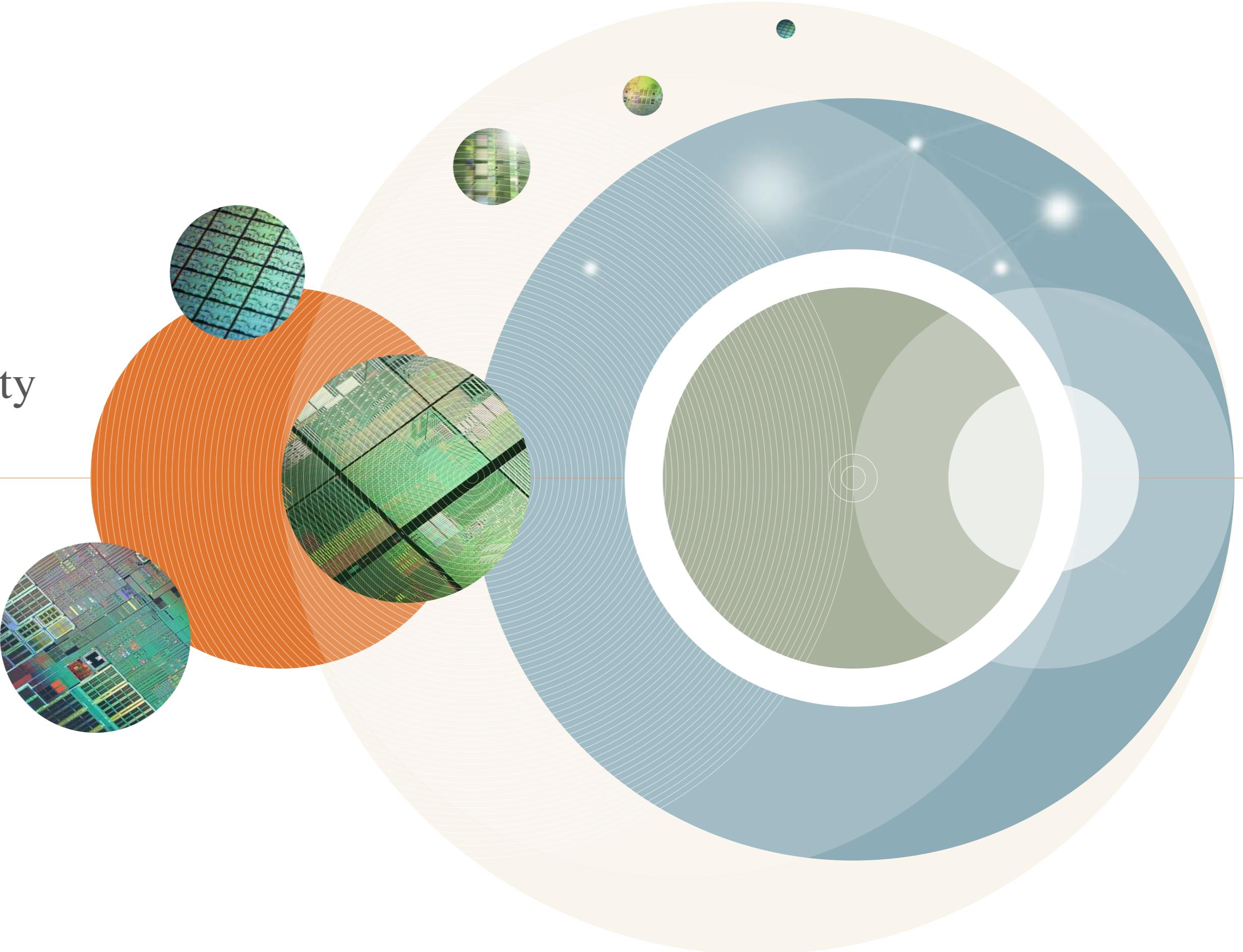




TSMC Corporate Social Responsibility Report

2018





Stewards of a Sustainable Future

TSMC practices innovation through technology, and drives the ceaseless progress of global technology through semiconductors.

"Integrity" and "responsible operations" are the two cornerstones of TSMC's business, and its unwavering commitment. In addition to developing growth potential in its core business, TSMC continues to cultivate green manufacturing, create an inclusive workplace, care for the disadvantaged, and build a responsible supply chain to serve as a positive force in society.

It is the unshirkable duty of everyone in TSMC to do their utmost to fulfill the Company's responsibilities as a corporate citizen. Bearing a dedication to "diligently doing everything right", we never stray from the path of pursuing sustainability and the mutual good, and always seek a way to improve and move forward.





Contents

Letter from the CSR Committee Chairperson	4
Sustainability Performance	7
Awards, Recognition and Ratings	8

9

14

30

Our Business

About TSMC	10
Financial Performance	11
Tax Policy	13

Sustainable Governance

Corporate Social Responsibility Policy	15
Corporate Social Responsibility Matrix	16
Corporate Governance	17
Corporate Social Responsibility Committee	18
Materiality Analysis and Stakeholder Communication	20
Sustainable Value Creation	26
Responding to UN Sustainable Development Goals	27

Our Focuses and Progress

focus 1	Ethical Management	31
	Ethics and Regulatory Compliance	32

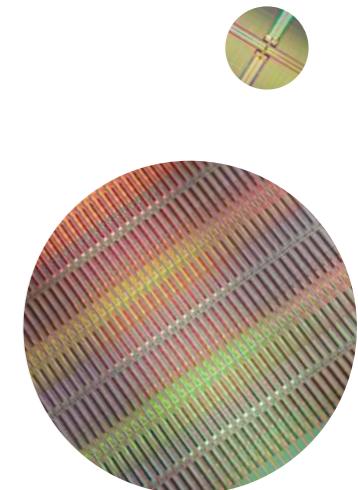
focus 2	Innovation and Service	37
	Innovation Management	38
	Sustainable Products	49
	Product Quality	57
	Customer Service	64

focus 3	Responsible Supply Chain	71
	Supplier Sustainability Management	72

focus 4	Green Manufacturing	84
	Climate Change and Energy Management	85
	Water Management	98
	Waste Management	109
	Air Pollution Control	118

focus 5	Inclusive Workplace	125
	Talent Attraction and Retention	126
	Talent Development	137
	Human Rights	143
	Occupational Safety and Health	149

focus 6	Common Good	162
	TSMC Education and Culture Foundation	164
	TSMC Charity Foundation	171



184

Appendix

About This Report	185
Participation in Industry Associations and Non-Profit Organizations	187
CSR Performance Summary	188
GRI Standards Comparison Table	190
Independent Third Party Assurance Statement	203
Contact Information	204



Letter from the CSR Committee Chairperson

Taking a Sustainable Path

This is an age where no one can be an exception.

Facing global climate change and an uncertain world, we are all in the same boat.

Every person, every enterprise is part of the same whole.

The only path to sustainability is the common good.





Q How does TSMC define its role as a corporate citizen?

As the world's largest dedicated semiconductor foundry, TSMC accelerates the flow of innovation in IC design and product applications with a pioneering business model. We have enabled a world where semiconductors are ubiquitous and brought epoch-marking changes to the way we live, work, and play over the past 31 years.

As we move from the digital age to the intelligent age, we continue to expand the possibilities for innovation, and work hand in hand with our customers to take great strides forward in technology. We are ushering cities, medicine, and all the necessities of human daily life towards an intelligent future; using technology to serve people, and using innovation to bring prosperity and happiness.

Nonetheless, technological progress and corporate growth are only meaningful in a sustainable society and environment. That is why TSMC endeavors to be a force that uplifts society, and does its utmost to fulfill its responsibilities as a corporate citizen through its three missions of "Integrity, Strengthening Environmental Protection, and Caring for the Disadvantaged".



TSMC aims to be an action-taker in corporate social responsibility. Facing increasingly difficult challenges from our environment, we will continue to strive and do our duty.

Q Why is integrity TSMC's foremost mission in corporate social responsibility?

Integrity is not only TSMC's foremost mission in corporate social responsibility, it is a fundamental part of our core values and business philosophy, and most of all our highest principle for doing business, because we believe transparent business operations are keys to initiating change in society. Thorough and healthy corporate governance is the foundation of corporate social responsibility, and for corporate governance to be successful, it must be guided by moral values and integrity, balance the interest of all stakeholders, and generate a positive cycle in order to continue creating value.

Q How important is carrying out corporate social responsibility to TSMC, and what are your priorities?

Corporate Social Responsibility requires a company to attend to corporate governance and pursue profitable growth, while also paying attention to environment, society, and other non-economic benchmarks. To TSMC, the most important is to "keep to the basics": to adhere to our 10 business principles, persist in building on our Trinity of Strengths – Technology Leadership, Manufacturing Excellence, and Customer Trust, make outstanding performances in business, and maintain our leadership position. In 2018, our market share increased for the ninth straight year to reach 56%, while revenues and profits reached a record high for the seventh consecutive year, firmly solidifying our position as the world's largest dedicated semiconductor foundry.

In addition to pursuing the highest accomplishments in our core business, TSMC uses its influence as an industry leader to fulfill its responsibilities in environmental protection and supply chain management.

In 2018, TSMC invested nearly NT\$18.17 billion in environmental protection, carried out 667 projects in energy and water conservation, and continued to raise the efficiency of its energy consumption. We also set our action plan for renewable energy adoption: we committed to a target of 20% renewable energy for 3 nanometer production, and to gradually achieve a long-term target of 20% renewable energy for the entire company based on the availability of renewable energy in Taiwan. In 2018, all overseas sites now use 100% renewable energy, beginning from regions with comprehensive regulations and ample supply.



In terms of sustainable supply chain, we continued with our "Responsible Supply Chain Action Plan" proposed in 2017. In 2018, we systematically established a tier-based management system for suppliers based on size and frequency of transactions, supply availability, and related health and safety performance. Based on this system, we set corresponding measurement benchmarks and management goals, and brought their upstream suppliers and contractors into the scope of our sustainable action.

TSMC strives to be pro-active in corporate social responsibility, and connects with the "TSMC Education and Culture Foundation" and the "TSMC Charity Foundation" to form a network for social participation. We continue to cultivate artistic culture, support diverse education, promote filial piety, and care for the livelihood and education of the disadvantaged. In 2018, through our collaboration with suppliers in the Hualien Earthquake Relief Project, we deeply experienced how gathering love from all sides can make good things happen faster. I have always believed that changing the world is not one person doing many things, but many people committing to do their part. Looking ahead, we will not only bring together the resources of our company and our employees, but also cross boundaries to other companies and organizations with our charity activities and let the power of doing good continue to flow.

Q How does TSMC manage corporate social responsibility?

TSMC never stops improving the way it fulfills its corporate social responsibility. At present, we leverage the CSR Committee as a management platform for building consensus, communicating across organizations, and consolidating resources. We use disclosure of sustainability information as our tool for active management.

In 2018 we began publishing the monthly "CSR Newsletter" to regularly share TSMC's sustainability achievements, and also to let our first-line colleagues know how their efforts are bringing changes to the world. At the same time, the Corporate Social Responsibility Report we compile each year serves as a survey of the Company's sustainability status, and drives each organization to improve. This is because the process of preparing information for the CSR Report leads us to evaluate major issues of concern, benchmark against international practices, set our execution strategy as well as mid- to long-term goals, and propose plans for improvement. All of these actions eventually come back to one core question: what kind of company do we want to be?

We know that whether at home or abroad, people have high expectations for TSMC, and they look to us to make the first move to bring about positive change. It is both an honor and an obligation. Despite the challenges, we will continue to strive and do our duty.



How will TSMC's corporate social responsibility develop in the future?

As an important member of the global semiconductor industry, it is our responsibility to face up to the challenges of an increasing difficult environment. TSMC believes in and supports the United Nations' Sustainable Development Goals (SDGs). Through the operations of the CSR Committee, we have made a thorough survey of the ways that the SDGs align with TSMC's operations, and encourage employees to consider together how to take action on sustainability in their daily work. We hope that corporate social responsibility can help to drive our company's team spirit and build a challenging and fun workplace. Furthermore, we support our colleagues in their efforts to keep learning and keep innovating. If every one of our colleagues can always bear in mind how to bring more sustainability into their work, and take the initiative to care about the people around them, then I believe that the sustainable society we speak of will not just be a vision and an ideal, but a beautiful reality that you, I, and all future generations can enjoy.



Lora Ho

Senior Vice President and Corporate Social
Responsibility Committee Chairperson



Sustainability Performance

1

The world's largest dedicated semiconductor foundry

351.13 bn (NT\$)

Reached a record-high net income in 2018

22.0%

2018 ROE

8%

Continued to expand research and development, 2018 expenditures in R&D totaled US\$2.85 billion, equivalent to 8% of the year's total revenue

7 nm

Led the industry in volume production of 7nm process technology in 2018

17%

2018 greenhouse gas emission per unit product reduced to 17% below 2010 levels

1

2018 perfluorinated compound (PFC) emission per unit product reduced to 60% below 2010 levels – the largest reduction in the industry

880 GWh

880 GWh of renewable energy purchased worldwide in 2018, the largest amount purchased in the Taiwan semiconductor industry

24.7%

2018 water consumption per unit product reduced to 24.7% below 2010 levels

95%

2018 waste recycling rate reached 95%, exceeding 90% for 10 consecutive years

32 months

In 2018, annual compensation for newly-graduated engineers employed by TSMC in Taiwan with a master's degree was equivalent to 32 months of salary, exceeding industry standards

3X minimum wage

In 2018, the average monthly salary of direct labor in TSMC's facilities in Taiwan was 3 times higher than the minimum wage in Taiwan

27,590 people-time

Person-time of volunteers in 2018

109,059 hours

Hours dedicated to volunteer services in 2018

690,151,360 (NT\$)

Total investments in social participation in 2018





Awards, Recognition and Ratings



Dow Jones Sustainability World Index component for the 18th consecutive year



World's Best Employers



2019 Constituent
MSCI ESG
Leaders Indexes

MSCI ACWI ESG Leaders Index component



The World's 50 Most Innovative Companies



FTSE4Good

FTSE4Good Emerging Index component
FTSE4Good TIP Taiwan ESG Index component



Overall Most Outstanding Company in Taiwan



"Prime" rated by ISS-oekom Corporate Rating



Rated an ESG "Leader" within the Semiconductor Industry



The Magazine for Clean Capitalism

Global 100 Most Sustainable Corporations



Top 100 Global Technology Leaders

MSCI ESG Indexes

MSCI ACWI SRI Index component

IR Magazine

Best Investor Relations (Awards by region / Taiwan)

Best Crisis Management

Most Honored Company ((Technology / Semiconductors)

Best Corporate Governance ((Technology / Semiconductors) – 1st Place -All-Asia)

Best ESG / SRI Metrics (Technology / Semiconductor) – 1st Place- All-Asia

Best CEO ((Technology / Semiconductors) – 1st Place -All-Asia)

Best CFO ((Technology / Semiconductors) – 1st Place -All-Asia)

Best Investor Relations Professional ((Technology / Semiconductors) – 1st Place -All-Asia)

Best Investor Relations Program ((Technology / Semiconductors) – 1st Place -All-Asia)

Best Analyst Days ((Technology / Semiconductors) – 1st Place -All-Asia)

Nikkei

Nikkei Asia 300 Indexes

FORTUNE

Fortune Global 500

PricewaterhouseCoopers

Global Top 100 Companies by market capitalization for the 6th consecutive year

CommonWealth Magazine

Corporate Social Responsibility Award

Taiwan Institute of Sustainable Energy

The Most Prestigious Sustainability Awards – Top Ten Domestic Corporates

Taiwan Stock Exchange

Taiwan Top 50 Corporate Responsibility Report Awards – IT & IC Manufacturing Industry

Top 5% in Corporate Governance Evaluation of Listed Companies for the 4th consecutive year

TWSE Corporate Governance 100 Index component



For more details of 2018 CSR awards and recognition, please refer to [TSMCs 2018 Annual Report](#)



Our Business

[About TSMC](#) 10

[Financial Performance](#) 11

[Tax Policy](#) 13

About TSMC

Headquarters

Hsinchu
Science Park,
Taiwan

Founded in

1987

**Number of
Employees**

48,752



7 years

The 7th consecutive year of record high revenue, net income, and earnings per share

56 %

The 9th consecutive year of market share growth, reaching 56% in global market share

In the face of a dramatically changing global political and economic environment, TSMC has always strived to be the most reliable collaborative partner for its customers, and is unwavering in its commitment to strengthening technology leadership and being an outstanding manufacturer. TSMC's consolidated sales reached NT\$1,031.47 billion in 2018, and global market share reached a record high of 56% after 9 years of continuous growth. With its leading and diverse portfolio of manufacturing technologies, TSMC provides the most advanced and comprehensive semiconductor application solutions to maintain its leading position in the industry. In addition, TSMC upholds a responsible business philosophy, collaborates with both upstream and downstream partners to foster sustainable development, and works to make progress in the dimensions of economy, environment, and society. TSMC aspires to be an uplifting force for the common good of society.

1

The world's largest wafer capacity provider for logic ICs

1

The world's first semiconductor foundry to reach volume production of 7nm process technology, leading industry by one year

1

The world's first semiconductor foundry to reach volume production of 5G wireless network chips

TSMC operates in regions including Taiwan, North America, Europe, Japan, China, and South Korea with wafer fabs, subsidiaries, and offices. TSMC Nanjing Co. Ltd. began to provide additional 12-inch wafer capacity in 2018.

481 customers

TSMC produced 10,436 different products for 481 customers through 261 process technologies.

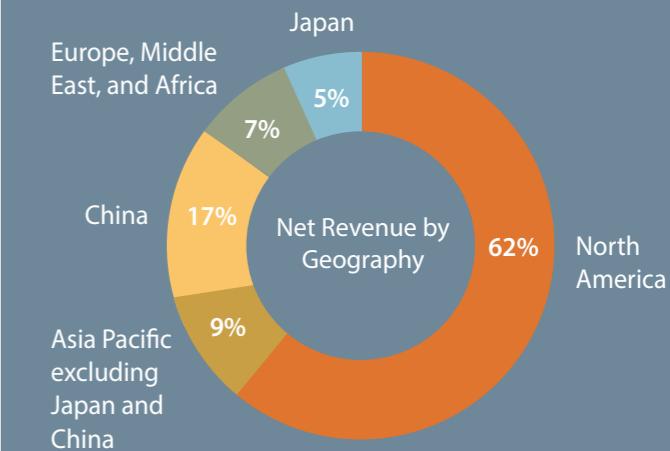
>12 million wafers

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

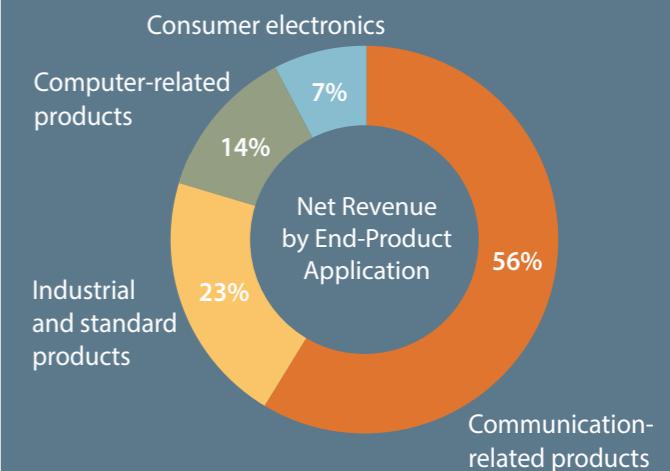
63 %

Advanced processes at 28nm and beyond generated 63% of revenue compared to 58% in 2017.

Net Revenue by Geography



Net Revenue by End-Product Application





Financial Performance

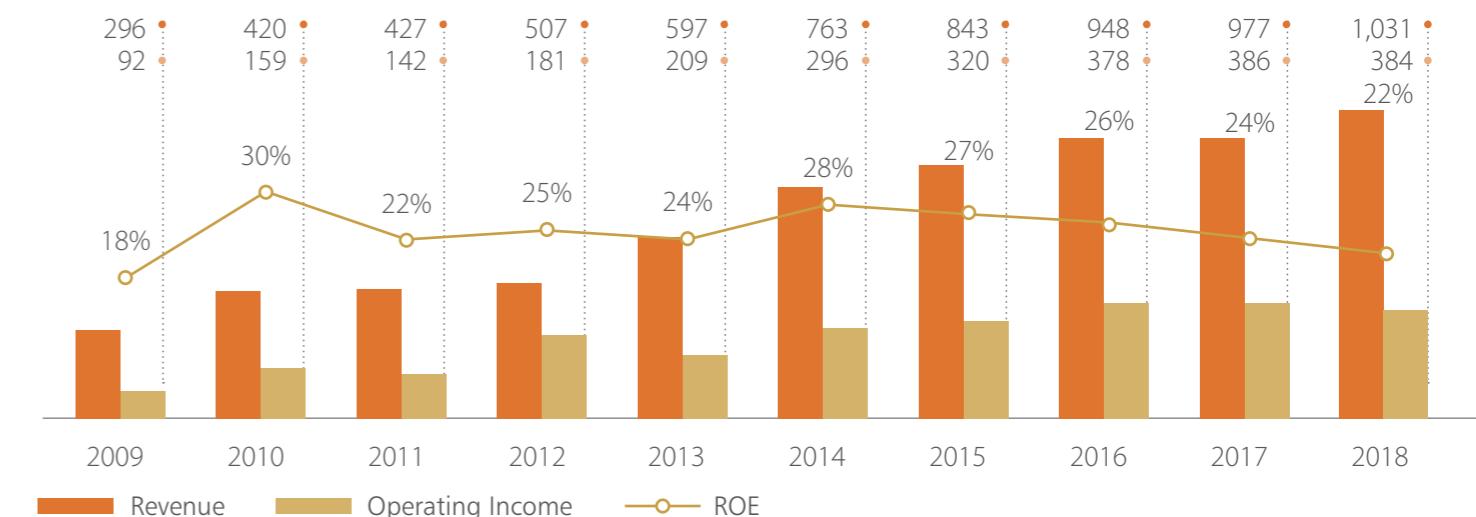
Good financial performance is the key to corporate sustainability. TSMC pursues good financial performance mainly through revenue growth and consistent improvement in profitability, to create greater economic value for its stakeholders, including shareholders, employees, customers, suppliers, government, society, and others. To help investors better understand TSMC's long-term investment value, TSMC has 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.

In 2018, TSMC's ROE reached 22.0%; revenue growth calculated in NT dollars reached 5.5%, while net income growth was 2.3%. Net income growth in 2018 was lower than the long-term target as capacity utilization was impacted by (1) excess inventory in the global semiconductor supply chain, (2) macroeconomic uncertainties and (3) product seasonality in certain end markets. Despite these short-term challenges, TSMC believes the ongoing megatrends of 5G and AI will fuel the future development of the semiconductor industry, and mobile devices, high-performance computing, automotive electronics and the Internet of Things (IoT) markets will continue to drive the Company's long-term growth. Therefore, the Company still expects to achieve its strategic financial objectives.



Financial Performance

Unit: NT\$ billion



To maintain good financial performance, TSMC adopts four strategies to increase long-term investment value: (1) continue to invest in process technologies and capacity, (2) maintain trusting relationships with customers, (3) pursue growth in revenue and in market segment share, and (4) maintain or improve profitability and investment returns.

AA-

Standard & Poor's (S&P) Ratings

Aa3

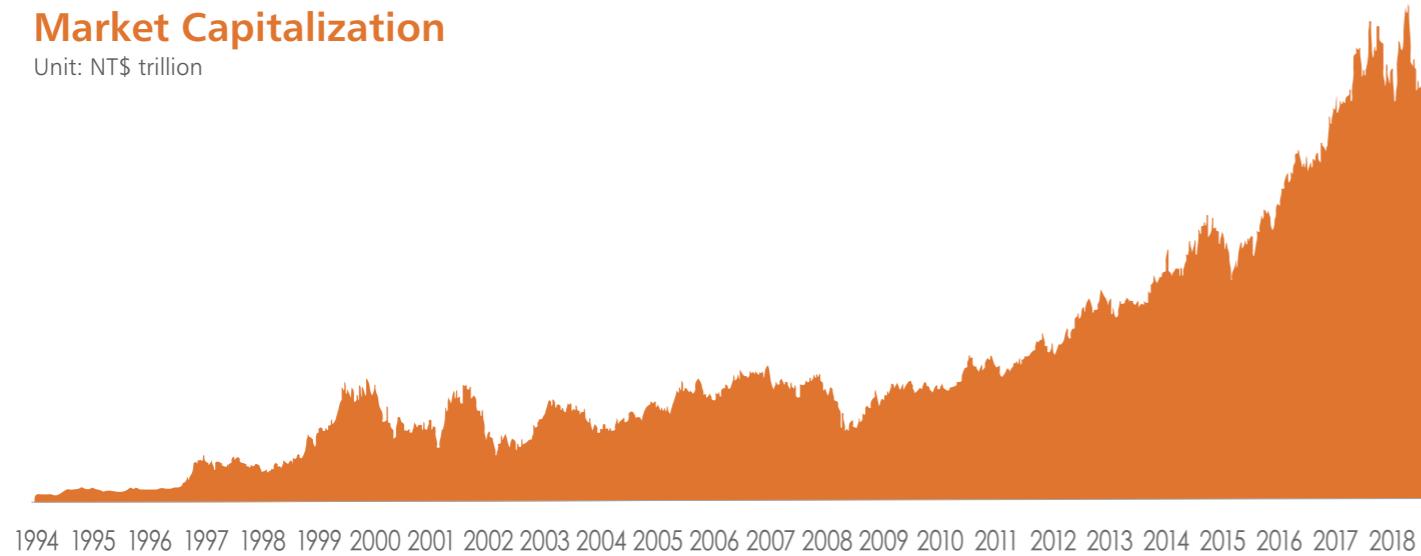
Moody's Ratings

twAAA

Taiwan Ratings

Market Capitalization

Unit: NT\$ trillion



1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Supported by solid operating performance and future growth potential, TSMC's share price, adjusted for cash dividends, increased 1.8% in 2018, marking 10 consecutive years of annual growth. Since the Company went public in 1994, TSMC has been profitable every year and TSMC's market capitalization has grown steadily. As of December 31, 2018, TSMC's market capitalization reached NT\$5.8 trillion, or US\$190 billion.

TSMC's solid financial performance enables the Company to distribute profits to shareholders in the form of annual cash dividends. From 2004 to 2018, TSMC has paid out nearly NT\$1.4 trillion, or US\$45 billion, in cash dividends.

Cash Dividend

Unit: NT\$ billion



■ Total Dividend Paid —○— Cash Dividend per Share (NT\$)

In the future, TSMC intends to maintain a stable dividend policy and to return about 70% of free cash flow to shareholders every year by distributing quarterly dividends. As the Company's business continues to grow and generates greater amounts of free cash flow, TSMC remains committed to a sustainable cash dividends on both an annual and quarterly basis.

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 will receive a total of NT\$10 per share in cash dividends in 2019.

25%

10-Year Averaged ROE
(2009-2018)

13%

10-Year Net Income CAGR
(2009-2018)

5.8 trillion (NT\$)

Market Capitalization at the End
of 2018

1.8%

Total Shareholder Return in 2018

1.4 trillion (NT\$)

Cumulative Cash Dividends from
2004 to 2018

10 per share (NT\$)

Total Cash Dividend Payments
in 2019



Tax Policy

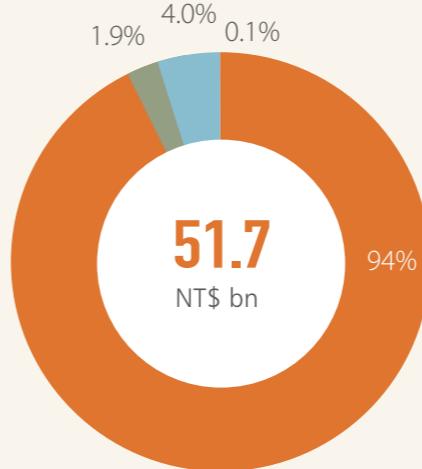
Our Commitments

- Act at all times in accordance 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

- We are subject to tax laws and regulations in various jurisdictions in which we operate or conduct business. Any unfavorable changes of tax laws and regulations in these jurisdictions could increase our effective tax rate and have an adverse effect on our operating results. We have established 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 2018 Annual Report.
- Our effective tax rate in 2018 was 11.7%, lower than 13.4% in 2017, mainly due to lower surtax imposed on unappropriated earnings. In addition, the effective tax rate in 2018 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.

2018 Taxes Paid Breakdown^{Note}



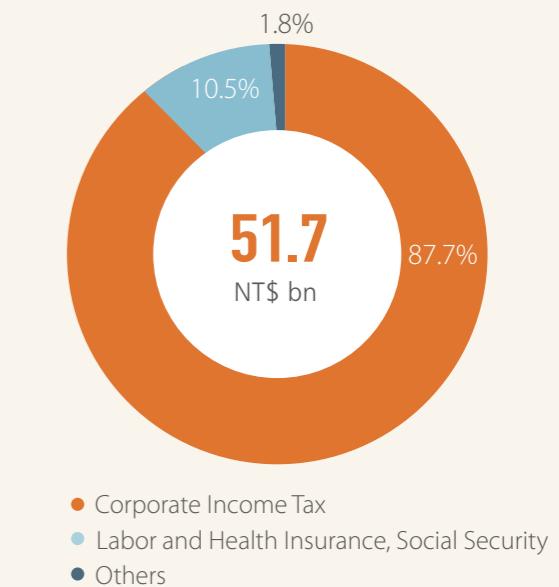
● Taiwan R.O.C. ● North America
● Asia (excluding R.O.C.) ● Others
Note We categorize our tax paid geographically based on the country in which TSMC and subsidiaries are located.

51.7 bn (NT\$)

In 2018, TSMC's total tax payments on a cash basis worldwide were NT\$51.7 billion.

>90%

In 2018, over 90% of TSMC's revenue and operating profit were generated from our business operations in Taiwan. At the same time, over 90% of our tax payments were also made to the R.O.C. government.



1

Based on data provided by "Bloomberg Professional", TSMC was the largest corporate income taxpayer among all public listed companies in Taiwan in 2018.

7.6%

TSMC's 2018 income tax payment in Taiwan represented 7.6% of total corporate income taxes collected by the R.O.C. government.



Sustainable Governance

Corporate Social Responsibility Policy [15](#)

Corporate Social Responsibility Matrix [16](#)

Corporate Governance [17](#)

Corporate Social Responsibility Committee [18](#)

Materiality Analysis and Stakeholder Communication [20](#)

Sustainable Value Creation [26](#)

Responding to the UN Sustainable Development Goals [27](#)



Corporate Social Responsibility Policy



Dr. Mark Liu, Chairman



To Uplift Society

Vision

Mission

Guiding Principles



Acting with Integrity: TSMC believes in acting ethically, following the law, and balancing the interests of all stakeholders. The Company endeavors to use the experience of developing a sustainable business to drive the industry and supply chain into a positive cycle and to act together with them as an uplifting force in society.



Strengthening Environmental Protection: TSMC strives to achieve environmental sustainability and continues to promote green fabs, green manufacturing, and green supply chains. The Company seeks the most efficient use of energy and resources and is committed to reducing waste and preventing pollution. TSMC is eager to share its environmental experience and expertise and aims to collaborate with government, academia, and all of society to address the challenges of climate change.



Caring for the Disadvantaged: TSMC believes in equality, justice, and a safe and prosperous society. The Company combines its resources with employee volunteer service to commit money, material and labor to the two main areas of "education" and "living." TSMC hopes to provide underprivileged students in rural regions with diverse learning opportunities and to offer disadvantaged groups necessary aid and emergency relief for the common good of society.



Corporate Social Responsibility Matrix

"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 Governance

TSMC advocates and acts upon the principles of operational transparency and respect for shareholder rights. We believe that the basis for successful corporate governance is a sound and effective Board of Directors. In line with this principle, 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. The chairperson of the CSR Committee reports annually to the Board of Directors on implementation results for the year and the future work plan.

Governance Structure



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 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 on Ethics and Regulatory Compliance at TSMC, please also refer to TSMC's 2018 Annual Report "Code of Ethics and Business Conduct" and "Regulatory Compliance".

Risk Management

TSMC established an enterprise risk management (ERM) program to integrate and manage strategic, operational, financial and hazardous risks together with potential consequences to operations and financial results. For more details of Risk Management, please refer to TSMC's 2018 Annual Report "Risk Management", which includes detailed explanations of the recent computer virus incident and the Fab 14B photoresist material incident. TSMC will continue working on the fundamentals of our business and strengthen our cybersecurity and proprietary information protection.

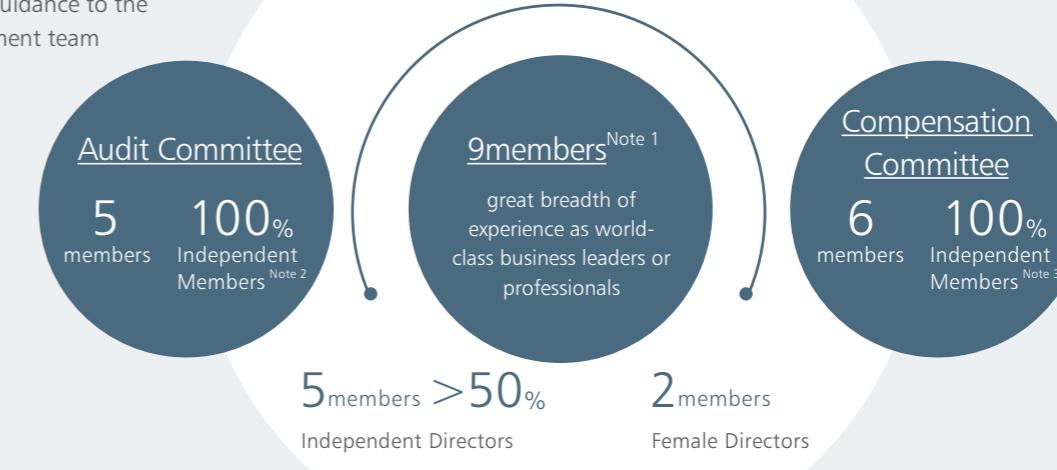
Board of Directors and Committees Structure

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

TSMC's Board of Directors



Note 1 Mr. Thomas J. Engibous resigned as an Independent Director, Audit Committee member and Compensation Committee member due to health reasons, effective January 1, 2019.

Note 2 Audit Committee consists of all five Independent Directors.

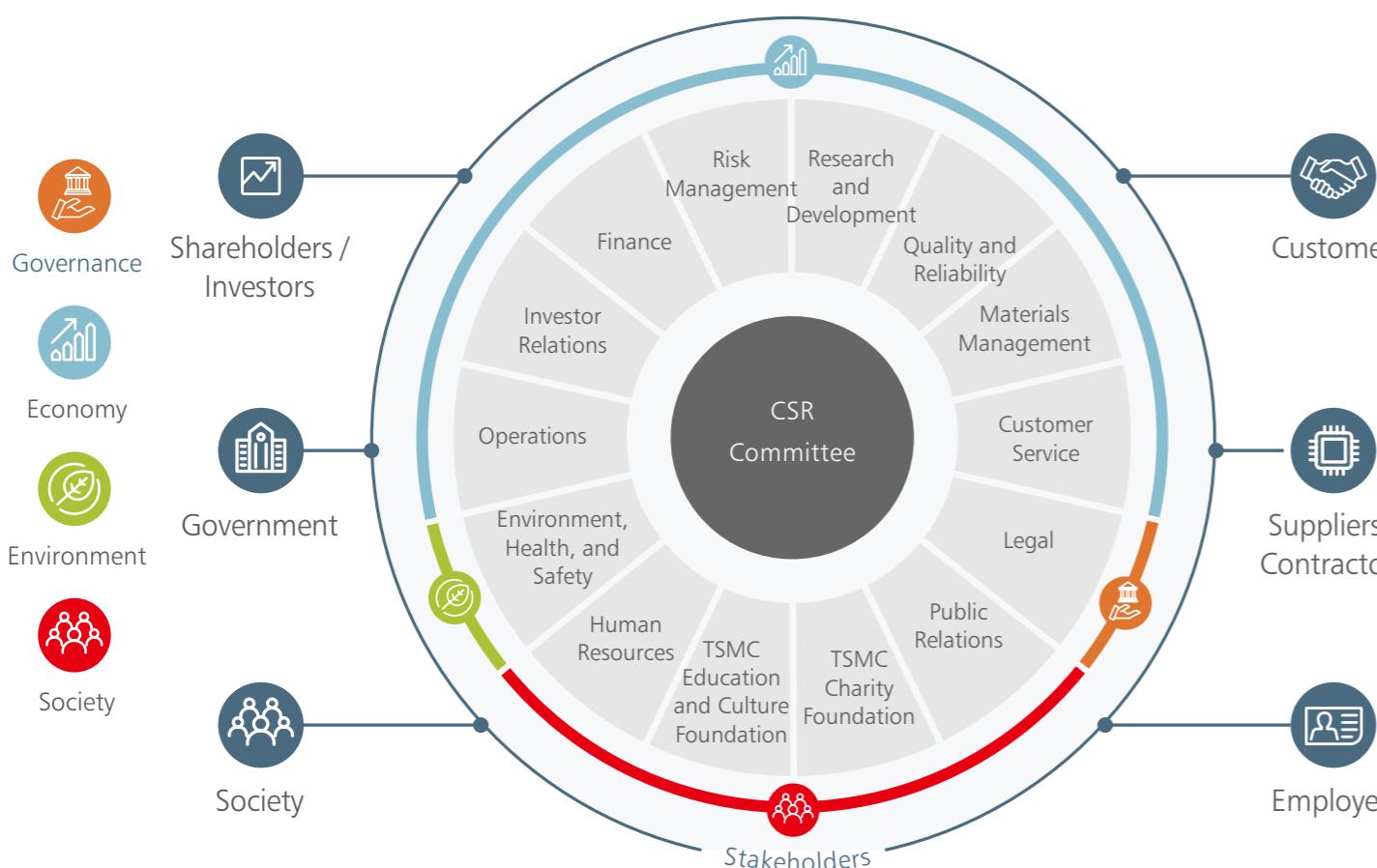
Note 3 In addition to all five Independent Directors, at the meeting of November 13, 2018, TSMC's Board of Directors appointed Mr. Moshe N. Gavrielov (former Chief Executive Officer of Xilinx, Inc.) as a member of the Compensation Committee.

Corporate Social Responsibility Committee

TSMC has established a Corporate Social Responsibility Committee that serves as a cross-department communication and management platform to fulfill its corporate citizenship and social responsibility. The Committee connects with international standards, and sets a top-to-bottom operation system with lateral cooperation. The chairperson leads the Committee in formulating annual strategies for issues on sustainability, setting mid-term and long-term goals and tracking their results, actively balancing the interests of stakeholders, and driving the positive development of the industry and its supply chain.

The Highest-level Corporate Social Responsibility Management Platform within TSMC

- | | |
|--------------------------|---|
| Chairperson | Chairman appointed CFO as the Committee chairperson |
| Committee Members | Functional organizations related to economy, environment, society, and corporate governance <u>propose representatives</u> . |
| Major Tasks | <ul style="list-style-type: none"> Quarterly Quarterly meetings are held to supervise the performances of issues on sustainability, conduct interdepartmental communication, coordination, resource integration, and establish continuous improvement plans. Annually The chairperson of the Committee reports to the Board of Directors annually on the results of the current year's performance results and the work plan for the upcoming year. |



Main Points of 2018 Chairperson's Report to the Board of Directors

Implementation Results for the Year

- In response to the impacts of climate change, we fulfilled strategies for water resources, waste management, energy and greenhouse gas emissions management, and increased the percentage of renewable energy use
- Strengthened responsible supply chain management, set the code of conduct for suppliers, held more frequent forums on responsible supply chain, and strengthened the auditing and coaching system for upstream and downstream manufacturers
- Aligned sustainability targets between TSMC's core business and UN Sustainable Development Goals
- TSMC Education and Culture Foundation and TSMC Charity Foundation continued to invest resources and volunteer services towards education, art promotion, the disadvantaged, and disaster relief

Work Plan for 2019

- Continue to improve the sustainable performance of green manufacturing, and fulfill long-term goals for 2025
- Increase the use ratio of renewable energy and alternative energy
- Promote responsible supply chains, working with upstream and downstream vendors to set and practice long-term energy saving and waste reduction goals

Corporate Social Responsibility Committee Achievements in 2018

- Provided coaching and improved corporate social responsibility management of subsidiaries, related enterprises, and suppliers. At the same time, the Committee led functional units to review major issues and UN Sustainable Development Goals, developed strategies, set medium to long-term goals, and tracked annual performance
- Continued to drive the upgrading of local supply chains, extended local procurement plans, and established a complete supplier audit and coaching system extending to Tier 2 suppliers to expand the influence of a green supply chain
- Optimized the efficiency of energy usage, not only purchasing renewable energy, but also promoting circular economy. Cooperated with the government to set up a platform for recycling waste resources, and expanded the effectiveness of TSMC's green management internally and externally
- Carried out disaster relief and care operations in Hualien, the TSMC Charity Foundation assisted 439 vulnerable victims to rebuild their homes and boost local tourism
- Responded to global sustainability trends, established an environmental profit and loss assessment model to examine the added value created by TSMC's sustainability initiatives



Words from Committee Members



Sylvia Fang Vice President, Legal and General Counsel

"Integrity" is the foundation of TSMC's sustainable operations, and it also serves as the common code of conduct abided by TSMC's supply chain. From upstream to downstream, and from internal to external, TSMC and its supply chain partners will act on the core values of "integrity" as we carry out our daily business activities.



J.K. Wang Senior Vice President, Operations / Fab Operations

TSMC is an advocate of environmental sustainability and continuously promotes green factories, green manufacturing, and green supply chains in pursuit of optimal energy and resource efficiency. TSMC has also proactively developed waste reduction and pollution prevention technologies. In recent years, TSMC further supported the development of renewable energy, reclaimed water, and circular economy with concrete actions. This wave of green action is TSMC's unwavering promise to building a sustainable society.



Jun He Senior Director, Quality and Reliability Organization

Quality is a key element in the development TSMC's sustainable business. The Company is uncompromising in the pursuit of quality. We have made great efforts in strengthening our corporate culture of quality to ensure all colleagues are on the same page. TSMC is devoted to improving the capabilities of its organizations and employees in realizing myriad product applications and supporting clients in winning markets and improving quality.



Connie Ma Vice President, Human Resources

Employees are an important asset in keeping TSMC's competitive advantage. We strive to foster communication and offer an inclusive and friendly workplace for staff members to contribute and grow in the organization.



Y.P. Chin Senior Vice President, Operations / Product Development

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



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

Education is the cornerstone of a nation, and culture is the soul of a society. TSMC values education and culture, and helps the next generation turn their dreams into reality through diverse education projects led by the TSMC Education and Culture Foundation. TSMC also promotes artistic and cultural exhibitions and performances to bring society one step closer to perfect harmony.



J.K. Lin Senior Vice President, Information Technology
and Materials Management & Risk Management

As a member of the Responsible Business Alliance (RBA), TSMC expresses its gratitude to all its supply chain partners for respecting and following its code of conduct. For our supply chain partners, the Company is also looking forward to extending their influence upwards along the supply chain and building a sustainable and green semiconductor industry together.



Sophie Chang Chairperson, TSMC Charity Foundation

It is undoubtably meaningful to look back at the actions we took and the paths we once tread when we grow older. It is the biggest joy of charity. I hope the small seeds planted today can one day sprout into kindness and beauty through the warmth and care of society, growing into an even greater influence.





Materiality Analysis and Stakeholder Communication

Corporate sustainability is an important driver of TSMC's progress. TSMC ponders how core competencies can add value and positive impacts on society. The Company also anticipates sustainable management practices can improve operation efficiency within organizations. Based on this, TSMC identifies important sustainability issues to formulate corresponding strategies and medium-to-long-term goals. The Company encourages colleagues to develop practical improvement plans for continuous advancement and create shared value for the Company and society. By adopting principles of materiality and following GRI Standards and the AA 1000 SES (Stakeholder Engagement Standards, SES), TSMC establishes systematic processes to manage major sustainability issues and objectives, and use materiality to serve as the basis for compiling its corporate social responsibility report.

Phase 1: Identification

TSMC uses the AA 1000 SES to identify six major stakeholders with the highest degree of relevance to company operations, regarding them as the main communication parties for the annual CSR report. Based on the overall consideration of stakeholder feedback, international standards and trends, sustainability assessments, and internal business objectives, TSMC identified a total of 20 sustainability issues as the basis for materiality analysis in 2018. General result-oriented issues, such as corporate governance, risk management, stakeholder communication, financial performance and tax, and more, will continue to be disclosed in the Company's annual report, CSR report, and company website instead of being mapped in the materiality matrix.

Phase 2: Analysis

The purpose of materiality analysis is to determine the priority of sustainability issues that will become the principles used to edit the CSR report. In the process of materiality analysis, TSMC grasped two major factors: the extent of stakeholder concerns and the impact of issues in company operations. When targeting the extent of stakeholder concerns, the Company first defines the importance and influence of each stakeholder. It then selects recipients for questionnaire surveys to collect representative feedback. Regarding the impact of issues on company operations, the Company assesses the influence each issue has on company operations (innovation / development, revenue, cost, customer satisfaction, brand / reputation and risk). Senior Vice President and Chairperson of the CSR Committee Lora Ho leads TSMC and its managers and staff directly related to sustainability affairs to decide the significance of each sustainability issue.

Step 1 Define major stakeholders

6 Major Categories of Stakeholders

TSMC defined major stakeholders as "internal and external groups or individuals who have impacts on or are affected by TSMC." By that definition, six major categories of stakeholders were identified: shareholders / investors, employees, customers, suppliers / contractors, government, and society (community, academic institutions, media, NGO/NPO, etc.)

Step 2 Identify sustainability issues

20 Issues

20 sustainability issues relevant to TSMC were derived from four major sources: international sustainability standards and regulations (GRI Standards, ISO26000, UN Global Compacts, RBA); sustainable investment institutions (DJSI, CDP, MSCI ESG Index); the Company's internal development goals and vision; and communication with stakeholders.

Step 3 Investigate the level of interest

703 Valid Samples

Collecting valid feedback from stakeholders is one of the key elements to determine material issues. TSMC identified key stakeholders within the six major categories of stakeholders based on their interaction with the Company, level of impact, and level of importance to the Company. An online survey was conducted among the key stakeholders on their level of interest in different sustainability issues, and a total of 703 valid samples were collected.

Step 4 Analyze operational impact

80 Employees

Taking into account economic, environmental, and social dimensions, TSMC measured the impact of the sustainability issues on the Company's operations against six factors: innovation/R&D, revenue, cost, customer satisfaction, brand/reputation, and risk. A total of 80 employees who were in charge of corporate sustainability, including a senior vice president, vice presidents, and senior directors participated in this process.

Step 5 Draft materiality matrix

17 Material Issues

Based on the analysis results of Steps 3 and 4, materiality matrix was drafted and reviewed by TSMC's CSR Committee. After merging 3 issues, the Committee identified 9 high impact issues and another 8 as potential issues.



(continue from previous page)

Phase 3: Confirmation

Based on the results of materiality analysis, TSMC's CSR Committee decided to consolidate several issues into three broader categories ("labor management relations" was merged under "human rights," "industry localization and upgrading" was merged under "supplier sustainability management," and "employee diversity and equal opportunity" was merged under "talent attraction and retention"). Ultimately, 17 sustainability issues were selected to be the core areas of TSMC's 2018 CSR report. Long-term sustainable goals were also established to comprehensively implement sustainable governance. Compared with materiality analysis results from the previous year, the placement of "water management" and "social participation" in the materiality matrix has changed. This is primarily due to the assessment process — as members examined the importance of the two topics to company operations, they agreed that both were less crucial than those in the year before. The 17 areas were next evaluated to determine their impact on TSMC's upstream value chain, company operation, and downstream stages. They were also compared with GRI Standards, where 27 major topics for TSMC were identified. Following the reporting requirements and management approach of each topic, information and other data were collected.

Step 6
**Determine disclosure
boundaries**

Step 7:
Review disclosure content

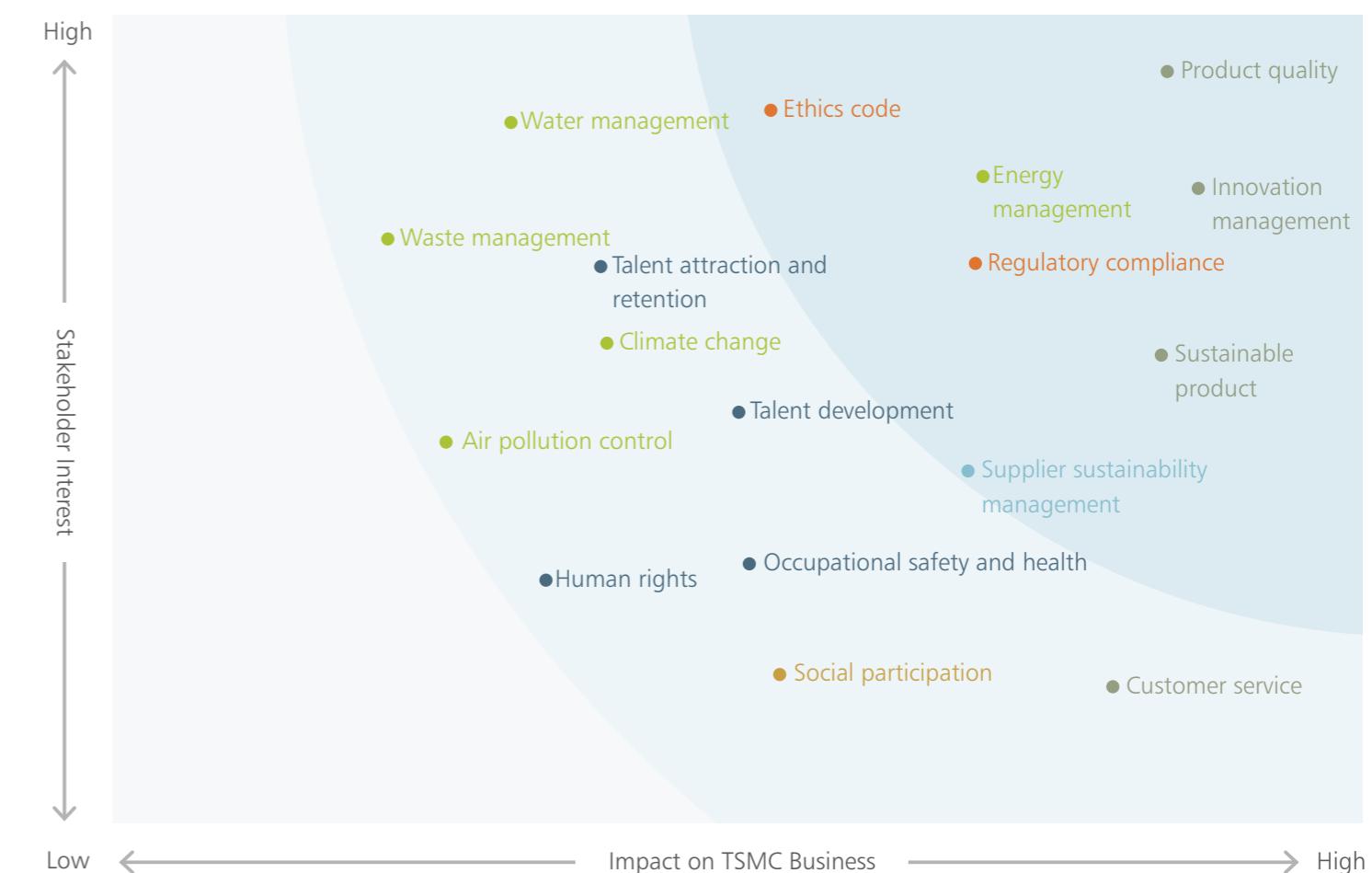
4 Stages of Value Chain

Procurement, wafer fabrication, packaging / testing, and customer usage are the four main stages of TSMC's value chain, which were also used to define the disclosure boundaries for the 17 material issues. The boundaries helped the Company understand the impact of sustainability issues on upstream, operations, and downstream stages.

27 Topics

In response to 17 material issues and 27 specific topics from the GRI standards, and based on reporting requirements and management direction of each topic, we collected and disclosed sustainability information. Other sustainability issues identified by TSMC's CSR Committee were disclosed at the same time.

TSMC Materiality



Note 1 Corporate governance, risk management, stakeholder communication, and financial performance were more generally disclosed or result-oriented issues. While they were not mapped on the materiality matrix, information pertaining to these issues will be disclosed in TSMC's annual report, CSR report, and CSR website.

Note 2 Considering the content and repetition of certain issues, "labor management relations" was merged under "human rights," "industry localization and upgrading" was merged under "supplier sustainability management," and "employee diversity and equal opportunity" was merged under "talent attraction and retention."



Material Issues and TSMC Value Chain

Focuses	Material Issues	Operational Impact						GRI Standards Aspects	Upstream ^{Note 1}	TSMC Operations ^{Note 2}		Downstream ^{Note 3}
		Innovation / R&D	Revenue	Cost	Customer Satisfaction	Brand / Reputation	Risk		Procurement	Fabrication	Testing	
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	✓	✓	✓	✓
	Product quality	✓	✓		✓		✓	Customer health and safety	✓	✓	✓	✓
	Customer service		✓		✓			Customer privacy				✓
Responsible Supply Chain	Supplier sustainability management		✓	✓				Procurement practices, supplier environmental assessment, supplier social assessment	✓			
Green Manufacturing	Energy management			✓			✓	Energy	✓	✓	✓	✓
	Climate change						✓	Emissions, economic performance	✓	✓	✓	✓
	Water management						✓	Water, effluents, and waste		✓		
	Air pollution control						✓	Emissions		✓		
	Waste management						✓	Effluents and waste	✓	✓		
Inclusive Workplace	Talent attraction and retention	✓	✓					Economic performance, employment, diversity and equal opportunity, market status		✓	✓	
	Talent development	✓	✓					Training and education		✓	✓	
	Human rights				✓		✓	Labor management relations, non-discrimination, freedom of association and collective bargaining, child labor, forced or compulsory labor, human rights assessment	✓	✓	✓	
	Occupational safety and health						✓	Occupational safety and health	✓	✓	✓	
Common Good	Social participation					✓		Economic performance, indirect economic impacts, local communities		✓	✓	

Note 1 Upstream Boundaries: materials, equipment and related services procured by TSMC

Note 2 Operation Boundaries: wafer fabrication and packaging / testing provided by TSMC

Note 3 Downstream Boundaries: end products destined for customers provided by TSMC



Listening to Stakeholders



Brief	<ul style="list-style-type: none"> To uphold the Company's values, we provide a challenging and enjoyable work environment, foster an open-style management system, and care for employees' interests to become the most appealing employer.
Communication Channels / Frequency	<ul style="list-style-type: none"> Communication meetings of all levels / quarterly Labor-management meetings / quarterly Fab Caring Circle, Employee Opinion Box and Ombudsman System / as needed Employee Surveys / annually Internal website, email and other announcements, such as posters / as needed
Issues	<ul style="list-style-type: none"> Innovation management Talent attraction and retention Talent development Ethics and regulatory compliance
Focus Areas	<ul style="list-style-type: none"> Prospects for the global integrated circuit industry and long-term competitiveness of the Company The leadership style of the management team following the retirement of the founder The Company's support measures to accommodate more frequent cross-regional transfers Determining the boundary of interest conflicts and implementing interest conflict avoidance and declaration
Responses from TSMC	<ul style="list-style-type: none"> Managers of all levels shared information about the Company's technology development, industrial position, and related information with employees in all communication meetings. The incumbent Chairman and CEO will continue adhering to the Company's shared vision and core values, take the Company's culture seriously, and expect employees to carry them out both in work and life. To help employees be open to taking up challenges and grow together with TSMC, the Company has established a sound cross-regional transfer policy with supporting measures, and communicates with employees frequently. The concept of conflicts of interest are explained and promoted through ethics and regulatory compliance trainings and company posters.



Customers

33
Customers involved in quarterly assessments

111
Quarterly assessment meetings

99
We have a very good relationship with the TSMC customer services team. Everyone works together to identify and solve problems with excellent interactions between TSMC and ADI.

Shay Whiston
Director, Foundry Technology, ADI

- Brief**
- Focus on TSMC's technology development plans, production planning, and the protection of customer information.
- Communication Channels / Frequency**
- Business and technology assessment / quarterly
 - Annual customer satisfaction survey / annually
 - Customer meetings / as needed
- Issues**
- Technology innovation
 - Excellent manufacturing
 - Virtual fab
 - Hazardous substance management
- Focus Areas**
- Technology development schedules and plans
 - Capacity planning and production information
 - Information transparency and protection
 - Elimination of specific chemicals (e.g. NMP) from manufacturing processes
- Responses from TSMC**
- In line with the technology roadmap, customers were provided with over 700 types of manufacturing and processing technologies.
 - Customers were provided with "All-in-One" product manufacturing information.
 - In 2018, TSMC applied for safe IC production certifications for certain factories, enabling them to take production orders for high-security products at any time.
 - Launched an NMP reduction plan ahead of customer requirements. It is expected to reduce the use of NMP in manufacturing and processing by 70% in 2019.

Suppliers / Contractors

313
Suppliers participated in the TSMC Sustainable Supply Chain Forums

108
Supplier communication meetings

99
As a local business, we must move forward towards continuous improvement of production processes to reduce waste. We hope to work with TSMC to create a green production environment!

Jerry Lu
CEO, KANTO-PPC

99
We respect TSMC's commitment to corporate social responsibility, support the RBA, use renewable energy and improve energy efficiency to contribute to industry sustainability and a low-carbon society.

Olivier BLACHER
President, Air Liquide Far Eastern

Responses from TSMC

Brief

- Focus on TSMC's future developments and quality improvements in manufacturing and processing technology, external auditing, and ESH standards, as well as compliance with the code of ethics and business conduct.

Communication Channels / Frequency

- Supplier Management Forum, Responsible Supply Chain Forum, Advanced Process Material forum, Supply Chain Environment, Safety, and Health Forum / annually
- On-site consult and audit / as needed
- Supplier ethics promotion / annually
- Supplier self-assessment questionnaire / annually

Issues

- Professional ethics
- Product quality
- Waste management

Focus Areas

- TSMC's Code of Ethics and Suppliers Code of Conduct
- Evaluation of TSMC's internal operation mechanism in selecting suppliers
- Raw material quality standards
- TSMC's knowledge sharing regarding OSH and waste management practices

Responses from TSMC

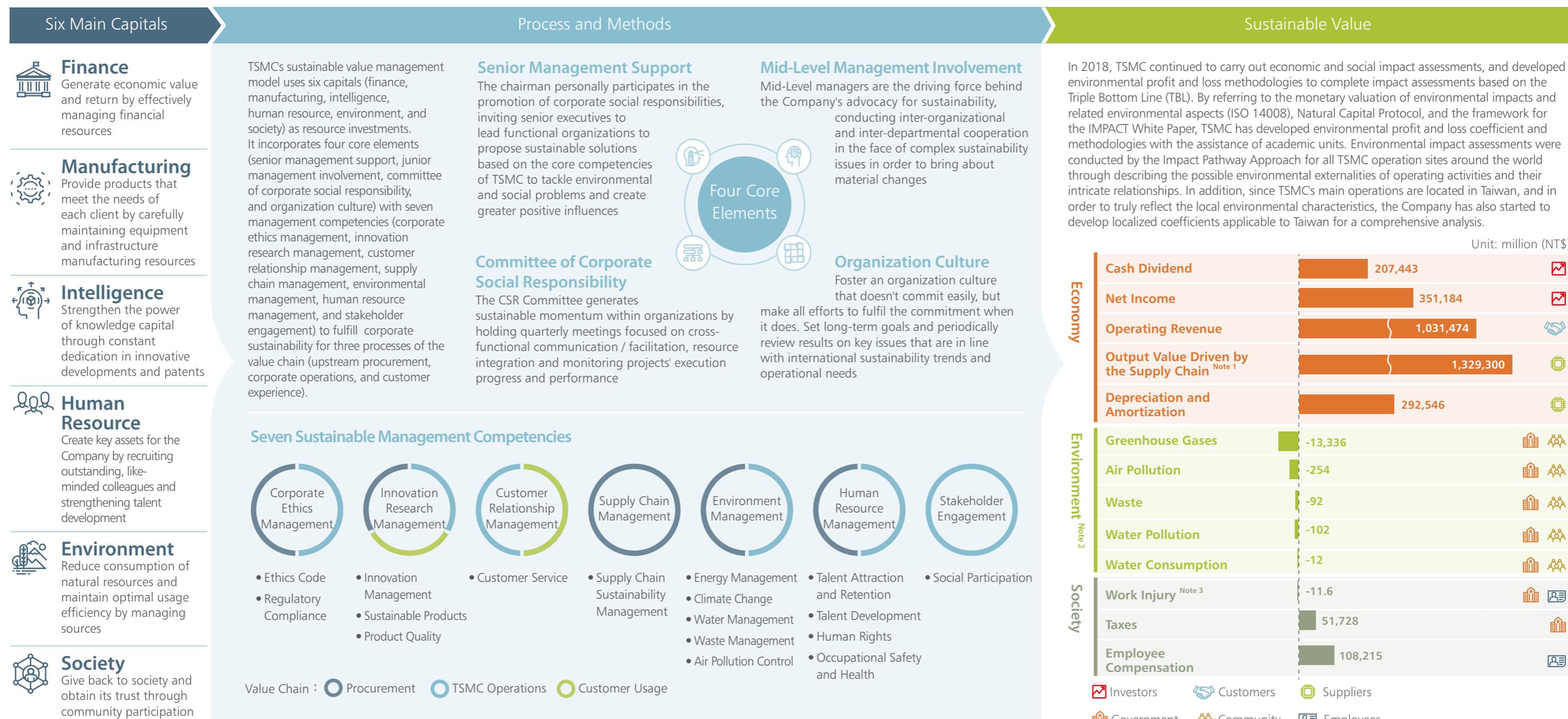
- In 2018, TSMC established risk assessments for new suppliers, and announced a Code of Ethics and Supplier Code of Conduct to be signed and followed by suppliers. The completion rate of the first stage was 100%. In the first quarter of 2019, suppliers will provide feedback on the guidelines for the Supplier Code of Conduct.
- In 2018, TSMC consulted suppliers to improve production processes and quality. Nine suppliers were consulted, bringing the number of suppliers consulted by TSMC to 29.
- In 2018, suppliers were required to accept sustainable risk auditing by third-party audit firms. 33 suppliers have been audited and the major defect rate has improved to 90.9%.
- In 2018, TSMC held the first Responsible Supply Chain Forum. Suppliers were invited to have face-to-face communications with the Company to understand the current situation and establish goals for energy-efficiency, water conservation, and waste minimization.





Sustainable Value Creation

TSMC is well aware that as the Company grows, the expansion of business brings us financial stability and success while it also has an impact on society and environment. Through sustainable corporate practices, the Company strives to maximize the net positive impact and minimize the negative impact to gain the trust of stakeholders by showing the Company's relentless efforts in sustainable development.



Note 1 The production value of supply chain drivers was estimated by the Industry, Science and Technology International Strategy Center with the 2011 Input-Output Tables (including imports) from the Directorate-General of Budget, Accounting and Statistics.

Note 2 Environmental profit and loss presented in this section is the monetary assessment of possible external impacts from TSMC's production. For the costs and economic benefits arising from the implementation of environmental protection projects, please refer to "Environmental Cost" in TSMC's 2018 annual report. For the methodologies of environmental profit and loss, please refer to the TSMC 2018 Environmental Profit and Loss (EP&L) Report. For past impact-related projects, please refer to the TSMC 2016-2017 Social Impact Valuation Report.

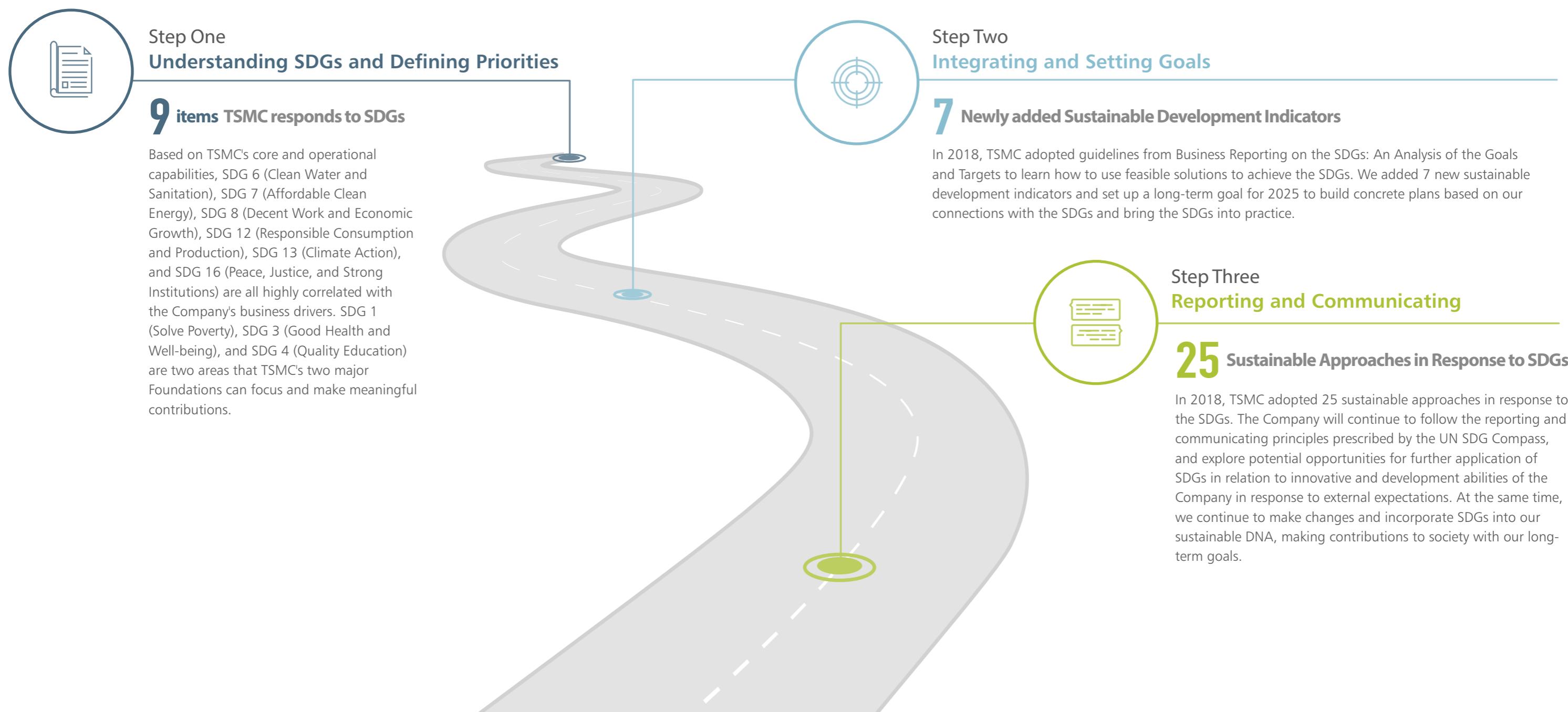
Note 3 Calculation of industrial injury value = industrial injury cost + medical cost + willingness to pay price to avoid occupational injury.

Note 4 Adjusted 2017 industrial injury value to NT\$6.5 million (original misquotation of NT\$65 million)



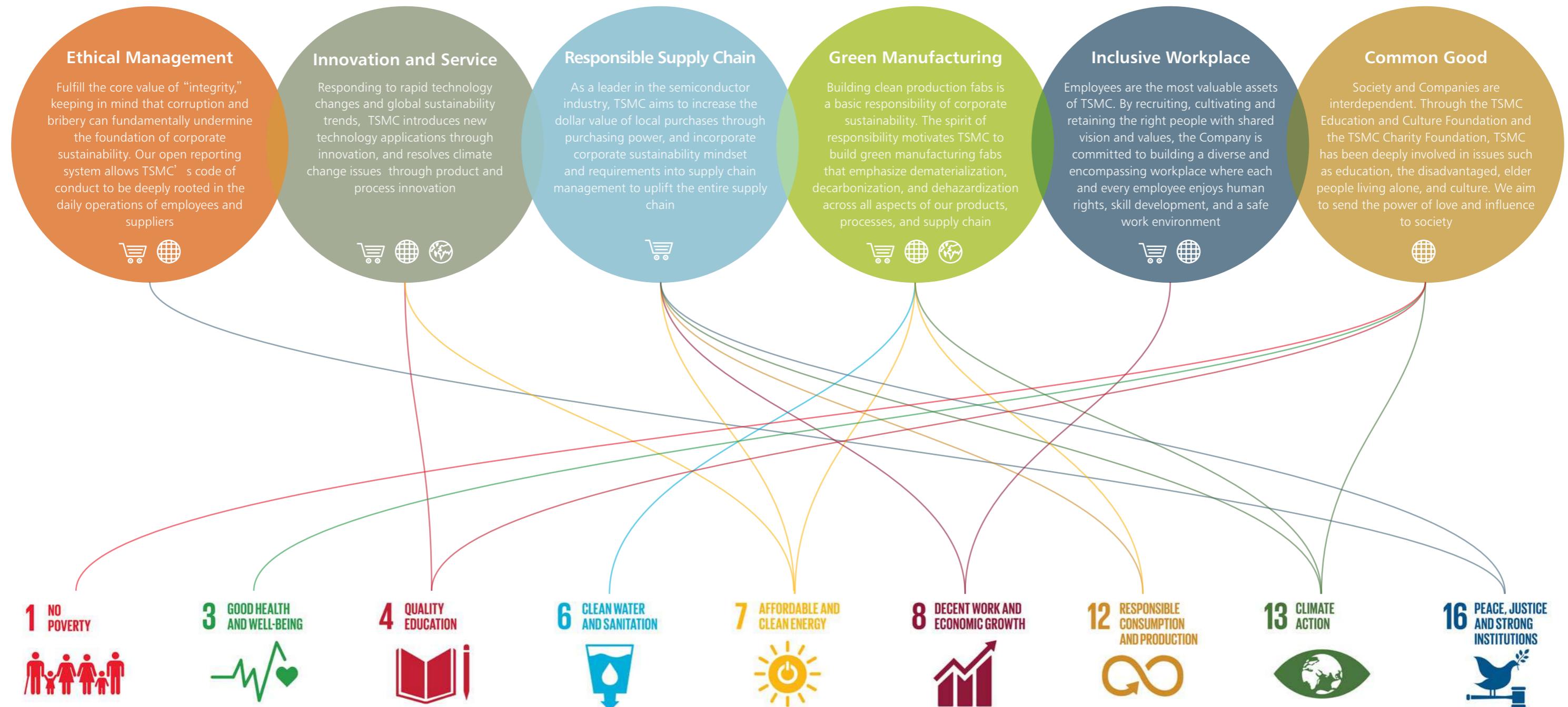
Responding to UN Sustainable Development Goals

TSMC starts from its core capability and responds proactively to UN Sustainable Development Goals (UN SDGs) to tackle global sustainable development challenges. In 2018, TSMC reviewed its alignment to UN SDGs through three major steps: "Understanding SDGs and Defining Priorities," "Integrating and Setting Goals," and "Reporting and Communicating." We tried to leverage our core advantages and joined hands with upstream and downstream partners to bring change and innovation. In 2019, the Company's chairman and the chairperson of the CSR Committee, along with high-level executives from research and development, business development, operations, materials and supply chain management, human resources, the TSMC Education and Culture Foundation, and the TSMC Charity Foundation, will jointly map out a promotion blueprint to connect TSMC's core capability with SDGs in 2019.



TSMC Material Issues and SDGs

Value Chain: Procurement TSMC Production Customer Usage





Linking SDGs and TSMC's Sustainable Development Goals for 2025



No Poverty

Provide various resources for disadvantaged groups

⌚ Goal: Donate at least NT\$10 million to disadvantaged groups per year



Affordable and Clean Energy

Develop energy-efficient manufacturing processes

⌚ Goal: Reduce power consumption per unit product (kWh / 8-inch wafer equivalent – mask layer) by 12% (base year: 2010)^{Note}

Develop energy-efficient equipment with suppliers

⌚ Goal: Accumulate 2,800 GWh of electricity savings for new energy conservation measures

Promote energy conservation measures with suppliers

⌚ Goal: Coach 30 suppliers to implement factory energy conservation, with accumulated electricity savings no less than 2% of the total electricity consumption of the 2018 base year NEW

Use renewable energy

⌚ Goal: Purchase renewable energy; gradually reach a target of 20% renewable energy consumption for new fabs at 3nm technology node and beyond, and increase renewable energy purchasing based on its availability in Taiwan NEW



Climate Action

Implement climate change strategies

⌚ Goal: Reduce GHG emission per unit of production by 18%^{Note} from 2010

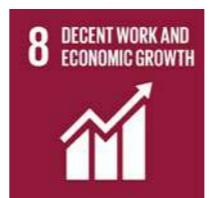
⌚ Goal: Days of manufacturing operations halted by natural disasters: 0 days



Good Health and Well-being

Improve medical care quality for elder people living alone

⌚ Goal: Provide service to at least 10,000 elder people living alone through the Network of Love System



Decent Work and Economic Growth

Provide Competitive Compensation

⌚ Goal: Sustain employee's total compensation at top 25% of the industry

Promote occupational safety

⌚ Goal: Frequency of debilitating injuries <0.41; Severity of debilitating injuries <6

Establish a sustainable supply chain

⌚ Goal: Require 100% of critical suppliers to conduct annual self-assessment of their upstream suppliers and request them to sign the Suppliers Code of Conduct and Self-Assessment Questionnaire of Sustainability Management NEW

⌚ Goal: 100% of outsourced waste treatment and recycling companies obtain international environmental safety management certificates such as ISO NEW



Support local suppliers

⌚ Goal: Coach 38 local suppliers to improve manufacturing processes and quality (base year: 2016)

Enforce a quality culture among suppliers

⌚ Goal: 100% of local suppliers to participate in the National United Circle Competition, with 60% of them entering the final round NEW



Peace, Justice and Strong Institutions

Mitigate corruption and bribery

⌚ Goal: 100% annual ethics and regulatory compliance

Improve supplier management ethics

⌚ Goal: 98% of suppliers in compliance with the "TSMC Supplier Code of Conduct" NEW



Quality Education

Promote filial piety among younger generations

⌚ Goal: Promote filial piety education in 100 education institutions

Care for the educationally disadvantaged

⌚ Goal: Invest at least NT10 million per year on education institutions

Recruit reading volunteers

⌚ Goal: Provide more than 8,000 hours of book reading services per year



Clean Water and Sanitation

Improve wastewater quality

⌚ Goal: Improve wastewater quality with standards stricter than the Effluent Standards NEW

Increase urban recycled water use

⌚ Goal: Replace tap water with recycled water for up to 50,000 metric tons per day

Replace PFOA-related substances

⌚ Goal: 100% compliance with hazardous waste regulations and customer requirements

Responsible Consumption and Production

Promote reduction of industrial waste output

⌚ Goal: Reduce outsourced waste treatment per unit wafer to ≤ 0.30 kg / 8-inch wafer equivalent – mask layer

Promote a closed loop fab economy

⌚ Goal: Develop electronic-grade materials recycling mechanisms with suppliers





Our Focuses and Progress

Focus 1	Ethical Management	31
Focus 2	Innovation and Service	37
Focus 3	Responsible Supply Chain	71
Focus 4	Green Manufacturing	84
Focus 5	Inclusive Workplace	125
Focus 6	Common Good	162



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, so that TSMC does not let down the customers who put their trust in the Company. At the same time, TSMC works hand in hand with its supply chain to serve the mutual benefit of the industry, and serves as a trustworthy partner to its stakeholders.

39,500

Number of employees who completed TSMC's 2018 ethics and regulatory compliance training

1,229

Number of TSMC suppliers that attended TSMC's 2018 ethical standards training program

Ethics and Regulatory Compliance



Ethics and Regulatory Compliance



Integrity as the Core Value — Tone from the Top

Integrity is the most important core value in TSMC's ethics and regulatory compliance system. It is built through a series 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 management acts in accordance with the ethical code, and fosters a robust ethics and regulatory compliance through the tone from the top.

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, misuse 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 management 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", bringing the core value of integrity into supply chains and demonstrating it in business behavior.





Regulatory Identification and Policy Creation

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. TSMC also actively participates in discussions of regulatory changes, sharing the Company's viewpoints and practical experience. In view of the significant amendment of the R.O.C. "Company Act" in 2018, TSMC's legal department participated in many public hearings and relevant forums to express the Company's opinions in hopes that the regulatory amendment would meet practical needs and, through this opportunity, to exchange experiences with different sectors of the community.



TSMC's legal department participated in the forum on the "Effects of The Amendment of the R.O.C. 'Company Act' on Operation of Corporate Governance, Shareholders Meetings, and Boards of Directors," sharing viewpoints and experiences of corporate governance and operation of the Board of Directors

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, based on laws and relevant internal regulations, provides various training courses for all employees with relevant job responsibilities. The training courses include face-to-face courses and promotions, and online required and elective 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.

TSMC provides training courses on anti-corruption and the Ethics Code to new employees upon hire. For current employees, TSMC also provides regulatory compliance training courses such as ethics and anti-corruption, prevention and reporting of conflicts of interest, export control, proprietary information protection, intellectual property rights protection, privacy and personal information protection, conflict-free minerals, and antitrust laws. In response to international interest in the EU's General Data

Protection Regulation, the Company has updated online courses on the Personal Information Protection Act and provided many face-to-face training courses. Around 1,900 employees, including Human Resources, Information Technology, and Customer Service department, whose jobs may involve handling personal information, are requested to complete the courses.

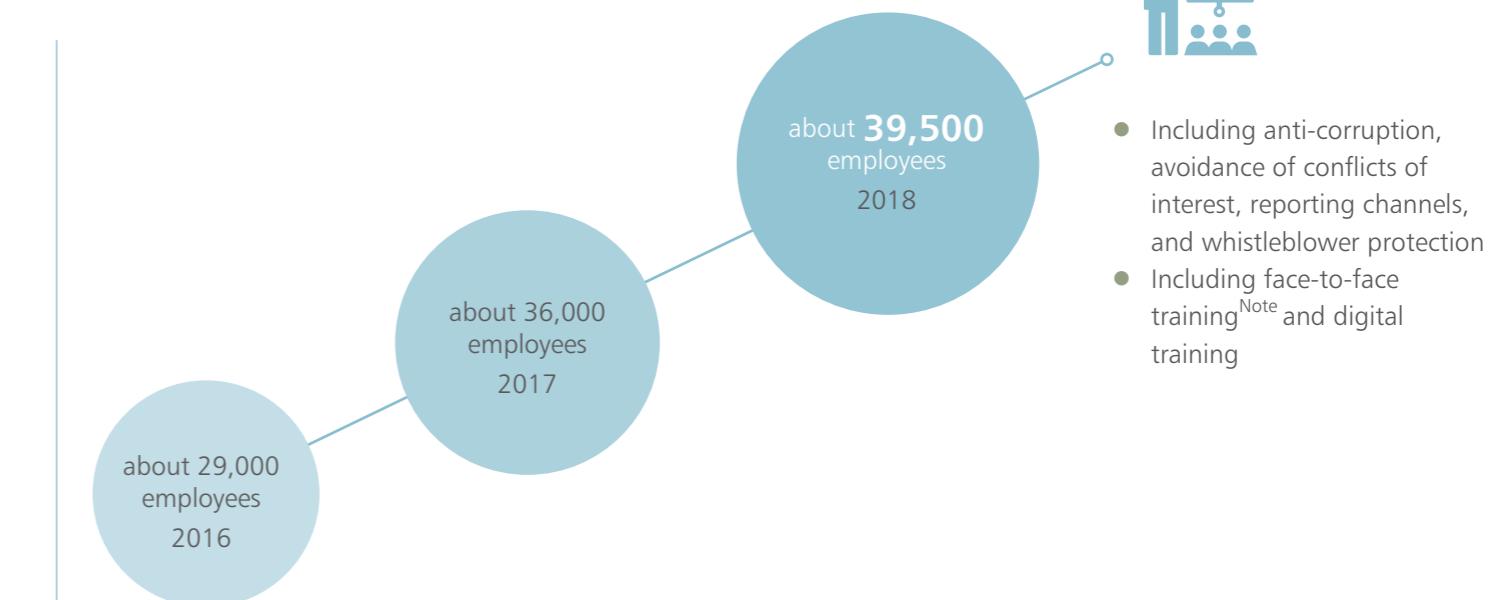
In 2018, the annual required courses of ethics and compliance training were further extended to production staff. As the production staff works in shifts, the Company leveraged digital and face-to-face approaches to ensure that approximately 8,500 production staff have participated and completed

the training. In total, approximately 39,500 TSMC employees (including those in subsidiaries) have completed the training.

• 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.

Ethics and Compliance Training Promotion



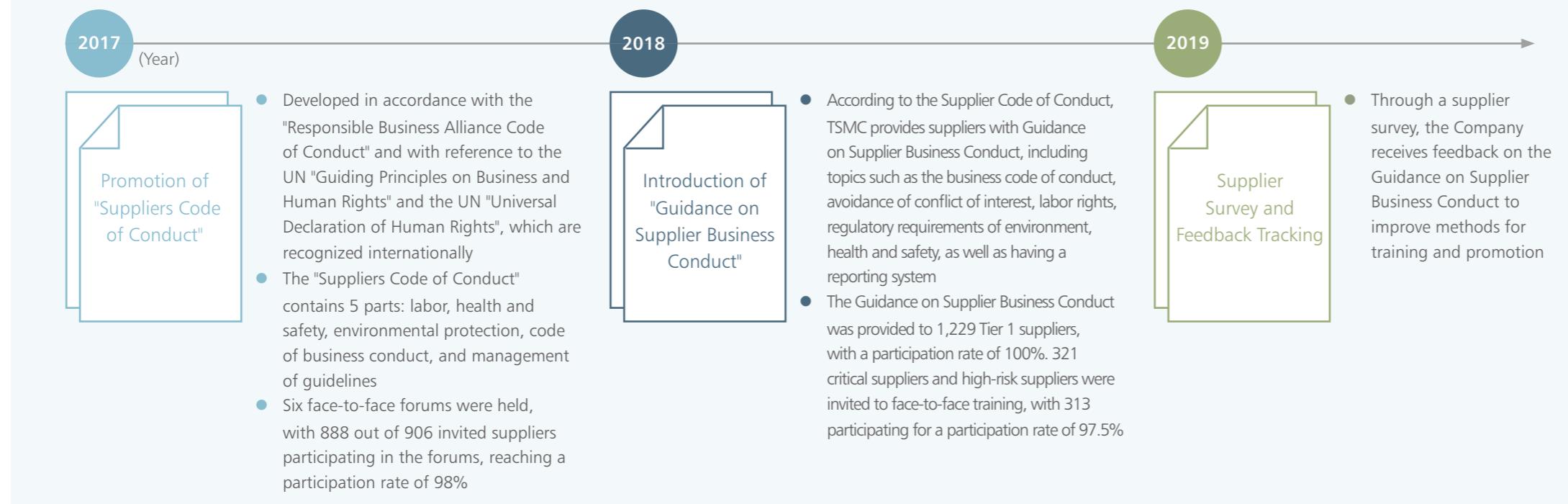
Note Some overseas subsidiaries, employees assigned abroad, and employees with specific responsibilities are provided with face-to-face training



- Including anti-corruption, avoidance of conflicts of interest, reporting channels, and whistleblower protection
- Including face-to-face training^{Note} and digital training



TSMC's Action on Suppliers Management



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. 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 also administers the CSA and assesses 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. A summary of the 2018 TSMC Employee Ethics Awareness Survey is shown below.

Actions Completed

- Annual Conflict of Interest Declaration
- Annual Control Self-Assessment
- Employee Survey



Results

• **92.6%**

of interviewed employees think TSMC takes a serious approach to the implementation of the Ethics Code and the investigation and disciplinary actions of violations

• **MORE THAN 90%**

of interviewed employees indicate they are willing to report illegal incidents through reporting channels

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 2018, the Committee held five 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. TSMC will also improve its management and internal control procedures as necessary. 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 2018, 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 2018, the incidents reported through the Audit Committee Whistleblower System, Ombudsman System, and Irregular Business Conduct Reporting System totaled 150. Among them, 14 incidents were related to ethics matters. Only 1 incident was "investigated as founded" and determined for disciplinary action by the Ethics Committee. This

case involved financial transactions between an employee and supplier which violated the Company's policy prohibiting conflicts of interest. The employee quit during the investigation. TSMC terminated its cooperation with the supplier and enhanced the promotion of ethical code to employees in the relevant divisions.



Reporting Channels and Procedures



Summary of Incidents Reported to and Investigated as Founded by the Reporting Channels from 2014 to 2018

	Audit Committee Whistleblower System	Ombudsman System	Irregular Business Conduct Reporting System	Total Incidents Reported	Total Incidents Investigated as Founded			
	Incidents Reported	Incidents related to Ethics	Incidents Reported	Incidents Related to Ethics	Incidents Reported	Incidents Related to Ethics	Total Incidents Reported	Total Incidents Investigated as Founded
2014	0	0	39	0	22	0	61	0
2015	0	0	60	0	16	0	76	0
2016	1	1	80	0	35	15	116	2
2017	2	2	79	0	32	18	113	4
2018	1	0	106	0	43	14	150	1
Incidents reported to the Audit Committee Whistleblower System: This case was not related to ethics matters.		Incidents reported to the Ombudsman System and Irregular Business Conduct Reporting: Among these 149 reported incidents, 14 were related to ethics matters, 103 were related to employment relationships (for example: performance evaluation, management and interpersonal relationships), and 32 were categorized as others (for example: personal issues or miscellaneous)						

Note For reported cases related to sexual harassment, please refer to "Human Rights" in this Report



Focus 2

Innovation and Service

A Pioneer in Innovation

Innovation is the driving force behind TSMC's continuous growth. As the leading dedicated IC foundry, the Company attends to feedback from customers, focuses on research and development, provides the highest standard of information security, and serves customers with leading-edge technology and solutions to help them gain a competitive edge in the market through high quality, low-power, next generation sustainable products.

- **Innovation Management**
- **Sustainable Products**
- **Product Quality**
- **Customer Service**

5,100 & 8,800

Number of global patent grants exceeded 5,100, and registered trade secrets over 8,800

93%

Customer satisfaction rate reached 93%, surpassing 90% for five consecutive years, demonstrating TSMC's good relationships with customers

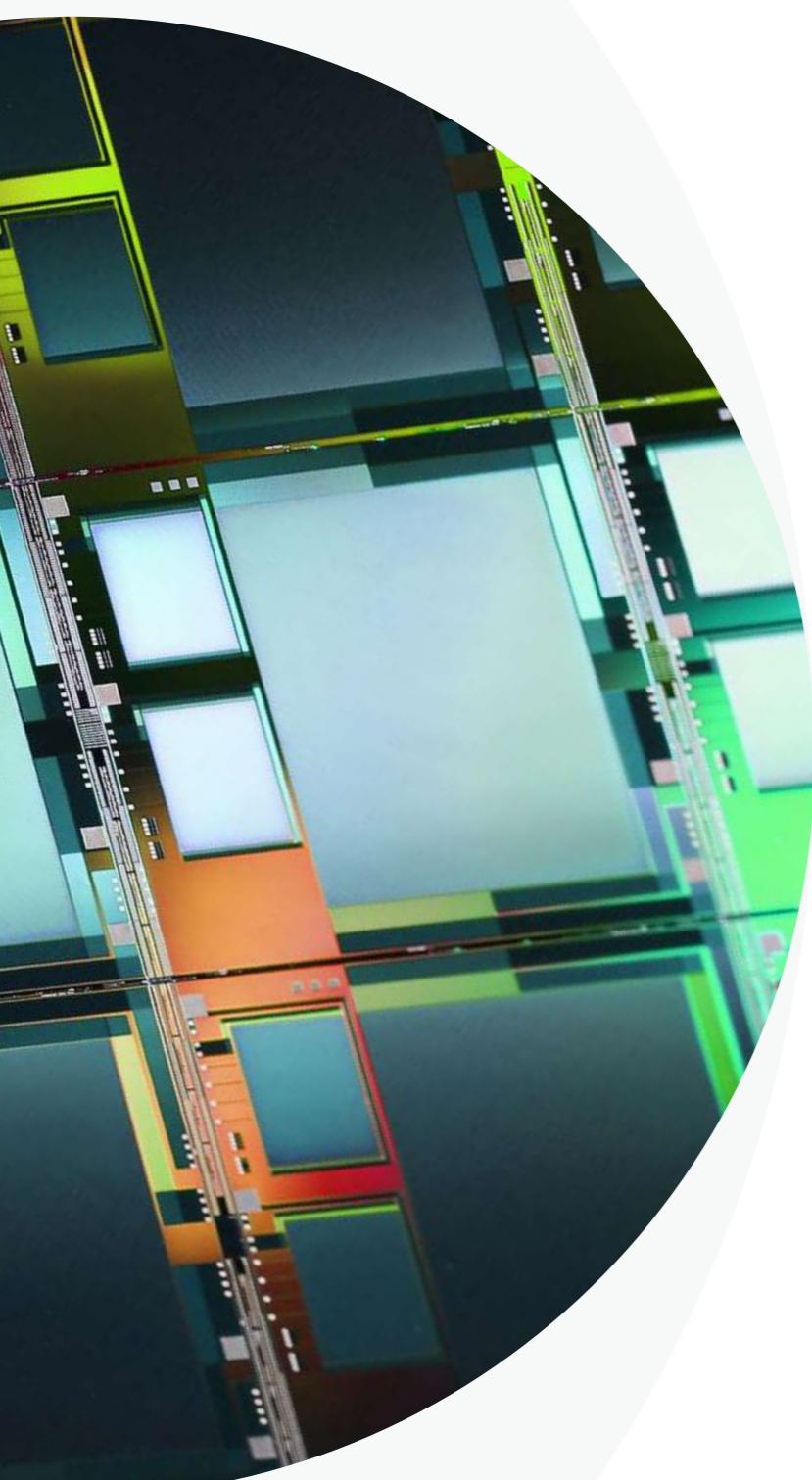
>10 billion (NT\$)

43,005 suggestions proposed by employees and 2,196 proposed continual improvement cases, creating a benefit of over NT\$10 billion



Innovation Management





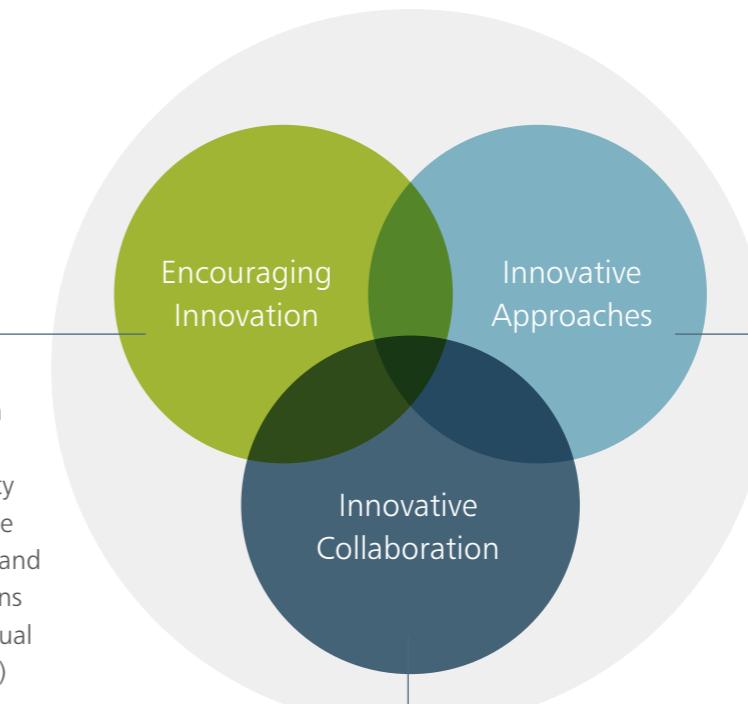
Developing a Culture of Innovation to Maintain Corporate Vitality

Innovation has been one of TSMC's core values for over 30 years since its establishment, and the Company has actively built a culture of innovation and a work environment encouraging more innovation that is finely tuned to the ever-changing characteristics of the semiconductor industry. In addition to unceasingly develop leading-edge technologies to maintain TSMC's technology leadership in the semiconductor industry, TSMC also designed an internal reward mechanism, encouraging employees to practice in their work for a wide range of innovation to continuously strengthen the organization's vitality. Meanwhile, TSMC also assists customers, industry and academic institutions to drive cross-platforms innovation, including product innovations in collaboration with customers, technology talent innovation with academic institutions, and "green innovation" with our suppliers.

Technology Leadership

TSMC continued to expand its research and development scale in 2018, and spent 8% of its total annual revenue on research and development, reaching US\$2.85 billion, a 7% increase from 2017. Now the Company has 6,216 employees working on R&D, a slight increase of 1% from the previous year. Such investment scale in R&D is on par with top tech companies worldwide and even surpasses some of the Company's leading counterparts.

Innovative Values



TSMC hosts an annual Idea Forum competition covering topics from Operations, R&D, Quality and Reliability, Corporate Planning Organization, and Finance; with suggestions from grassroots, Continual Improvement Team (CIT), Total Quality Excellence and Innovation Conference, and Tool Energy Saving Workshop.

Open Innovation Platform®
Collaboration with world-class R&D institutes^{note}

TSMC University Collaboration Programs

- TSMC University Research Center Program
- TSMC University Shuttle Program
- IC Layout Course

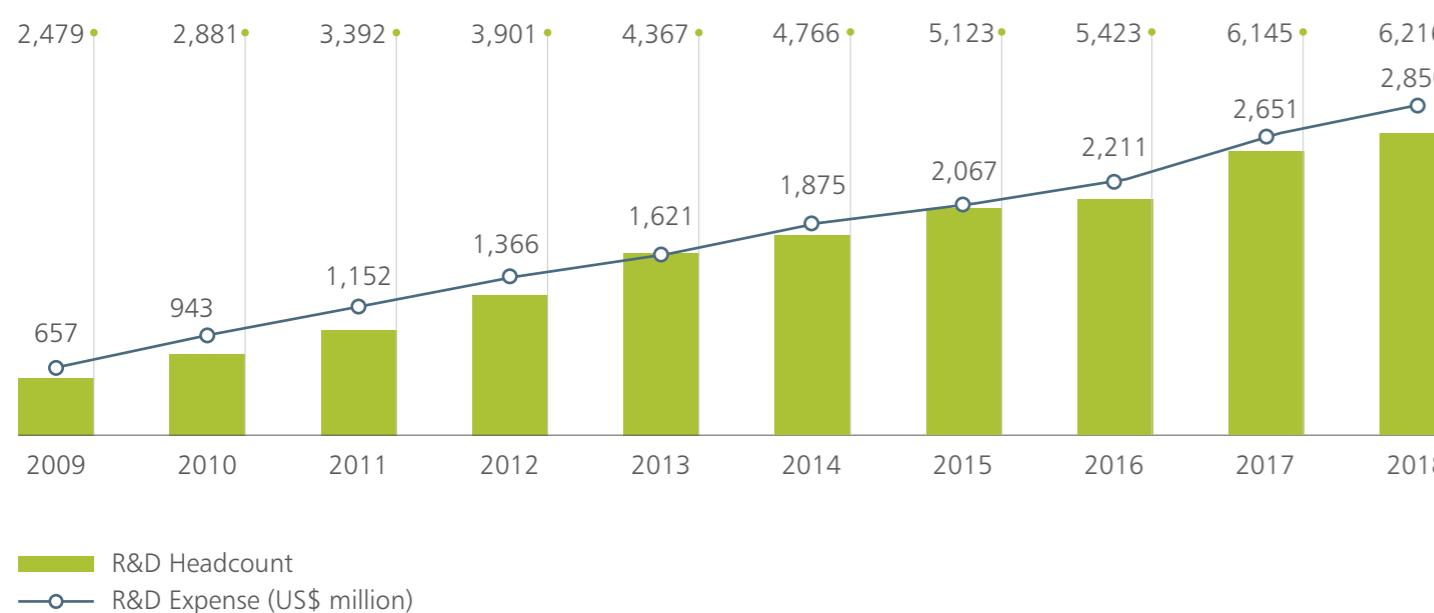
Technology Leadership
Intellectual Property Protection
Intelligent Precision
Manufacturing

Green Innovation Cases

- [Converting Ammonia Nitrogen Wastewater into Valuable Industrial-Grade Materials](#)
- [Copper Wastewater Fully Utilized as a Resource](#)
- [Project Big Green](#)
- [Utilize Zeolite Rotor Concentrators](#)
- [Most LEED Certified Semiconductor Industry Architecture Area in the World](#)
- [Intelligent Chilled Water System](#)

Note TSMC is a core partner of SRC (Semiconductor Research Corporation) and IMEC (Interuniversity Microelectronics Center), the U.S. and Europe's leading semiconductor technology R&D centers, and continues to sponsor the world's top universities in nanotechnology research to drive innovation and advancement in the field of nanoelectronics

Continued Investment in Research & Development (R&D)



Despite the increasingly complex and difficult challenge to continue extending Moore's Law, TSMC has focused its R&D efforts on enabling the Company to continually offer its customers first-to-market, leading-edge technologies and design solutions that contribute to their product success. In 2018, following the volume ramp-up of the industry leading 7nm (N7) technology, the R&D organization completed the transfer to manufacturing of 7nm+ (N7+) technology, an enhanced version of N7. At the same time, the R&D organization continues to fuel the pipeline of technological innovation needed to maintain industry leadership. TSMC's 5nm technology,

the fifth generation technology platform to make use of 3D FinFET transistors, is on track for risk production in 2019. TSMC's 3nm technology has entered full development stage, and the definition and intensive early development efforts have been progressing for nodes beyond 3nm.

In addition to CMOS logic, TSMC conducts R&D on a wide range of other semiconductor technologies that provide the functionality required by customers for mobile SoC and other applications.

Specialty Technologies / Integrated Interconnect & Packaging

- Advanced Fan-Out Packaging**
 - High-volume production of Gen-3 Integrated Fan-Out Package on Package (InFO-PoP Gen-3) for mobile application processor packaging
 - Successful qualification of the fourth generation InFO-PoP advanced packaging technology (InFO-PoP Gen-4) for mobile applications and Integrated Fan-Out on Substrate (InFO-oS) for HPC applications
- Power IC / BCD Technology**
 - Developed unique 90nm BCD (Bipolar-CMOS-DMOS) technology offering leading-edge 5-16V power devices and dense logic integration with competitive cost, as the next generation mobile Power Management IC (PMIC) solution
- Embedded Flash Technology**
 - Stable yield and reliability demonstration of 28nm node eFlash for high performance mobile computing
- CMOS Image Sensor Technology**
 - Mass production launch of new generation CMOS image sensors with sub-micron pixel for mobile applications and development of Ge-on-Si sensor for three dimensional range sensing applications with superior performance

In 2018, TSMC maintained strong partnerships with world-class research institutions, including SRC in the U.S. and IMEC in Belgium. TSMC also continued to expand research collaborations with leading universities around the world for two grand purposes: the advancement of semiconductor technologies and the incubation of future talent.



Leading Technologies and Innovational Achievements



CMOS Logic Technologies

2014

- Led the industry in volume manufacturing of 16nm technology, the first integrated technology platform to make use of 3D FinFET transistors.

2015

- Led the industry in volume manufacturing of 16FF+ technology, which operated 40% faster than planar 20nm technology or consumed 50% less power at the same speed.

2016

- Completed the transfer to manufacturing of industry-leading 10nm technology, the 3rd generation of technology platform to make use of 3D FinFET transistors.

2017

- Completed the transfer to manufacturing of the industry leading 7nm technology, the 4th generation of technology to make use of 3D FinFET transistors.

2018

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



Specialty Technologies / Integrated Packaging Technologies for Conductors



- TSMC qualified for manufacture a new TSV (Through-Silicon Via)-based platform in 2014 for fingerprint sensor applications, an important industrial milestone to integrate TSV with active devices.
- The first foundry to implement GaN technology in a 6-inch fab

- Successfully qualified InFO PoP (Integrated Fan-Out Package on Package) advanced packaging technology, low cost solution for mobile customers.
- The third generation of 0.18 μ m BCD technology adopted TSMC proprietary device structure which boosted world leading performance higher.
- The first and the only company to offer both 100V and 650V GaN foundry service in a 6-inch fab

- Achieved the world's first high-volume production of InFO PoP for mobile application processor packaging.
- 0.18 μ m second generation BCD technology resulting in the world's highest performance quick charger and wireless charger

- 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
- Foundry's first under panel optical fingerprint sensor technology in production
- Developed an industry's unique 90nm BCD technology offering leading-edge 5-16V power devices and dense logic integration with competitive cost, as the next generation mobile Power Management IC (PMIC) solution.
- Mass production launch of new generation CMOS image sensors of sub-micron pixel for mobile applications and development of Ge-on-Si sensor for three dimensional range sensing applications with superior performance
- High-volume production of InFO-PoP Gen-3 for mobile application processor packaging



Applications

First foundry to provide 16nm FinFET Radio Frequency (RF) volume production of sub-6Ghz RF chips for 5G mobile communications

First foundry to begin 22nm Ultra Low Power RF (22nm ULP RF) risk production of 5G millimeter wave (mmWave) RF chips

Successfully delivered the world's first CMOS-MEMS (Micro-electromechanical Systems) monolithic capacitive barometer to customer. This barometer featured sensitivity to altitude changes as small as 5cm and fitted in a package of slightly less than 1mm².

InFO PoP technology, which integrated 7nm SoC (System on Chip) and DRAM for advanced mobile device applications, began volume production in the second quarter.

CoWoS® (Chip on Wafer on Substrate) technology that heterogeneously integrated a 7nm SoC and the second generation high bandwidth memory (HBM2) successfully completed qualification and began production for high-performance computing for Artificial Intelligence applications, etc.

In addition to CoWoS®, InFO_oS (integrated fan-out on substrate) technology integrating multiple 16nm SoC chips began production.



Intellectual Property Protection

To strengthen TSMC's technology leadership and protect our advanced and leading-edge technologies, TSMC has established a process to generate company value from intellectual property strategy by aligning intellectual capital management strategy with business operation objectives and R&D resources. Intellectual property rights protect the Company's freedom to operate, enhance competitive position, and provide leverage to participate in many profit-generating activities.

Patent Protection

TSMC's global strategic patent portfolio construction include patent profiling, patent generating, portfolio constructing, and portfolio parading. With its review mechanism, reward system, education and training programs, the Company is dedicated to protecting its research and development results and upholding its industry-leading position.

Objectives

Protect R&D
Investment &
Technology
Leadership

Ensure
Freedom
of Business
Operation

Strengthen
Market
Competitiveness

Establish IP
Reputation in the
Industry



Patent Profiling

- IP Category Profiling
- Patent Profiling by Tiers
- Worldwide Profiling
- Patent Map Navigation

Patent Generation

- Invention Mining
- Comprehensive Protection
- JDA Patent Productivity
- Patent Strategic Acquisition

Portfolio Expansion

- Patent Prosecution
- Patent Optimization
- Patent Family
- Patent Customization

Portfolio Management

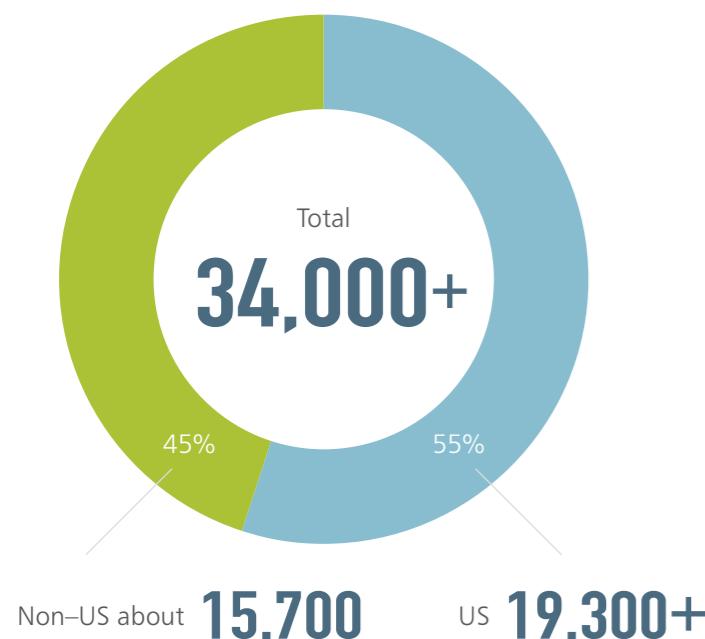
- Portfolio Review
- Portfolio Trooping
- Battle-tested Patents
- Portfolio Enhancement





• Achievements and Honors

Equivalent emphasis on both quality and quantity is the core principle of TSMC's patent management. In 2018, the number of global patents of the Company exceeded 34,000, including 19,336 US patent grants. In particular, the number of US patent grants keeps increasing, and the Company has been one of the top 10 patent holders in the US for three consecutive years. In Taiwan, the number of the Company's patent grants has also ranked first for three straight years. In terms of patent quality, TSMC has received the highest patent approval rate among the top 10 patent holders in the US in 2018. These fruitful achievements have strengthened TSMC's technology leadership, built up the Company's good reputation in IP protection, and ensured TSMC's freedom to operate in the world.



Trade Secret Protection

Trade secrets are vital to TSMC's competitive advantages, including technology leadership, manufacturing excellence, and customer trust. The core strategy of the Company is to strengthen its corporate competitiveness rather than protecting specific intellectual assets. In regards to this, TSMC built up the Trade Secret Registration and Management System, a comprehensive trade secret management mechanism, in 2013 to record and integrate trade secrets that are essential to maintaining the Company's competitive advantages.

TSMC encourages its employees to keep detailed records of inventions, technology innovations, and improvements in the Trade Secret Registration System, which is a high-standard control area for extremely confidential documents and is supervised by the Company's legal department. In addition, TSMC grants its annual Golden Trade Secret Awards to its employees to recognize and encourage their contributions to the Company. By the end of 2018, TSMC had given 1,063 awards to more than 3,300 employees who had registered trade secrets. Since the establishment of the Trade Secret Registration System, the number of registered trade secrets has been gradually growing every year. In 2018 alone, a record-breaking 8,800 trade secrets were registered.

TSMC has synchronized the Trade Secret Registration System with other internal systems and included it in the Company's business value assessment to better arrange and manage trade secrets. Management measures include active monitoring of potential trade secret misappropriation or other violations of law. When suspicious incidents are discovered, the

Company conducts prompt investigations and takes timely legal measures to protect its trade secrets and competitive advantages.



For more details, please refer to TSMC CSR website:
A Record High of Over 8,800 Trade Secrets Registered



Integration with other systems
for maximum synergy



Detailed online records of invention,
technology innovation or improvement



Enabling prompt collection of
relevant evidence in cases of
misappropriation



Strategic Management of IP
Portfolio



Monitoring and prevention of
trade secret leakage



Intelligent Precision Manufacturing

As the leader in the IC foundry industry, manufacturing excellence is the cornerstone for TSMC's competitive advantages. In 2000, TSMC was the first in the industry to reach 100% automated manufacturing. In 2011, with the increase in advanced technology complexity, the Company entered the intelligent manufacturing stage by implementing artificial intelligence (AI) to its wafer manufacturing process to improve yield rates and stabilize production capacity. In addition, the Company has built a smart manufacturing environment with intelligent system analysis, which is capable of self-diagnosis and self-reacting. Together with machine learning and deep learning technologies, production parameters are constantly improved. As a result, TSMC constantly optimize cross-fab alignment technique, reaching the goal of equivalent level of quality among

fabs (Fab Matching) and further strengthening TSMC's competitiveness.

As of 2018, TSMC boasted a team of nearly 1,000 IT professionals and 300 machine learning experts. The team works together on the Company's machine learning platform to collect a colossal amount of wafer fabrication data and develop innovative analysis techniques to improve and expand the intelligent manufacturing system with the assistance of high-performance computing and open source machine learning software. Currently, TSMC's intelligent manufacturing techniques have been applied to smart scheduling, precision dispatching, people productivity enhancing, equipment productivity optimizing, and manufacturing process and tool control monitoring. Taking TSMC's smart scheduling and precision

dispatching as an example, the production path of each product has been optimized based on the complexity of its manufacturing environment. As a result, run time and queue time in the wafer fabrication process have been minimized. For a fab with 4,000 tools and a monthly production capacity of 300,000 wafers, the cycle time has been shortened to 1-1.2 days per mask layer.

With its unwavering pursuit of manufacturing excellence, TSMC aims to inject innovation vitality and momentum to global IC industries through intelligent precision manufacturing, and become a long-term, trusted manufacturing technology and production capacity provider for its customers.

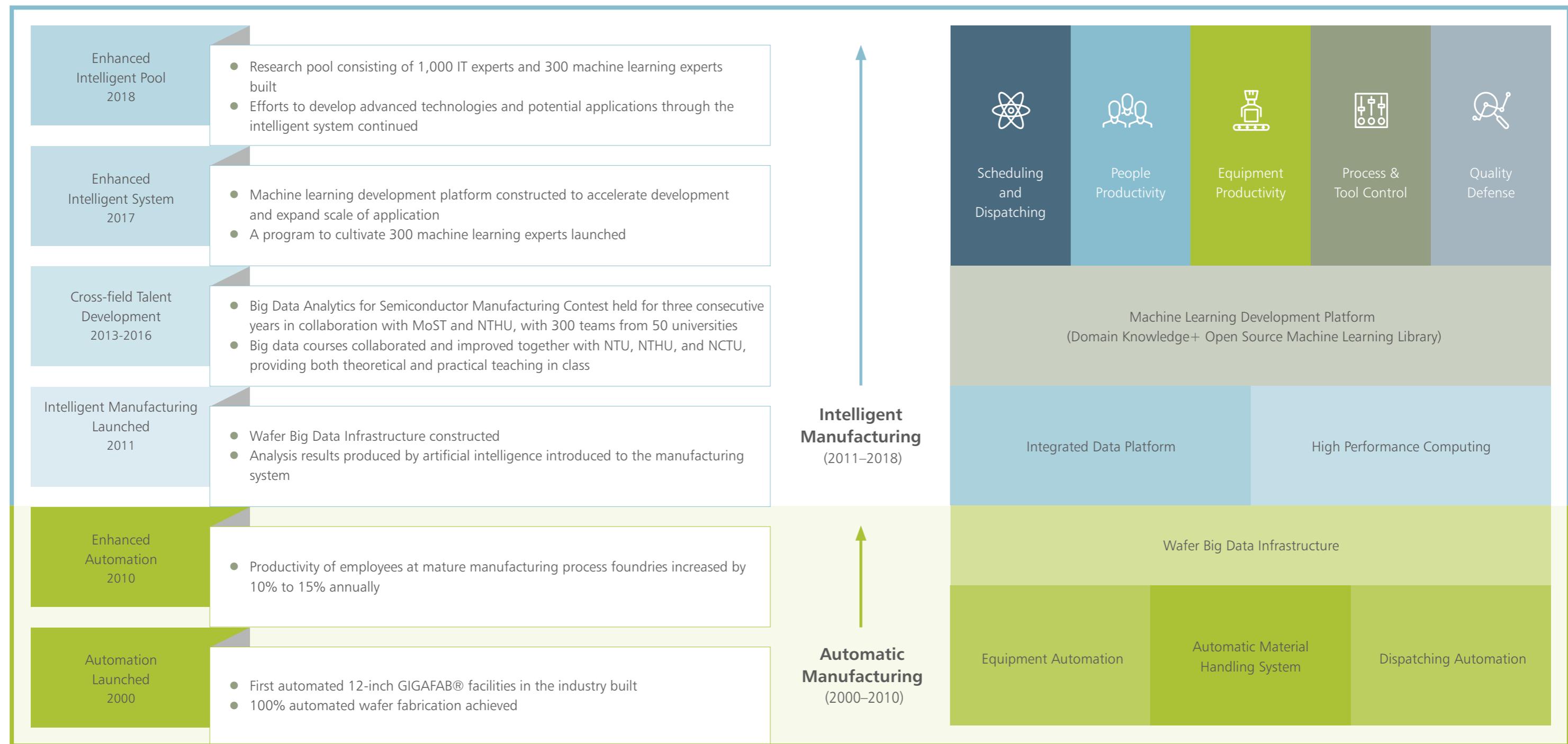


Wafer manufacturing is performed through intelligent systems. Engineers and operations focus on high-value monitoring and analysis in the Manufacturing Command Center to ensure efficient and stable fab operation.





Manufacturing Excellence





Open Innovation Platform®

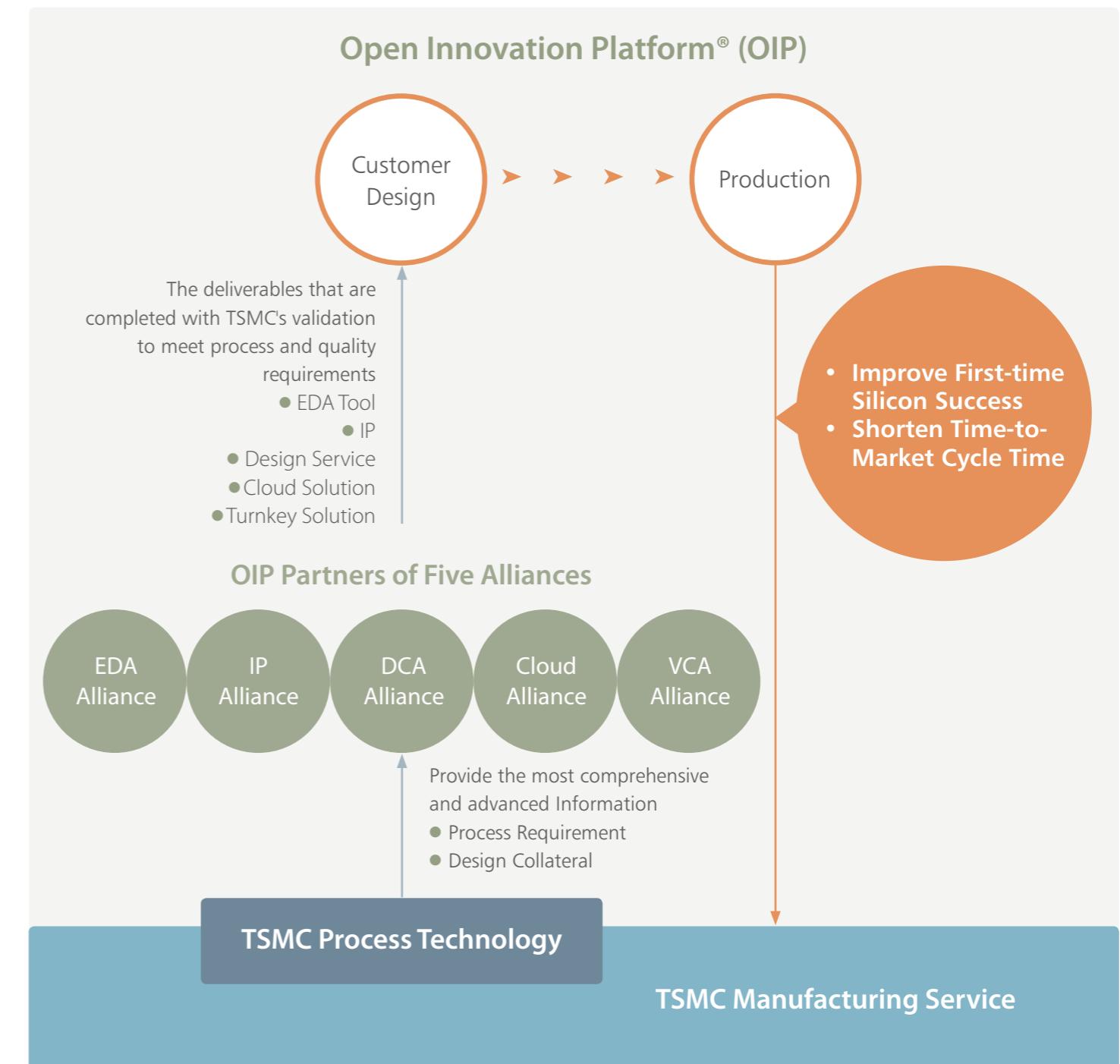
TSMC's Open Innovation Platform® (OIP) is a comprehensive design technology infrastructure that continuously drives innovation. It encompasses all critical IC implementation areas to effectively reduce design barriers and improve customers' first-time silicon success. OIP promotes innovative implementation amongst the semiconductor design community, TSMC's ecosystem partners, TSMC's Intellectual Property (IP), design implementation, process technology and backend packaging & testing services. OIP has brought continuous innovations over the past ten years to meet the timely demands from the semiconductor industry since its inception in 2008.

In 2018, on top of the existing EDA Alliance, IP Alliance, Design Center Alliance (DCA) and Value Chain Aggregator (VCA) , TSMC announced the Cloud Alliance as TSMC's 5th OIP alliance with inaugural members of Amazon Web Services (AWS) , Cadence, Microsoft Azure, and Synopsys to offer Cloud computing service for semiconductor designs for the first time. With the jointly developed OIP Virtual Design Environment (OIP VDE) , it provides a complete system-on-chip (SoC) design infrastructure for customers to further enhance design productivity and shorten time-to-market cycle time by leveraging high performance computing power and flexibility within the Cloud services.

In addition to the announcement of new Cloud alliance solutions, TSMC and OIP ecosystem partners continue to provide innovative solutions to the design enablement platforms for advanced technologies of 5nm, 7nm, 7nm+, 22nm, as well as automotive and wafer level system integration technologies to meet customer's requirements at various design stages. Through the integration of various R&D resources and collaboration with OIP ecosystem partners, TSMC's customers can be more focused on developing innovative products efficiently, and successfully roll out their products with higher quality and lower energy consumption.



For more details, please refer to TSMC CSR website:
[TSMC Celebrated OIP 10th Anniversary](#)



TSMC University Programs

University Research Center

TSMC has long been dedicated to cultivating industry-academic partnership with universities in Taiwan. Since 2013, to further enhance such partnership, the Company has established four research centers in National Chiao Tung University, National Taiwan University, National Cheng Kung University, and National Tsing Hua University respectively, investing research funds and encouraging university professors to undertake advanced semiconductor research projects. It is the Company's goal to develop cutting-edge technologies in semiconductor components, materials, processes, and circuit design through these projects, and at the same time incubate research postgraduates. In 2018, TSMC funded more than NT\$100 million on over 50 research projects, in collaboration with 50 plus faculty members in the fields of Electronic Engineering, Physics, Material Sciences, Chemistry, Chemical Engineering, and Mechanical Engineering. By the end of 2018, around 160 professors and 2,300 students had joined the research centers, and more than 100 U.S. patent applications had been filed.

In addition to Taiwan local universities, TSMC has also conducted strategic research projects with top universities around the world, such as Stanford University, Massachusetts Institute of Technology, and University of California, Berkeley, with research fields covering some of the most advanced and innovative technologies in transistors, conductors, photomasks, simulations, and special processes.

Elite Camp

Each year, TSMC invites undergraduate students with presidential awards to its annual Elite Camp. The Camp has been held for eight consecutive years since 2011, in hopes that the Camp can give students a better understanding of the semiconductor industry and what TSMC Research Centers offer, thus motivating the students to participate in nanoelectronics research. The ultimate goal is to help these young minds to grow into highly skilled talent sought after by the semiconductor industry.

75%

About 75% of students participating in the Elite Camp showed interest in pursuing a PhD in semiconductors.

Funding for Exceptional Research

To foster an environment where students are able to focus on research projects in semiconductor components, materials, processes, and IC design with financial aid, TSMC provides Research Assistantship of up to NT\$100,000 for undergraduates; NT\$120,000 for master's student; and NT\$360,000 for doctoral students. In 2018, a total of NT\$17.16 million was awarded to 151 students. In addition, to enrich students' and scholars' global exposure, the Company provided grants to 8 professors and students to participate in international conferences such as the International Electron Devices Meeting (IEDM) and Symposia on VLSI Technology and Circuits.

1,716

NT\$17.16 million
Grants in total of NT\$17.16 million awarded to 151 students.

"TSMC established a research center in NTU, providing students with a high-quality training environment and sufficient grants. As a result, those who are interested in material sciences, components, physics, chemistry, or mechanical engineering now have a better chance for advanced study."

Chee-Wee Liu

Professor, Department of Electrical Engineering, National Taiwan University

"When student feels confused about his or her school work and future career, the research center is always there to provide support.

I realized that even if I failed, the research center would give me a hand and help me overcome obstacles; thus, I could keep on pushing my limits."

Shih-Hao Tsai

Undergraduate Honors Program of Nano Science and Engineering, National Chiao Tung University

For further information, please refer to the official website of TSMC: [TSMC's "Elite Camp" Aims to Cultivate Top Talent for the Semiconductor Industry](#)



University Shuttle Program

TSMC has been running its University Shuttle Program for over ten years to help cultivate talent "...in the semiconductor industry." The program provides complimentary support to professors and students from top universities around the world, putting their IC design on actual chips and validating the application system performance of their design. By integrating research and textbook theories with real work, the program nurtures technology talent to drive innovation development in the semiconductor industry.

In 2018, TSMC supported the implementation of nearly 100 IC designs from our University Programs with its fabrication services. A total of 24 top universities around the globe participated, including University of California, Berkeley, Massachusetts Institute of Technology, Stanford University, University of California, Los Angeles, University of Michigan, National University of Singapore, and four Taiwanese universities where TSMC established collaborative research centers. Fields of research covered topics, including 5G communication, Artificial Intelligence, 3D IC integration technology, Internet of Things, Biomedical Applications, and many more. 64 research papers have been generated through this program, which are published in internationally renowned journals and conferences, including the IEEE Journal of Solid-State Circuits (JSSC), International Solid-State Circuits Conference (ISSCC), Symposia on VLSI Technology and Circuits and Asian Solid-State Circuits Conference (ASSCC).

Technology and Research Applications of University Shuttle Program in 2018

Process Technologies for University Design Research Applications in Recent Years	
Non-volatile memory (NVM)	Automotive Electronics
Microelectromechanical system (MEMS)	5G communication technology
Analog signal circuits	IoT and energy efficiency technology
Digital signal circuits	Non-volatile memory — next generation memory
Mixed signal circuits	Artificial Intelligence
RF circuit design	Biotechnology
	High-speed data transmission

Featured Projects and Partners

Projects	Our Partners
Artificial Intelligence	Dr. Anantha P. Chandrakasan Dean of the School of Engineering, MIT
5G communication technology, portable terahertz spectrometer for PM 2.5 gas detection	Dr. M.C. Frank Chang President of National Chiao Tung University / Distinguished Professor of Electrical Engineering, UCLA
Communications technology and energy efficiency technology	Dr. Ali M. Niknejad Professor of Electrical Engineering and Computer Sciences, UC Berkeley / Faculty Director of the Berkeley Wireless Research Center (BWRC)
5G communication technology	Dr. Behzad Razavi Professor of Electrical Engineering, UCLA

Note Names are listed in alphabetical order.

IC Layout Course

In accordance with Moore's Law, integrated circuit manufacturing processes are becoming increasingly complex, posing greater challenges to the layout of IC chips. Since 2016, TSMC has worked together with National Taipei University of Technology (NTUT) to offer an 18-week IC layout course: Design and Practice of Integrated Circuit Layout. As of the end of 2018, this course has been running for three consecutive years, with 90 students enabled.

The course combines the strengths of both NTUT and TSMC by integrating theories, teaching, and field experience. Engineers from the Layout Design Engineering Division of TSMC give in-class lectures and demonstrate circuit design with case studies. In addition, the Company provides key IC manufacturing processes, layout techniques, and patent resources to students where necessary.

IC layout is the key step in the IC design process and is also the driving force behind technology innovation. With the efforts of IC layout engineers, customers' designs can fully leverage the competitive advantages of power, performance, and area (PPA) on TSMC's advanced processes.

In addition to the course, TSMC also provides summer internship opportunities and advance offers for talented students. Students with potential and enthusiasm about IC layout design get chances to apply their knowledge in real work.



The most distinguishing factor of this course from other electrical engineering courses is that the most cutting-edge and difficult manufacturing processes are taught. I learned to analyze IC designs from the perspectives of IC layout and processes. To be able to integrate in-class experiences with industry applications is a precious experience that you can't learn anywhere else.

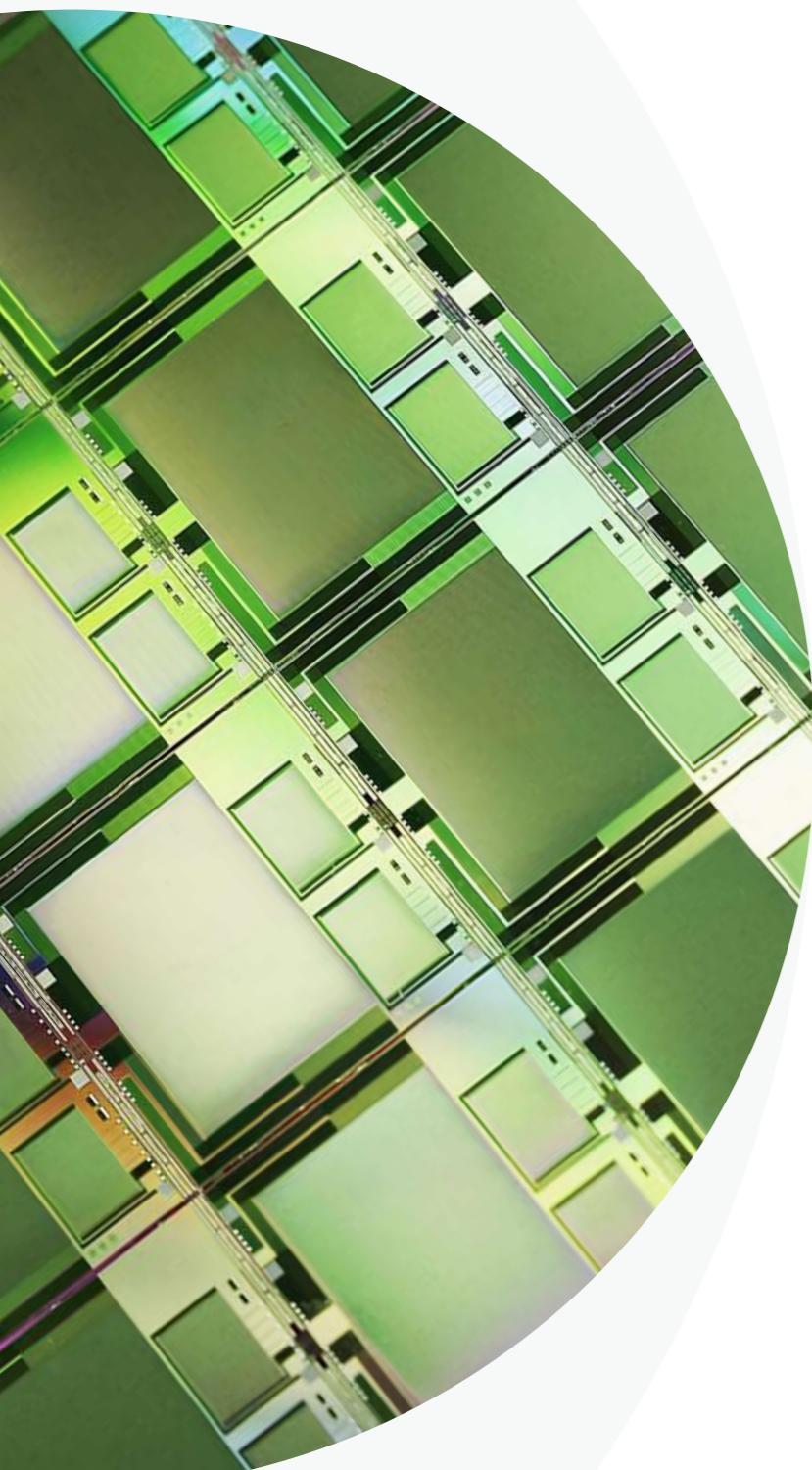
Chen Buoyao

student of the 2nd Design and Practice of Integrated Circuit Layout course.
(Chen currently serves as a memory layout design engineer at TSMC)



Sustainable Products





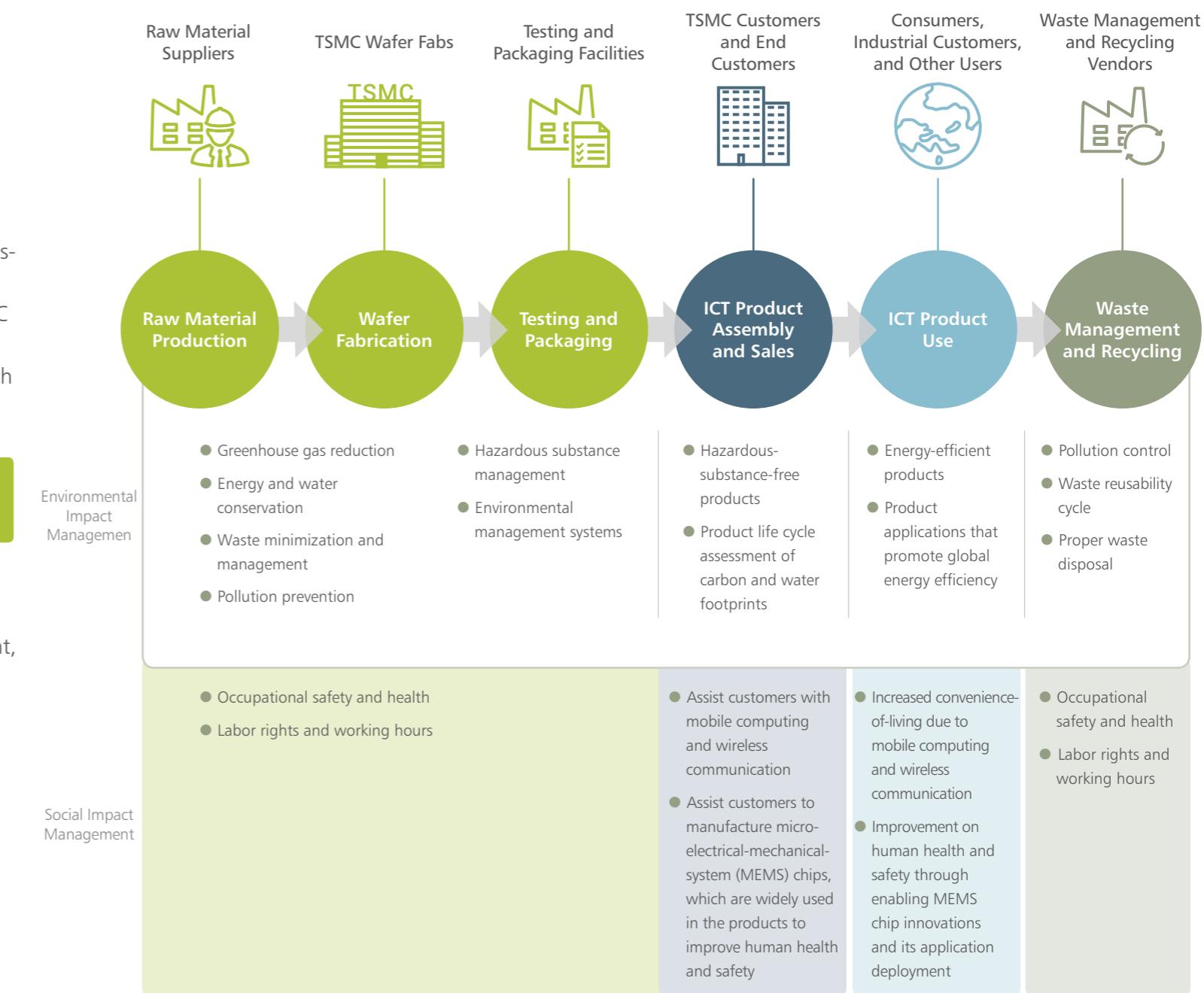
Striving for a Lower Environmental Footprint by Creating Sustainable Products

At TSMC, product life cycle is taken into serious consideration in order to lower a product's environmental footprint, thereby reducing its environmental and social impacts, as well as its energy consumption. Close attention is also given to the assessment and selection of lower hazard substances such that products comply with hazardous-substance-free standards. A drive towards ever-advancing manufacturing processes means that TSMC can assist customers in creating even higher energy-efficient designs for sustainable products that are both innovative and environmentally friendly.

Product Life Cycle Management

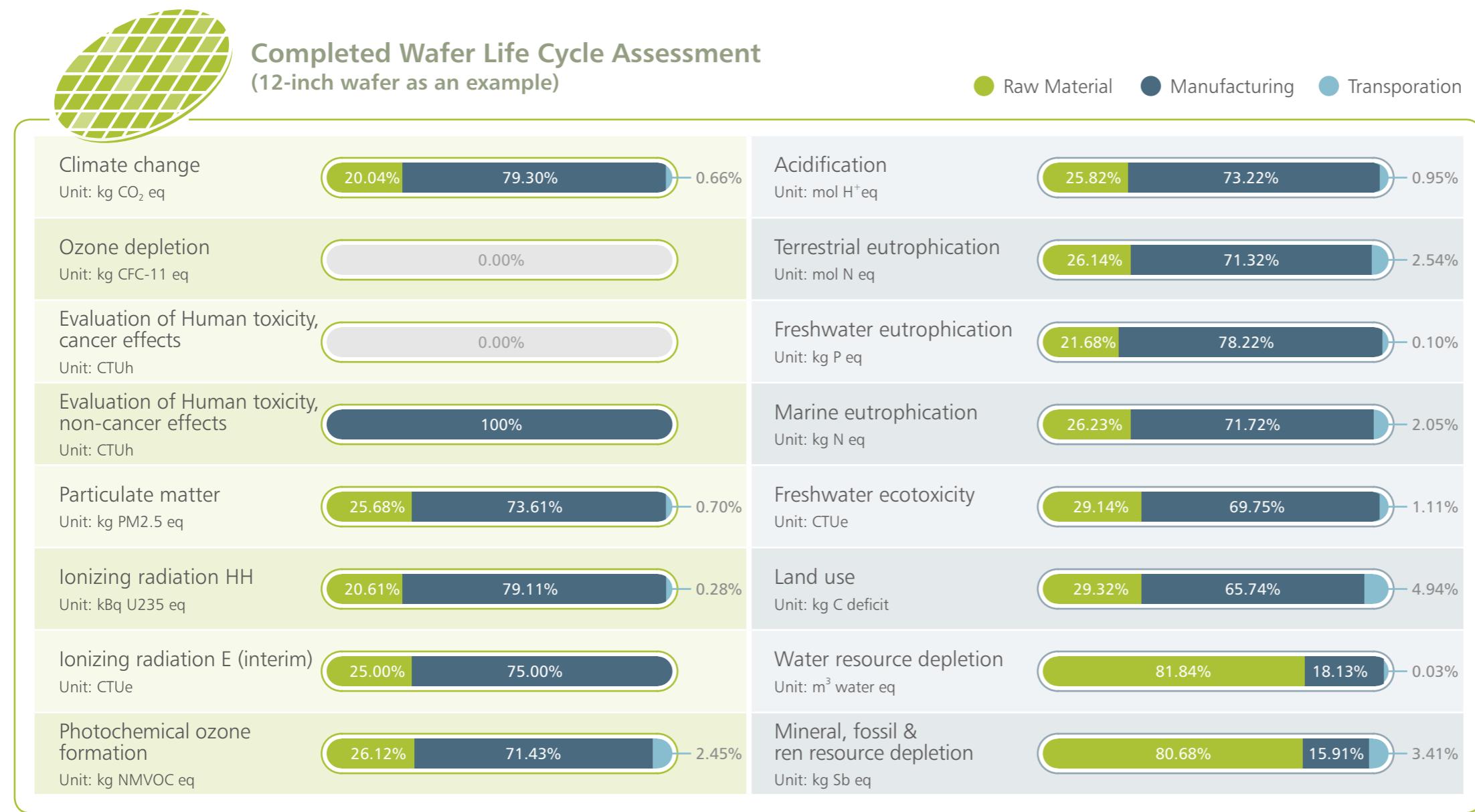
TSMC carefully considers environmental impacts at every stage of the product life cycle. This includes collaboration with customers on product development, the production and transportation of raw materials, and product manufacturing, testing, and packaging. The Company also strives to set high standards throughout the manufacturing process in the areas of hazardous substance management, pollution prevention, energy-efficiency, and natural resource consumption. In order to lower the environmental, carbon, and water footprints of semiconductor products throughout their life cycle, TSMC requires and assists suppliers to take proper steps towards environmental protection.

TSMC Product Life Cycle Environmental and Social Impact Management

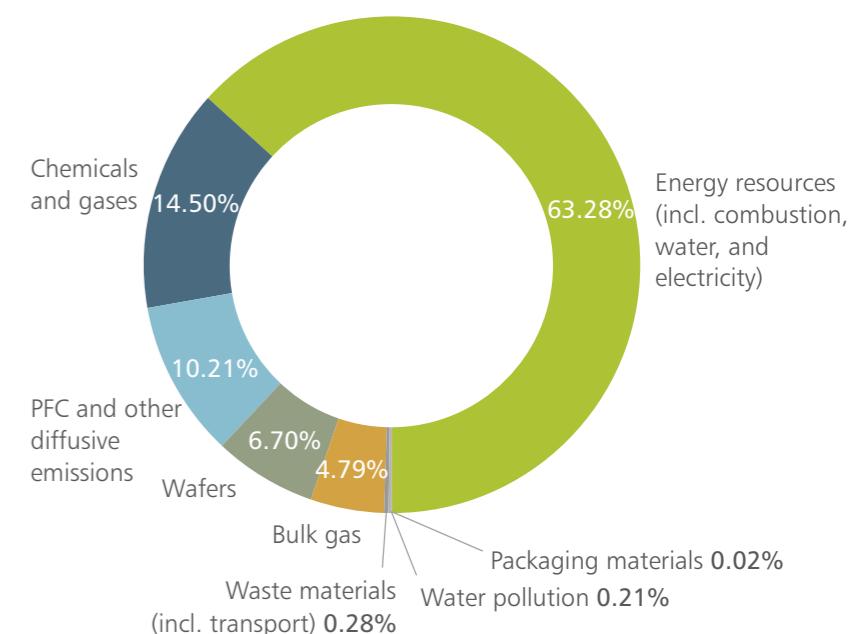




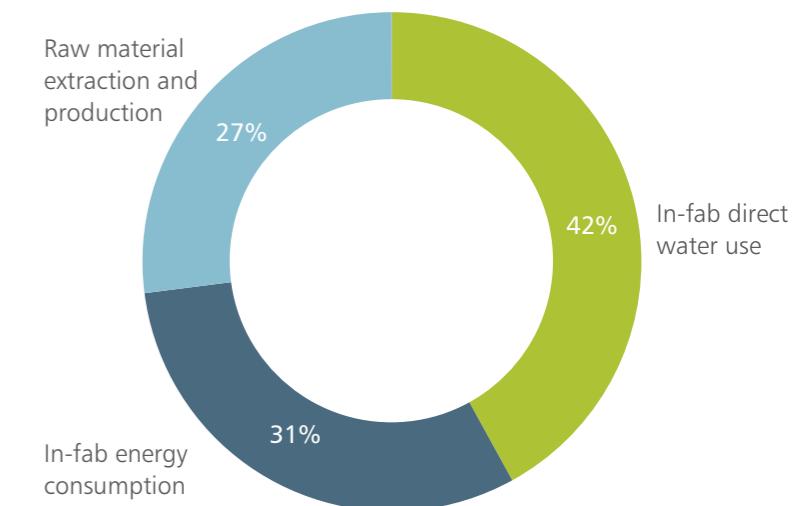
In 2018, TSMC initiated a project to update product life cycle assessments, carbon footprint and water footprint across all company fabs. Assessments and third-party verification were completed, and the Company received ISO14040, ISO14067 and ISO14046 certifications. Examinations of the product life cycle, carbon footprint, and water footprint of wafer products have shown that more than 70% of major environmental impact comes from wafer fabrication. In the upstream supply chain, environmental impacts mainly stem from raw silicon wafers, chemicals, and gases. In efforts to reduce the environmental footprint of its products, TSMC is continuing to make progress in company-wide reductions of greenhouse gas emissions, energy and water conservation, waste minimization and reusability cycles, and pollution prevention. The Company also actively requires and assists its upstream and downstream supply chain partners to invest in [similar initiatives](#).



Carbon Footprint of Wafer Products (12-inch wafers)



Water Footprint of Wafer Products (12-inch wafers)



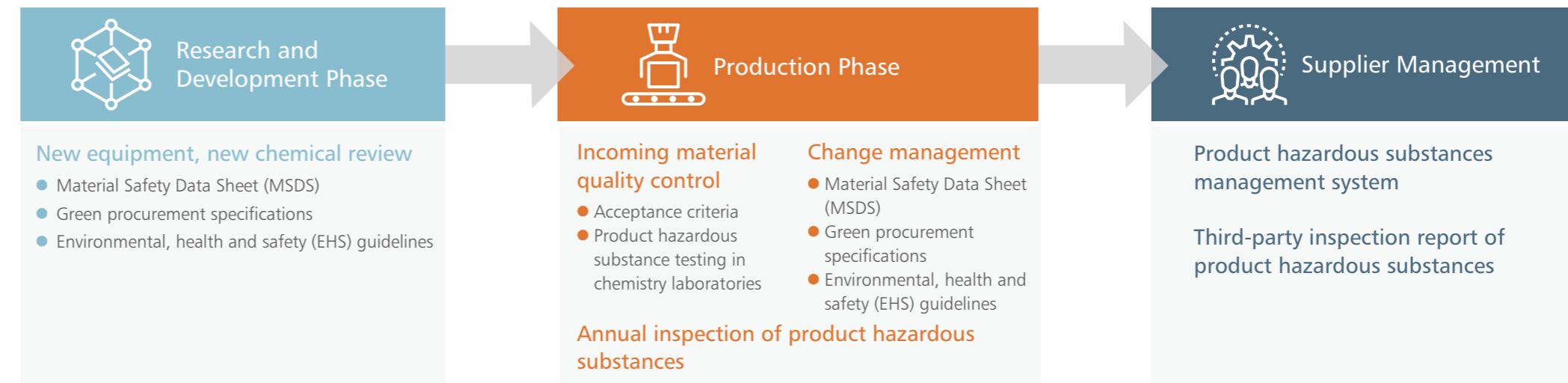


Hazardous Substance Management

TSMC gives serious consideration to social impacts throughout the product life cycle. The Company practices quality occupational health and safety management to create a safe and healthy work environment, and also adheres to standards set by the Responsible Business Alliance's (RBA) Code of Conduct when interacting with customers and suppliers in order to improve workplace health and safety performance in the supply chain. In the usage stage of semiconductor products, TSMC is driven to make everyday living more convenient and to advance capabilities in the areas of health, safety, and more.

TSMC has established a management system for hazardous substances in products by promoting and receiving QC 080000 Hazardous Substances Process Management (HSPM) certification. Throughout the manufacturing process, design, and development stages, TSMC follows the principles of green design, avoids the use of raw materials containing hazardous substances in manufacturing, and ensures that all products comply with domestic and international regulations, as well as customer standards on the restriction of products containing hazardous substances. In the stage of raw materials procurement, TSMC has established a green procurement process. This process involves strict reviewing and management over any new raw materials planned to use in the phases of research and development, production, and engineering change. Source inspection from beginning means that all raw materials are in compliance with TSMC's specifications for restricted hazardous substances.

Hazardous Substance Management Phases



Product Hazardous Substance Management is Compliant with or Surpasses International Regulations

International Regulations / Customer Requirements	Description of Legal Compliance
European Union Restriction of Hazardous Substance (EU RoHS)	<ul style="list-style-type: none"> TSMC provides lead-free bumps to customers. A few customers still need trace lead contained bump which is exempted by EU RoHS Other EU RoHS restricted substances are not used in TSMC process
Product Halogen Free Requirements	<ul style="list-style-type: none"> All TSMC products are compliant
Perfluorooctanesulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA) Restriction in Process	<ul style="list-style-type: none"> TSMC has totally phased out using PFOS and PFOA, and all products also do not contain these two substances
EU Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Annex XVII	<ul style="list-style-type: none"> All TSMC products are compliant
EU REACH Substances of Very High Concern (SVHC)	<ul style="list-style-type: none"> All TSMC products are compliant
EU Waste Electrical and Electronic Equipment (WEEE) Directive	<ul style="list-style-type: none"> TSMC's products are not final products and this law is not directly applicable



It is possible that the use of certain raw materials containing hazardous substances will be restricted or banned in the future. In response, the Company has proactively taken measures to assess manufacturing and chemical substitutes, which are to be gradually implemented via designated multi-year projects.

TSMC has always upheld its stance towards avoiding or restricting the use of substances that are carcinogenic, mutagenic, or toxic for production (CMR substances) in its management of substances used in the manufacturing process. When the use of

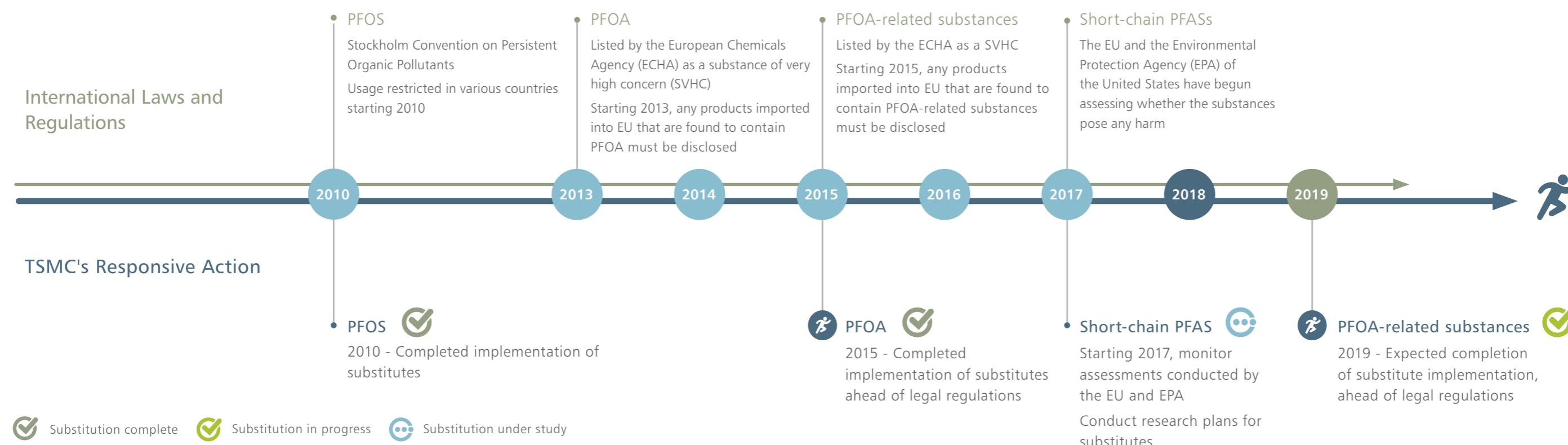
such substances is unavoidable in the manufacturing, research, and development processes, a respective unit must draft a rigorous EHS protection plan. The plan then undergoes a stringent review process by the internal board to ensure EHS-related risks are as low as possible. Usage permission is given when the plan has been approved by VP-level executives.

In recent years, perfluoroalkyl substances (PFASs) have received worldwide attention due to its potentially adverse effects on humans and the environment. An increasing number of countries have responded

by proposing relevant laws and regulations. Prior to 2016, TSMC had already initiated projects to substitute PFOA precursors, derivatives, and other related substances. However, evaluations of new substitutes have often found that these substances may negatively affect product yield during testing. This consequently requires adjustments to processing parameters and repeated testing until the issues are resolved. As of the end of 2018, 86% of PFOA related substances substitutes have been implemented, with the use of all PFOA-related substances expected to be completely phased out in 2019. In regards to short-chain PFASs,

TSMC continues to monitor the impact of these substances on humans and environment, as well as any laws and regulations instituted by other countries. Any countermeasures will be taken as early as possible when needed. TSMC also puts a lot of efforts to reduce its use of NMP, a substance commonly used in the industry that has since been recognized to be toxic for reproduction. As of 2018, company-wide use of NMP has dropped by 48% compared to 2016.

PFASs Laws and Regulations & TSMC's Responsive Actions





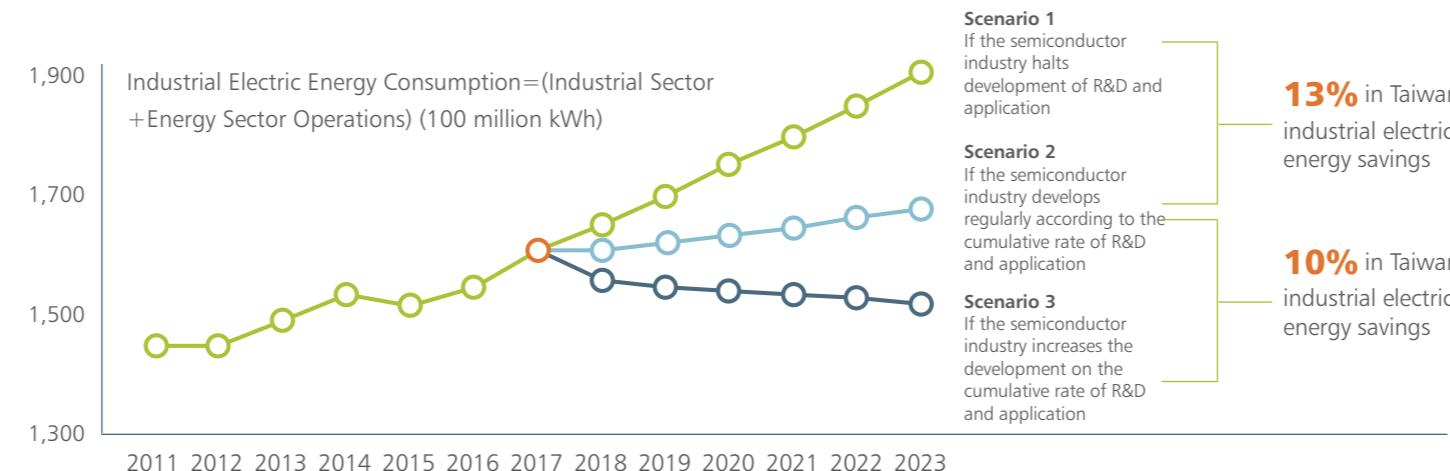
Help Customers Create Global Energy-saving Sustainable Products

The constant improvement of semiconductor manufacturing technology continues to boost the advancement of all products. Semiconductor-containing products are becoming increasingly energy-efficient, and their various smart applications in areas including smart construction, smart manufacturing, and smart grids are allowing users to save energy while improving work efficiency.

From 2015 up through 2018, TSMC has continually collaborated with the Industry, Science and Technology International Strategy Center (ISTI) of the Industrial Technology Research Institute (ITRI) to research avenues where the advancement and application of semiconductor products and techniques can improve the energy-efficiency of computers, communication, data centers, power plants, and ultimately the whole of Taiwan.

Studies by ISTI have shown that for every 1.0% increase in cumulative investments towards research and development, there is a 0.27- 0.30% decrease in electric energy consumption. An analysis of the total amount of national research and development or semiconductor research and development reveals that ISTI's advancements in product and manufacturing efficacy have contributed to reducing electric energy consumption in the industrial sector. In 2017, the total value of domestic semiconductor R&D was NT\$ 239.9 billion... TSMC's research and development expenditures accounted for 33.3% - a 6.2% increase since 2016 - thus marking the Company as a key spender towards Taiwan's domestic semiconductor R&D. The diffusion of benefits associated with TSMC's R&D and products has been conducive to

Simulation Model of Semiconductor Industry R&D and Industrial Electric Energy Consumption



ISTI Simulation Modeling Analysis

- Scenario 2 If the semiconductor industry develops regularly according to the cumulative rate of R&D and application over the past five years and is compared with Scenario 1 (where R&D and application are halted), then by 2025, it will potentially lead to industrial electric energy savings of 13% in Taiwan.
- Scenario 3 If the semiconductor industry increases the development on the cumulative rate of R&D and application over the past five years and is compared with Scenario 2, by 2025, it will potentially lead to an additional 10% in Taiwan's industrial electric energy savings.

Source : ISTI

Case Study

Reduce use of NMP and Lower EHS Risks

Since 2018, TSMC has continuously reduced its use of the harmful substance, NMP. It has already completed key testing on the manufacturing process of substitutes and begun implementing these substances at each fab. Because NMP is a substance toxic for reproduction, TSMC ensures that its work environmental assessment result is far below the limit stipulated in legal restrictions. The Company

also follows best practices on protection to prevent human exposure to the chemicals. The use of NMP is avoided whenever possible during reviews of newly processed chemicals. TSMC will continue to carry out plans to reduce its use of NMP. It is expected that by 2020, NMP use will be reduced by 95%.

NMP Reduction Milestones





both increasing the country's energy efficiency and decreasing its consumption of electric energy.

More Advanced and More Energy-efficient Electronic Products

New-generation IC manufacturing technologies make circuit line widths shrink, leading to a smaller IC chip and lower product power consumption. TSMC is consistently first among dedicated foundries to provide next-generation, leading-edge technologies. The Company also provides comprehensive specialty technologies and excellent frontend and backend integration capabilities. These help customers produce more advanced, energy-saving and environmentally friendly products to minimize the environmental impact of technology progress. With TSMC's manufacturing technologies, customers can unleash their design innovations in a wide range of applications including computer, communications, consumer, industrial and other electronic products, significantly contributing to the progress in our modern society.

One remarkable example is that Broadcom achieved mass production of its industry-leading 12.8 Tbps Tomahawk® 3 Ethernet Switch Family in 2018, using TSMC's industry-leading and reliable 16nm process technology.

The Tomahawk® 3 series is the world's highest performing single-chip Ethernet switch family, while



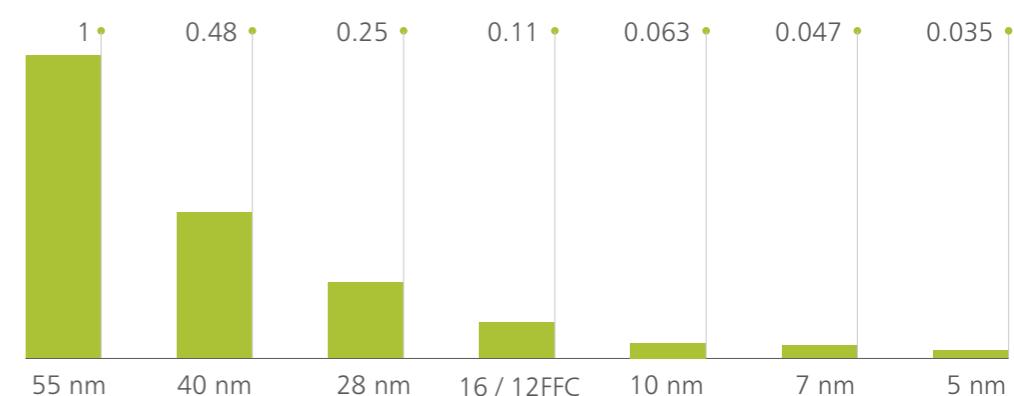
Broadcom's industry-leading Tomahawk® 3 Ethernet Switch Family, using TSMC's industry-leading 16nm technology, enables massive scale-out cloud data centers to keep up with the exponential growth in data traffic in the 5G era. (Photo courtesy of [Broadcom](#))

it significantly reduces cost per 100GbE port by 75% and power-per-100GbE port by 40% compared to existing solutions. It supports high-density and configurable interconnect, including 32x400GbE, 64x200GbE, and 128x100GbE, for massive scale-out cloud data centers. It is a key catalyst for next generation cloud networks enabling data center operators to upgrade and scale their network infrastructure in order to keep up with the exponential growth in data traffic due to booming of IoT devices, content streaming, and artificial intelligence applications in the 5G era.

Chip Die Size Cross-Technology Comparison

Die size is shrinking as line width shrinks

Source : TSMC

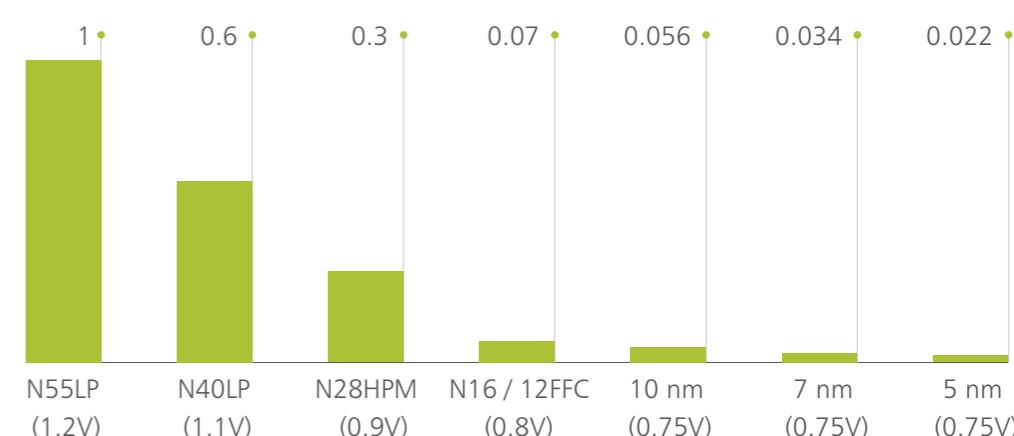


Note The logic chip / SRAM / IO (Input / Output) ratio, which affects die size and power consumption, was re-aligned.

Chip Total Power Consumption Cross-Technology Comparison

More power is saved as line width shrinks

Source : TSMC



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

Unleash Customers' Chip Innovations that Enhance Mobility and Convenience

The rapid growth of smartphones and tablets in recent years reflects people's strong demand for mobile devices and high expectation for a convenient life. TSMC is committed to unleashing customers' mobile and wireless chip innovations and has already made significant contributions.



TSMC's industry-leading 7nm FinFET technology entered volume production in the second quarter of 2018. This technology supports customers in a wide spectrum of applications including mobile devices, game consoles, artificial intelligence, central processing units, graphic processing units and networking devices. In addition, 7nm FinFET technology also set a new company record in terms of production ramp-up speed.



- New TSMC process technology helps chips achieve faster computing speeds in a smaller die area, leading to smaller form factors for 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. People can therefore use mobile devices for a longer period of time.
- 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.



Unleash Customer's Innovations to Improve Human Health and Safety

TSMC continues to enhance or develop innovative CIS (CMOS image sensor) and MEMS (micro electro mechanical systems) technologies, which are expanding from traditional sensing to machine sensing. By combining advantages of traditional sensing and machine sensing, new products using TSMC CIS and MEMS technologies can be made smaller and faster, while consuming less power, and bringing people a more convenient, healthy, and safe lifestyle.



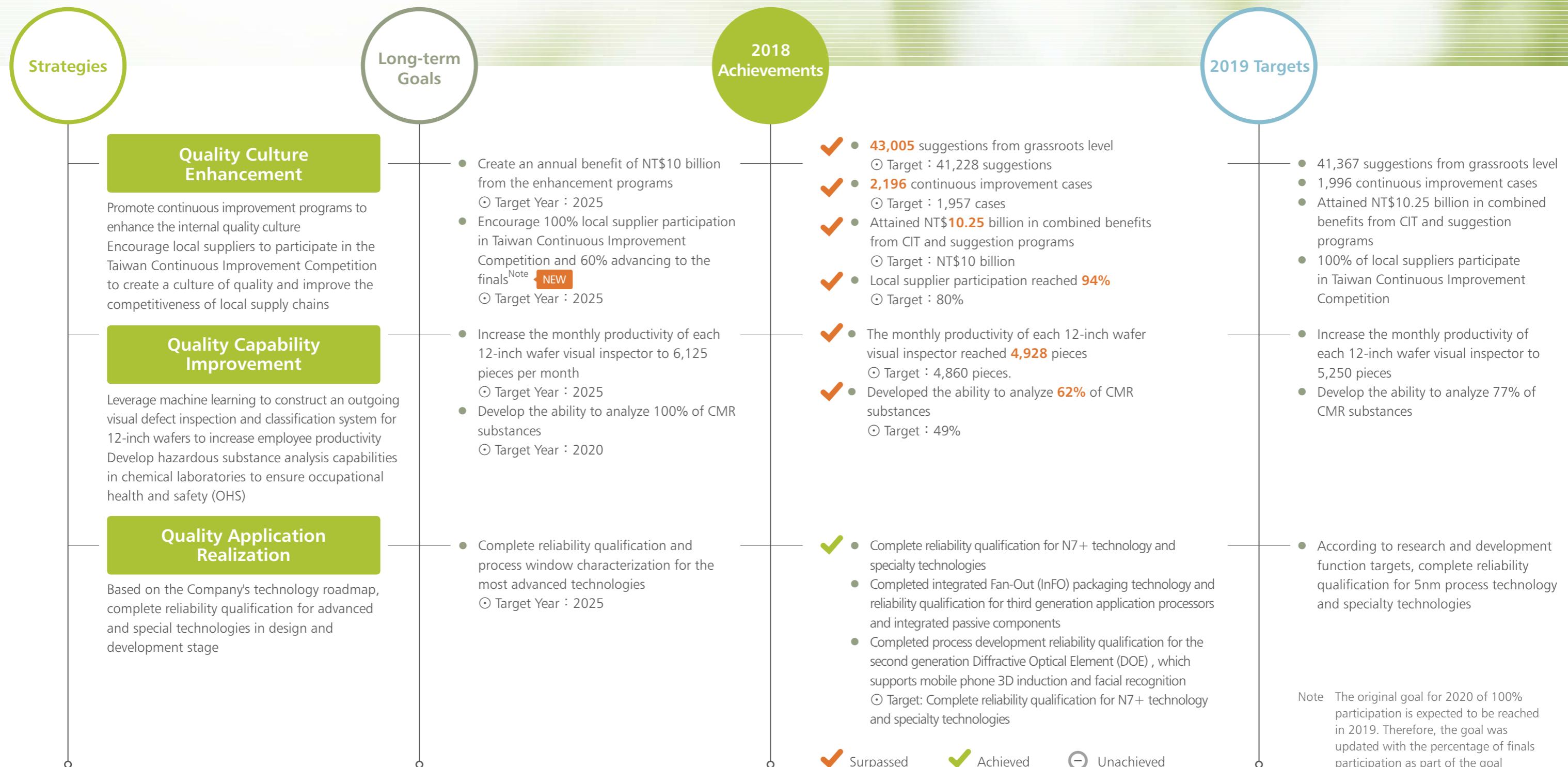
In 2018, TSMC successfully delivered the world's first CMOS-MEMS (micro-electromechanical systems) monolithic capacitive barometer, which features sensitivity to change in altitude as small as 5cm and fits in a package of slightly less than 1mm², for various system applications, including personal activity tracking and indoor navigation.

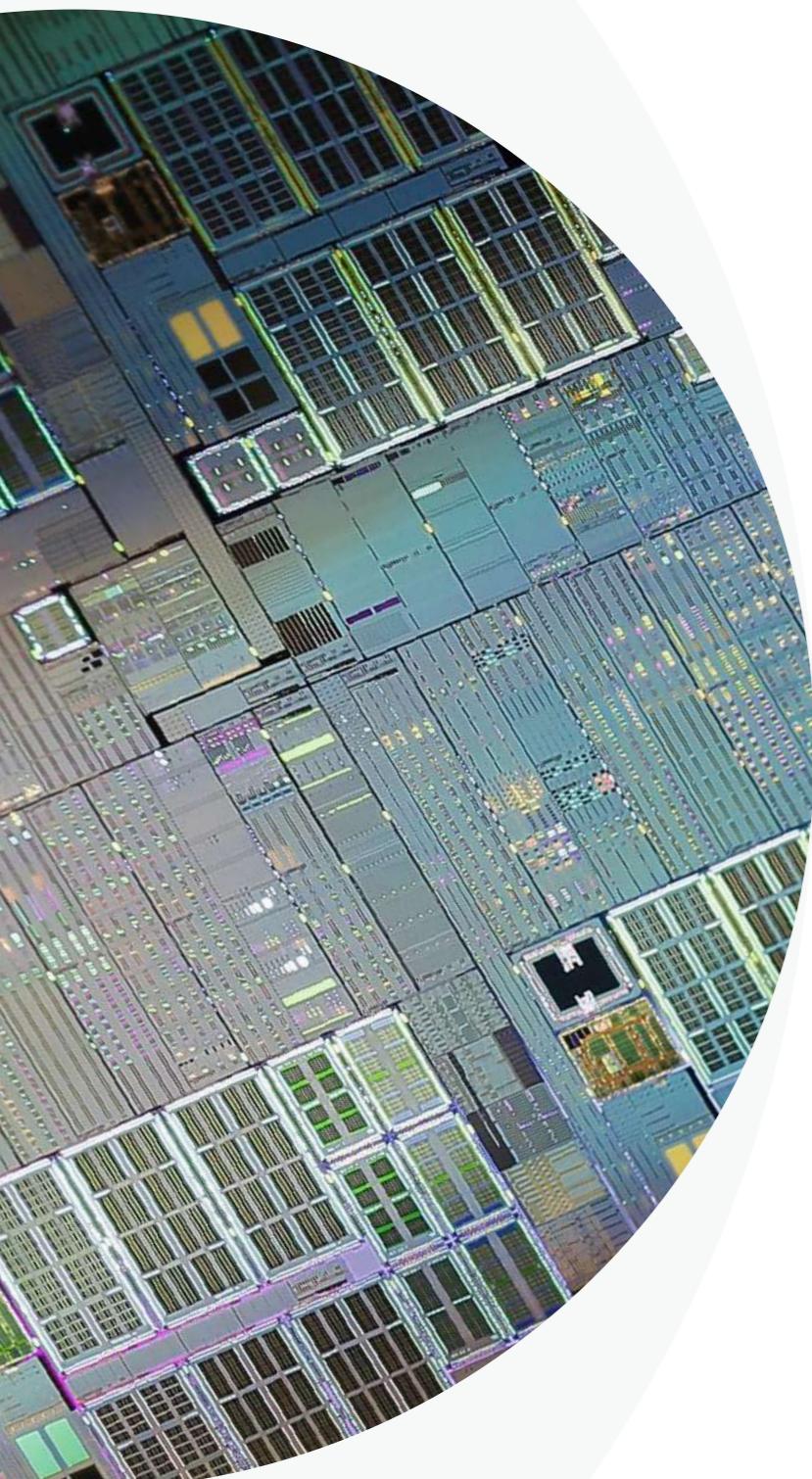


- Extend traditional sensing to machine sensing, such as NIR (near infrared), ultrasound, and micro-actuators, etc.
- Adopted for consumer electronics, smartphones and other electronic devices make our lives more convenient
- Adopted for advanced medical treatments and preventative health care applications improve human health
- Adopted for automotive electronics to improve car safety systems



Product Quality





Quality is the Key to TSMC's Sustainable Operation

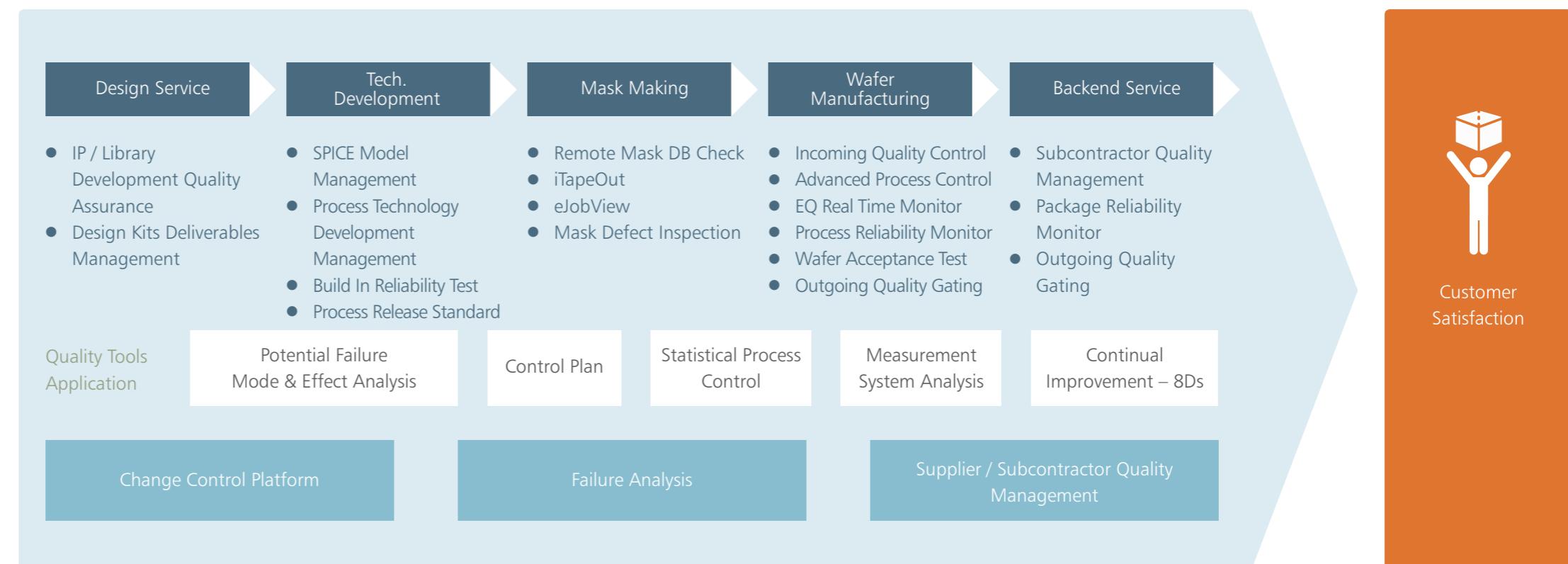
Semiconductors are the soul of electronic products. As the world's largest dedicated IC foundry, TSMC leads the advancement in semiconductor process technology and is committed to the improvement of wafer quality and reliability.

In order to provide customers with the highest quality products and services, 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 services, technology development, mask making, wafer fabrication, and back-end services. Quality tools used in the automotive industry are applied to carry out primary product quality planning and quality control in the manufacturing stage, and the 8Ds method is used for continual improvement to ensure product quality and customer satisfaction. When changes are needed in the operation process, a

cross-functional team carefully reviews the process to ensure that any changes are risk-free. Failure analyses are also conducted to find effective solutions. In addition to pursuing excellence, TSMC also promotes quality management requirements to its suppliers and subcontractors, leading partners to make continuous improvement and improve organizational health.

TSMC's Quality Management System





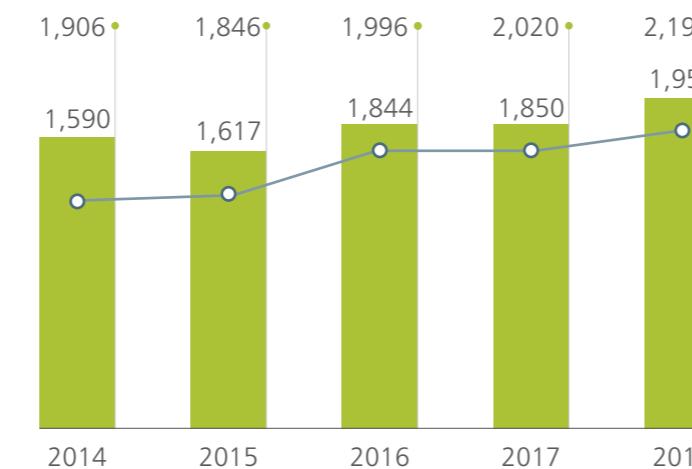
Quality Culture Enhancement

At TSMC, quality is the responsibility of each employee and also the principle that everyone should follow when doing his or her work or providing services. In addition to improving product quality, TSMC also aspires to continue increasing customer satisfaction.

To strengthen company culture, continuously improve product quality and production efficiency, reduce production costs, and to improve customer satisfaction, TSMC promotes a grassroots-level suggestion program and Continuous Improvement Team (CIT) activities throughout the Company. Following the principle of "everyone participates", the Company sets a target for improvement cases raised by both the suggestion and CIT programs based on employee numbers. TSMC then holds a Total Quality Excellence (TQE) & Innovation Conference, a company-wide event to present those improvement cases. The Company provides incentives, including cash bonuses and public recognition at the conference to encourage employees to strive for excellence, drive cross-team observation and learning, and enhance their innovative and problem-solving abilities. These programs greatly contribute to achieving a win-win situation of maintaining TSMC's competitive leadership and achieving customer satisfaction. In 2018, there were 43,005 suggestions generated from the grassroots level and 2,196 from Continuous Improvement Team activities. The benefits generated from these two improvement programs reached NT\$10.25 billion. Among them, 52% of the continuous improvement activities (1,143 cases) were related to product quality improvement.

Continuous Improvement Team (CIT) Activities

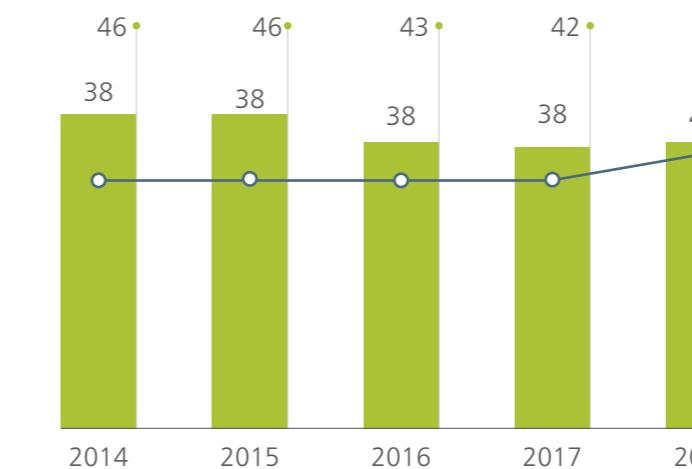
Unit: cases



█ CIT cases (actual)
—○— CIT cases (goal)

Suggestion Program

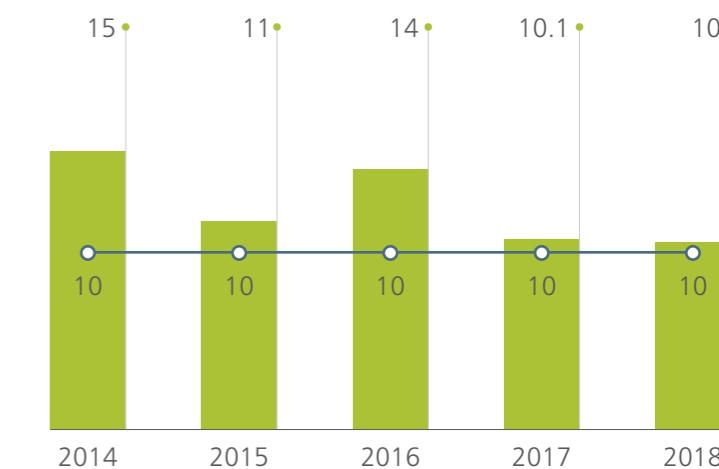
Unit: thousand



█ Suggestion cases (actual)
—○— Suggestion cases (goal)

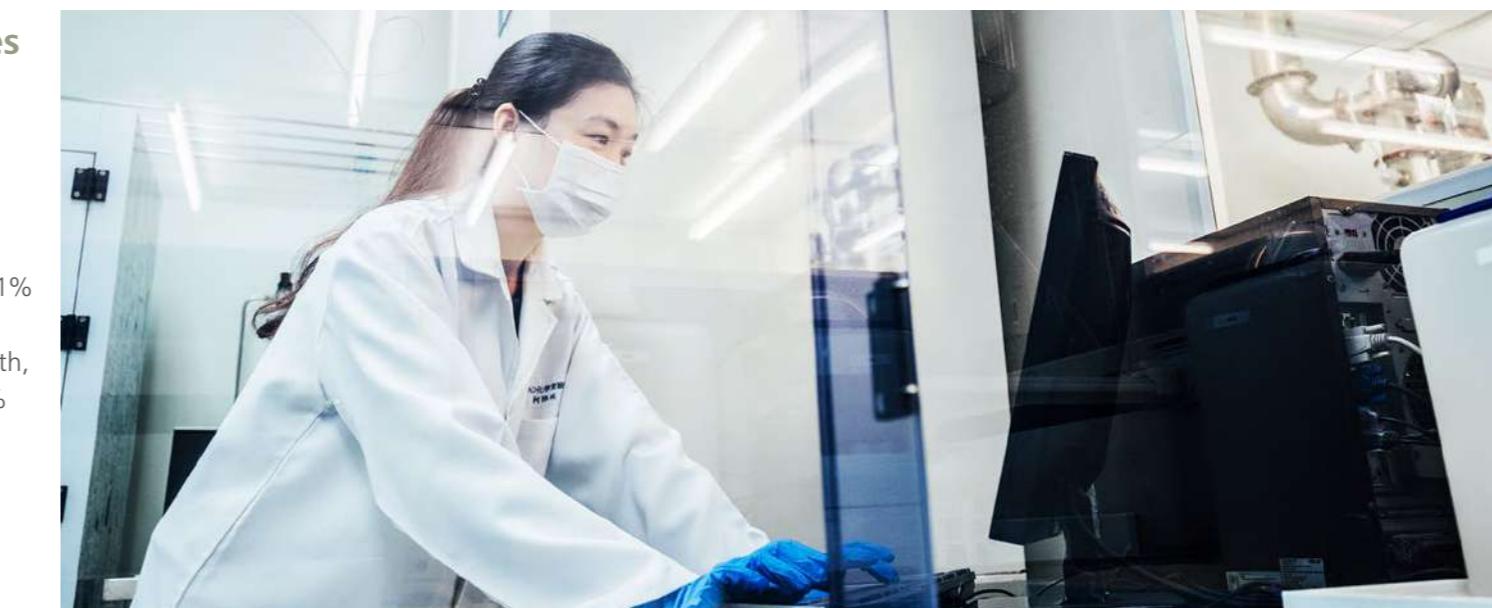
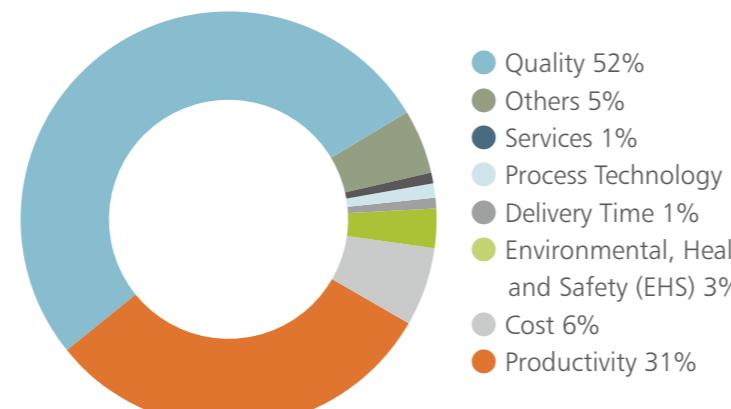
Suggestions and Continual Improvement Team Activity Benefits

Unit: NT\$ billion



█ Benefits
—○— Goal

Continuous Improvement Team Activities





Highlight Cases in the 2018 Total Quality Excellence (TQE) & Innovation Conference

Category	Case	Benefit
 Quality Improvement	Improve the manufacturing process of wiring parts, capacitance parts, and backside capacitances parts of InFO packaging	99.2% Reduce passive electronic components failure rates by 99.2%
	Improve the bonding process of Hybrid Bond CIS	91% Successfully mass produce the world's first 1.0 micron copper-copper hybrid-bonded CMOS image sensor with a yield of 91%
	Develop production technology for 7nm positive photoresist copper bump	83% Reduce product-specific defects by 83%, leading the technological industry
	Apply AI, machine learning and big data technology to solve abnormal cases of statistical process control	38.9% Reduce the number of abnormal cases in statistical process control within the processing cycle by 38.9%
 Customer Satisfaction	Improve 22nm ultra-low power process technology of Random Telegraph Signal (RTS) in CMOS	50% Reduce customer chip sizes by 50%
	Optimize Poly Rs correction algorithm for 40nm low power process technology	1 Enable customer successfully launch the world's first anti-noise Bluetooth chip
 EHS	Design and develop the Frame Auto Cleaner	14.6 Save 14.6 metric tons of chemical use annually

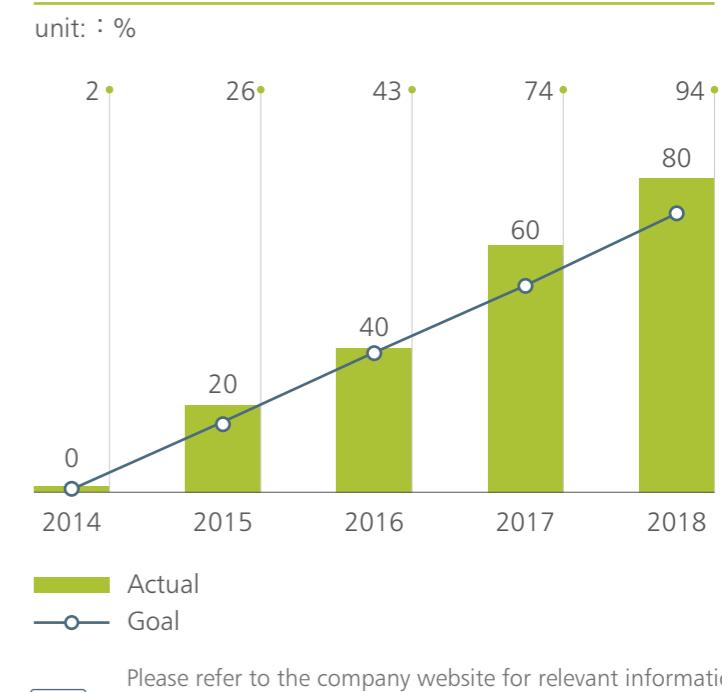


TSMC participated in 2018 Taiwan Continuous Improvement Competition

In addition to internal cross-function-team learning and exchange, TSMC shares its experience with other industries through the Taiwan Continuous Improvement Competition. The Company hopes to drive the development of other local industries through experience sharing, and observe the improvement methods of other industries to enhance the problem-solving and innovation ability of its employees. In 2018, TSMC's outstanding performance was awarded with four Gold Awards, one Silver Award and two Best Improvement and Innovation Awards.

In addition to strengthening the culture of quality at TSMC, the Quality and Reliability function asked local raw material suppliers to participate in the Taiwan Continuous Improvement Competition to continuously enhance performance, to promote a culture of quality and abilities among them, and to commit to a win-win situation locally. In 2018, the proportion of TSMC's local raw material suppliers in the Taiwan Continuous Improvement Competition reached 94%, and a supplier also won its first Gold Award.

The Percentage of TSMC Suppliers participating in the Taiwan Continuous Improvement Competition



Please refer to the company website for relevant information on TSMC Suppliers whom have participated in the Taiwan Continuous Improvement Competition



Participating TSMC Cases in 2018 Taiwan Continuous Improvement Competition

Case	Benefit	Award
Construct a machine maintenance automatic scheduling system, global scheduling system and an intelligent information center	<ul style="list-style-type: none"> Increased employee productivity by 49%, with a total benefit of NT\$670 million 	 Total benefit of NT\$670 million
Develop 10nm wafer probe cards and automatic needle implanters	<ul style="list-style-type: none"> 9 time increase in the production capacity of needle implanting 80% reduction of the production cycle of probe head and needle implanting 47% reduction in the cost of each probe card, resulting in a total benefit of NT\$389 million 	 Total benefit of NT\$389 million
Develop Near-InfraRed (NIR) sensor special structure process technology	<ul style="list-style-type: none"> 3 time improvement of sensor quantum efficiency; helped customers win the annual new products award 	 Helped customers win the annual new products award
Improve old piping and management system	<ul style="list-style-type: none"> Reduce the number of abnormal pipeline leakage to 0 per season, and reduce the cost of pipeline maintenance downtime by NT\$9.4 billion 	 Reduce the cost of pipeline maintenance downtime by NT\$9.4 Billion
Improve AI defect image recognition systems	<ul style="list-style-type: none"> 76% improvement of the Defect Wrong Label Rate 75% shorter defect learning time 46% defect detection time saved, with a total benefit of NT\$121 million 	 Total benefit of NT\$121 million

With the development of semiconductor technology and changes in product trends, customers keep increasing their quality requirements and expectations. The enhancement of employee's quality awareness has become crucial. In 2018, Quality and Reliability function cooperated with Fab Operation function and HR function to hold Quality Excellence^{Note} training courses for the employees at fabs in Taiwan, Shanghai, and Nanjing. Through concept promotion, mindset establishment, cases study, and improvement

techniques, TSMC strengthens the employee's attitude on pursuing technical excellence and exemplary quality, and carrying out the belief of "Best Tech, Best Quality, and the Best for Customers." In 2019, the Quality and Reliability function will regularly promote the concept of quality with cases, and add a "Stop & Fix" competition group to the Total Quality Excellence (TQE) & Innovation Conference to enhance quality awareness and develop skills for employee to prevent quality abnormalities.

Note For details of the training course of Quality Excellence, please refer to [Talent Development](#)



Automatic Needle Implanter



Quality Capability Enhancement

In the process of technology development, it is crucial to establish effective measurement methods to reduce variation. In 2018, the Quality and Reliability function collaborated with metrology experts in the R&D function to propose Hybrid Metrology, an analysis strategy for complex three-dimensional nanostructures. By using a variety of chemical analysis and physical measurement techniques, the demand for nano- and atomic-level feature analysis was fulfilled. Now the Hybrid Metrology analysis method has been applied towards the development of 5nm technology, and will be extended to the research and development of 3nm and specialty technologies. The analytical capabilities of 2nm Ultra-thin Film crystal structure has been completed, and the productivity of transmission electron microscopes has been enhanced by 15 percent — enough to support the research and development of 5nm and 7nm technologies.

In addition, in order to continue reducing product defects, improve process control, detect anomalies early on, and prevent quality incidents from affecting customers, the Quality and Reliability function and Fab Operation function are collaborating in a joint effort to apply advanced statistical techniques and quality tools towards the creation of an immediate defense system. By utilizing machine learning methods and the use of advanced spectral analysis, differences among processes and equipment were detected, immediately triggering improvement actions. An outgoing visual

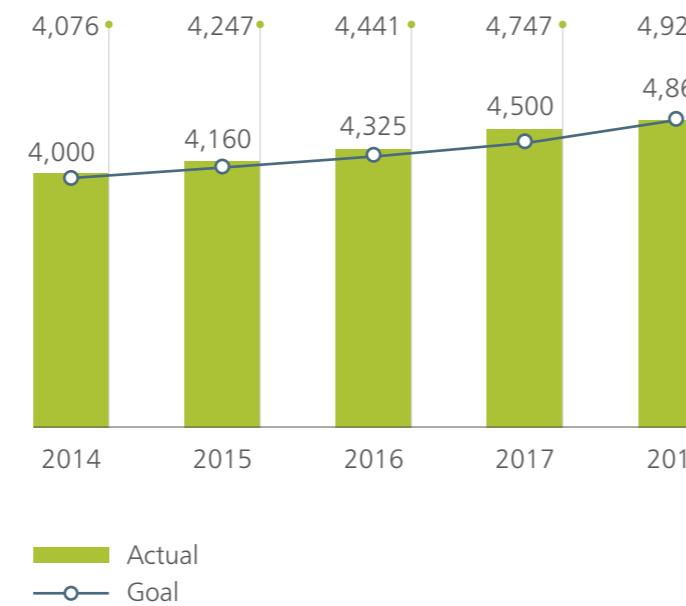
defect inspection and classification system for 12-inch wafers was established to refine the consistency of visual inspections. In 2018, the productivity of each 12-inch wafer visual inspector had increased to 4,928 per month.

The Quality and Reliability function, in collaboration with the ESH Division, has classified the current suspect materials by their risk and established a sampling plan for testing. To control and manage new materials,

in addition to requiring suppliers to declare whether the provided materials contain hazardous substances, sampling tests are also carried out to ensure that their declarations are accurate. In 2018, the Quality and Reliability function further strengthened the ability of chemical laboratories to analyze suspicious substances. 62% of the substances have been analyzed for CMR effects.

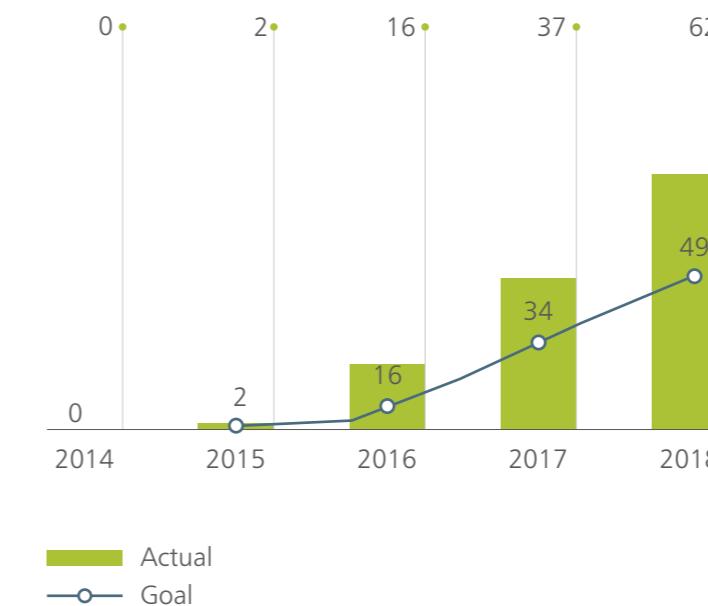
The Productivity of Each 12-inch Wafer Visual Inspector

Unit:Wafer Quantity



Materials tested for CMR substances

Unit:%





Apart from meeting customer needs, pursuing customer satisfaction, and creating customer value, environmental sustainability should also be taken into consideration with product quality to ensure ecological stability and sustainable development. To conform to EU regulations and customer requirements on green products, TSMC has adopted the Hazardous Substance Process Management System IECQ QC 080000, developed by the Quality Assessment System for Electronic Components of International Electrotechnical Commission, and integrated it with the Automotive Quality Management System, IATF 16949 to establish hazardous substance management requirements in the stages of design and development, raw material procurement, supply chain management, and processing control. In 2018, through third-party auditing and certification, TSMC ensured that its hazardous substances management system and quality management system meet the requirements of IECQ QC 080000 and IATF 16949. Moreover, the products produced by TSMC are sampled and tested by a third-party external laboratory and comply with EU regulations and customers' requirements.

Quality Application Realization

To provide excellent and reliable product quality, timely delivery for customers, ensure the safety of consumers and product applications, and prevent mass product recalls, the Quality and Reliability function helps customers to design high-quality products in the technology development and product design stage. TSMC has also implemented automotive quality improvement projects to meet the requirements of low Defect Parts Per Million (DPPM) for automotive customers.

In 2018, the Quality and Reliability function cooperated with the R&D function to complete quality and reliability qualifications of advanced logic 7nm-enhanced technology (the third-generation Fin Field-effect transistor), the third-generation application processor and InFO packaging technology of Integrated Passive Components, and the second-generation Diffractive Optical Element (DOE) of 3D sensor and facial recognition on mobile phones. Additionally, the Quality and Reliability function has worked with the Fab Operation function to further tighten process controls, wafer acceptance test, and maverick wafer handling of automotive products. With these measures, TSMC did not have any massive product recalls in 2018.

Case Study

First in the World – The Successful Framework Development of an Automatic Cleaning Machine

To encourage colleagues to continuously improve environmental sustainability, TSMC has added the ESH group to the in the Total Quality Excellence (TQE) & Innovation Conference so colleagues may explore improvement opportunities in daily business and take initiative to propose and implement countermeasures.

In 2018, the Advanced Packaging Technology and Service function improved the frame cleaning operation, which requires the use of large amounts of chemicals, and successfully developed the Frame Auto Cleaner. The cleaner not only replaces chemical substances with pure water, but also automates the entire process, effectively improving production capacity and yield rate. This improvement proposal is the first of its kind, and was awarded the TQE gold medal in 2018.

Before improvement

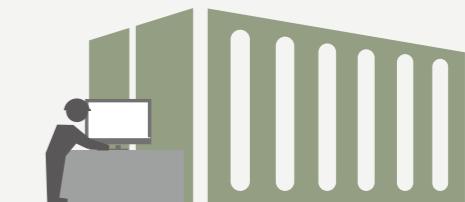
Manually remove the frame label with a cutter, clean residue and dirt with an acid-base solvent or organic solvent



Manually clean frames with a cutter

After improvement

Use a mechanical roller to remove the frame label, tape and dirt, and use pure water for automatic cleaning



Automatic cleaning machine for frames

14.6 Saves 14.6 metric tons of chemical use per year

77% Improves productivity and yield rate by 77%

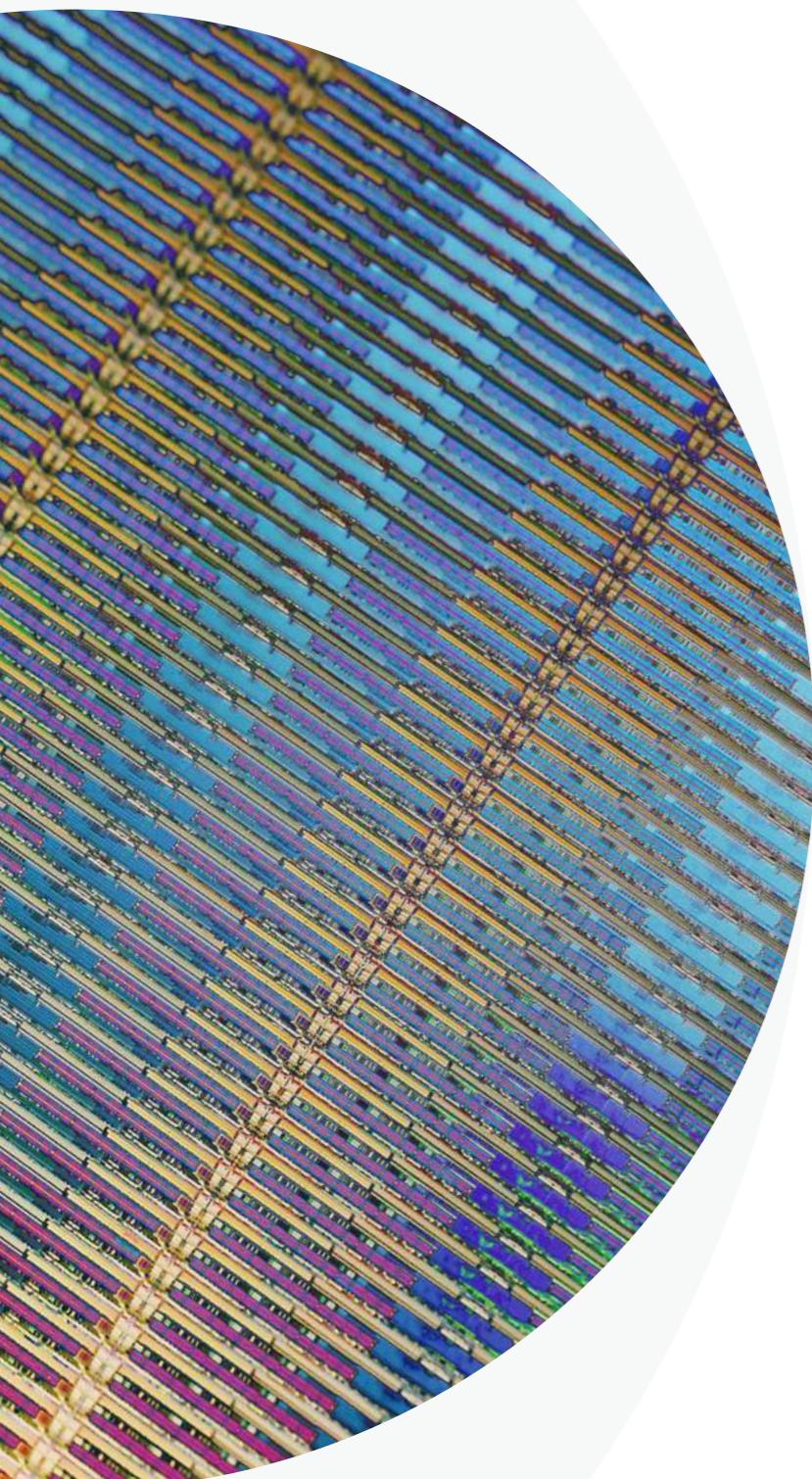


Please refer to [Quality and Reliability](#) in the TSMC annual report for more details



Customer Service





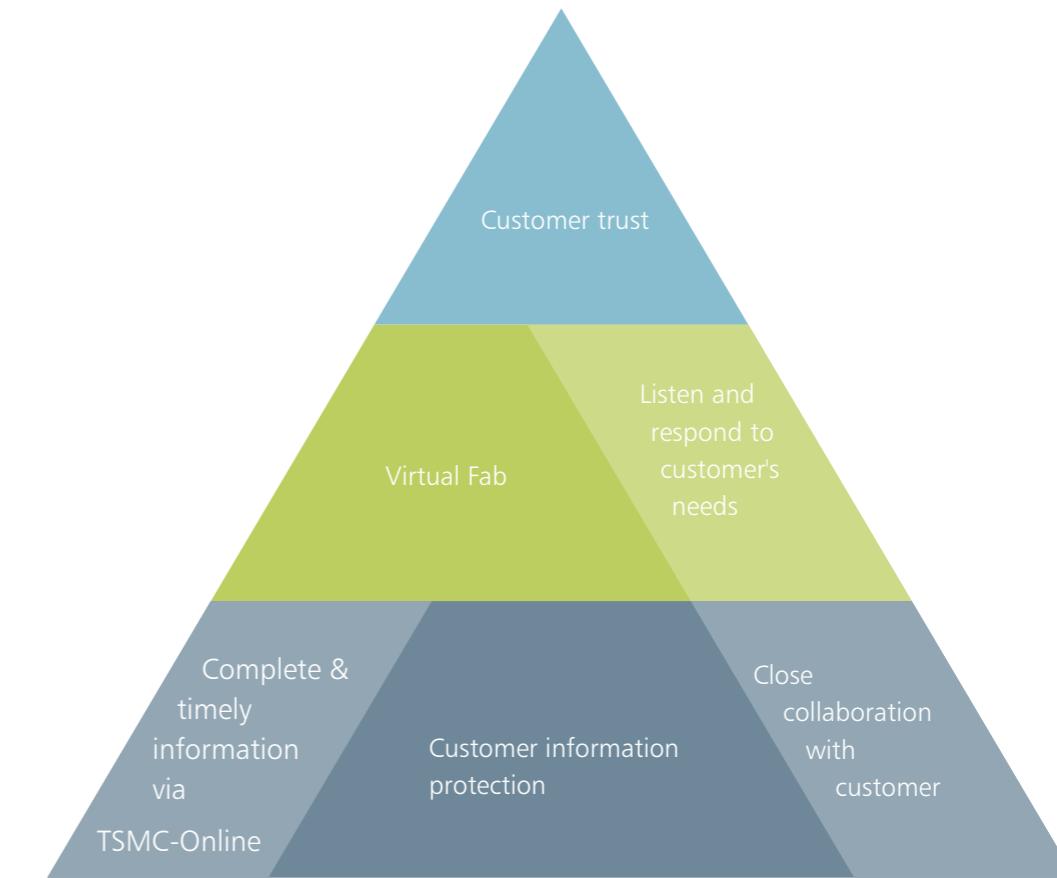
Providing Customers the Highest Standard of Service

TSMC aims to help customers achieve success and become their trusted business partner. To provide the best service to customers, TSMC has established a customer service team dedicated to both serving as a communication portal and providing world-class service in every stage of production, including design, mask making, wafer manufacturing and processing, and testing. TSMC also commits to protecting customers' confidential with the highest standards.

Precise Response to Customer Needs

In order to assess and satisfy the needs of its customers, TSMC conducts quarterly business and technology reviews, as well as annual customer satisfaction surveys with its major customers. Customers can then utilize these channels to provide feedback to TSMC on the performance of company technology, quality, yield rate, design assistance, manufacturing, customer service, and additional expectations for the future. The quarterly review consists of six areas: technology, quality, yield rate, design, manufacturing, and customer service. These reviews are conducted by both TSMC customer service teams and customers. The annual customer satisfaction survey covers behavior, impression and execution, and is conducted by neutral third-party consulting firms through interviews or online questionnaires. TSMC considers its customer feedback and opinions as the cornerstone to developing a good customer relationship. Improvement plans and schedules are reviewed on a regular basis. Due

The Customer Service Strategy Pyramid



to the enhancement of procedural and information transparency in 2018, quarterly reviews show that 74% of customers were satisfied with TSMC's service performance — a 3 percentage point increase from the previous year. According to the annual customer satisfaction survey, TSMC received a high score of 93%, thereby maintaining its high-quality ratings of 90% and above. In 2018, TSMC continued to strive for product quality excellence by launching a series of training programs to ensure all employees adhere to TSMC's values of "Best Technology, Best Quality, and the Best for Customers."

These initiatives have strengthened TSMC's image and reputation with quality excellence. Furthermore, in line with its technology roadmap, TSMC now provides customers with over 700 types of available manufacturing and processing technology. In an ever-changing market, TSMC's close collaboration and interaction with customers helps the Company greatly satisfy its customers with advanced technology, manufacturing excellence, and high-quality service.

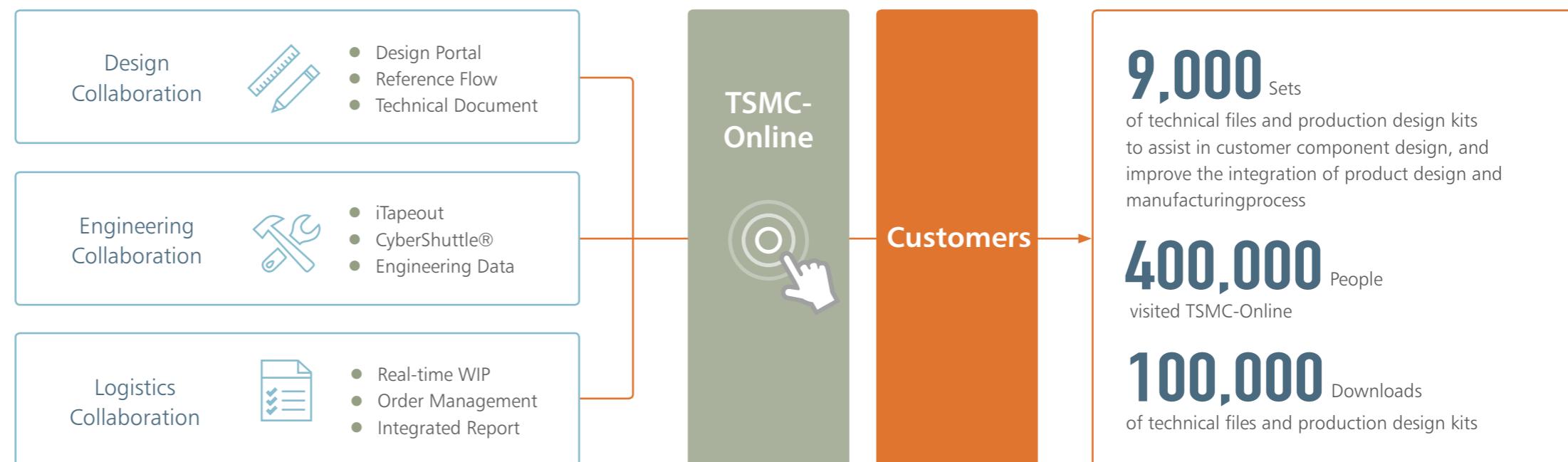


Customers' Virtual Fab

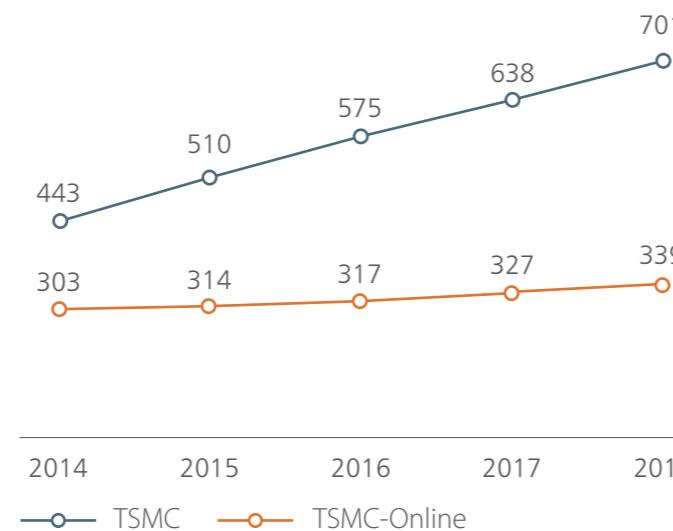
Customer trust is one of TSMC's core values, which is also the primary reason why customers choose TSMC as their foundry service provider. The key factors to build customer trust are instant communication and information update, and thorough protection of customer's confidential information.

For instant communication and information update, TSMC- Online, a system dedicated to providing design, engineering and integrated logistical services, allows customers to have 24 / 7 access to critical information. The system also provides customized statements based on each customer's management focus and needs in order to improve customers' wafer management efficiency. With TSMC-Online, customer has full access to monitor and manage its own product and manufacturing information. Based on the online system, TSMC provides customers with transparent and comprehensive wafer manufacturing and processing services, and assists them to achieve their product success.

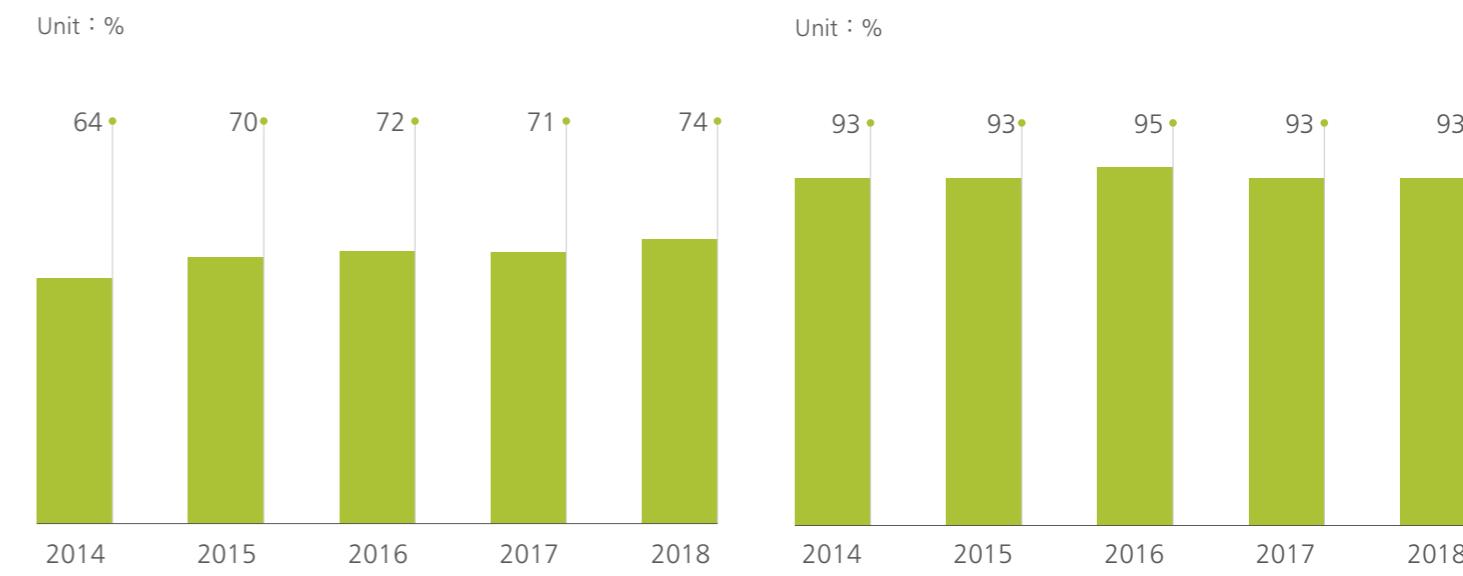
To protect customer's confidential information, TSMC promises to guarantee the interests of its customers. To serve as a customer's "virtual fab," TSMC holds the highest standard to protect its customers by implementing a special safety monitoring mechanism throughout the whole production process with annual audits of all control points.



Types of Technology for Customer for Manufacturing Use



Quarterly Business Review (QBR) Customer Service Satisfaction



Annual Customer Satisfaction



In response to customer requirements, TSMC helped customers received ISO 15408 certification for different types of high-security chip products in 2018, which comprises of product certification and site certification. To avoid any redundancy in the product certification process, TSMC applied for site certification for certain foundries in the same year. Foundry certification represents the foundry service with high safety standards in both product and confidential information protection. With this certification, the service provider can accept manufacturing orders for high-security products a safe IC product manufacturer. TSMC aims to pass all annual inspections of customer products and information protection, enhancing the trust and partnership between TSMC and its customers.

TSMC firmly believes the key factors to maintain a long-lasting customer satisfaction are constant innovation and high-quality products and services. Good customer satisfaction allows TSMC to better retain existing customers, attract new customers, and strengthen the customer relationships. That's also how to generate long-term profits for the Company. In 2018, TSMC utilized 261 types of technology to produce 10,436 products for 481 customers, which contained a total of 10.8 million 12-inch equivalent wafers. In the future, TSMC will continue to be a trusted technology provider, manufacturer, and reliable business partner in the global semiconductor industry.



Customer recognition of TSMC's excellence in customer service

Case Study

All-in-One Wafer in Process Report

In 2018, TSMC analyzed reports and information queries on customer's wafer processing through TSMC-Online. These analytical data was then compiled and then successfully launched as the "All-in-One Wafer in Process Report." Compared to the previous process, this new report provides with the completed wafer information from each stage of processing for customers to access, including new product trial run, order reports, and WIP status. In addition, the report is well customizable to match each customer's needs. All the useful information provided in this innovative report can be accessed with 50% less clicks, and it takes only 5 minutes to generate the customized report compared to several days in the past, which greatly increased overall efficiency and convenience to satisfy customer's needs on every stage of production process.

↑ 50% Easier Access to Information → 5 Mins Less Time to Customize Reports

Original Process



Manual Information Collection
into
Process Reports





Proprietary Information Protection



Proprietary Information Protection is TSMC's commitment to its customers, shareholders and employees. Proprietary information protection plays an important role in maintaining TSMC's leadership in the semiconductor industry. TSMC intellectual property, trade secrets and nonpublic proprietary information are well protected for the best interest of employees, customers, vendors, shareholders, and TSMC.



Strategy and Tactics

Proprietary Information Protection (PIP) is one of the Company's important business strategies. The Company maintains a Proprietary Information Protection Division (PIPD) with a primary focus of defining proprietary information protection and management guidelines, including proprietary information labeling management, access privilege authorization, training and compliance to protect TSMC information, TSMC subsidiary information and information used between TSMC and any other third parties. With resilient and agile improvements and constant communications, the awareness of Proprietary Information Protection has been greatly raised among employees, vendors and

other third parties, while information breach risks have been mitigated. Additionally, with security risk analysis by security experts, the potential risks and threats of information leakage are identified; the appropriate countermeasures and practices are developed to achieve the goal of effectively protecting confidential information at TSMC.

Diverse PIP Training and Promotions

Through continuous education, training and communication on a regular basis, TSMC keeps increasing the recognition of confidential information protection among employees and suppliers to ensure their compliance with the related regulations. The

Company also continuously enhances its proprietary information protection capability through planning, execution, verification and actions.

In order to strengthen the concept and awareness of all employees on confidential information protection, the Proprietary Information Protection Division has systematically assisted employees to understand the Company's confidential information protection policy in 2018.

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17 Regulations

Revised 17 Proprietary Information Protection regulations

46,000 Employees

Over 46,000 employees have completed Proprietary Information Protection annual refresh e-learning course. Course content:

- PIP policy and core concepts
- PIP milestones and new regulations in 2018
- PIP violation case studies and reminders
- PIP information channels

100%

Over 2,100 newcomers completed Proprietary Information Protection training courses

100%

Over 25,000 new vendors have completed Proprietary Information Protection training courses

Note 2018 Proprietary Information Protection applied to TSMC facilities in Taiwan, TSMC (China) and TSMC (Nanjing).

9 PIP Micro-Films

Produced 9 PIP micro-films to address PIP major concepts effectively

30 PIP Posters

Produced 30 PIP promotion posters to raise PIP awareness

95 Points

95 points average score for employees PIP engagement

- Conducted PIP engagement survey for all employees: collected over 40,000 surveys with over 85% response rate. Survey result shows significant PIP engagement with 95 points

2 Fab certified for ISO 15408

F14A and 14B were successfully certified by the German Federal Office for Information Security (BSI) for ISO15408 EAL6 site certification and qualified to accept security IC orders for higher security product manufacturing.

4 Customer Security Audits

Assisted 4 customers to pass security audits and achieve certification, ensuring product information protection during the whole production process

3 Million Checks

3 million PIP checks conducted per month, including:

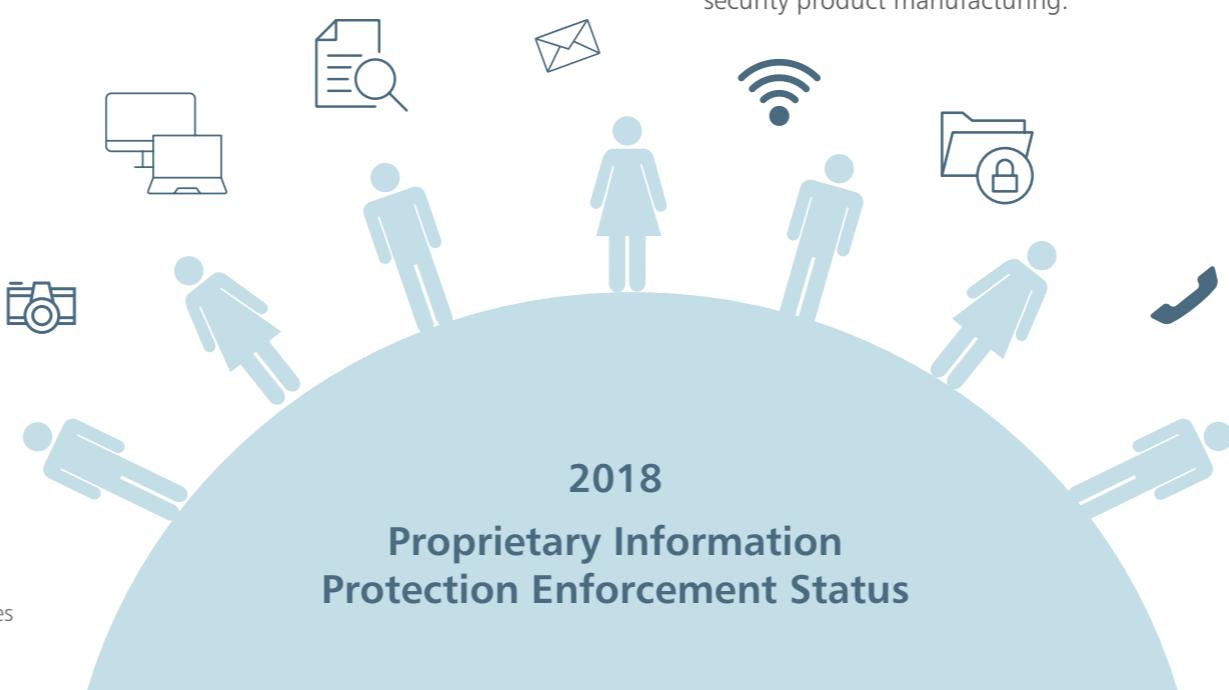
- PIP contrabands
- Fab premises access privilege compliance
- Proprietary information use
- E-mail use
- Vendor PIP compliances checks

1.1%

Employee PIP violation rate: 1.1%

Cause: individual negligence or failure to comply with PIP procedures. Continuing corrective actions:

- Reinforce PIP promotions and training through multiple channels
- Information access control for assigned employees
- Document printing, storage and access management

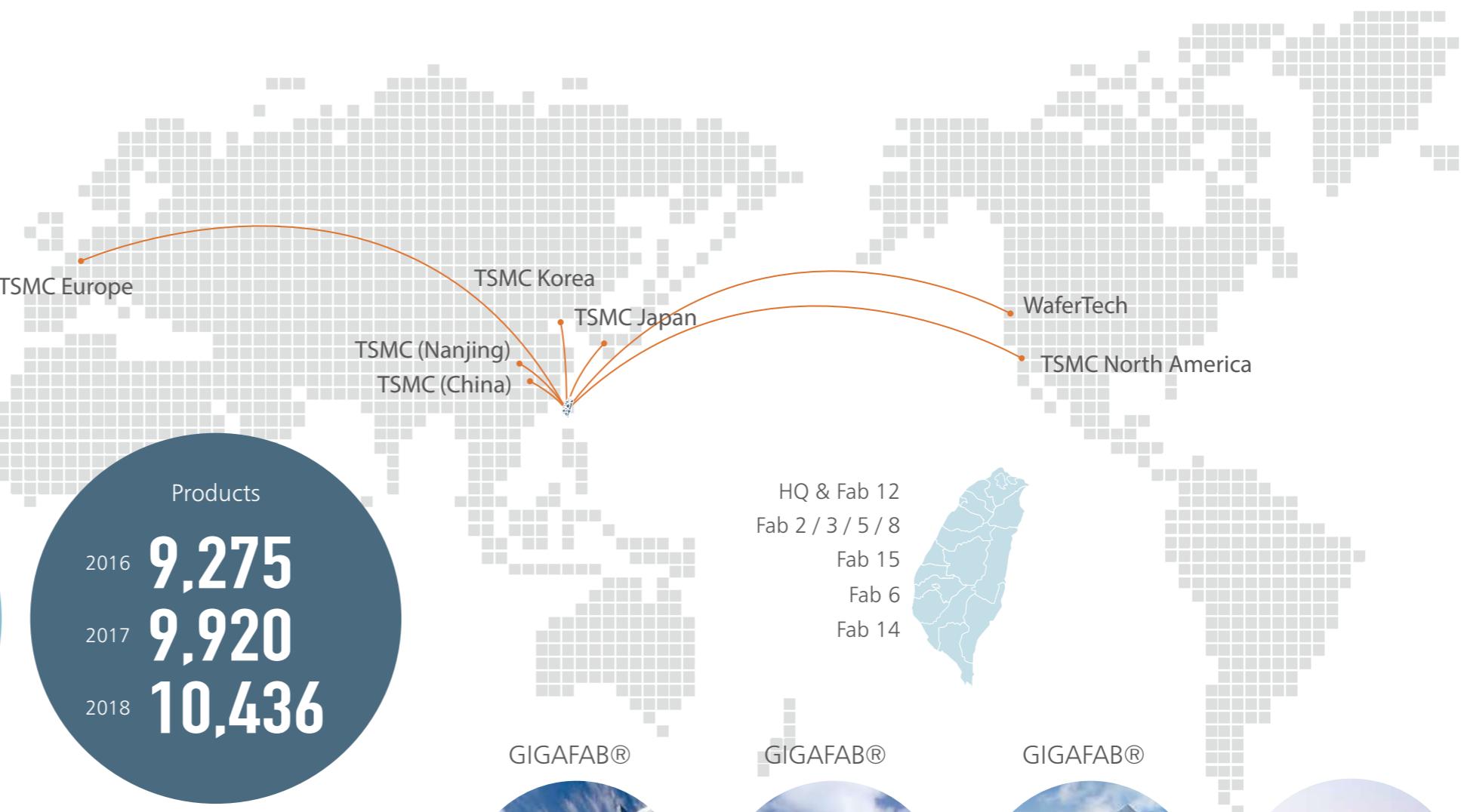




TSMC Delivers Unrivalled Manufacturing Flexibility

10.8 million

Total wafer shipments increased 2.9% from 2017 to reach 10.8 million 12-inch equivalent wafers.



Fab 2



Fab 3



Fab 5



Fab 6



Fab 8



TSMC (China)



WaferTech



Fab 12



Fab 14



Fab 15



TSMC (Nanjing)

● 30
● 77
● 1,204

● 70
● 153
● 1,377

● 23
● 46
● 291

● 59
● 139
● 901

● 47
● 177
● 1,731

● 45
● 140
● 942

● 23
● 31
● 435

● 60
● 126
● 1,034

● 69
● 196
● 1,823

● 15
● 107
● 941

● 4
● 5
● 13



Focus 3

Responsible Supply Chain

A Responsible Purchaser

As the world's largest dedicated IC foundry, TSMC actively seeks to use its influence as an industry leader in encouraging upstream and downstream suppliers to seek advancements in technology, quality, delivery, environment, human rights, safety, and health. TSMC is committed to building a world-class green semiconductor supply chain.

Supplier Sustainability Management

100%

100% of first-tier suppliers signed the Supplier Code of Conduct, the Guidance on Supplier Business Conduct, and the Self-Assessment Questionnaire

100%

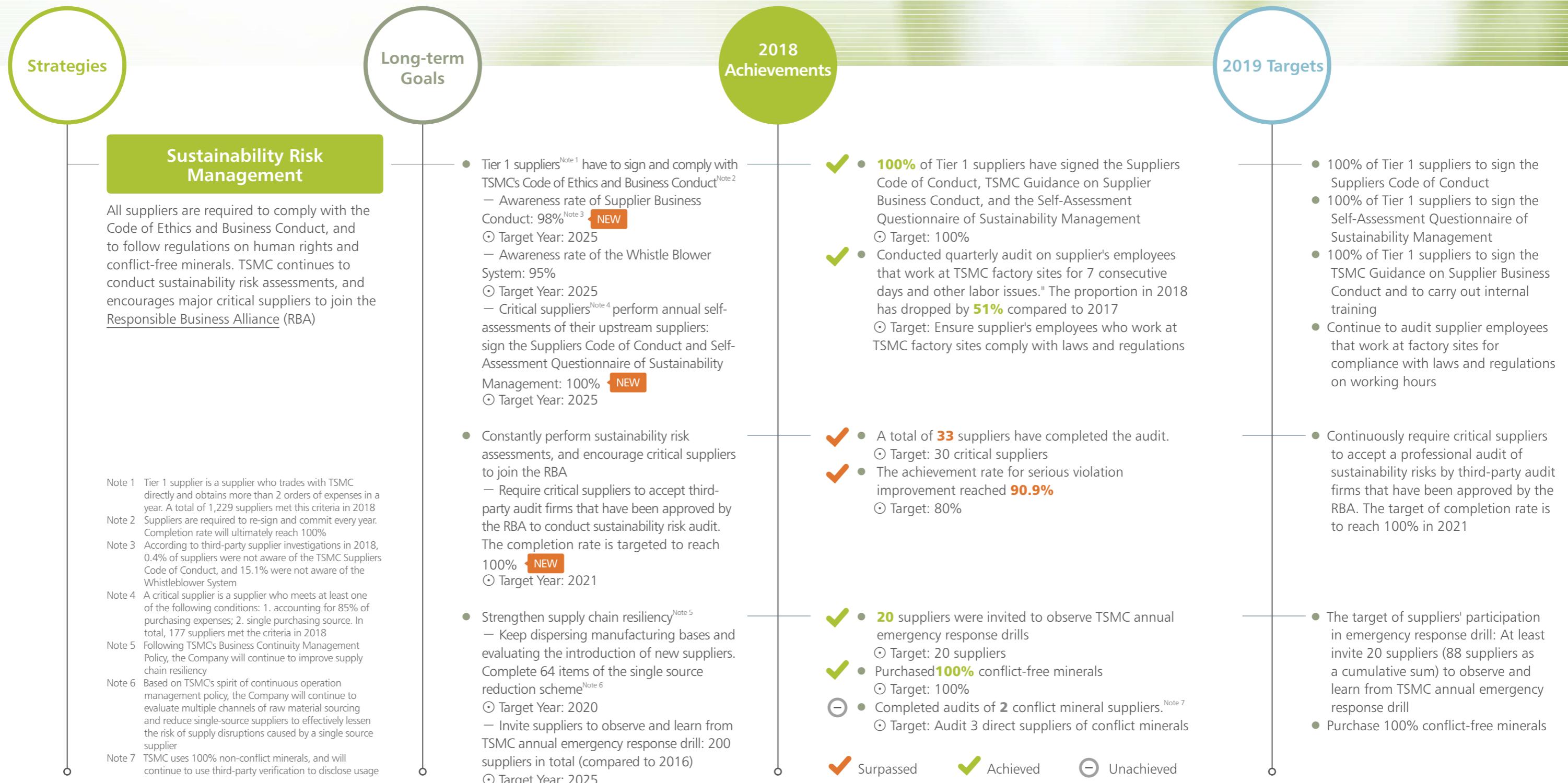
100% of suppliers have requested their direct suppliers to conduct self-assessments and sign the Guidance on Supplier Business Conduct and the Self-Assessment Questionnaire

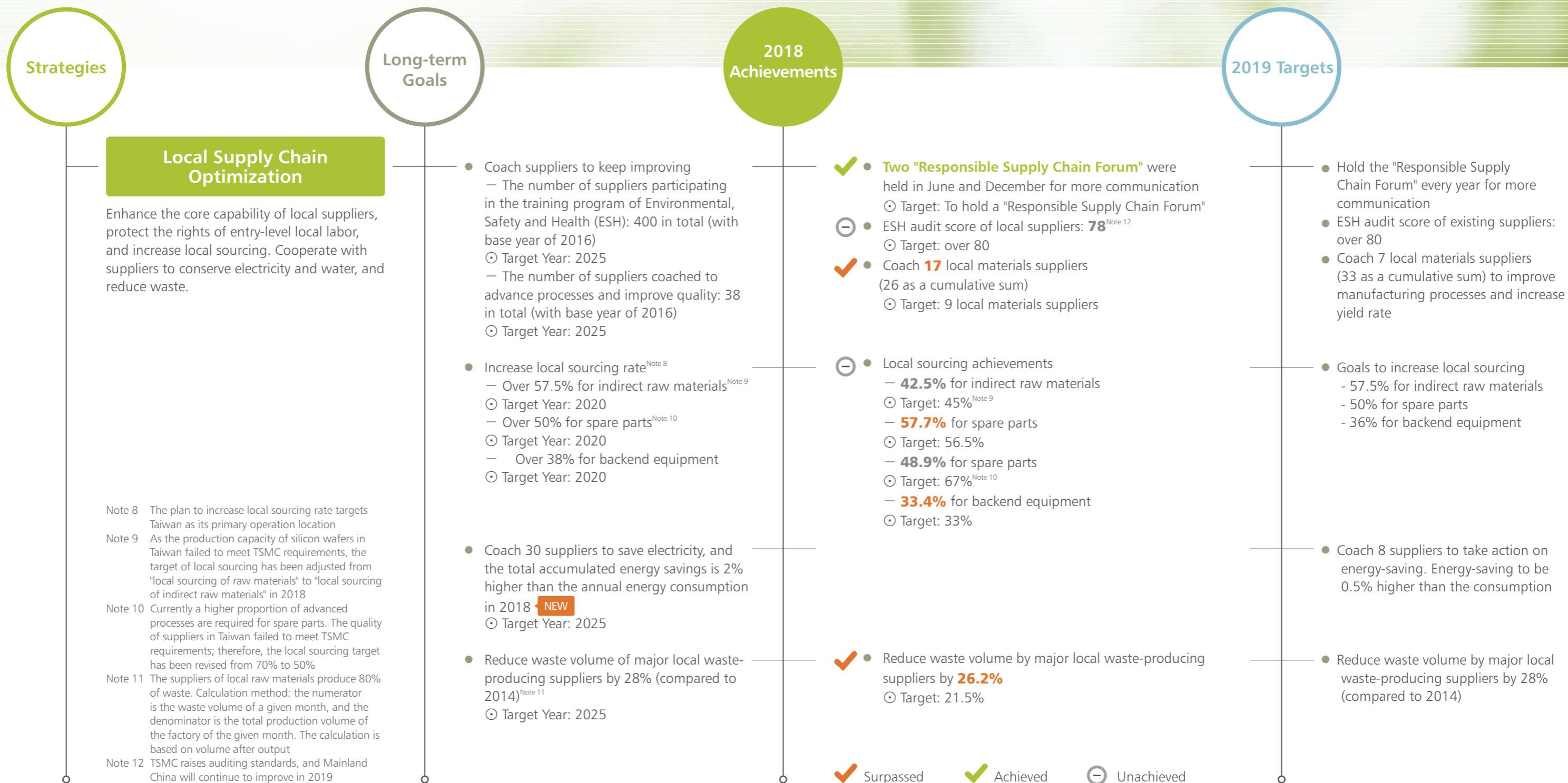
100%

100% of commodities purchased are DRC conflict-free



Supplier Sustainability Management







Guiding Suppliers to Continuously Strive for Sustainability

TSMC is dedicated to driving a positive cycle in the industry and supply chain, and actively seeks collaboration with supplier partners. The Company contributes to the sustainable development of the supply chain to ensure a safe work environment, labor relations with respect and dignity, operation in line with code of ethics, and to facilitate environmental protection. TSMC has proposed two policies -- Sustainability Risk Management, and Local Supply Optimization -- and four guiding principles -- Code Compliance, Risk Assessment, Audit Participation and Consistent Improvement -- as a fulfillment of the Company's commitment on a responsible supply chain through concrete actions. The Company leads supplier partners to continuously improve their sustainability on environmental protection, and social and economic development. The partners are required to build connections with their upstream suppliers, contractors and service providers to take initiatives on sustainability management. TSMC strives to further enhance the supply chain of the semiconductor industry, expand its overall influence, and achieve its sustainability goals.

The Four Guiding Principles of Supply Chain Management

TSMC considers sustainable supply chain development as one of the most important corporate social responsibilities. Following four guiding principles, the Company and its supplier partners continuously exchange experience, improve action plans, implement responsible supply chain management, and drive the semiconductor industry and sustainable supply chain into a positive cycle.





Implementation of Responsible Supply Chain Management

Code Compliance

TSMC pays attention to managing critical suppliers and Tier 1 suppliers. In 2018, the Company achieved its goal of having two regulatory documents, the "Code of Ethics" and "Supplier Code of Conduct," signed by 100% of (over 1,200) Tier 1 suppliers, ensuring all supplier partners understand TSMC's specific requirements toward a responsible supply chain. The Company also requires new suppliers to abide by all regulations and rules on being a part of a sustainable supply chain. It is necessary for suppliers to sign the Supplier Code of Conduct and keep their commitment towards achieving sustainable development goals. They also need to receive TSMC's risk assessment and regular auditing.

Overview of Suppliers Code Compliance and Management in 2018



TSMC's New Supplier Risk Assessment



Risk Assessment

TSMC continues to conduct Tier 1 supplier risk assessments through four major assessment methods, including SAQ^{Note}, on-site audit, serious violation assessments, and high-risk suppliers identification by TSMC's team of experts. 100% of the high-risk suppliers had completed on-site audit in 2018. The Company uses a tracking system called Corrective Action Request (CAR) (+) to make sure that any supplier violations found through audit will be properly improved, to understand current supplier's performance, and to completely control supply chain sustainability risks. Currently, TSMC conducts supplier risk assessments and audit in accordance to RBA regulatory standards.

Supplier Risk Management Process



2018 Risk Assessment Results

Suppliers Assessed	Assessment Methods	Assessment Results
Tier 1 Suppliers		1,229 SAQ+on-site audit+serious violation assessments+TSMC team of experts' identification of high-risk suppliers
		113 high-risk suppliers

Note In 2018, TSMC sent SAQ to its Tier 1 suppliers with a response rate of 100%.



Audit Participation

Since 2018, TSMC's internal audit team has conducted 74 on-site supplier audits and required suppliers to be audited by RBA-certified third-party audit firms in order to examine their sustainability risks. There were 33 suppliers audited in the same year. The requirement of having an 80% improvement rate on serious violations was also achieved in 2018. The Company estimates that all critical suppliers will complete this audit in 2021 to enhance their comprehensive performance.

2018 Supplier Audit Results

Supplier Audited	Audit Methods	Audit Score	Audit Results
74	On-site audit and evaluation: 74 in total	78	<ul style="list-style-type: none"> ● Serious violations: None ● Other violations: Occupational safety and health (OSH), Fire safety ● Follow-up actions: Put forward an action plan on OSH implementation to actively assist suppliers with enhancing their occupational health performance
33	Audit on sustainability risks was conducted by RBA-certified third-party audit firms		<ul style="list-style-type: none"> ● Serious violations: Improvement rate was 90.9% ● Other violations: There was a problem of supplier's employee working-hours management including employees "working for 7 consecutive days" ● Follow-up actions: The 33 audited suppliers all improved their employee working-hours management, making sure that no more issues of "working for 7 consecutive days"

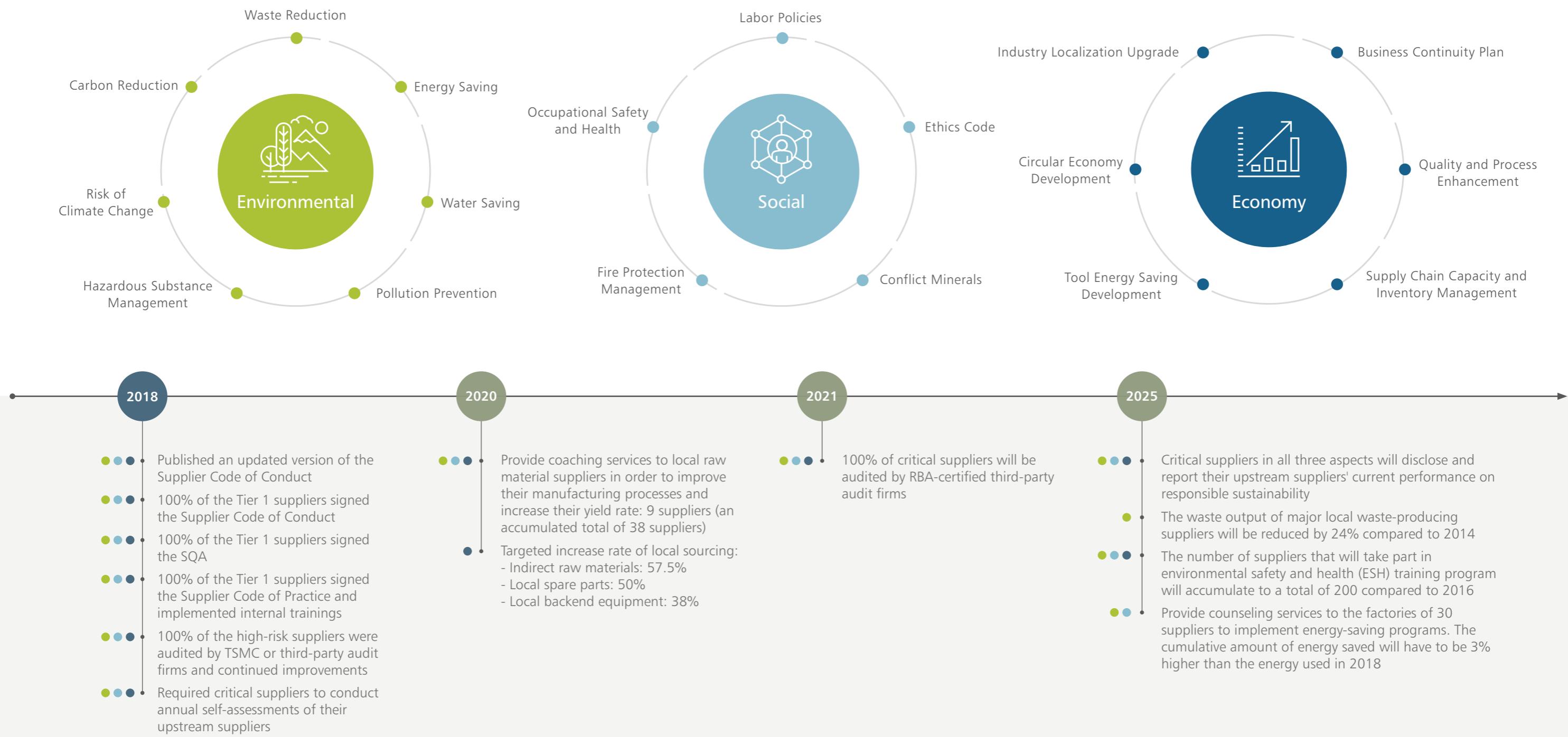
Use Influence of Supply Chain Sustainability

TSMC always strives for perfection through continuous improvement. The TSMC Supplier Code of Conduct focuses on five major areas, including Labor, Health and Safety, Environmental Protection, Business Ethics Standards, and Code of Conduct Management. TSMC thus formulated two main strategies in 2018 that are Sustainability Risks Management and Local Supply Optimization. By implementing these two strategies, the Company continues to develop sustainability within three important aspects, including environmental, social, and economic aspects. TSMC is driven to enhance the performance of supply chain management, and to use its sustainable influence for a responsible supply chain.





Sustainable Supply Chain Action Plans

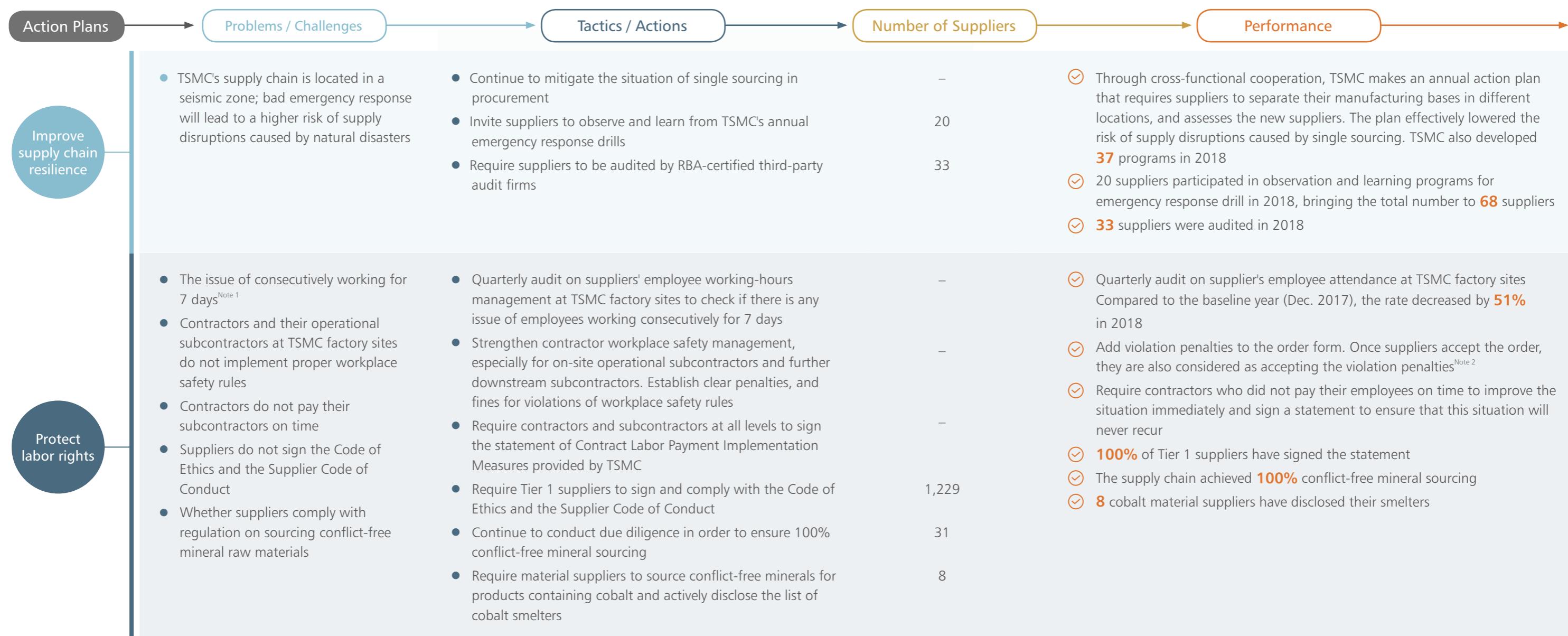




Sustainability Risk Management

TSMC looks forward to cooperating with suppliers on sustainable growth in order to create a workplace where labor dignity is respected, and enterprises uphold ethical values. In 2018, TSMC found that there was still room to improve in terms of supplier's employee working-hours management, OSH, and their emergency response performance.

Moreover, customers have higher expectations on conflict mineral management than the existing industry regulations. Therefore, TSMC has been focusing on improving supply chain resiliency and labor rights since 2018, working together with suppliers to establish a good foundation for a long-lasting business.



Note 1 In 2018, TSMC found there were employees of TSMC's suppliers that had been consecutively working for 7 days at TSMC factory sites. Therefore, TSMC reinforced the importance of employee working-hours management and required its suppliers to improve the situation within a given timeframe

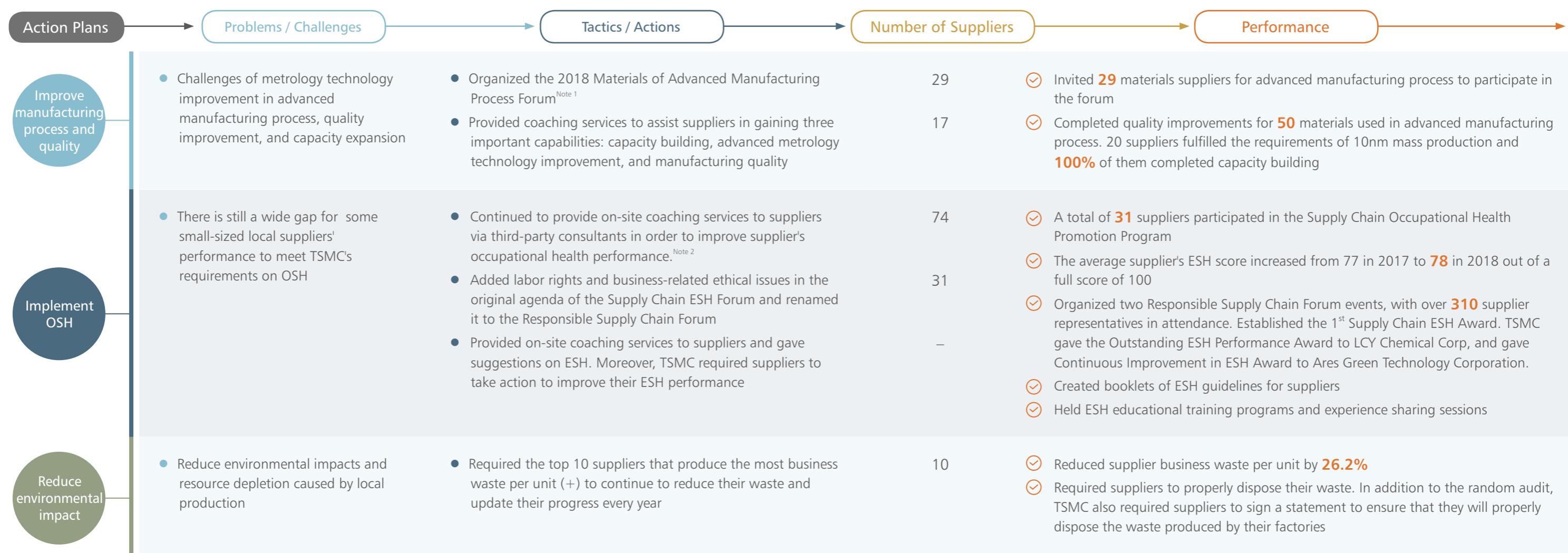
Note 2 Added violation penalties to the order form in 2018



Local Supply Chain Optimization

TSMC considers the optimization of local supply chain as a key sourcing strategy. The Company strengthens supplier emergency response performance by providing diverse coaching services to continue improving manufacturing process and quality, and to ensure sustainable development. TSMC works together with its suppliers to effectively

deal with environmental issues and lower processing costs so the issue of rising costs due to climate change and resource depletion can be avoided. TSMC also requires suppliers to take eco-friendly measures that promote supply chain energy-saving and waste reduction according to the Supplier Code of Conduct. By doing so, resources can be recycled and applied to different industries to create economic synergy and ensure positive developments in supply chain.



Note 1 Organized the 2018 Materials of Advanced Manufacturing Process Forum in March 2018. The theme was "Future and Challenges of Green Manufacturing".

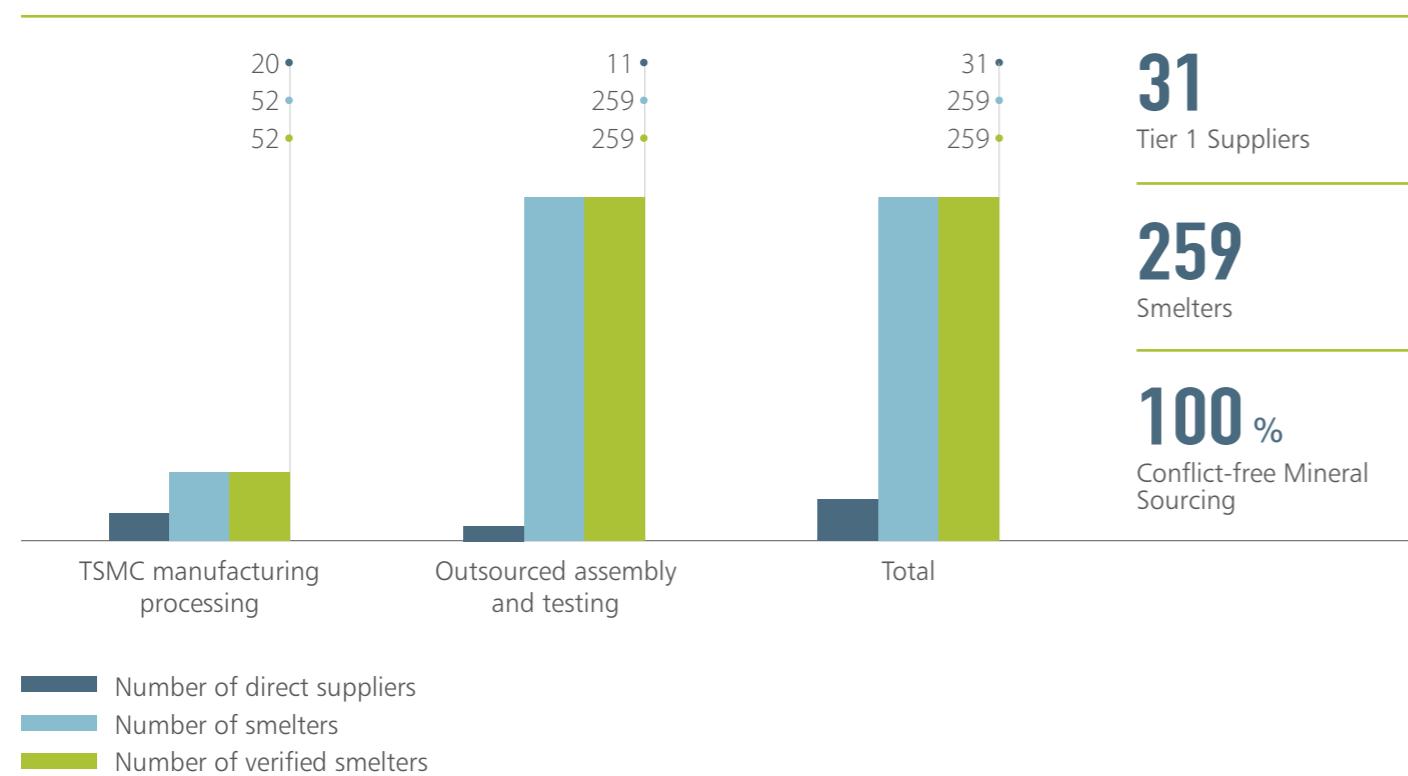
Note 2 A year later in 2018, TSMC cooperated for the second time with the Occupational Safety and Health Administration, Ministry of Labor, and Dr. Lin Yuwen from Fu Jen Catholic University to invite 31 suppliers, such as ones providing pump maintenance service and maintaining filter materials used in washing towers, to participate in the Supply Chain Occupational Health Promotion Program. By reviewing documents and conducting on-site audit in the factories, the team gave suggestions to suppliers on work environment improvement, hardware construction, labor health promotion, etc.



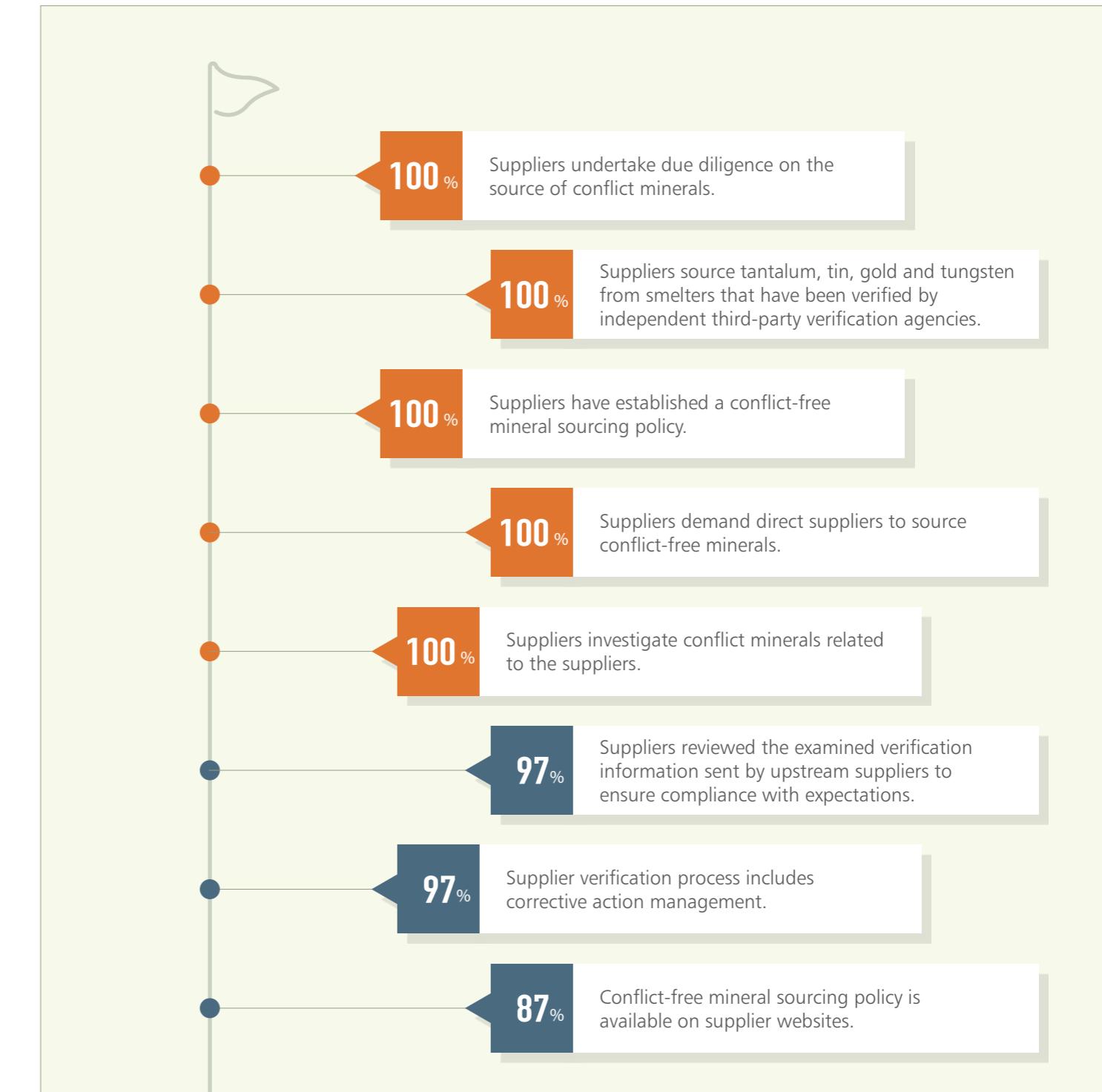
Conflict-free Mineral Sourcing

TSMC supports the proposition of the Responsible Mineral Sourcing put forward by the RBA and Global e-Sustainability Initiative (GeSI). The Company also requires its suppliers to source conflict-free raw materials according to the [Responsible Minerals Assurance Process](#) (RMAP). TSMC requires the suppliers, whose products contain tantalum, tin, gold and tungsten, to follow the conflict-free minerals sourcing policy, and sign a statement of conflict-free mineral sourcing. In 2018, the Company even disclosed the details of smelters that provide cobalt for TSMC's product manufacturing.

The Updated TSMC Due Diligence Results CMRT V.5.11



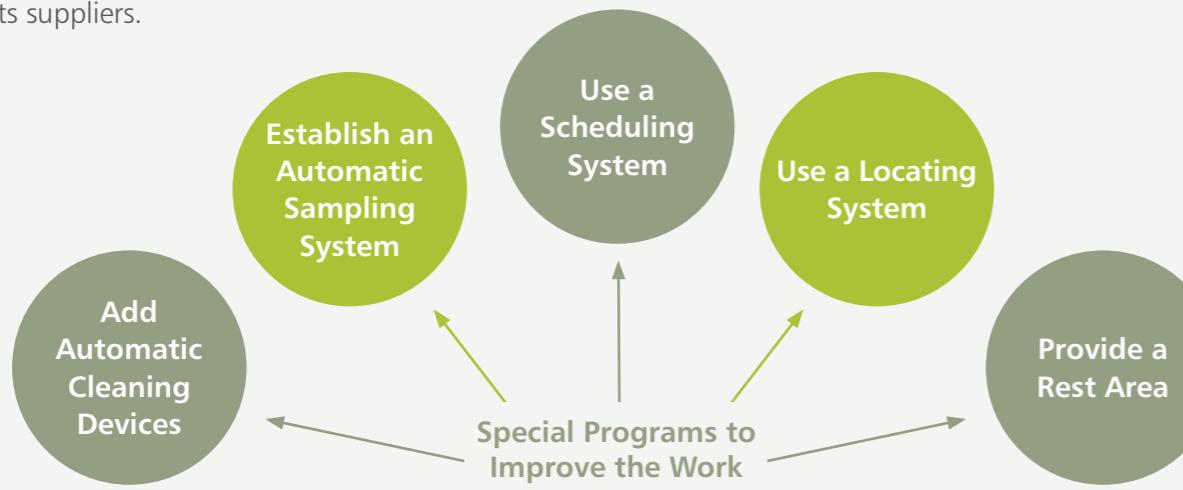
Note The information above included the direct suppliers of TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.



Case
Study

Special Program to Improve the Working-Hours Management and Work Environment of Supplier's Tank Truck Drivers at TSMC Facilities

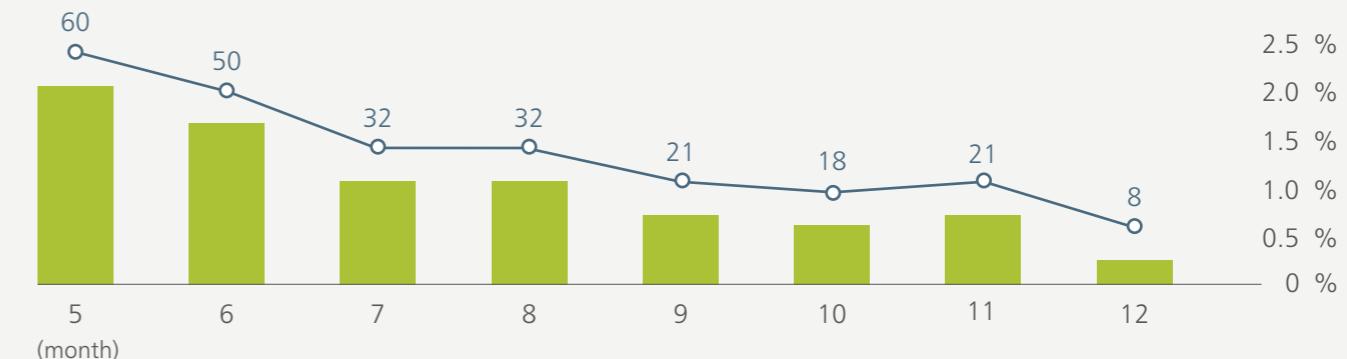
TSMC found that the supplier's tank truck drivers often work overtime due to the nature of their work, and there was no proper rest area for them. TSMC greatly values labor rights, and the Company has launched a special program to improve the truck operational process. By doing so, working-hours of truck drivers have been reduced. TSMC has also provided a user-friendly rest area for drivers. These substantial improvements have increased the speed of truck operational processes, and have also ensured uninterrupted raw materials supply without any delivery issues caused by driving while fatigued, creating a win-win situation for both TSMC and its suppliers.



TSMC jointly worked with its suppliers to actively adopt the following five approaches, achieving good results in 2018. Through adding cleaning devices and an automatic sampling system, interference during incoming quality control (IQC) decreased. TSMC and its suppliers also used a scheduling and locating system to supervise and control tank truck loading times via computer. Furthermore, the Company provided workers with a proper rest area. As a result, the number of overtime cases decreased from 60 in May to less than 8 in December.

The Number of Instances Tank Truck Loading Time Exceeded 8 Hrs in 2018

Unit: number of times



Case
Study

Continue to Upgrade Local Supply Chains

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 the procurements. To build a sustainable supply chain, TSMC considers the sustainability improvement of the local semiconductor industry as an important issue, and has put lots of efforts on the continuous upgrade of local supply chain. Therefore, the Company has set up a local procurement^{Note 1} goal and has been driving it for many years.

Supply chain localization improves supply flexibility, shortens the product development cycle, reduces unnecessary costs, lowers carbon emissions for the whole supply chain, and thus ensures the quality and effect of customer services.

TSMC has established a local procurement goal and has been driving it for many years. TSMC (China)^{Note 2}, WaferTech in the United States, and other subsidiaries have their own independent procurement organization as an extension of TSMC's global supply chain. They also actively promote supply chain localization to help local suppliers enhance their capabilities and ensure a win-win situation for all.

Note 1 Procurement localization refers to suppliers which manufacture and process products locally.

Note 2 100% of the equipment and direct raw materials of TSMC (China) are imported from abroad.

Note 3 As the production capacity of silicon wafers in Taiwan failed to meet TSMC requirements, the target of local sourcing has been adjusted from "local sourcing of raw materials" to "local sourcing of indirect raw materials" in 2018.

The Upgrade Directions for Local Supply Chains



Provide active coaching services to assist suppliers of key equipment, spare parts, and raw materials in improving their technology and product quality in order to increase local sourcing



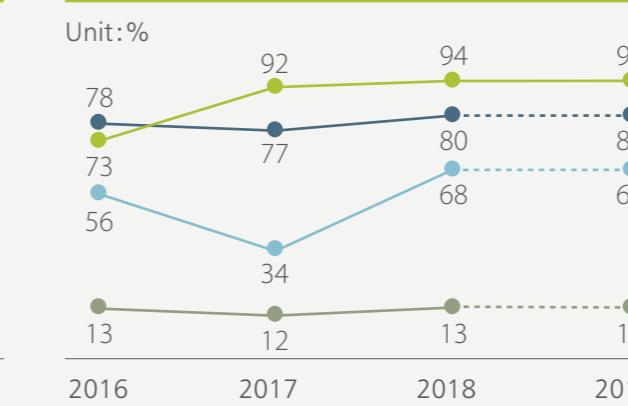
Continue to maintain or increase the proportion of local sourcing through a smoothly running supply chain

Taiwan



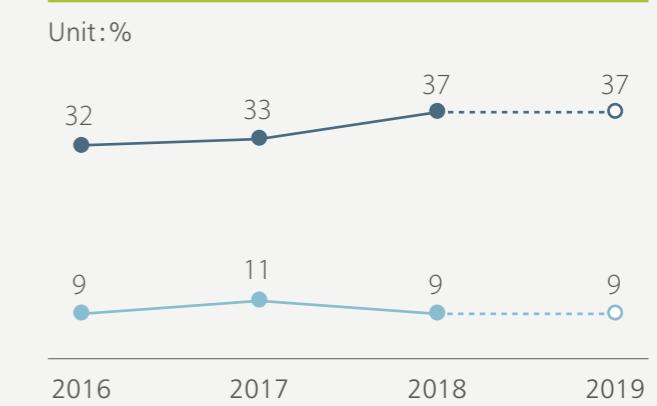
—●— Spare Parts —●— Raw Materials^{Note 3}
—●— IDM

United States



—●— Spare Parts —●— Indirect Raw Materials
—●— Tools —●— Direct Raw Materials

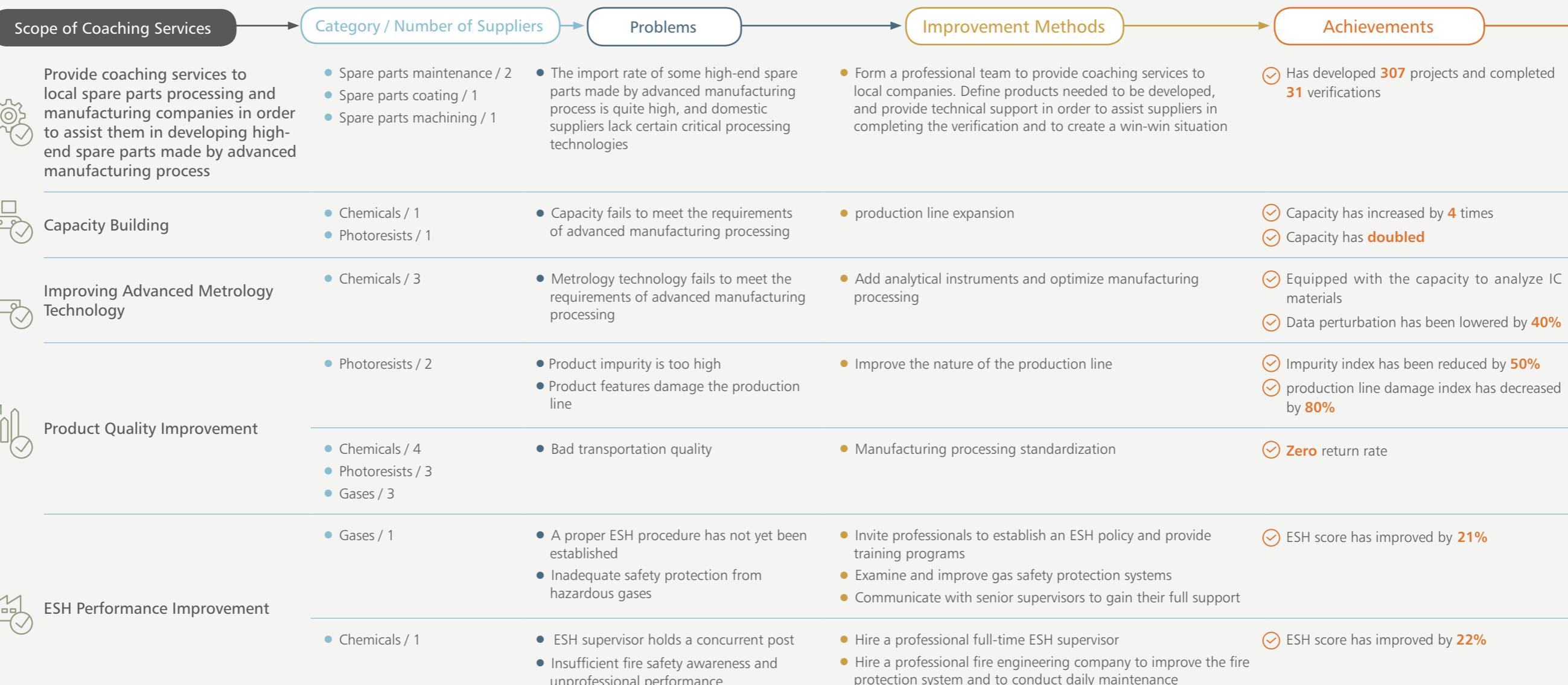
China



—●— Spare Parts —●— Raw Materials
—●— Tools

Case
Study

2018 Local Supplier Coaching Results





Focus 4

Green Manufacturing

A Practitioner of Green Power

Green management is deeply ingrained in the daily operations of TSMC, and the Company continues to push forward with green fabs and green manufacturing. TSMC strengthens its green process capability through the four dimensions of energy management, water management, waste management, and air pollution control. The Company also selflessly shares its experience in sustainability, broadening its impact on society and realizing the goal of an environment in harmony with technology.

524 measures

Number of conservation measures which effectively reduced energy consumption by 300 GWh

129 million metric tons

129 million metric tons of water recycled, equivalent to 4.1 times the volume of Baoshan Reservoir II

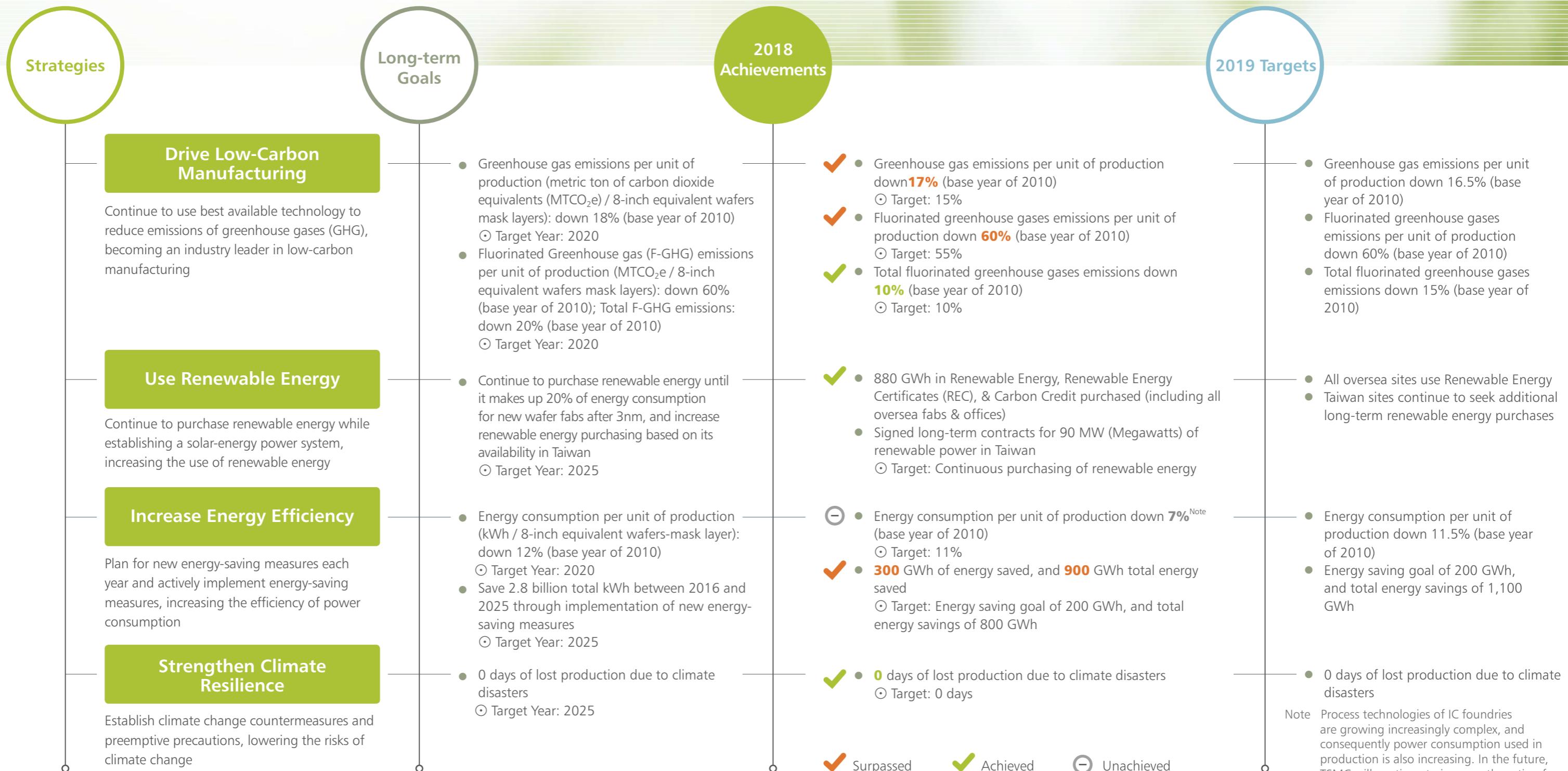
96.9%

Annual volatile organic gas emissions reduced by 96.9%





Climate Change and Energy Management





Responding to Climate Change is the Responsibility of a Sustainable Business

In the face of a changing global climate, TSMC has not only strengthened its resilience to climate change, but also made preparations to lessen the possible impact disasters could have on operations and made efforts to reduce greenhouse gas emissions. As declared in the Corporate Social Responsibility Policy and Environmental Protection Policy, responding to climate

change is the responsibility of a sustainable business. TSMC faces the harsh challenges of climate change in collaboration with business partners, academia, government, and all of society by continuing to use energy more efficiently and by using renewable energy. TSMC strives to become a world leader in green production.

Looking back to 2018, energy management was one of TSMC's most urgent issues. With the continuous advancement of process technology, integrated circuits

are growing increasingly complex and the power required to manufacture them continues to grow. Even though TSMC invested significant resources into 524 energy-saving measures and saved 300 GWh in electricity, energy consumption per unit of production still exceeded set goals. As a result, the Company actively responded by buying renewable energy and built a renewable energy power station. The percentage of renewable energy in the energy structure of TSMC increased and effectively reduced greenhouse gas emissions.

A History of Responses to Climate Change

Green House Gas Regulatory Restriction

- Jul. GHG Reduction & Management Acts (Taiwan)
- Nov. COP21 in Paris

TSMC Actions

- | | | | |
|---|---|--|--|
| <ul style="list-style-type: none"> • 2015 Nov. Published CSR policy | <ul style="list-style-type: none"> • 2016 Mar. Published Environmental Policy May Carbon Management Platform launched Aug. Energy and Carbon Reduction Committee launched | <ul style="list-style-type: none"> • 2017 Feb. Created TSMC (China) carbon credit & trade flow Mar. Renewable Energy Task launched Jun. Created internal carbon pricing & impact evaluation Jul. Joined Science Based Target initiative | <ul style="list-style-type: none"> • 2018 Mar. Joined the Industrial Development Bureau Voluntary Carbon Reduction Platform May Launched the Green Tools Certification Project Nov. Launched TSIA Energy-Saving Work Platform Signed Power Purchase Agreement for 90 MW (Megawatts) of renewable power in Taiwan Dec. Overseas Locations Completed Purchases of Renewable Energy |
|---|---|--|--|

Note Science Based Targets Initiative, SBTi is an initiative jointly established by the Carbon Disclosure Project (CDP), the "We Mean Business" Coalition, the UN Global Compact, and the World Wide Fund for Nature (WWF). It aims for companies to set reductions in line with the Paris Agreement.



TSMC established a comprehensive Carbon Management Platform, with three main goals of complying with regulations, reducing energy consumptions and carbon emissions, and the management of carbon assets. Under the guidance of the Corporate Social Responsibility Committee, the platform has continuously tracked climate change trends and changes in local and global government regulation. The platform supports regular reports to the Board of Directors on the status of the Company's operations in response to climate change. In addition, an Energy and Carbon Reduction Committee led by two senior vice presidents responsible for fab operations and materials management and risk management regularly follows up and checks on energy-related carbon emission performances, setting goals for continuous improvement. Given that climate change could potentially affect operations and pose financial risk, in 2018 TSMC began using the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) released by the Financial Stability Board (FSB) to determine risk and opportunities, and based metrics and target management on the results.



60%

Fluorinated greenhouse gases emissions per unit of production decreased 60%, meeting 2020 long-term goals ahead of schedule.

TSMC TCFD Framework

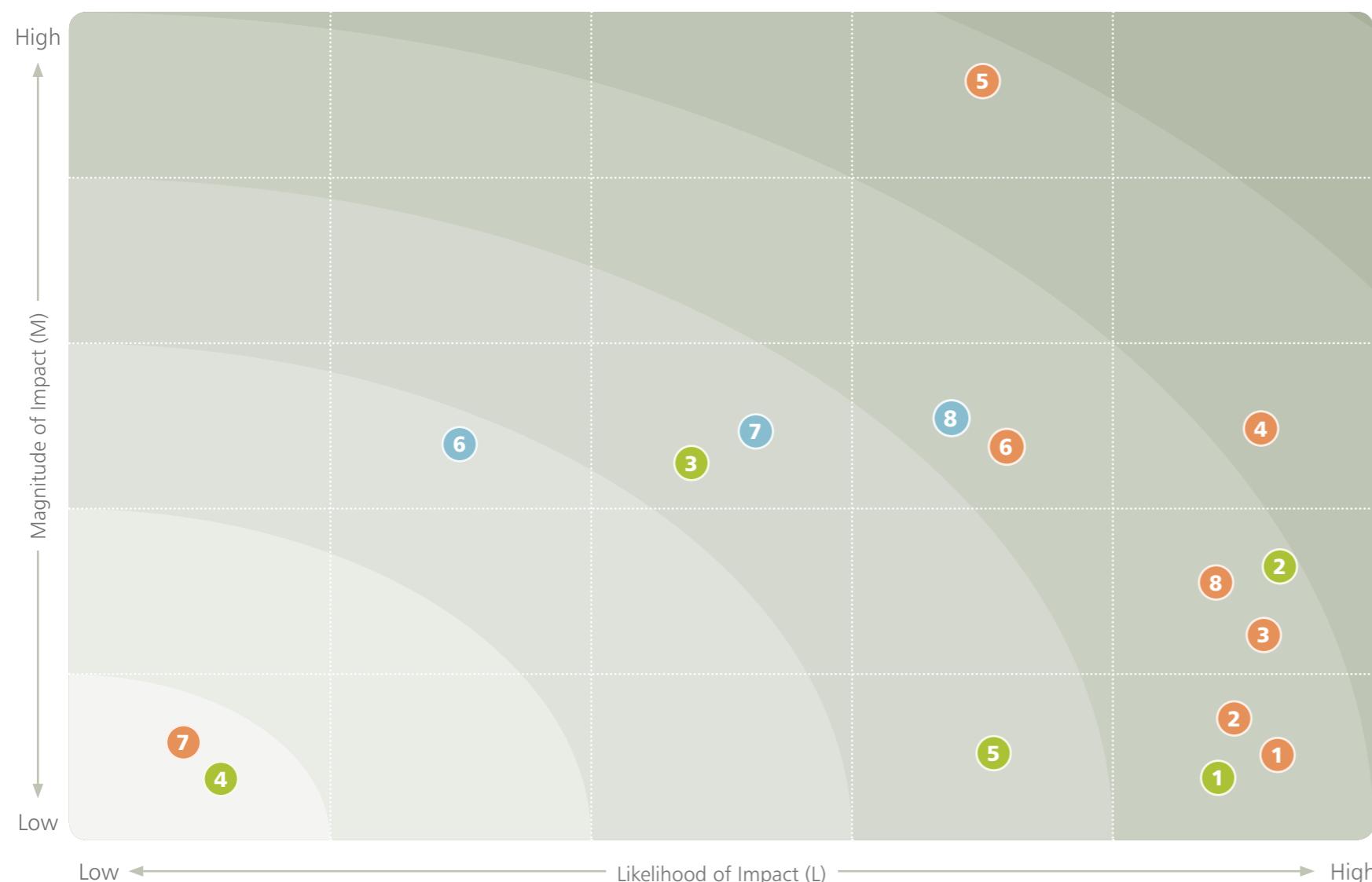
Category	Management Actions
Governance	Board of Directors The risks to water and energy resources by climate change are integrated in corporate risk management, and the Senior Vice President of Materials Management and Risk Management makes annual reports to the Board of Directors on corporate risk and measures taken
	Corporate Social Responsibility Committee The Company's top organization in dealing with and managing climate change. The CFO serves as chairperson and oversees quarterly reviews of climate change-related issues and progress, and annual reports are made directly by the chairperson to the Board of Directors on results of climate change-rated measures
	Energy and Carbon Reduction Committee The Company's top management organization in taking action on climate change risk and opportunity. It is led by the senior vice presidents of Operations and of Materials Management and Risk Management, who serve as Co-Chairmen. This committee holds quarterly reviews on execution of management plans, holds in-depth discussions and makes decisions on these plans
Strategy	Determining risk and opportunity Climate risk and opportunity is divided into short (less than 3 years), medium (3 to 5 years), and long (greater than 5 years) term based on internal target management periods
	Evaluating potential economic impact Major risks and opportunities are evaluated by the possibility of affecting Company operations and economic impact
	Setting Climate Strategy Four major strategies have been set based on the Company's long-term climate change goals: low-carbon manufacturing, using renewable resources, improving resource usage efficiency, and strengthening climate resilience
	Climate Scenario Analysis In response to global carbon reduction goals, scenario analyses are carried out with science based targets (SBT) and preemptive measures are carried out in response to possible impact on the Company
Risk Management	Using TCFD Using the TCFD framework to recognize climate change risk and opportunities and hosting workshops to reach a consensus approved by senior management
	Climate Risk Management Using Enterprise Relationship Management (ERM) process to manage climate change risks and integrate climate risk factors within operational risk management to create an action plan
Metrics and Targets	6 Main Metrics of Climate Strategy Decrease total greenhouse gas emissions per unit of production, decrease fluorinated greenhouse gases emissions per unit of production, increase the use of renewable energy as the market matures, decrease energy consumption per unit of production, increase total energy saved, minimize potential for disruption of production due to climate disaster
	Climate Strategy Action Policies Best available technology is fully implemented in new fabs, and abatement equipment is upgraded in existing fabs, build a renewable energy power system, purchase renewable energy, comply with US LEED green architecture guidelines, expand power-saving measures, set long-term goals in preparation for climate risk. Set long term goals for 2020 to 2025 based on the six indexes above and manage climate risk and opportunities
	GHG Emissions Disclosure Examine emission data annually according to ISO 14064-1 and accept external verification



Determining Climate Risk and Opportunities

In response to the potential dangers of climate change and energy supply, TSMC has set policies and solutions that encompass economical development, environmental protection, and sustainable development. The Company actively implements energy saving, carbon reduction, and water-saving plans; mitigates climate change risk, establishes CO₂ assets, develops energy-saving products and services, strengthens climate resilience, and develops a culture of environmental sustainability.

Climate Risk and Opportunity Matrix



Transition Risks

- 1 GHG Restrictions and Carbon Trading System
- 2 Voluntary GHG Reduction Commitment
- 3 Unstable Utilities (Water, Electricity)
- 4 Cost of Development for Low Carbon Energy Saving Products
- 5 Impact on the Company's Image

Opportunities

- 1 Participate in Carbon Trading / Renewable Energy Market
- 2 Cooperation with Public Sector Reward Programs
- 3 Construct Green Buildings
- 4 Increase Water Resource Usage Efficiency and Use Recycled Water Sources
- 5 Develop Low-Carbon Products and Serve the Market
- 6 Increase Willingness for Long-term Investments
- 7 Strengthen Resilience to Natural Disasters
- 8 Promote Energy-Saving Low-Carbon Production

Physical Risks

- 6 Typhoon, flooding
- 7 Drought
- 8 Rise in Temperature



Financial Impact Analysis of Climate Risks and Opportunities

Climate Risks	Potential Financial Impact	Climate Opportunities	Potential Financial Impact	2018 Actions
GHG emissions cap and carbon trading system	Restriction on capacity expansion, increase in operation costs	Participation in carbon trading and renewable energy plans	Early purchases of renewable energy, successfully increasing capacity	<ul style="list-style-type: none"> Signed a long-term contract for 90 MW (Megawatts) of renewable energy in Taiwan 880 GWh in Renewable Energy, Renewable Energy Certificates (REC), and Carbon Credit purchased
GHG Voluntary Reduction Commitments	Increased cost of installation for carbon reduction facilities and operating costs	Win public recognition / cooperation	Accumulate carbon credits in preparation for future expansion	<ul style="list-style-type: none"> Application to exchange increased compressor system efficiency for project rewards was approved
Unstable Utility Supply	Impact on production, increase in operating costs	Construct green buildings	Lower utility costs	<ul style="list-style-type: none"> Built two additional green fabs and six LEED-certified buildings
Cost of developing low-carbon energy saving products	Increased cost of developing low-carbon energy saving products	Develop or increase energy-saving products or services	Satisfy customer demands for energy-saving products, increase in revenue	<ul style="list-style-type: none"> Built new fabs (Fab 15, Fab 16, and Fab 18) while maintaining a water recycling rate greater than 85% Investing in the development of energy-saving products
Impact on the Company's Image	Unable to satisfy the expectations of stakeholders, impacting the Company's reputation or image	Increase investors' willingness for long-term investment	Stabilize stakeholder structure, lessen the risk of large stock fluctuations	<ul style="list-style-type: none"> Boost green production
Typhoon, Flooding	Production is affected, causing financial losses and a decrease in revenue	Increase resilience against natural disasters	Strengthened climate resilience, lowering risk of operations being disrupted and potential losses	<ul style="list-style-type: none"> Installed flood doors in Fab 18 Raised the building base of Fab 18 two meters higher
Drought				<ul style="list-style-type: none"> Fab 18 is committed to using and developing renewable water Established a comprehensive water monitoring system
Rising Temperatures	Increase in energy demand, cost, and carbon emissions	Driving low-carbon green manufacturing	Save energy and cut cost	<ul style="list-style-type: none"> Conserved 300 GWh of electricity through energy-saving projects



Drive Low-Carbon Manufacturing

Greenhouse Gases (GHG) Inventory

TSMC is committed to being a world leader in low-carbon manufacturing. Through annual analysis and examination of GHG inventories and tracking overall carbon reduction, TSMC has found that fluorinated greenhouse gas emissions and the indirect emission of GHGs due to power consumption are the two main sources of emissions. As a result, TSMC comprehensively adopted the industrial best practice measures of reducing both exhaust and gases used in production.

Coupled with the continuous implementation of energy saving projects, along with increasing usage of renewable energy, TSMC has lowered the amount of GHG emissions per unit of production. The most important aspect of reducing GHGs is following Science-Based Targets (SBT) in accordance with the Paris Agreement of restricting global warming to within 2°C. The Company diligently searches for any opportunity to achieve this goal, and hopes to lead its supply chain to save energy and reduce carbon emissions together, stimulating the development of regional renewable energy and the sustainability of the environment.

Fluorinated GHGs and nitrous oxide were found to be the main sources of GHG emission from the semiconductor manufacturing process. As a result, TSMC optimizes the amount of gases used in the

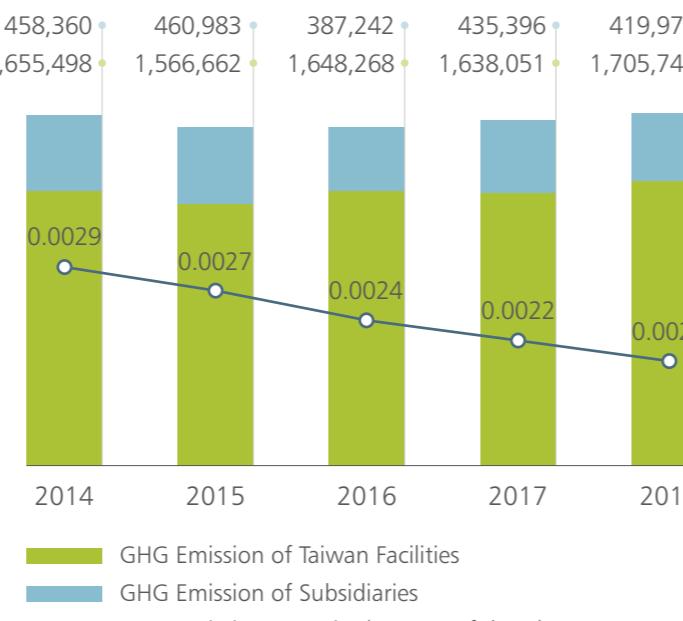
manufacturing process, adopts gases with low Global Warming Potential (GWP), and installed exhaust-removal apparatus in order to reduce direct emissions. In 2018, emissions were cut by 2.6 million tons of CO₂

equivalent, a major decrease from the previous year. GHG emission per unit of production was down 60% compared to the base year of 2010, and successfully achieved the Company's annual goal, far surpassing

the 2020 voluntary PFC agreement target set by the World Semiconductor Council (WSC). TSMC is number one in the industry for reduction of emissions in the manufacturing process.

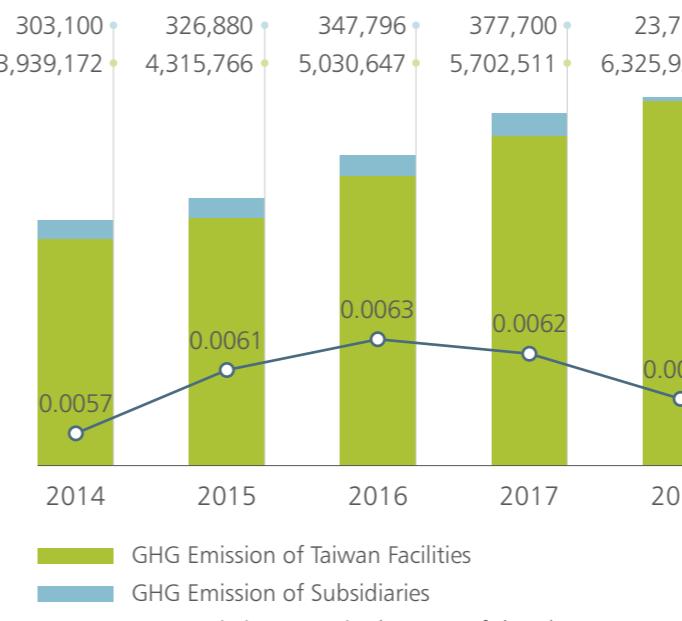
Scope 1 – GHG Emissions

Unit: metric ton CO₂e



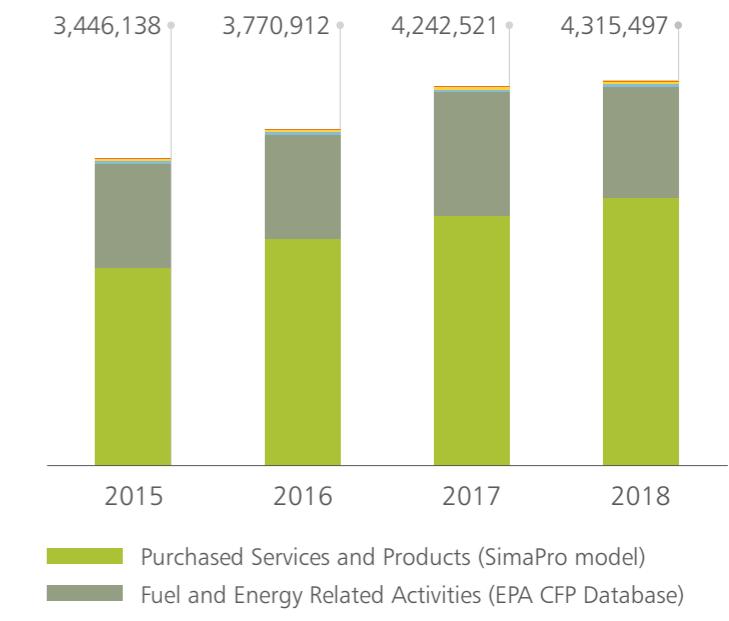
Scope 2 – GHG Emissions

Unit: metric ton CO₂e



Scope 3 – GHG Emissions

Unit: metric ton CO₂e



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 2018 by the Bureau of Energy stating that 0.554 kg of CO₂ equivalent / kWh, where 1 kg of CO₂ equivalent equals 6,805 kilojoules.

Note 1 Data of scope 3 included TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants).

Note 2 Emission factor is based on data released in 2018 by the Bureau of Energy stating that 0.554 kg of CO₂ equivalent / kWh, where 1 kg of CO₂ equivalent equals 6,805 kilojoules.



GHG Reduction Standard Practices

TSMC Standard Practices		2018 Implementation Status
Scope 1 Direct Emissions of GHG	ISO 14064-1 inventory and third party verification	100% All fabs and subsidiaries underwent inventory and third party verification
	Optimization of gas quantity used in fabrication	Optimization process parameters Fab 15B introduced GHG optimization process parameters in accordance with the manufacturing specifications of the Technical Committee
	Substitute high-GWP fabrication gases	100% All 12-inch fabs are now using optimized carbon reduction technology - enthalpy of dissociation of nitrogen trifluoride, while 6-inch and 8-inch fabs are using nitrogen trifluoride / octafluorobutane
	Install Point-Of-Use abatement equipment for fluorinated GHGs	100% 100% installed POU abatement equipment on new process tools using F-GHG in new and existing fabs (including subsidiaries)
	Continue to develop on-site nitrous oxide removal technology	87% Continued to replace and upgrade 127 POU abatement equipment in 2018, install rate increased to 87%
	ISO 50001 energy management and third party verification	1 → 3 Continued to develop removal technology, and certified equipment increased to 3 from 1 Added to the standard equipment of new fabs
	New-generation fab tools use energy-saving, carbon-reducing designs	Only semiconductor foundry in the world Launched an energy conservation project for next-generation fab tools, and in 2018, implemented 42 energy saving projects to 30 process tools
Scope 2 Indirect Emissions of GHG	Introduce renewable energy	880 GWh Leading semiconductor manufacturer in Taiwan, with 880 GWh in Renewable Energy, Renewable Energy Certificates (REC), & Carbon Credit purchased
	Energy efficiency standards	524 Energy efficiency of advanced-technology fab tools leads industry peers, with 524 energy saving measures implemented and 300 GWh saved

Note Data comparison with industry peers is taken from the World Semiconductor Association Report

Use Renewable Energy

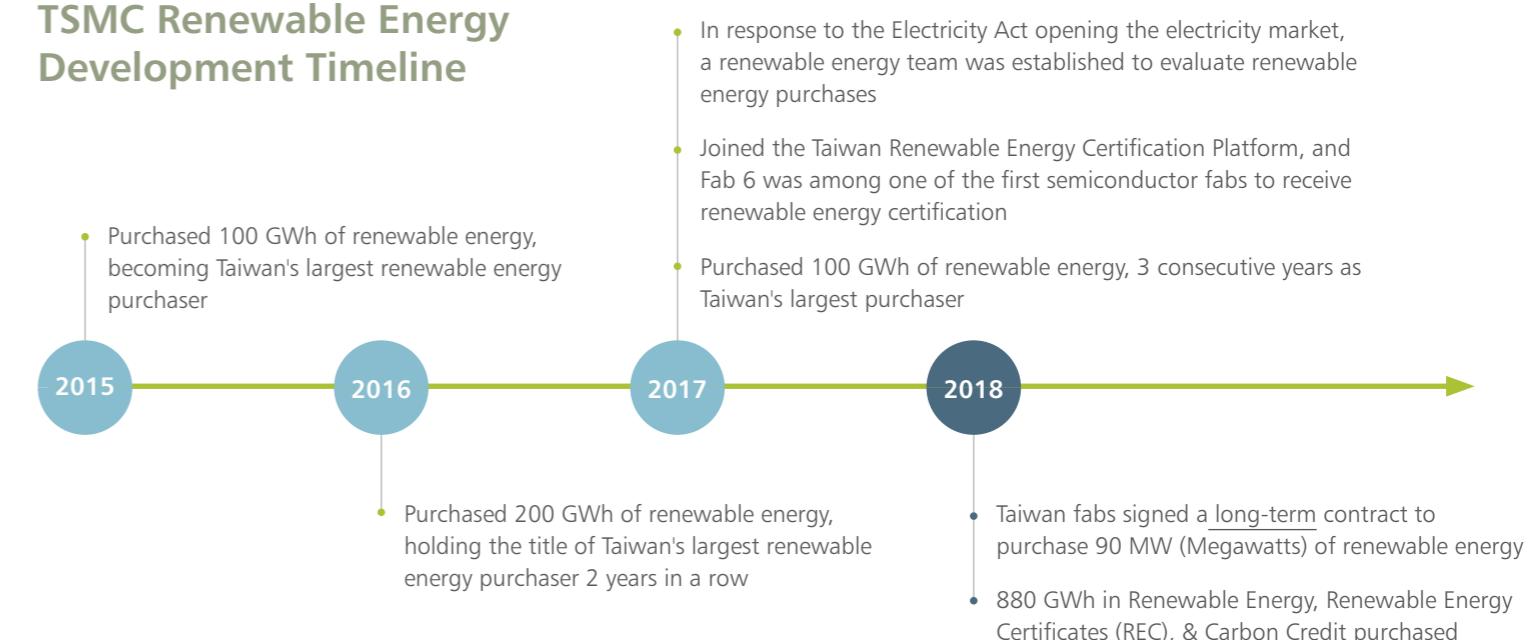
TSMC practices environmental sustainability by continuing to invest in its own renewable energy facilities, and collaborates with energy suppliers and other companies to widen adoption of renewable energy.

Purchasing Renewable Energy

TSMC is committed to directly buying renewable energy or renewable energy certificates (REC) under mature regulatory and market conditions, supports the UN sustainability goals of affordable and clean energy and climate action, and works to reduce the impact climate change will bring to the environment. TSMC

operates around the world, and different countries operate under different legislation on renewable energy and different market conditions. Beginning in 2018, TSMC started to purchase renewable energy, RECs, and carbon credits in countries with comprehensive regulations and ample supply. About 600 thousand tons of carbon dioxide equivalent was offset from the 880 GWh of power used in locations around the world such as the United States, Canada, Europe, China, and Japan. At the same time, TSMC is also actively seeking a source of renewable energy in Taiwan. Despite a low supply of renewable energy, TSMC signed a long-term contract in 2018 for 90 MW (Megawatts) of renewable power, and has committed to powering 20% of 3nm production with renewable energy. TSMC supports the development of renewable energy through concrete actions with the goal of effectively curbing GHG emissions.

TSMC Renewable Energy Development Timeline



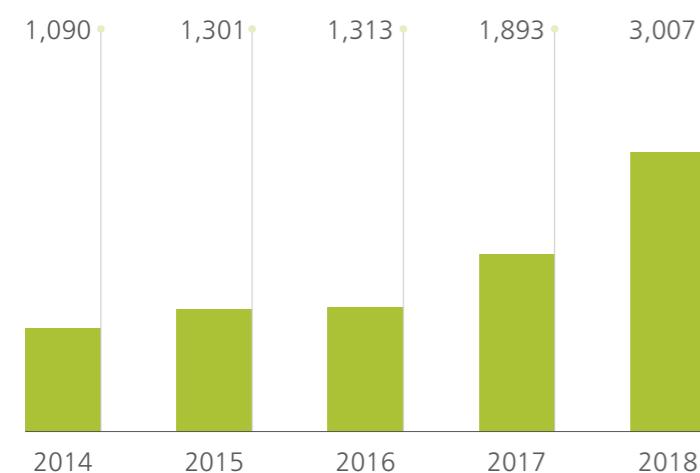


Installing a Renewable Energy Power System

Apart from purchasing renewable energy, TSMC has also installed solar panels at its sites, providing zero-carbon emission renewable energy for fabs. In 2018, 1,114 kW of solar panel capacity was installed, and has already provided 3 GWh, decreasing carbon emissions by 1.67 million kilograms, or the annual carbon absorbed by 167,000 trees. In 2019, an additional 2,000 kW in capacity of solar panels will be added.

Total Capacity of Renewable Energy Facilities (kW)

Unit: kW



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

Increase Energy Efficiency

Comprehensive Energy Examination and Efficiency Boost

In 2018, TSMC consumed a total of 12,290 GWh in non-renewable energy; with electricity making up 94.2%, natural gases coming second at 5.9%, and diesel with less than 0.1%. Electricity is the main energy used to power TSMC's manufacturing

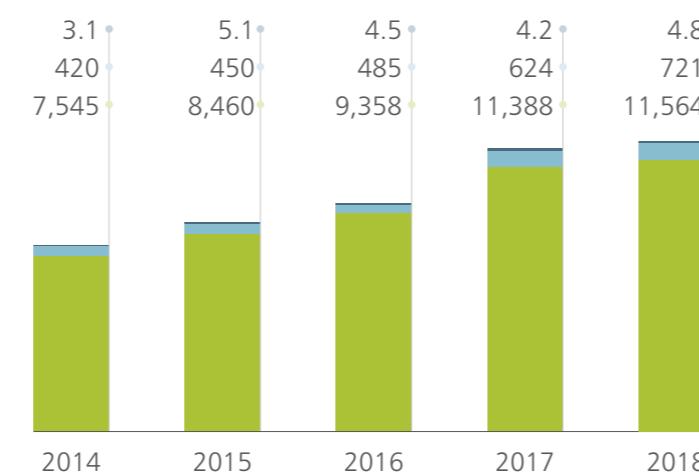
equipment and fab systems. Natural gas is used in exhaust processing facilities to decrease the direct emission of fluoride gases. Diesel is not used directly in production, but to run power generators and fire pumps during emergencies, power outages, or during annual maintenance.

TSMC proposed a plan spanning from 2016 to 2025 to enhance energy efficiency, with projected annual energy saving rates greater than 1%. In 2018, the energy savings rate was 2.4%, while between 2016

and 2018, the average energy savings rate was 2.6%, higher than the average energy savings rate of 2.4% of the Taiwan Semiconductor Industry Association and reaching TSMC's target. However, due to test production in new fabs and transition to advanced process technology production lines, total energy expenditure was 9% greater than 2017, missing the previously set target of 11%, while 7% lower than the base year of 2010. Going forward, the Company will

TSMC Total Energy Consumption

Unit: GWh



Total Diesel Consumption (GWh)
Total Natural Gas Consumption (GWh)
Total Non-renewable Energy Consumption (GWh)

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

TSMC Total Power Consumption

Unit: GWh

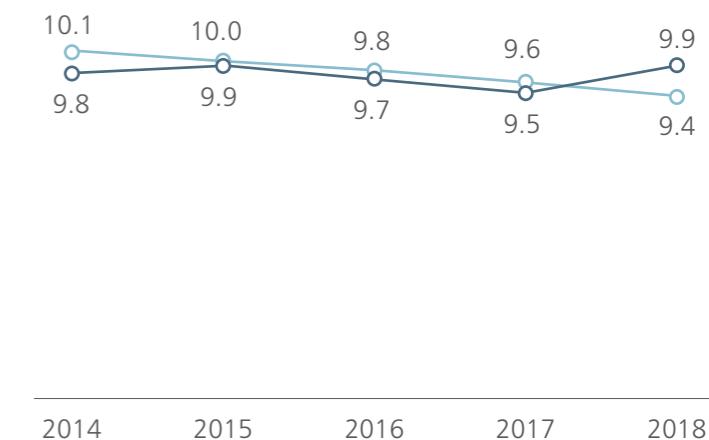


Renewable Energy
Non-renewable energy

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

Unit Power Consumption and Goal Completion

Unit: kWh / 8-inch e wafer-layer



Unit Power Consumption – Target
Unit Power Consumption – Actual

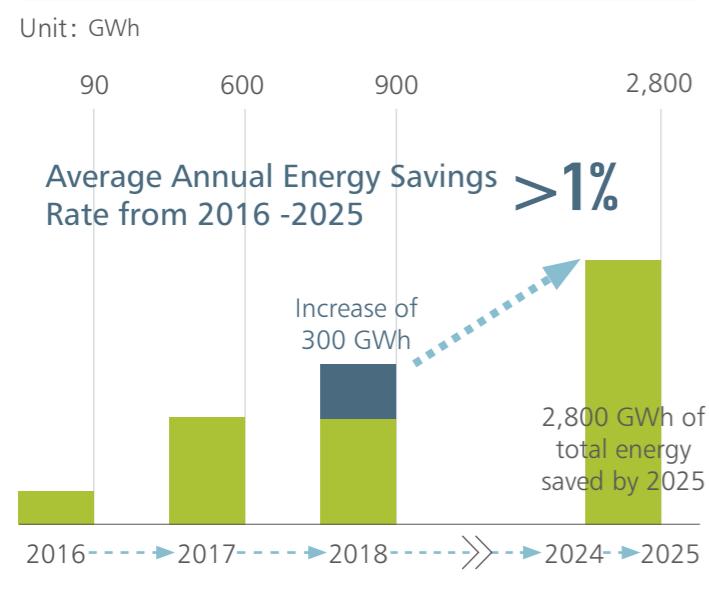
Note 1 Data included TSMC's wafer fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.

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



adopt more energy-saving measures, follow [national energy conservation targets](#), further develop an energy conservation management platform, and undergo comprehensive energy inspections ensuring that each unit of power is optimized to its fullest. In 2019, all TSMC fabs will be ISO-50001:2018 certified and reach international standards, seeking more opportunities for better energy management.

TSMC 10-year Energy-Saving Targets



$$600(\text{GWh}) + 300(\text{GWh}) = 900(\text{GWh})$$

2017 Energy Saved 2018 Additional Energy Saved 2018 Accumulated Energy Saved

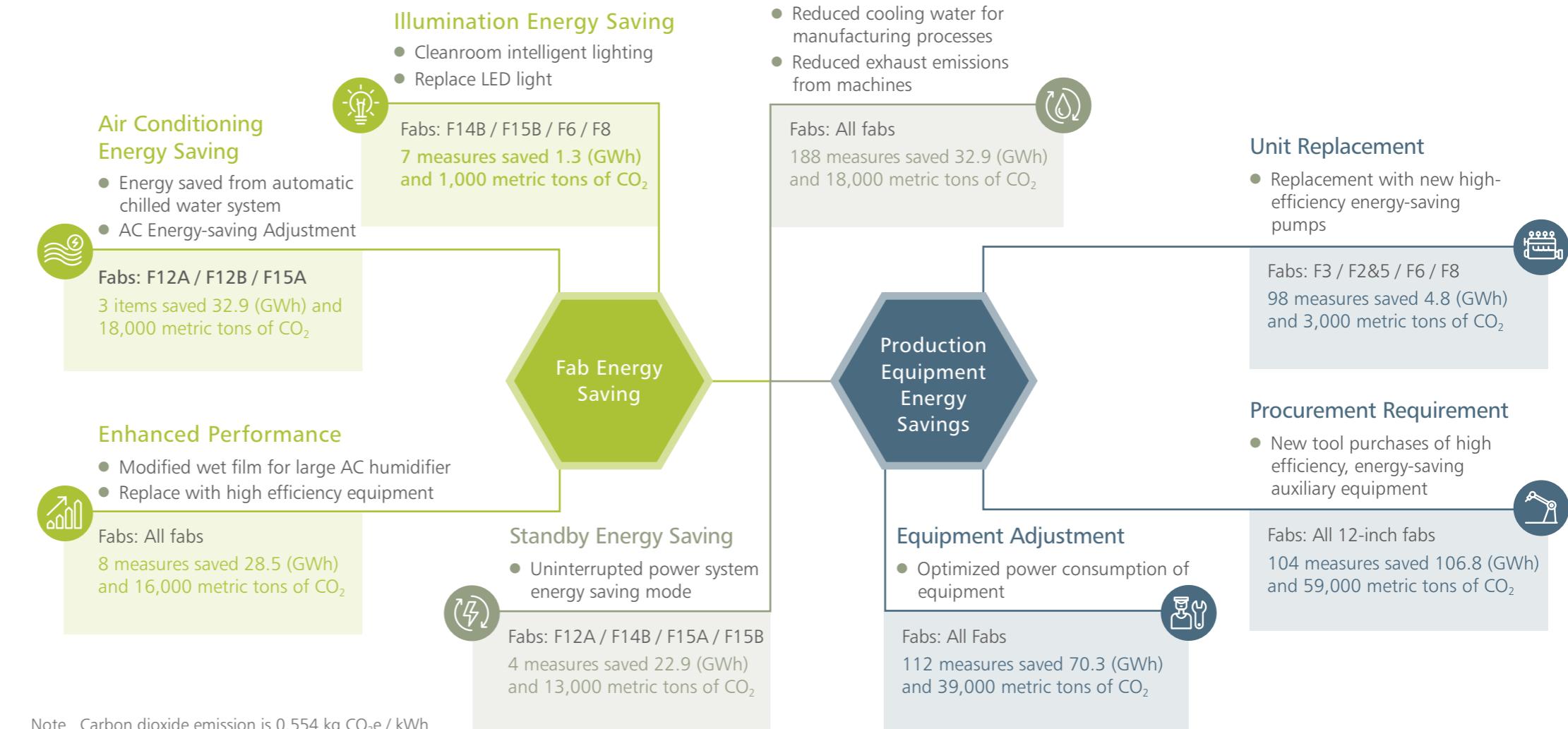
Expanding Energy Saving Measures

TSMC's 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. In 2018, the Facilities department completed the innovation of an energy-saving autonomous intelligent chilled water system, and plans on replacing large air

conditioning units with open circuit cooling towers over the next few years. In addition, the Operations department implemented a plan to replace low energy efficiency components and optimize energy usage of its equipment, carrying out a total of 524 energy-saving measures spanning 8 different categories. These measures saved 300 GWh, which is equal to eliminating 166 thousand metric tons of carbon dioxide emissions, and saved NT\$750 million in utility fees. By

cutting down on carbon dioxide emissions, [NT\\$250 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 2018, 42 energy-saving projects were introduced to 30 equipment models, with 24 models reaching average energy savings of 10%, surpassing annual energy targets.

2018 New Energy Saving Performances



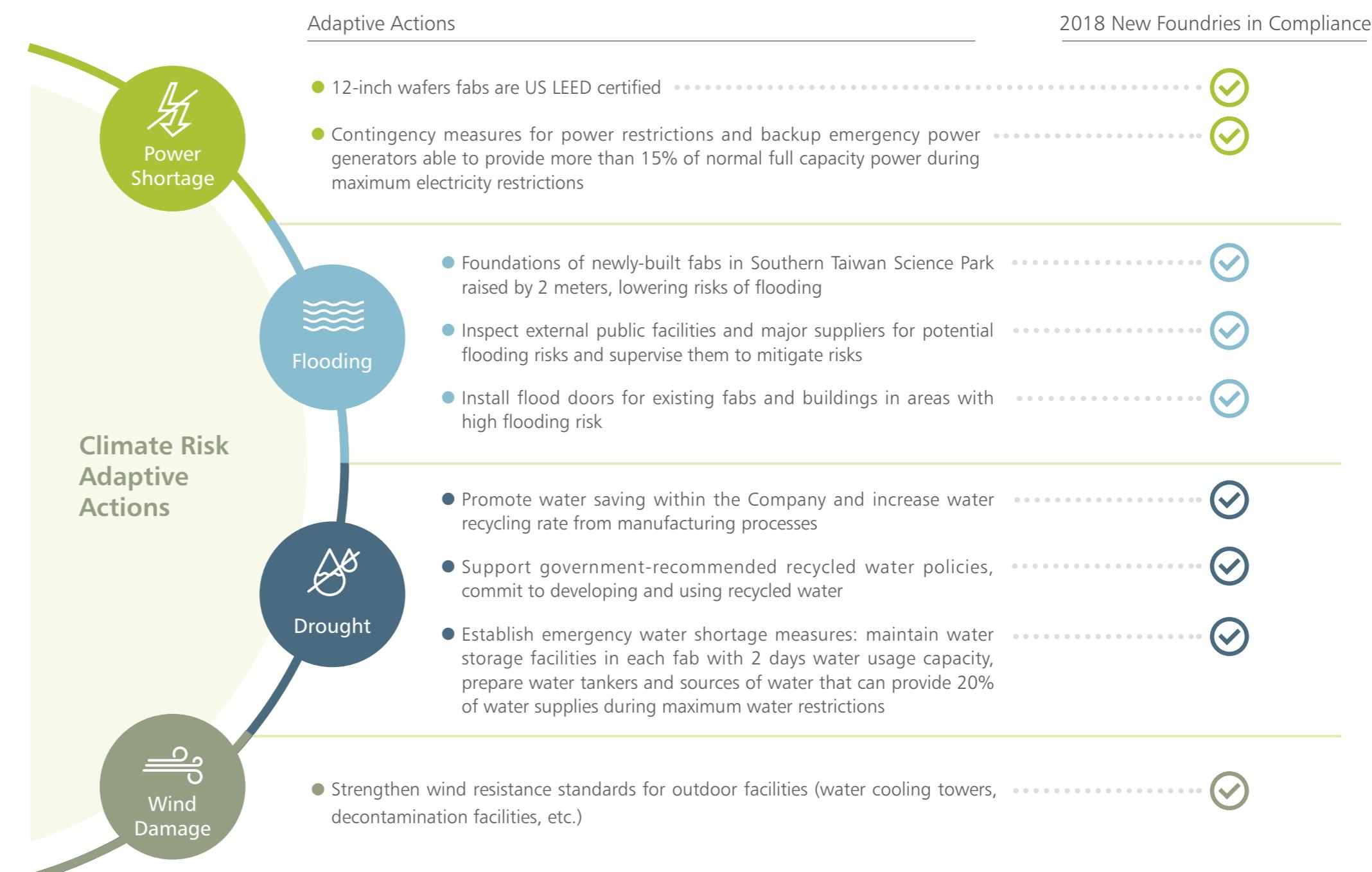


Strengthen Climate Resilience

TSMC identifies key factors from climate change and extreme weather each year that could affect operations such as drought, high temperatures, power shortages, flooding, and wind damage, and establishes standard guidelines for all fabs to strengthen operational resilience. The Company successfully achieved its target of undisrupted production in 2018, and successfully protected against possible natural disasters brought on by climate change.

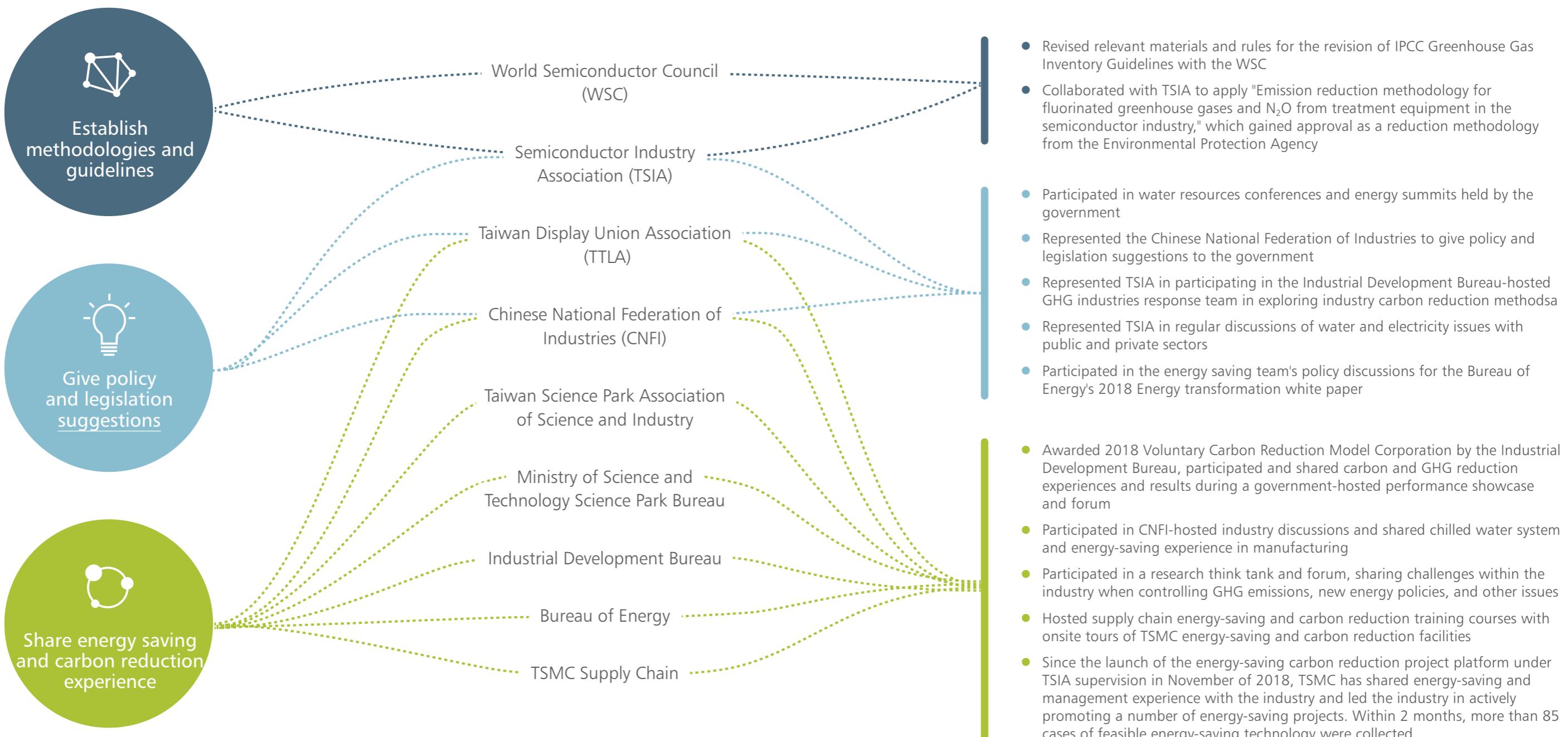
Leading the Industry in Facing Climate Change

No business is excluded from the impact of global climate change. TSMC has been proactively adjusting its operations to mitigate the impacts of climate change and is more than happy to share environmental knowledge, experience, and optimized measures through public associations so that industry standards can be improved. The Company has received the support of the Allied Association for Science Park Industries, Science Park Administrations, the Ministry of Science and Technology, the Water Resources Agency, Taiwan Power Company, and Taiwan Water Corporation. TSMC firmly believes that only industry-government-academia collaboration and the participation of leading companies in various industries can deal with the severe challenges brought by climate change.





Collaborating with Government, Industry and Academia to Build Sustainability for the Next Generation



Case
Study

Most LEED Certified Semiconductor Industry Architecture Area in the World

As the trusted long-term technology and capacity provider to the global logic IC industry, TSMC not only leads the way in terms of technological advancement, but also continues to build fabs to expand production capacity. In order to be an environmentally friendly, energy- and water-efficient "green foundry", TSMC has diligently developed world-class environmental capabilities, ensuring that the environment is not left behind in the pursuit of technological advancement. From 2006, all newly-built TSMC fabs and office buildings must be in compliance with [LEED](#) and [EEWH](#) green architecture standards and certifications. Existing fabs and office buildings also have started strengthening environmental protection measures to lessen their impact on the environment.



TSMC Four Top Green Achievements

		U.S. LEED Green Architecture
		Taiwan Green Architecture EEWH
		Green Factory
		Exceptional Smart Building

1

Number 1 semiconductor industry in the world with the largest LEED-certified building area, number 1 most LEED-certified company in Taiwan

1

Largest EEWH-certified building area in Taiwan

1

Most green factory certifications in Taiwan

1

Most exceptional smart building-certified building area in Taiwan

30 green buildings
All 12-inch fabs are LEED certified

21 green buildings
All 12-inch fabs are EEWH certified

12 green fabs

Currently, all TSMC 12-inch fabs are LEED certified. In 2018, a total of 30 TSMC fabs and office buildings received LEED certifications, 21 received EEWH green architecture certifications, and 12 received green factory certifications, making TSMC the leading Taiwan corporation in number of green buildings. TSMC is also the leading semiconductor company worldwide for the largest LEED-certified architectural area, and number one in Taiwan for largest green building-certified areas and certified green fabs. As of end-2018, TSMC was number one worldwide for the semiconductor industry in terms of LEED certified architecture area, and number one in Taiwan for certified green architecture area and green factory certifications.

In addition to these green certifications, TSMC's Fab 14 introduced a smart control system with features including automatic curtains that open and close to control lighting, and automatic carbon dioxide detectors that draw fresh air from outside. Room temperature and air quality can be adjusted according to the season and temperature, maintaining a comfortable, low-energy consumption, and smart work environment. Fab 14 received the first exceptional smart building award from the Ministry of the Interior, and became the largest building in Taiwan to receive the award.



Case
Study

Green Innovation—Intelligent Chilled Water System

TSMC fulfills its promise of green manufacturing and protecting the environment through innovation and development. In 2017, TSMC developed an industry first "optimal energy-saving control program" for its chilled water system. Furthermore, in 2018, an energy-saving measure incorporating artificial intelligence (AI) and machine learning (ML) was introduced as an upgrade for chilled water systems, building a low energy consumption model that further increased energy savings rates by 2%.

Precise Control, Optimal Control Point

TSMC fosters the spirit of innovation through "Energy-Saving Competitions" that encourages employees to come up with ground-breaking ideas to discover more energy-saving actions in our daily lives. In 2018, the facilities and operations organizations collaborated to participate in the "Energy Saving Competition" using analyses of AI algorithms to precisely predict the correlation between the chiller, cooling tower, and cooling water pumps of the chilled water system. Optimal efficiency was

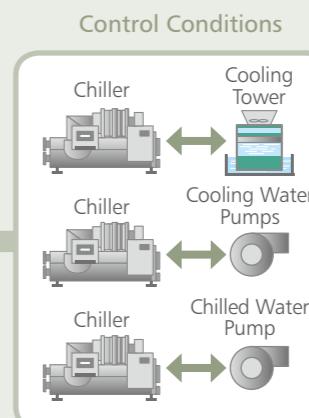
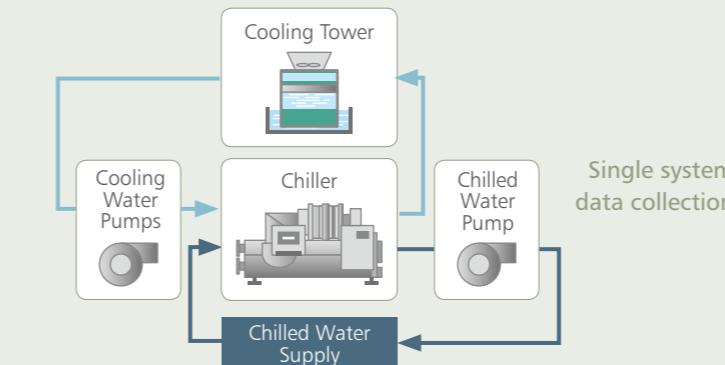
reached for the control system by taking into account the ageing of equipment, difference in plumbing, and other factors.

Successful Integration Maximizing Promotional Benefits Within the Industry

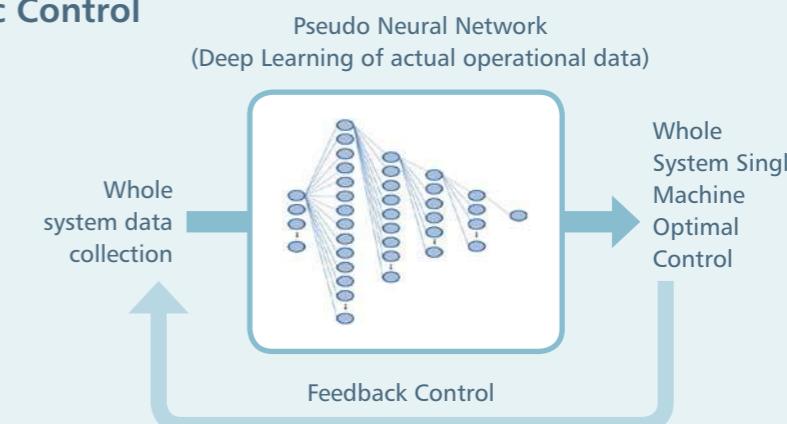
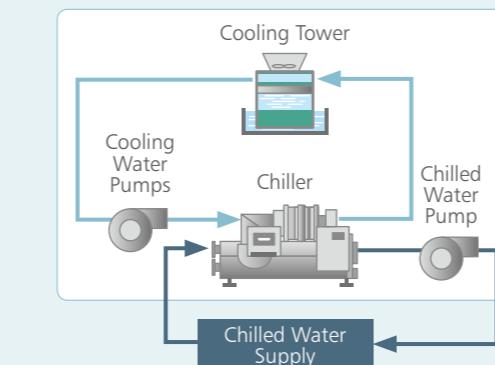
In order to find the optimal energy efficiency of the chilled water system, TSMC uses the massive amounts of data produced by the optimal energy-saving control program and a pseudo neural network to create a model. By taking 90 key parameters from amongst thousands of related variables, and after 4.15 million numerical models lasting 15 months exploring the relationship and weighting between variables, the real-time prediction function of the chilled water system was finally completed. Energy efficiency increased by 2% and TSMC estimates that 30GWh can be conserved each year. TSMC has selflessly shared this technology with the Taiwan Semiconductor Industry Association in hopes of raising the standards of environmental protection and continue the promotion of green innovation.

AI-ML Intelligent Energy-Saving Chilled Water System

Traditional Control Point Manual Adjustment

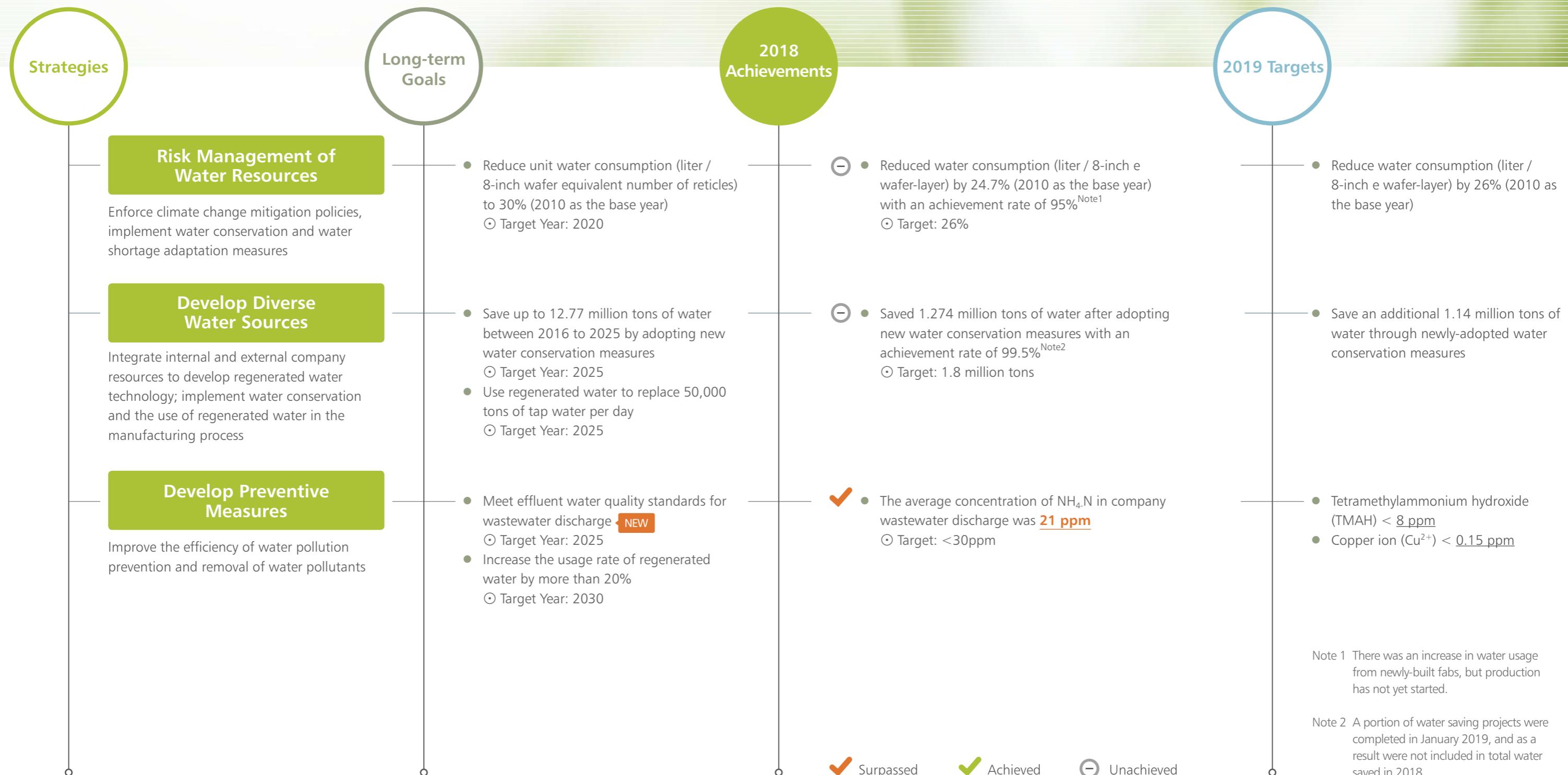


Optimal Control Point Automatic Control





Water Management





Expand Sources and Reduce Consumption to Ensure Sustainable Production

Water is a precious life-giving resource for our planet. In recent years, the impact of global climate change is tipping the balance between water supply and demand. As a global citizen, TSMC is taking concrete action to expand new resources and cut down on consumption by actively integrating internal and external resources. It has invested great effort in water resource risk management, expansion of diverse water sources, and the development of pollution prevention techniques while cooperating with external partners to ensure sustainable production.

Risk Management of Water Resources

Establishing an Effective Index for Monitoring Water Use

With a comprehensive water reporting system, TSMC monitors the volume of each reservoir and the water usage rate at every plant, thereby establishing an effective water resource management index. During a water shortage in Tainan County from January to May 2018, TSMC took action prior to the government's announcement of Stage One water restrictions, such as reducing landscaping irrigation by 50% and decreasing pressure in its water supply. It also saved up to 3% of water, lowering demand from reservoirs and mitigating the impact of the water shortage on the environment.

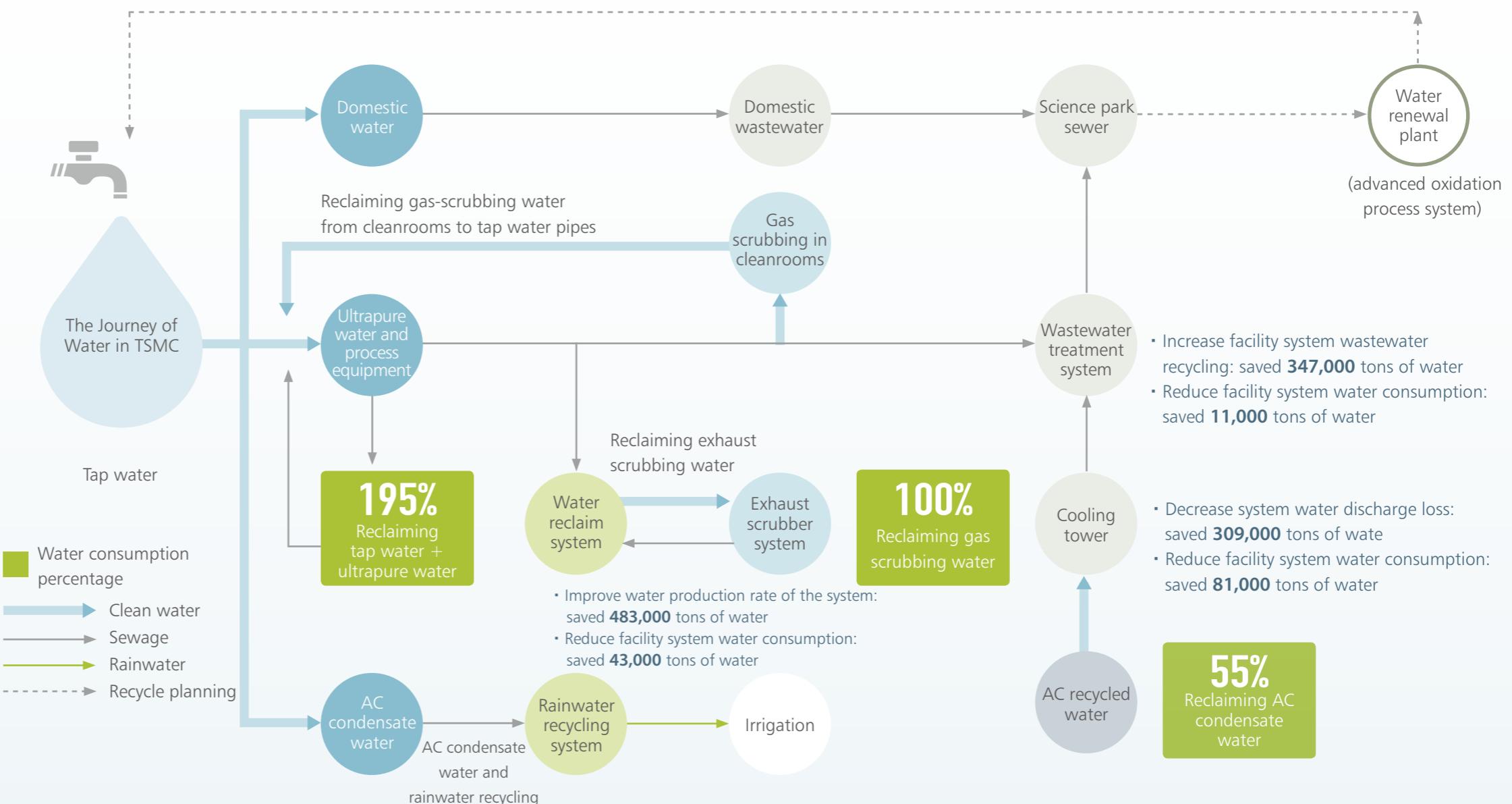
Pre-emptive Water Management Measures

TSMC Water Resource Management Benchmarks	Government Water Status Indicator	Government Water Restriction Measures	Situation in 2018
Establish a comprehensive water use monitoring system → Early warning of long-term water use trends → Assess water installations for any improvements	Blue Normal	Stabilize supply and demand	<ul style="list-style-type: none"> Constantly monitored the water supply of every reservoir as reported by the Water Resources Agency, and held periodic drills
Create a contingency group → Assess the demand for water tankers / reserve water sources → Formulate and negotiate water conservation guidelines between fabs	Green Slight Water Shortage	Encourage farmers to leave lands fallow	<ul style="list-style-type: none"> Created a contingency group to take inventory of water sources and water tanker capacity Lowered water supply pressure by voluntarily reducing water use by 3%
Voluntarily reduce water consumption by 3% → Formulate a systematic water conservation mode → Practice drills in using water tankers to transport water	Yellow Stage One	Decrease water supply pressure during specific time intervals	<ul style="list-style-type: none"> Did not occur
Implement water restrictions at all levels and enforce necessary water conservation measures → Cross-organizational drought emergency response team → Systematic water conservation and water transportation via water tankers	Orange Stage Two	Industrial Consumers 5-20% cut in water supply	<ul style="list-style-type: none"> Did not occur
	Red Stage Three	Rotating Water Outages	<ul style="list-style-type: none"> Did not occur

Actively Promote Water Recycling

In order to use water more efficiently, TSMC categorizes wastewater from purification and processing equipment according to purity. The cleanest water is given priority to be purified and recycled for use in the manufacturing process; the next grade goes through water recycling system treatment to serve as water for non-manufacturing processes; unrecyclable wastewater is discharged to an on-site wastewater treatment plant for terminal wastewater management. TSMC has invested considerable effort into building various wastewater recycling systems to enable water purification and reuse. Through layers of recycling, all tap water is completely reclaimed every day. Each drop of water can be used an average of 3.5 times. In 2018, the total amount of water recycled by TSMC reached a record high of 129 million tons, equal to 4.1 times the volume of the Second Baoshan Reservoir.

Main Water Cell and On-site Recycling System



How one drop of water can be used 3.5 times?

$$\frac{\text{Tap water} + \text{Recycled water}}{\text{Tap water}} = \text{Water usage times}$$

Note Water consumption percentage is the ratio of recycled water to tap water, or in other words, the proportion of water recycling volume to water consumption volume in treatment. Proportions of these water treatment equipment may vary depending on allocation by the science parks



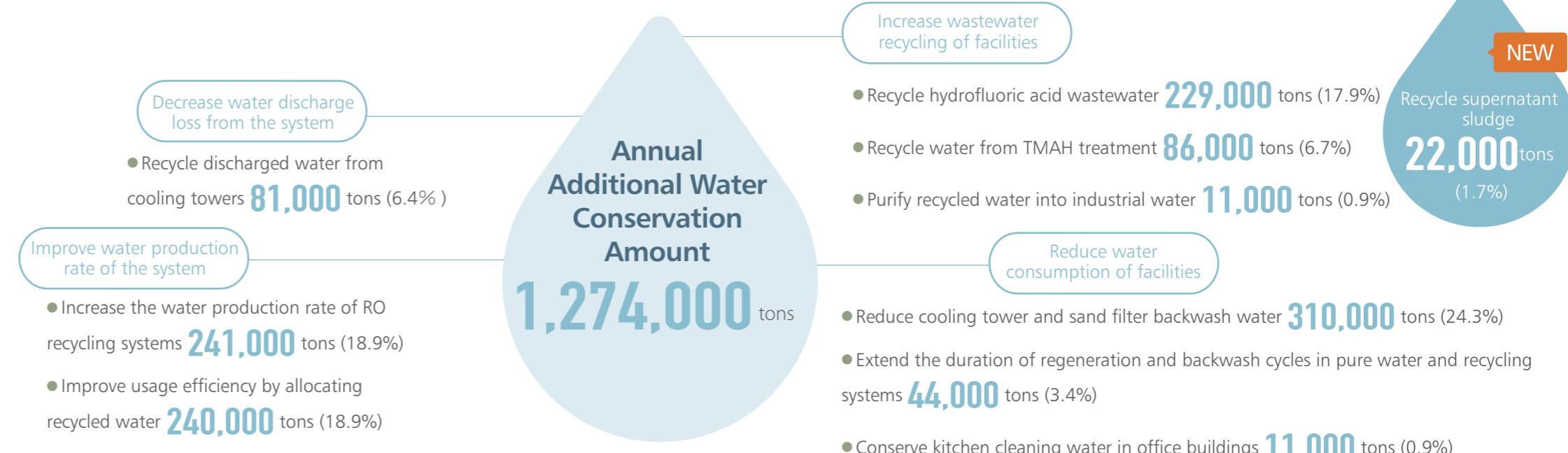
New Water Conservation Measures in 2018

Water recycling has become a more urgent issue than ever as advanced process technologies take a larger proportion of the Company's production, IC line widths continue to shrink, requirements for product purity continue to rise, and water needed per unit wafer of production continues to increase. In an effort to develop more water-saving methods, TSMC's water conservation guidelines focus on four aspects: 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 2018, the Company enhanced the effectiveness and expanded the scale of the ten existing water-saving measures. It also took a further step by putting sludge supernatant into coagulation-precipitation treatment through strict separation for water reuse. This method not only puts water conservation into practice, but it reduces wastewater and sludge. In 2018, an additional 1.27 million tons of water was conserved.

Many newly-built TSMC fabs (Fab 15B) began operating in 2018. To deal with the increasing consumption of tap water, TSMC has continued to propose many innovative water conservation measures to improve the water use efficiency, water recycling rate, and recycling volume of advanced manufacturing processes. In total, water use intensity (Water Consumption Per Wafer-layer) in 2018 decreased 24.7% from 62.6 (liter / 8-inch e wafer-layer) in 2010 to 47.1 (liter / 8-inch e wafer-layer). The rate of reduction was down from 2017 due to water consumption by newly-built facilities.

Water Conservation Measures and Results in 2018



Water Conservation Effectiveness

	2014	2015	2016	2017	2018
Average recycling rate of water for manufacturing processes (%) ^{Note1}	87.6	87.3	87.4	87.5	87.5
Ultrapure water consumption (Million metric tons) ^{Note2}	56.6	61.0	68.8	79.7	85.1
Tap water consumption (Million metric tons) ^{Note2}	38.2	37.5	42.0	49.0	56.8
Total amount of water recycling (Million metric tons) ^{Note3}	81.0	85.6	94.3	103.4	129.0
Equivalent volume of the Second Baowan Reservoir (number) ^{Note4}	2.57	2.72	3.00	3.29	4.10
Equivalent volume of a standard swimming pool (number) ^{Note5}	32,396	34,252	37,732	41,360	51,612
Number of times each drop of water is used	3.3	3.5	3.5	3.5	3.5

Note 1 Statistics are calculated by a standard formula assigned by the Science Park Administration

Note 2 Ultrapure water and tap water consumption includes numbers from Taiwan sites (all wafer fabs and back-end assembly facilities), WaferTech, TSMC (China), TSMC (Nanjing) and VisEra

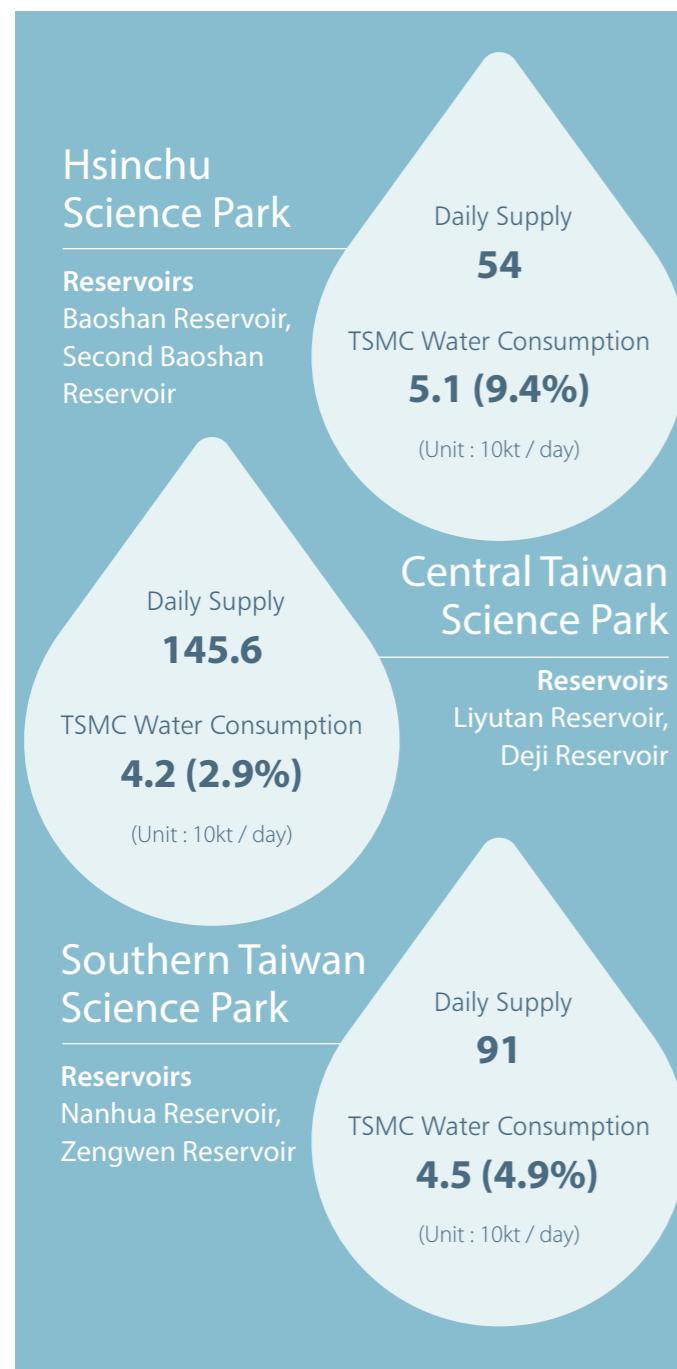
Note 3 Total amount of water recycling includes all data from Taiwan sites (all wafer fabs and back-end assembly facilities in Taiwan)

Note 4 The water in Hsinchu Science Park is mainly supplied by the Second Baowan Reservoir, whose full capacity amounts to 31.49 million tons

Note 5 A standard swimming pool is 50x25x2 meters in size, or 2,500 tons in volume



TSMC Water Consumption Rate at Three Science Parks



Annual Water Conserved

Unit: Ten thousand tons



Water Recycling and Usage Efficiency



█ Total amount of water recycled (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 The total amount of water recycled is 2.5 times the volume of tap water consumption

City Water Consumption and Water Consumption per Wafer-Layer



█ Total tap water consumption of subsidiaries (Million metric tons)
█ Total tap water consumption in Taiwan facilities (Million metric tons)
—○— Water Consumption Per Wafer-layer (liter / 8-inch e wafer-layer)

Note 1 Tap water consumption includes numbers from TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Note 2 The indicator for water usage per wafer-layer represents data from all wafer fabs of TSMC and subsidiaries

Note Reservoir capacity is according to the water supply information of all regions published on the Water Resources Agency website. The capacity of reservoirs supplying Central Taiwan Science Park includes numbers from Taichung and Miaoli



Develop Diverse Water Sources

TSMC's water sources include tap water, air conditioning (AC) condensate water, and rainwater. Tap water is used for manufacturing processes and domestic purposes; AC condensate, for manufacturing processes and irrigation; and rainwater, for irrigation systems. In order to cope with water shortages and comply with water supply diversity policies, TSMC has been developing water reclamation technologies since 2015. Currently, the Company has successfully decreased the number of water quality factors, such as total organic carbon (TOC), carbamide, and electric conductivity in wastewater, and it now meets water management standards for manufacturing processes in wafer fabs. The quality of its wastewater has also reached effluent discharge standards. TSMC's achievements all mark a significant development milestone in water reclamation. In addition, the Company succeeded in reducing the unit cost of water production by 40% and made regenerated water more economical in 2017. TSMC also began to find partner firms for the establishment of a water reclamation plant for its Southern Taiwan Science Park (STSP) site, and the plant is expected to be approved and constructed in 2019, providing 20,000 tons of industrial regenerated water per day. In the future, TSMC will continue to promote the development of water reclamation and support it with tangible actions to expand the supply and recycling of sustainable fresh water.

Timeline of Highlights for Regenerated Water



Note The actual schedule of introducing regenerated water may be adjusted according to the water supply timetable in water reclamation plants

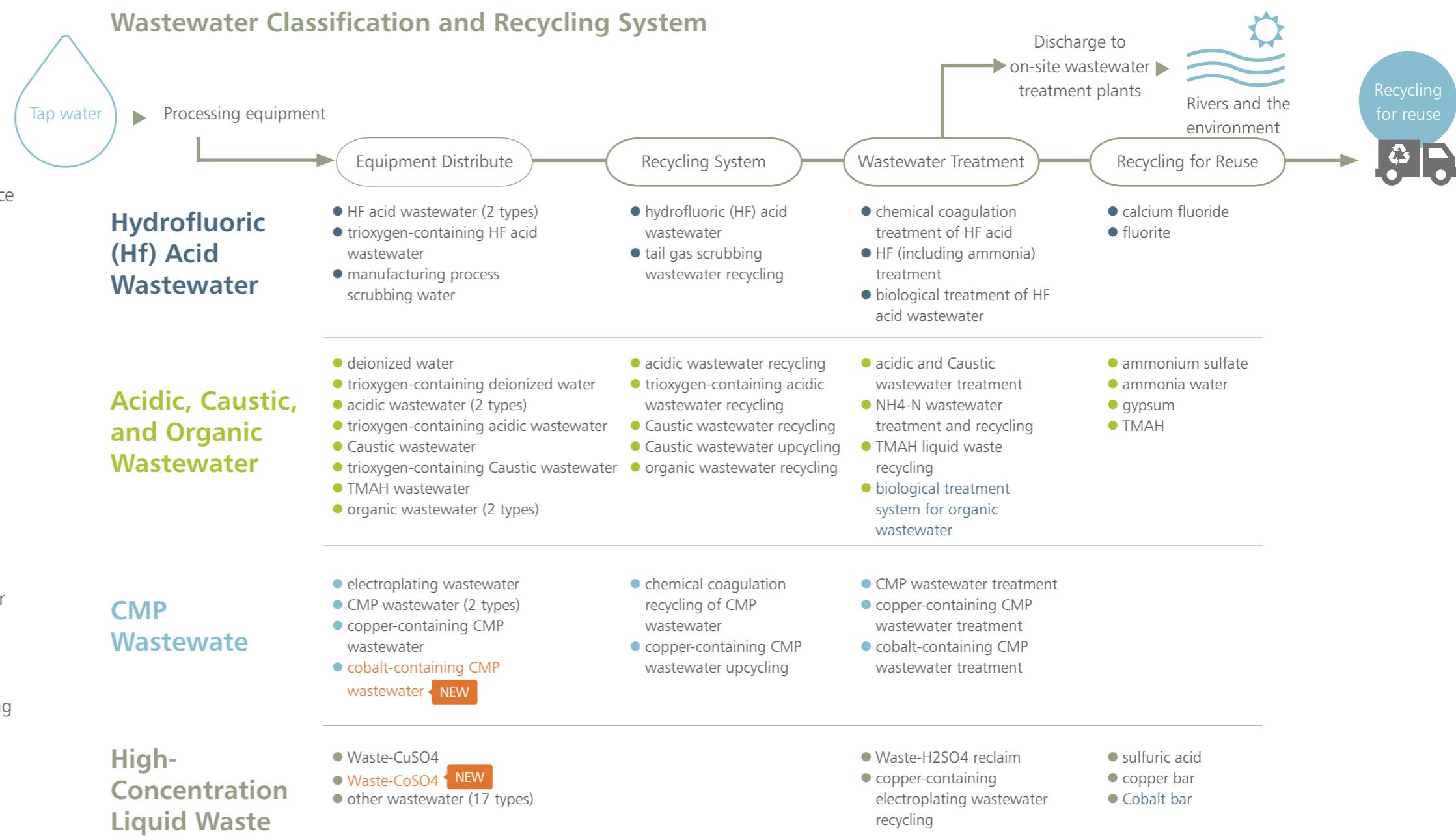




Develop Preventive Measures

More Effective Distribution Methods in Source Management

To maximize the performance of pollution prevention, source classification and management must be comprehensive. TSMC has put many resources into upgrading existing treatment equipment and constructing treatment facilities to direct wastewater towards appropriate treatment systems and preliminarily degrade all pollutants. Following this, wastewater is condensed and reclaimed through the recycling system to further reduce the concentration of pollutants in line with the Company goals. Wastewater from manufacturing processes are distributed into several categories: hydrofluoric acid wastewater, acidic and caustic wastewater, chemical mechanical polishing (CMP) wastewater, and high-concentration liquid waste. All wastewater is stringently classified immediately at the tool. A total of 38 distribution systems have been established based on the composition and concentration of wastewater from manufacturing processes. In 2018, following changes to manufacturing processes, TSMC began to use cobalt as the material of choice for interconnect and installed a new distribution and treatment system for wastewater containing high concentrations of cobalt and cobalt-containing CMP wastewater. Manufacturing process wastewater can flow through distribution pipelines to be collected by different wastewater treatment facilities. TSMC has built a comprehensive wastewater classification and resourcing system and made much progress in acid-base neutralization systems and coagulation-precipitation systems. Since the beginning of development, each plant now has 9 recycling systems and 12 wastewater treatment systems. With robust classification and treatment techniques, all components in wastewater can be transformed into reusable resources.



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 Categories of cobalt-containing wastewater and cobalt-containing liquid waste were added in 2018



Wastewater Discharge Monitoring

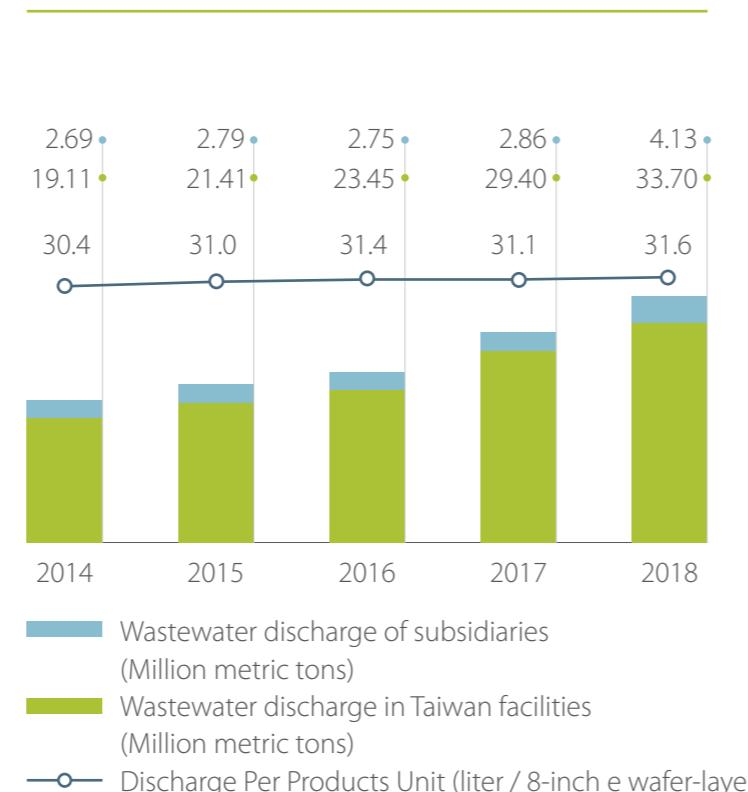
The amount of wastewater discharge is closely related to the volume of tap water consumption and water recycling. As TSMC's advanced process technology production continues to rise, unit water consumption, along with unit wastewater discharge, are increasing. TSMC has intensified its water recycling to reduce wastewater discharge. The discharge volume per product unit decreased by 2.4% from 2017 to 28.2 (liter / 8-inch e wafer-layer).

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 not only follows statutory effluent water quality standards but also participates in eco-friendly activities. After assessing manufacturing raw materials by referencing domestic and international studies on biological toxicity, TSMC has focused on pollutants in the semiconductor industry, such as TMAH (strong base), copper ions (heavy metal) and ammonia, as well as suspended solids and chemical oxygen demands that directly impact marine life, setting these as key targets to be improved. The Company has carried out various improvement measures and reduced the impact of wastewater discharge on the environment.



Wastewater Discharge Per Product Unit



Note 1 Total wastewater volume included numbers from TSMCs facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing), and VisEra

Note 2 Unit wastewater discharge intensity index is calculated with statistics from all TSMC wafer fabs and its subsidiaries

Preventive Techniques on Key Pollutants of Wastewater Quality and Improvement Achievements

Item	Standards set by Science Park Administration	TSMC Long-term Goals (2025)	Status in 2018	Improvement Achievements in 2018	Preventive Techniques
TMAH	HSP : 30 CTSP: 20 STSP: 60	1.0	13.1	Reduced by 57% from the previous year	<ul style="list-style-type: none"> Recycle low-concentration liquid waste Establish anion exchange resin towers
copper ion	HSP : 1 CTSP: 0.8 STSP: 3	0.1	0.18	Reduced by 53% from the previous year	<ul style="list-style-type: none"> Distribute copper-containing liquid waste Concentrate and recycle in resin towers (under planning)
NH4-N	HSP : 30 CTSP: 20 STSP: 60	20	21.0	Reduced by 87% from the previous year	<ul style="list-style-type: none"> Expand ammonia treatment systems
chemical oxygen demand	HSP : 500 CTSP: 500 STSP: 450	100	177.5	Raised by 47% from the previous year	<ul style="list-style-type: none"> Implement combustion treatment in strippers (under planning) Establish biological treatment systems (Bioprocess) (under planning)
suspended solids	HSP : 300 CTSP: 300 STSP: 250	30	29.4	Achieved long-term goals ahead of schedule	<ul style="list-style-type: none"> Recycle backwash wastewater after coagulation and precipitation

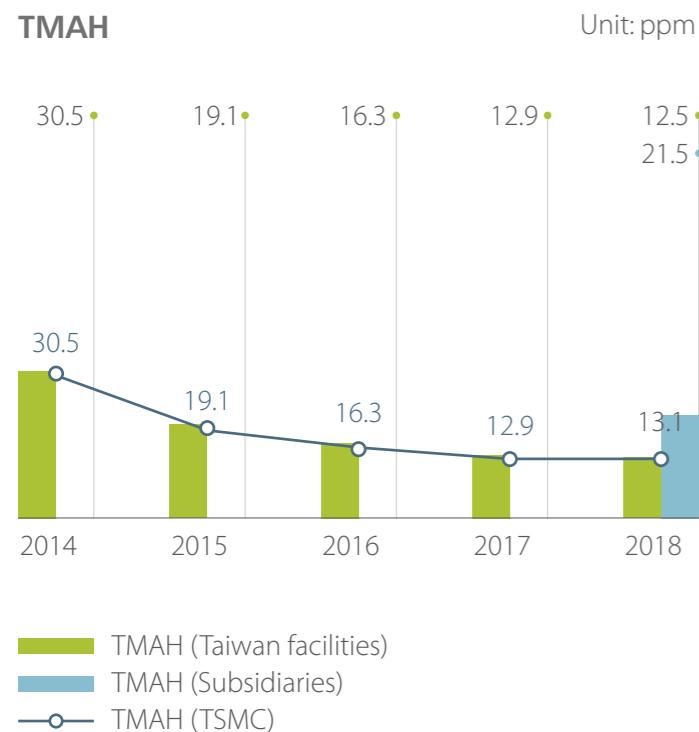
Unit: ppm

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

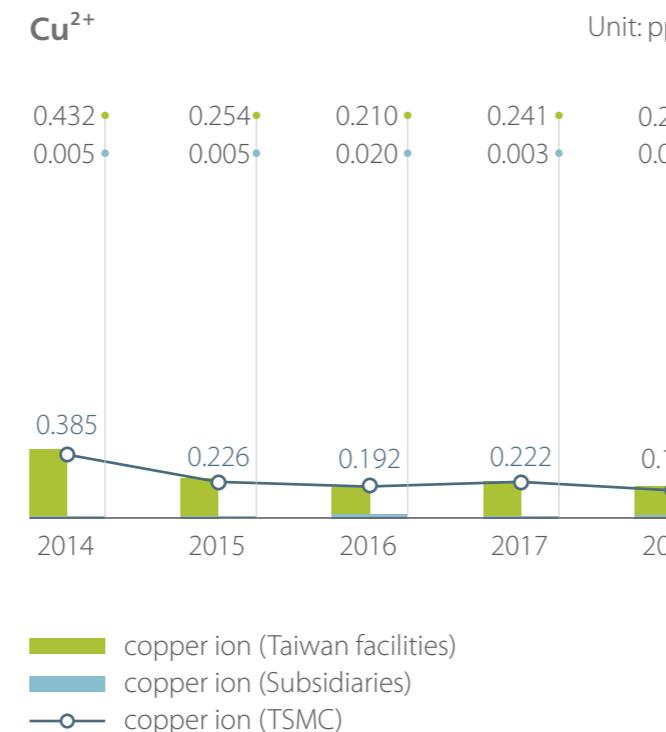


Pollutant Discharge Trends

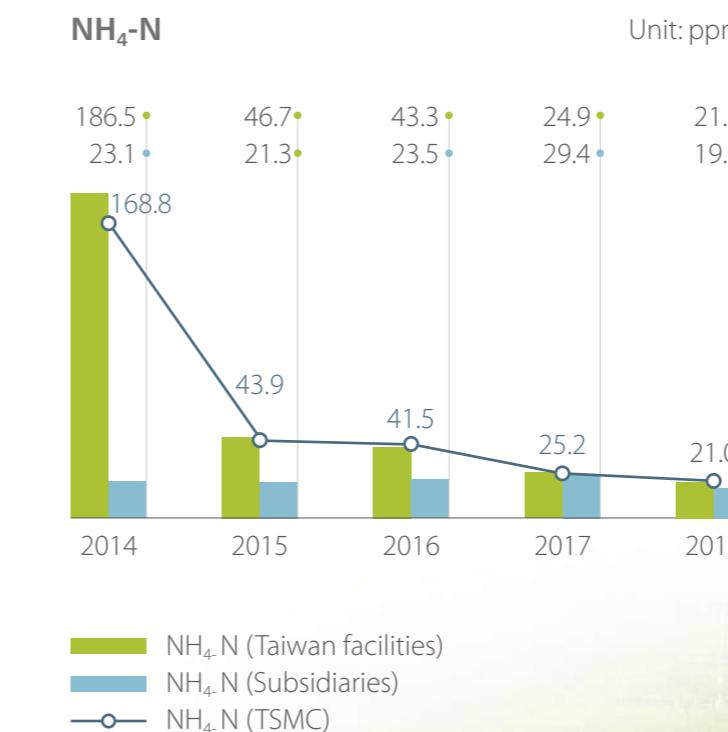
TMAH



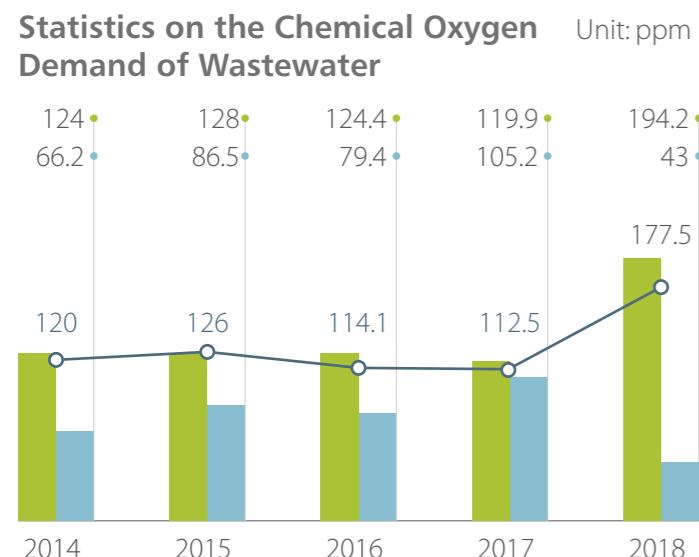
Cu²⁺



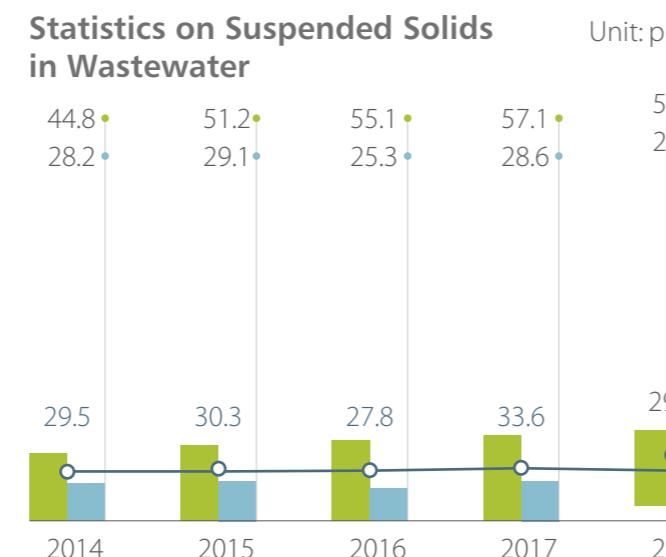
NH₄-N



Statistics on the Chemical Oxygen Demand of Wastewater



Statistics on Suspended Solids in Wastewater



chemical oxygen demand of wastewater (Taiwan facilities)
chemical oxygen demand of wastewater (Subsidiaries)
chemical oxygen demand of wastewater (TSMC)

suspended solids in wastewater (Taiwan facilities)
suspended solids in wastewater (Subsidiaries)
suspended solids in wastewater (TSMC)

Note 1 Statistics of TMAH include data from TSMC (all wafer fabs and back-end assembly facilities), TSMC (China) and TSMC (Nanjing)

Note 2 Statistics of copper ions, chemical oxygen demand, and suspended solids in wastewater include data from TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), TSMC (China), TSMC (Nanjing), and VisEra

Note 3 Statistics of NH4-N include data from TSMC (all wafer fabs and back-end assembly facilities), TSMC (China), TSMC (Nanjing), VisEra, and WaferTech

Note 4 The 2018 statistics on the chemical oxygen demand of wastewater and suspended solids in wastewater are calculated with the weighted average of water volumes across all campuses

Note 5 Data for TSMC (Nanjing) were added in 2018



Case Study

Distribute Low-Concentration Wastewater and Reduce Chemical Use During Treatment

Appropriate water pollution prevention measures require considerations of treatment procedures and chemical dosage to effectively reduce target pollutants without increasing the discharge of other pollutants. In order to enhance the efficiency of copper capture, TSMC reduced its chemical dosage in treatment procedures and decreased the amount of copper sulfate liquid waste and chemical coagulation byproducts. After evaluating the raw material consumption and wastewater discharge status in 2018, TSMC included lower concentrations of copper-containing liquid waste (< 2 ppm) for treatment. The concentration of wastewater discharge is expected to decrease to 0.1mg / L by 2025 as a result of TSMC's unrivaled strict adherence to industry standards.

Repeated Examinations and Efficiency Enhancement of Mid- and Low-Concentration Wastewater Treatment

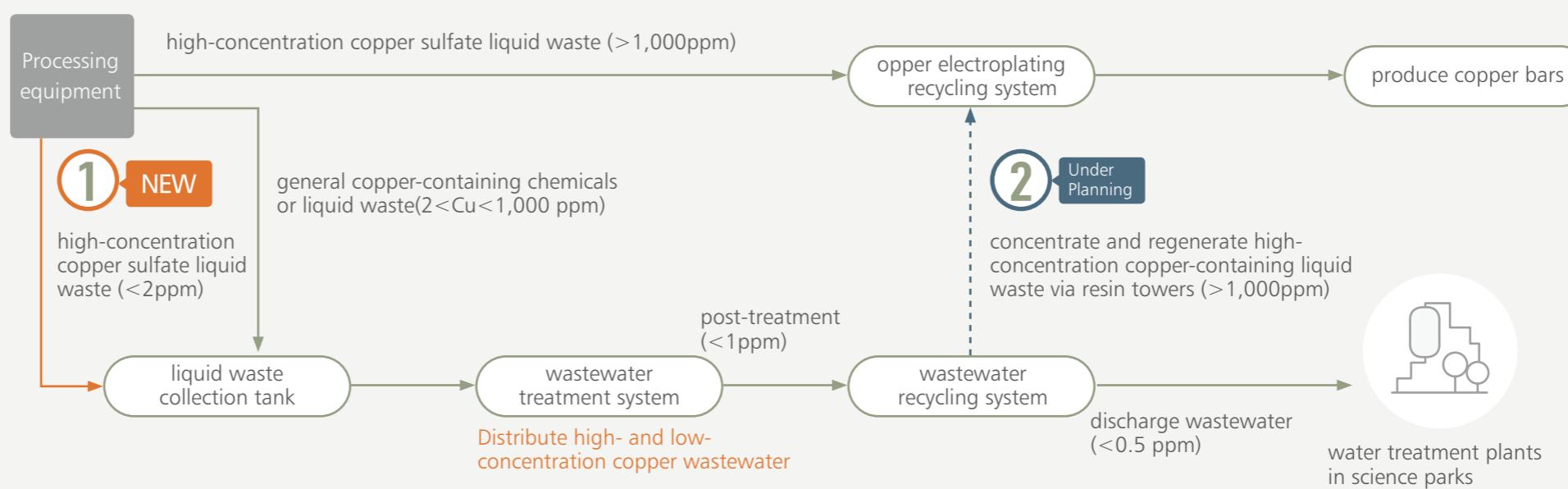
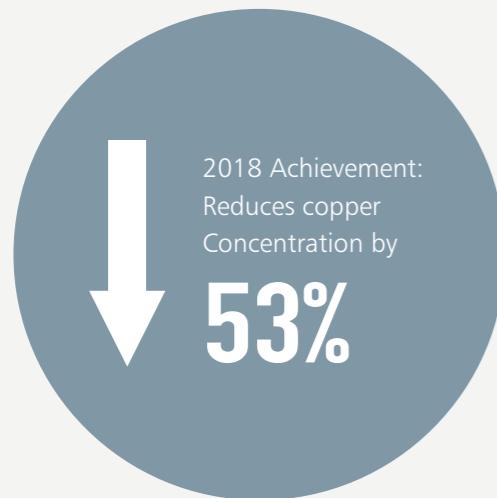
After approximately a thousand rounds of testing, examining, and analysis in 2018, TSMC has determined the optimal amount of chemicals for various concentrations and established two processes: recycling of low-concentration copper-containing chemicals and liquid waste, and the distribution of

wastewater containing high-concentration coordination complex ions. Compared to 2014, these processes maximize the functions of a copper ion capturing agent (Cu chelating agent) while decreasing the concentration of copper from 3-4 ppm to less than 1 ppm, leading to an accumulated reduction of 53%. Additionally, the concentration of effluent water was reduced from 0.38 ppm to 0.18 ppm, much lower than the standards in all science parks and the copper ion standard of 1 ppm for drinking water.

Condensate Wastewater - Concentration, Recycling, and Copper Bar Production in Resin Towers

Based on wastewater treatment results in 2018, TSMC is actively conducting assessments and examinations for the establishment of a wastewater condensation and high-concentration copper regeneration and electroplating system in the hope that through resin and regeneration concentration selection and mixing tests, low concentrations of copper ions absorbed by the cation resin tower following regeneration and concentration by strong acids (hydrochloric acid) can be reclaimed as copper bars via electroplating. Through this measure, the treatment procedures for copper liquid waste can be further refined and become more eco-friendly.

TSMC Treatment Procedures of Copper-Containing Liquid Waste



Case
Study

Comprehensive Collection and Double Treatment Reduces TMAH Concentration by 57%

Tetramethylammonium hydroxide (TMAH) is a strong alkali-containing neurotoxin commonly found in the wastewater of semiconductor manufacturing processes. TSMC has taken considerable efforts to capture TMAH through resin towers to mitigate its environmental impact. It has also cooperated with partner firms to reduce 25% concentrated TMAH into recyclable industrial-grade materials. In addition, TSMC has determined the optimal treatment curve for all fabs through long-term operation and continuous testing, thereby considerably reducing the amount of recycling by-products. To further decrease the concentration of TMAH, TSMC has extensively researched and analyzed the status of raw material use and waste discharge from equipment in 2018, following the two main guidelines of comprehensive collection and double treatment. In comparison to 2014, the average concentration of TMAH was reduced by 57% from 30.5 ppm to 13.1 ppm, and is expected to be reduced by 95% in 2025.

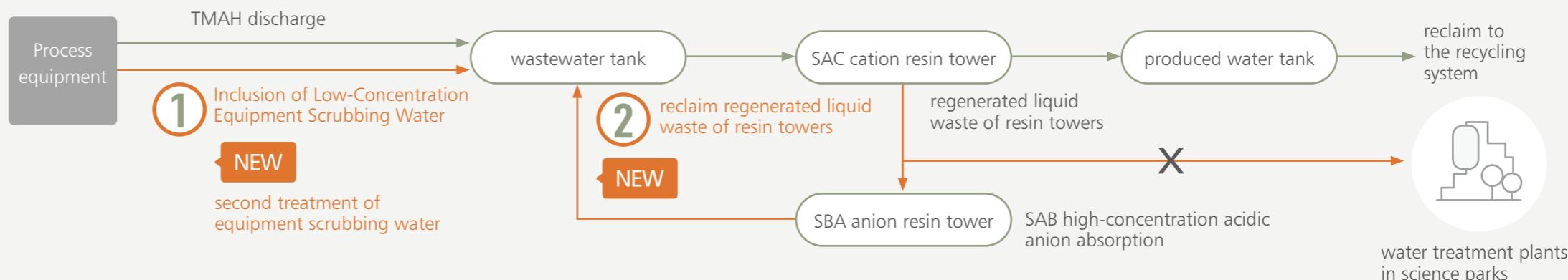
Comprehensive Collection: Inclusion of Low-Concentration Equipment Scrubbing Water

TSMC has established the most robust wastewater classification management system in the industry. It continues to improve the stability and efficiency of the system with thousands of parameter adjustments and resin category testing data every year. In 2018, the Company took a further step to collect and manage low-concentration liquid waste ($\text{TMAH} < 1,000 \text{ ppm}$). Instead of directly discharging the wastewater as before, pipelines for equipment scrubbing water were designed to recycle and manage the TMAH system in order to reclaim precious water resources.

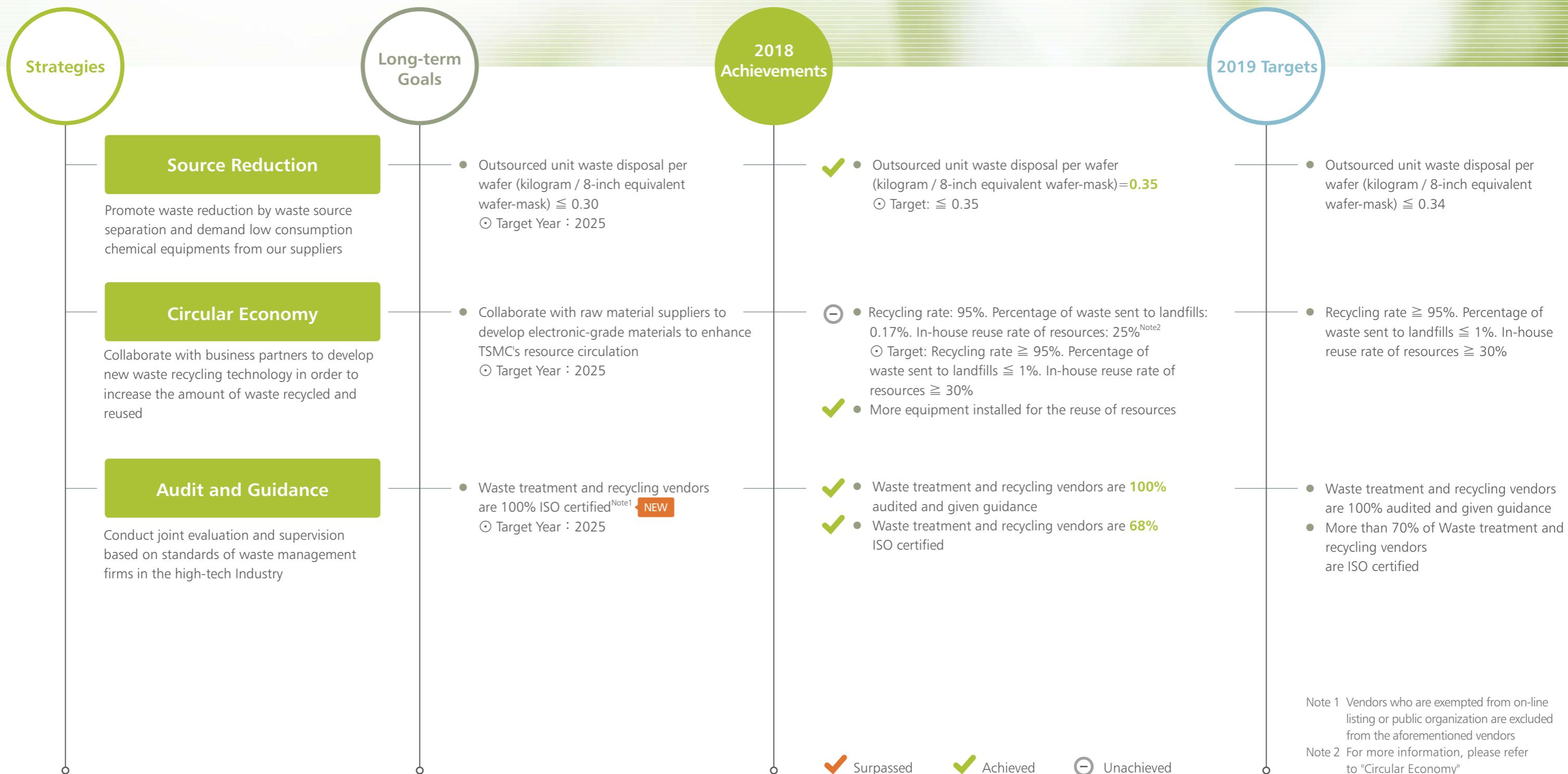
Double Treatment: Recycle Regenerated Liquid Waste from Resin Towers

Cation resin towers are often used to absorb TMAH in the semiconductor industry. After saturable absorption, TMAH is regenerated during neutralization with strong acids. In the past, low-concentration TMAH acid could not be reabsorbed in the process due to sulfate ions (SO_4^{2-}) and would often be discharged into wastewater. To resolve this issue, TSMC repeatedly examined and refined regeneration procedures until it successfully developed an anion resin tower mode, which takes regenerated liquid waste from resin towers and removes sulfate ions before introducing them into cation resin towers for effective absorption to further reduce TMAH concentration.

TSMC's Refined Procedures of TMAH Treatment



Waste Management



Note 1 Vendors who are exempted from on-line listing or public organization are excluded from the aforementioned vendors

Note 2 For more information, please refer to "Circular Economy"



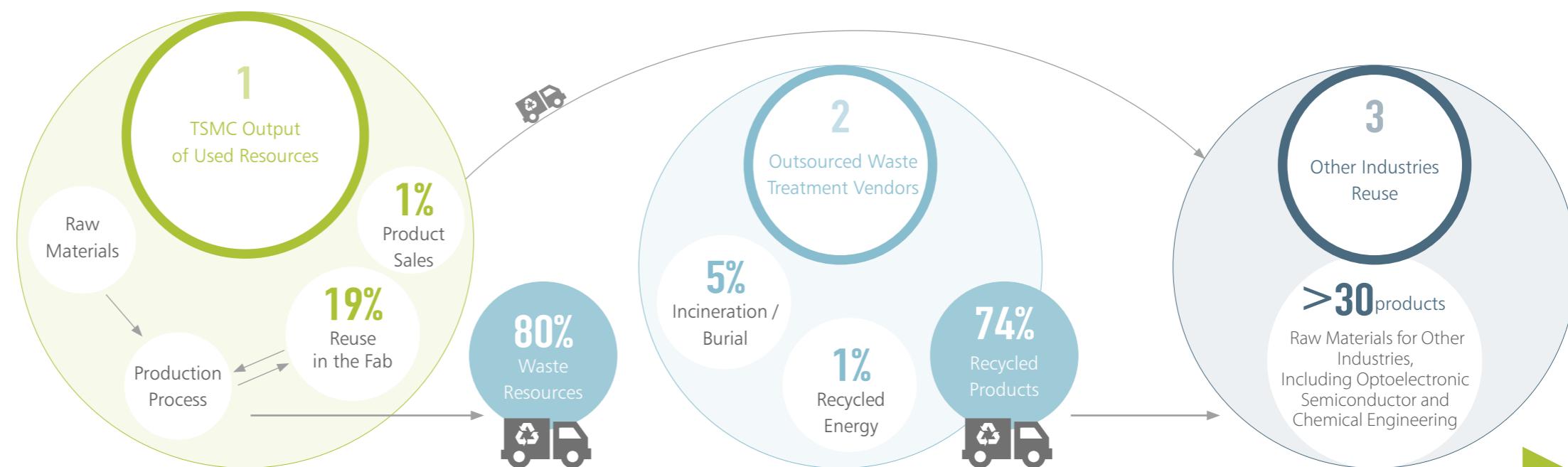
Minimizing Waste Production and Maximizing Reuse of Resources

TSMC's principle in waste management is to continuously reuse resources. As the Company's production and R&D continues to increase in scale, TSMC prevents corresponding increases in waste production and the potential impact on the environment by following the guidelines of "Minimal waste production, maximum continuous reuse of resources." To reduce waste production, TSMC requires production sources to adjust process technology and parameters for raw material use. With the assistance

of its supply chain, TSMC optimizes material usage and minimizes material consumption. With regard to maximizing the reuse of resources, TSMC constantly seeks out for new reusable materials; the Company's manufacturing fabs have been reducing material consumption and environmental impact by maximizing the reused resources. As for waste disposal, TSMC renews waste through resource renewal technology and converts waste into reusable resources that can be reused internally or sold to other industries. 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 in accordance to the principles of circular economy. When all options have been exhausted, TSMC's final option is to resort to waste incineration and landfill. In 2018, the recycling rate was 95%, and has been over 90% ten years in a row. TSMC has been actively implementing circular economy and has also established a "waste disposal vendor management procedure" with periodic onsite audits to ensure that all waste management and waste reuse is compliant with the law. TSMC also shares relevant environmental and sanitary management experience with waste treatment and recycling vendors, and requires them to be ISO certified to further improve the quality of waste management.

Life Cycle and Management of Sustainable Resources in TSMC



Source Management

- Categorize and collect from the source
- Tracking of output and fab waste reduction projects
- Wastes preprocessed in-house as reused resources

Waste Resource Management

- TSMC Satellite Management Tracking System
- Tracking of GPS Anomalies

On-site Audits

- Safety management and facility availability
- Inspection on input and output

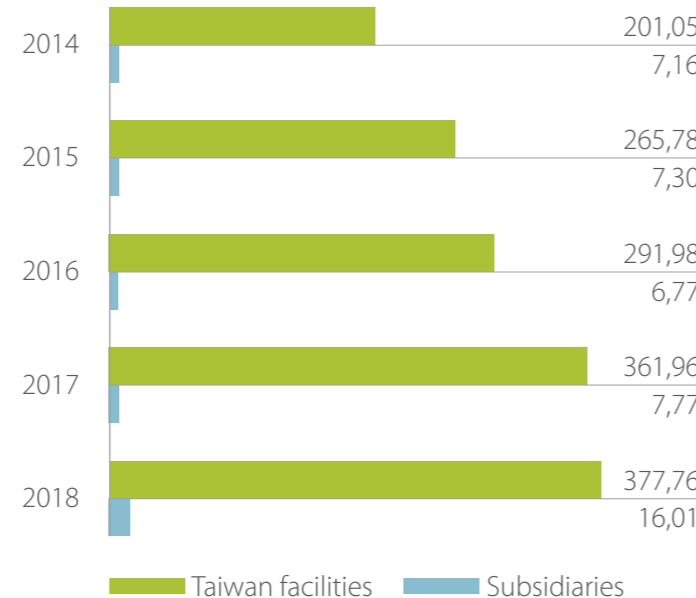
Follow-up on reused products

- Monthly sales of reused products
- Evaluation of the industry, clients, and usage
- Inspection of invoices and shipping records

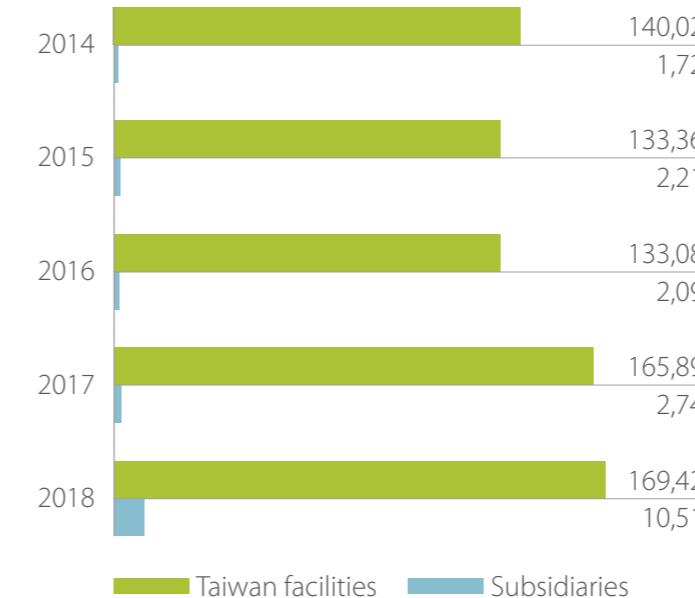


Waste Quantity and Treatment Status Statistics

Waste from Outsourced Businesses Unit : tons / year



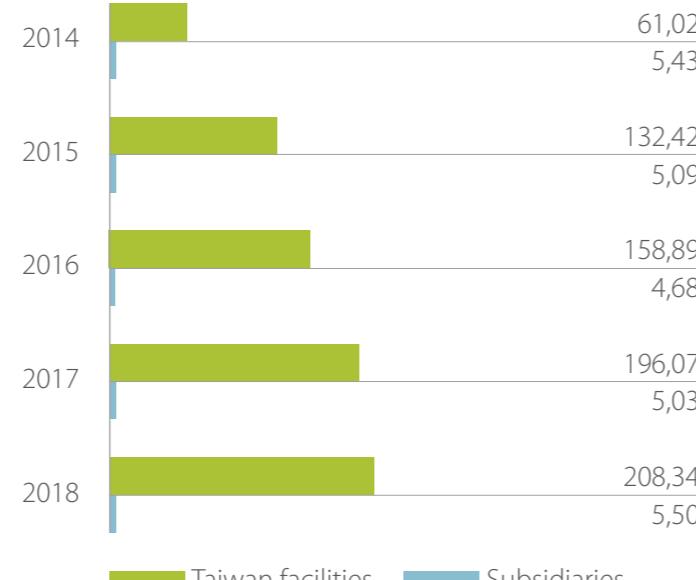
Hazardous Business Waste Unit : tons / year



Percentage of Recycled Waste Unit : %



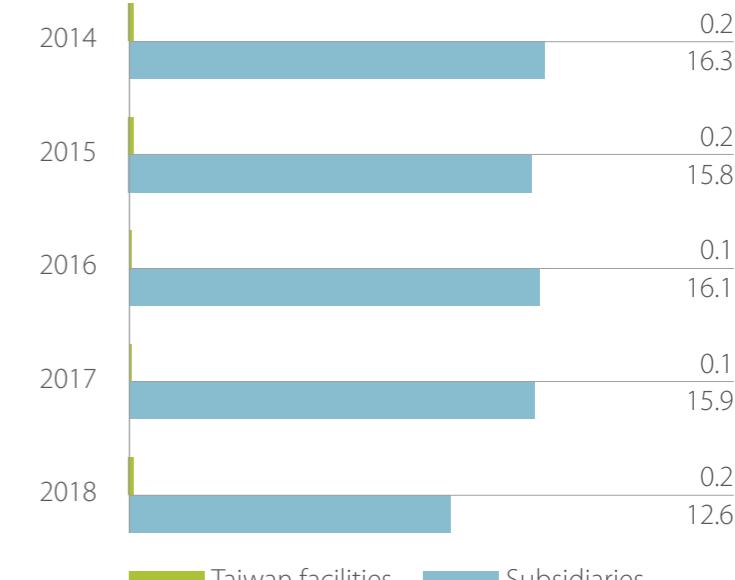
General Business Waste Unit : tons / year



Reused Resources Unit : tons / year



Rate of Buried Waste Unit : %



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 business waste.

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

Note 4 Data for hazardous business waste in 2015 and 2016 has been corrected and recalculated.



Source Reduction

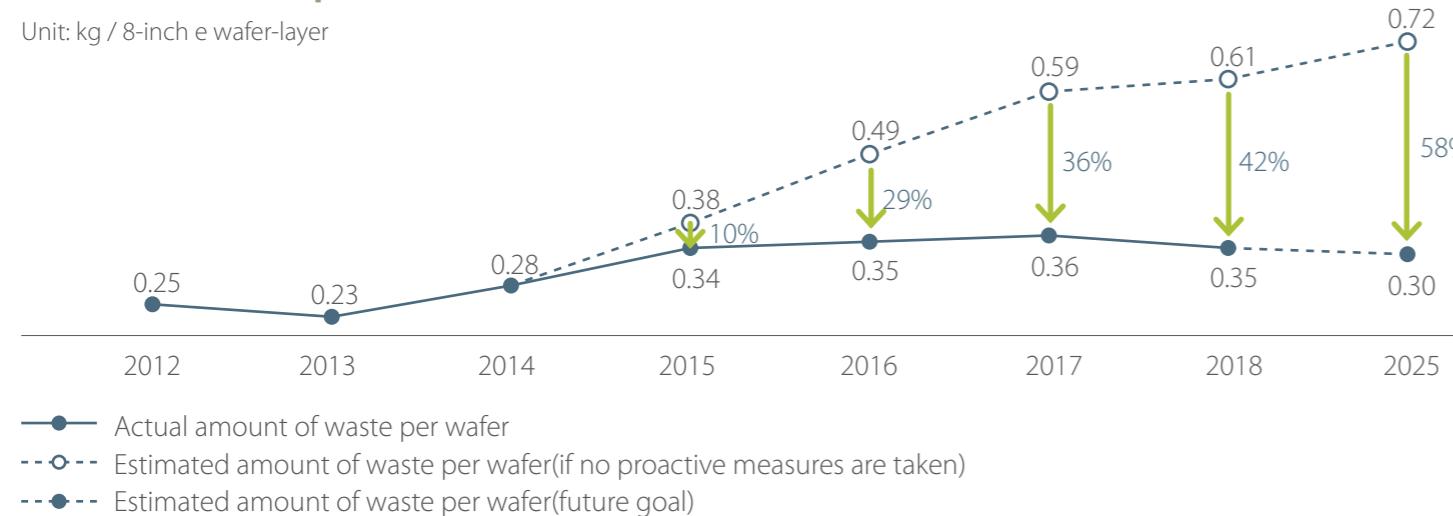
TSMC continuously develops advanced process technologies and expands its capacity, with rising demand for raw materials and standard of environmental regulations, TSMC estimates that by 2025, the weight of the Company's outsourced waste disposal per wafer will be at 0.72 kilograms.

TSMC established a "Waste Management Task Force", and within the committee, the Vice President of Operations designates inter-fab coordinators to come up with waste reduction plans with fab managers at the beginning of each year and to hold monthly progress checks. If it becomes apparent that a

reduction objective cannot be met, better solutions and measures will be implemented. In addition, TSMC has built a real time management system to track the amount of waste produced in the production process per unit. By doing so, fab managers can monitor the output of waste in real time and compare outputs with other fabs. When an effective solution to waste reduction is successfully verified, the method will be adopted by the other fabs in order to maximize waste reduction. In 2018, TSMC implemented 217 waste reduction proposals and reduced the amount of outsourced waste disposal for diluents. The weight of outsourced waste disposal per wafer was reduced to 0.35 kilograms from the projected 0.61 kilograms. TSMC will continue to seek opportunities to reduce chemical waste used in fabrication from the source, and increase the scope of waste renewal facilities and projects to meet the 2025 goal of reducing the amount of outsourced waste disposal to 0.3 kilograms.

Unit Waste Output Trendchart

Unit: kg / 8-inch e wafer-layer



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

Case Study

"Project Big Green" —A Full-Scale Chemical Reduction Plan

TSMC's environmental vision is to become an environmentally sustainable and world-class business in environmental protection. To live up to this aspiration, TSMC is actively making efforts to reduce waste production from the source, and has shown improvement each year by implementing the "Project Big Green" plan to reduce consumption of heavily used chemicals. Goals for 2018 include simplifying the manufacturing process, extending the life cycle of chemicals, and recycling and reusing resources. At the same time, TSMC has been exploring alternative chemical replacements, introduced high-temperature production processes to reduce the use of chemicals, and is seeking to extend the frequency of regular maintenance. Furthermore, the feeding system was replaced from storage drums to storage tanks to reduce residue materials. Once an effective solution for waste reduction is verified, the process is adopted by all fabs, ensuring product quality and at the same time cutting down on chemical use. In 2018, through a variety of source reduction plans, TSMC reduced the amount of waste per wafer by 28,907 tons per year, and decreased waste disposal expenses by NT\$220 million per year.



Simplify the Production Process

Extend the Life Cycle of Chemicals

Recycle and Reuse Chemicals

Search for New Chemicals as Alternatives

High-temperature Production Process

Less Frequent Maintenance

Replace Drums with Storage Tanks



Circular Economy

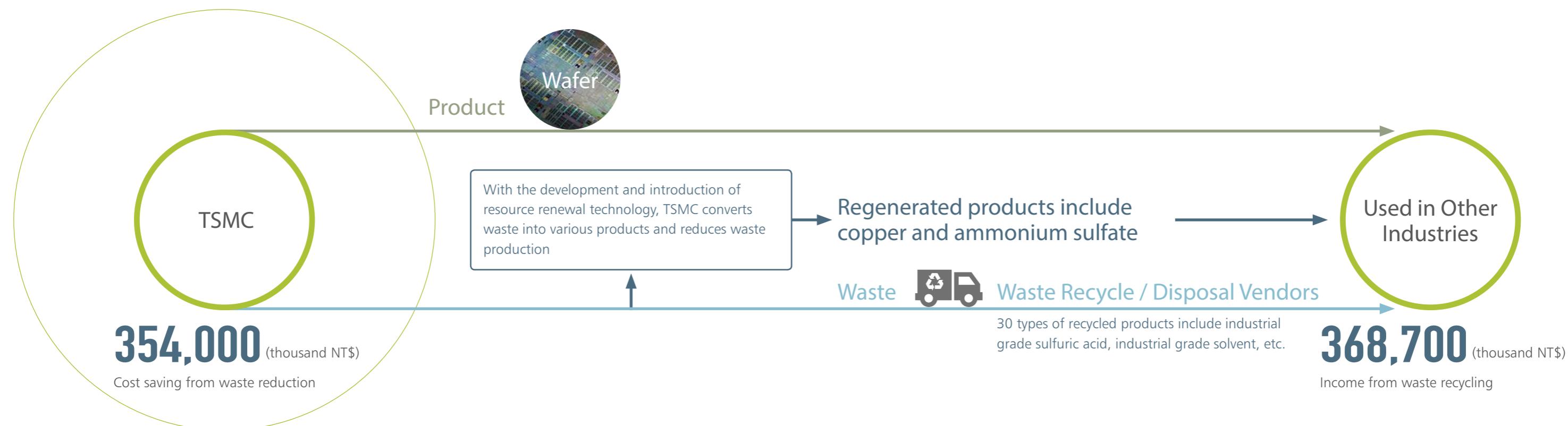
TSMC fulfills circular economy through the Company's actions, hoping that while people enjoy the convenience of technology, TSMC can at the same time lessen environmental impact by reusing materials. TSMC not only introduced resource renewal facilities, but also added chemical materials and 3 other categories of business items to the Company's Articles of Incorporation. By successfully converting waste material into valuable resources, TSMC began to sell

self-produced recycled products to other businesses in 2018, and expects to gradually expand its "High Added-Value Resource Plan" over the next five years. Through the development and introduction of resource renewal technology, the waste produced in the manufacturing process will be converted to products and directly reused in TSMC fabs or sold to other businesses. TSMC is transforming from a waste producer to becoming an advocate for circular economy, and actively shares the Company's experiences and management techniques in resource renewal with other businesses in the industry, hoping to improve the recycling capability of Taiwan's manufacturing industry and reach the goal of sustainable development in its supply chains.

In 2018, TSMC introduced new technology that converts wastewater containing ammonia nitrogen to ammonium sulfate crystals and successfully produced small amounts of ammonium sulfate. TSMC's first-ever drying system for ammonium sulfate was set to begin full operation in 2018 with a target of achieving over 30% resource renewal rate. However, due to the adjustments made to operating parameters during the production process, the ammonium sulfate drying system was only able to produce 40% of expected amounts. TSMC has made more adjustments to facilities and operating parameters and is now projecting to reach the target of 30% resource renewal rate in 2019.

In 2018, TSMC improved the existing electronic-grade copper material extraction from its copper sulfate recycling process, and copper can now be extracted from low concentrations of copper sulfate. TSMC has also been adding preprocessing facilities to extract low concentration copper sulfate wastewater which is to be used in the recycling process. The Company estimates that copper-contaminated wastewater will no longer have to be outsourced in 2019. In 2018, TSMC recycled a total of 95,989 tons of waste and reclaimed 90 tons of products for sale, bringing in an economic value of NT\$8 million in recycled resources.

TSMC Aspires to be a Practitioner of Circular Economy



Case
Study

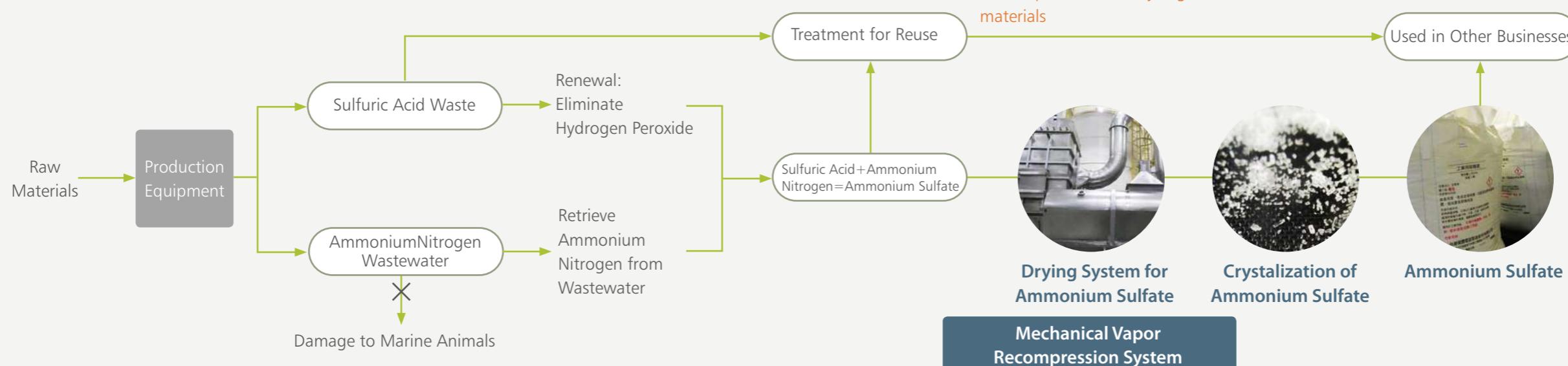
First in the Industry— Converting Ammonia Nitrogen Wastewater into Valuable Industrial-Grade Materials

Adhering to the principle of "Minimizing Waste and Maximizing Resources," TSMC developed a pre-processing system for sulfuric acid and ammonia nitrogen wastewater in 2015, and in 2017 it was adopted by all TSMC fabs. Recycled sulfuric acid waste in fabs was used as adsorbents and combined with ammonia nitrogen wastewater, creating ammonium sulfate wastewater, which was then outsourced and used for other purposes. In 2018, TSMC further improved the ammonium sulfate crystallization system by introducing Mechanical Vapor Recompression (MVR) to create a more energy-efficient and effective way to convert ammonium sulfate wastewater into valuable industrial-grade ammonium sulfate products for resale. This is a successful case of combining used sulfuric acid waste with ammonia nitrogen wastewater into a valuable resource that can be reused. The outsourced disposal of sulfuric acid waste and ammonium sulfate wastewater decreased by 90,409 tons (eliminating the expense of purchasing the same amount of industrial-grade sulfuric acid) and 1,956 tons respectively, creating an economic value of NT\$180 million per year, reducing outsourced disposal fees and sales fees for recycled resources.



Sulfuric Acid Waste Recycling System

Combining Used Sulfuric Acid Waste with Ammonia Nitrogen Wastewater into a Valuable Resource that Can Be Reused





Case Study

Copper Wastewater Fully Utilized as a Resource

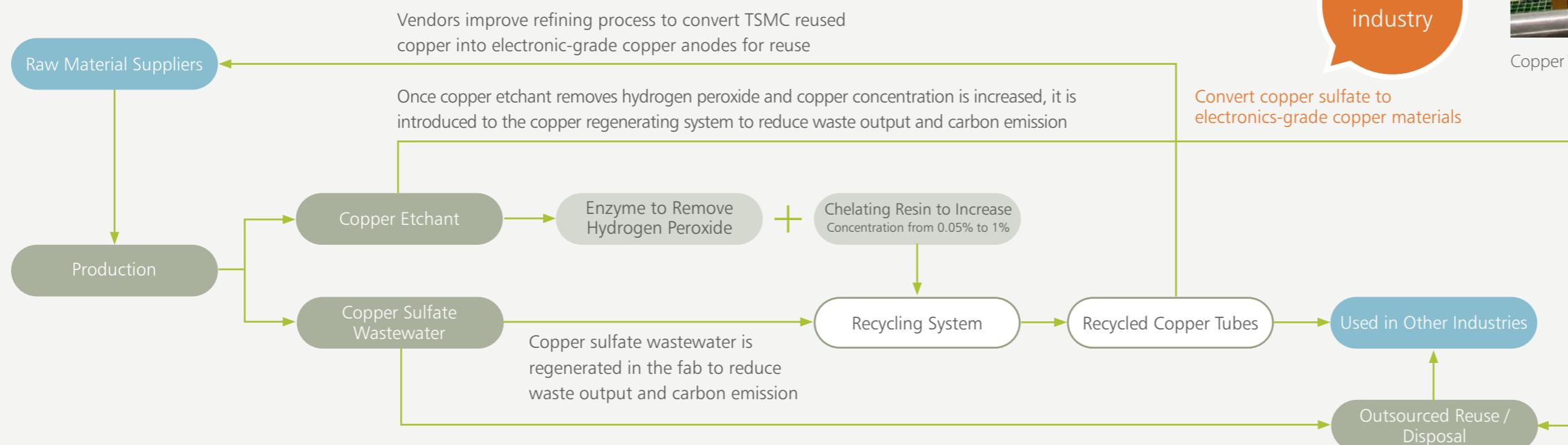
TSMC has assessed and understands the valuable nature of copper wastewater as a resource. In addition to reusing previously outsourced copper sulfate wastewater (concentration of 1-3%) and remaking it into valuable copper tubes and electronic-grade copper anodes, in 2018 TSMC successfully recycled copper wastewater that previously could not be reclaimed. This copper wastewater containing hydrogen peroxide from the etching process of the packaging phase could not be treated with electroplating due to the low concentrations of copper (400-500 ppm). It was instead treated with enzymes to eliminate hydrogen peroxide and chelating resin to increase the copper concentration in the pre-processing stage.

A total of 3,624 tons of copper wastewater was processed and 50 tons of copper tubes were produced. In 2019, the Company's goal is to extend this recycling process to additional manufacturing processes and achieve zero outsourced copper wastewater. TSMC works with suppliers to develop production processes in the fab for the reclaimed copper tubes, where they are remade into electronic-grade copper anodes and reused in TSMC, taking a big stride towards a circular economy.



Copper Wastewater Recycling System

First in the industry





Audit and Guidance

When it comes to waste management and reusing waste, TSMC has a thorough procedure for choosing business partners. A documentary review that includes business scale, reputation, and related certifications of its business partners is first conducted. Next, TSMC conducts an onsite audit and carefully chooses outstanding vendors to work with. Qualified vendors must go through inter-departmental annual evaluation by TSMC's Material Supply Chain Management Division, Corporate ESH Division, and Legal function and follow the "Waste Disposal and Waste Recycling Vendors Audit Plan" for an onsite audit. The provisions of the audit plan include 165 items that cover eight areas, including operating management, waste management, wastewater management, air pollution prevention, maintenance records, safety / health management, fire safety management, and emergency response. Vendors are also required to make a self-evaluation beforehand. This aids vendors in implementing these provisions in their daily management.

In 2018, TSMC conducted its annual audits and provided guidance for improvements in the eight areas in environment, safety, and health as follow-up management. The percentage of business partners evaluated as "excellent" and "good" increased from 36% in 2015 to 66% in 2018. In addition, since 2016, TSMC has been pushing for vendors to gain ISO certifications from third-party organizations recognized by TSMC. In 2018, the number of ISO-certified vendors increased

from 23 to 36, accounting for 68% of all vendors. In 2019, TSMC plans to increase the scale of the plan and work towards guiding all vendors towards certification. When selecting new vendors, certification will be a strong point for consideration in order to increase the quality of sustainable development management of vendors to reach the goal of 100% vendor certification by 2025.

To take responsibility for outsourcing the cleaning and management of its waste, TSMC requires all waste recycling vendors producing the recycled or regenerated products are to report their production and sales records on a monthly basis. TSMC also periodically conduct onsite inspection to cross-reference the actual disposals and recycling of the processing waste and compares that with the product sales records to ensure that recycled products are compliant with the law. TSMC ensures that all waste produced by the Company is properly tracked and well executed. To further increase management effectiveness, TSMC joined the Taiwan Semiconductor Industry Association and collaborated with Taiwan's Environmental Protection Agency to push for an "Electronics Manufacturers' Waste Resources Renewal Platform" in hopes that through the efforts of the government and business, a more efficient and effective management system for the flow of recycled resources can be established.



100%

Increase the number of ISO-certified vendors to reach the goal of 100% by 2025

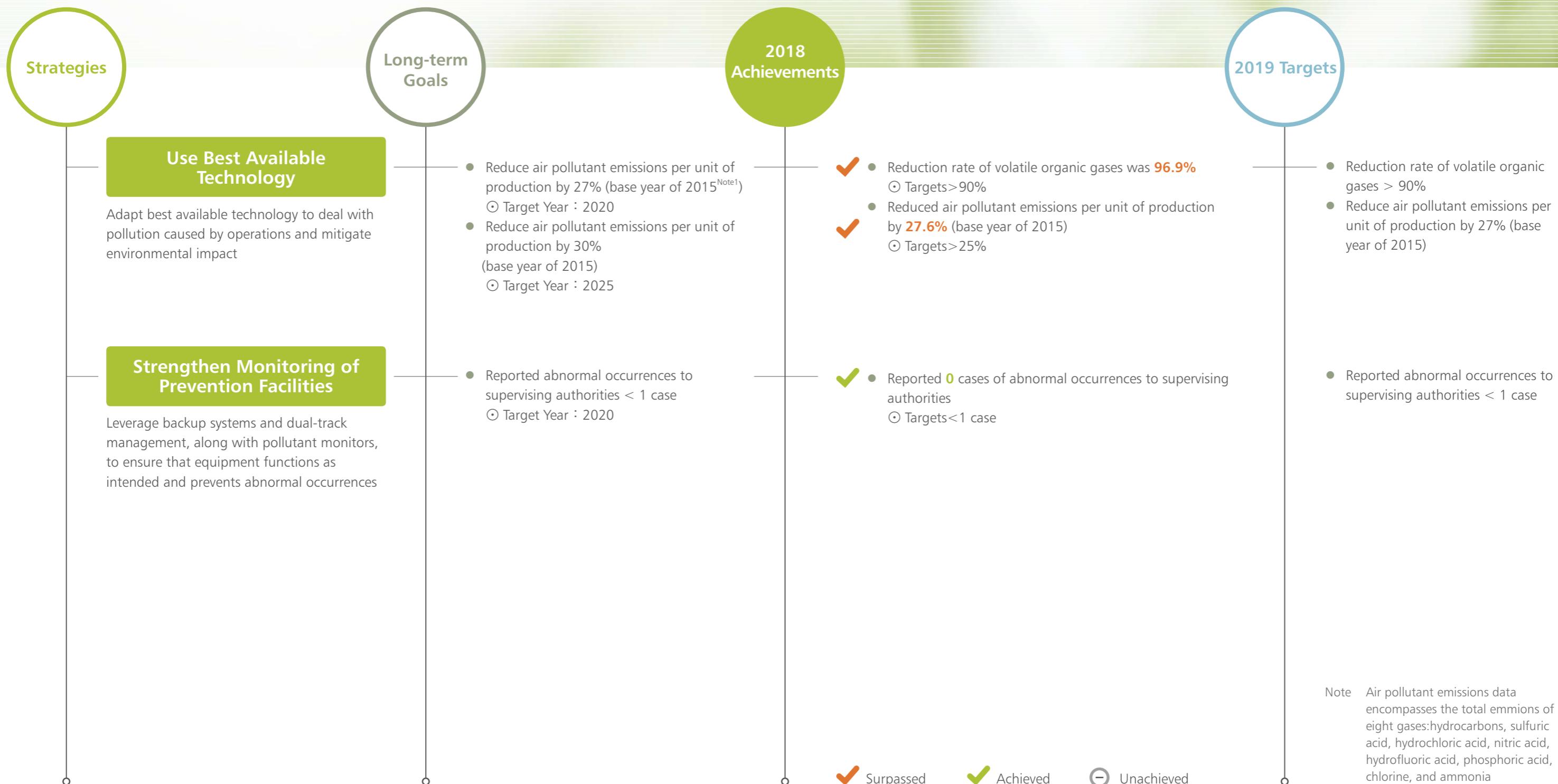


Waste Cleanup and Disposal Vendor Management Process





Air Pollution Control





Effectively Reducing All Types of Air Pollutant Emissions

TSMC strives to reduce air pollution with the best technology available such as source categorization and multi-station treatment so that various air pollutants can be treated effectively and concentrations of pollutants emitted to the atmosphere can meet or surpass governmental standards. In addition, to guarantee optimal operating conditions and to ensure that all colleagues 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. Related monitoring results are transmitted to the facility monitor control center and the industrial safety emergency response center to ensure that prevention facilities can immediately switch to backup systems if any abnormalities occur, and all air pollutants can still be properly treated.

Use Best Available Technology

According to the "Air Pollution Control and Emissions Standards for the Semiconductor Industry" and "Stationary Pollution Source Air Pollutant Emissions Standards" in Taiwan, air pollution caused by the semiconductor manufacturing industry is mainly composed of volatile organic compounds (VOCs), acid gases, and alkali gases. In order to reduce the probability and volume of pollutant emissions to the atmosphere, TSMC divides the 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

toxic gases, corrosive gases, flammable gases, and perfluorocarbons, while the rest of manufacturing process waste gases will also be 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-concentration of inorganic acids or bases will be sent to the central scrubber for second-stage water rinsing and neutralization treatment. With effective classification and a two-phase treatment process, the treatment efficiency of air pollution emissions has increased significantly.

Effective Reduction of Emission from Sources - Local Scrubbers

According to different properties of pollutants in high-concentration waste gases, TSMC performs preliminary treatments through seven types of local scrubbers: thermal, combustion, plasma, wet type

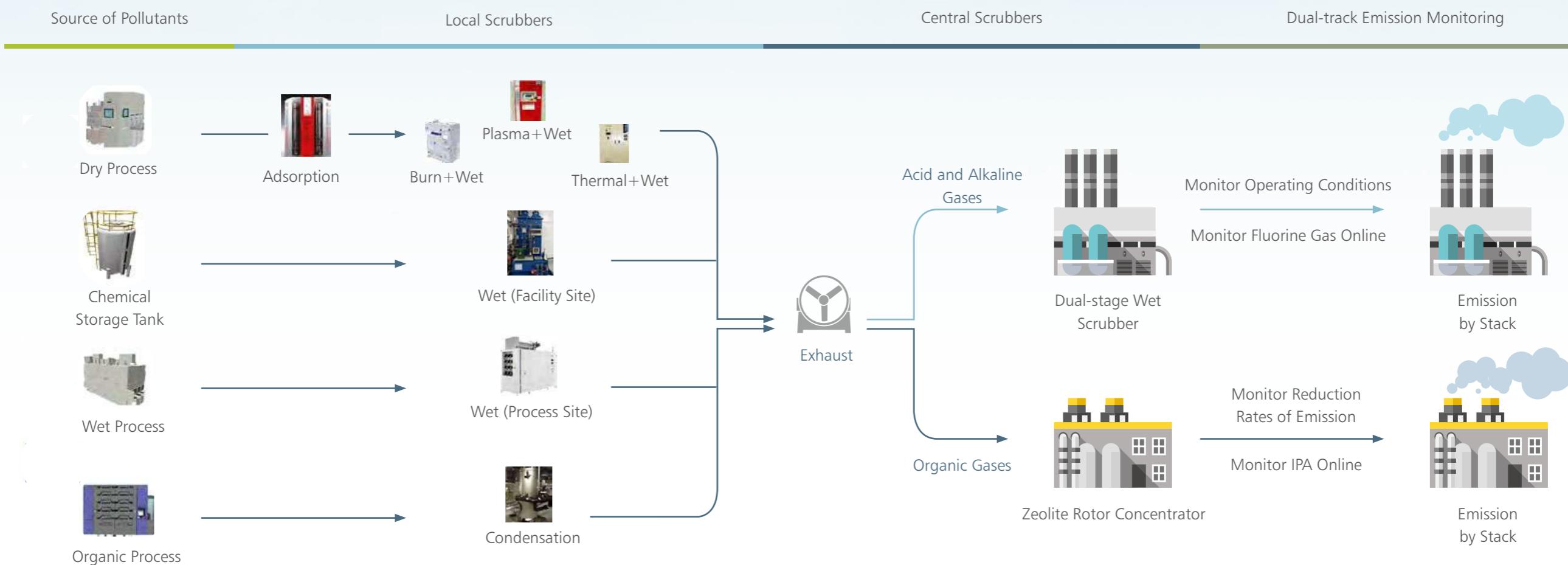
in facility site, wet type in process site, absorption, and condensation. The efficiency of each special gas treatment is certified by third-party institutions, and the reduction rate of the target pollutant can even surpass 95%. Due to the increasing proportion of lead-edge process technology products, TSMC continuously collaborates with suppliers to introduce new treatment facilities. The Company added a dosing system into the thermal-wet scrubbers in 2018, which can handle chlorine through scrubbing neutralization and reach a reduction rate above 99%. Moreover, in regards to chlorine-using dry process equipment, TSMC has demanded that dosing systems should be batch installed on all the equipment to improve the results of chlorine reduction and further decrease air pollutant emissions of the central scrubber.



High-Efficiency Air Treatment Equipment (Local Scrubber)



Air Pollution Prevention Treatment Procedures





Local Scrubbers Categories

Process Type	Semiconductor Manufacturing Process	Target Pollutants	Technology	Equipment Pictures	Reduction Rates	Real-time Monitoring Parameters
Dry Process	Epitaxial Dry Etching	Corrosive Gases	Burn-Wet		>99%	<ul style="list-style-type: none"> Natural Gas Flow Oxygen Flow Circulating Water Inlet Pressure
		PFCs				
	Dry Etching	Corrosive Gases	Plasma-Wet		>95%	<ul style="list-style-type: none"> Current Amperage Circulating Water Inlet Pressure
		PFCs				
		Combustible Gases				
	Thin film	Corrosive Gases				
	Diffusion	PFCs	Thermal-Wet		>95%	<ul style="list-style-type: none"> Reactor Temperature Circulating Water PH Value Inlet Pressure
	Sputtering	Combustible Gases				
	Ion Implantation Sputtering Epitaxy	Toxic Gases	Adsorption		>95%	<ul style="list-style-type: none"> Pressure Difference In Scrubber Inlet Pressure
	Wet Etching	Corrosive Gases	Wet (Process Site)		>95%	<ul style="list-style-type: none"> Pressure Difference In Scrubber Circulating Water Inlet Pressure PH Value
Organic Process	PR Stripping	High Boiling Point Organics	Condensation		Specific High Boiling Point Organics >95%	<ul style="list-style-type: none"> Pressure Difference In Scrubber Condensation Temperature
Storage Tank	Chemical Storage	Corrosive Gases	Wet (Facility Site)		>95%	<ul style="list-style-type: none"> Pressure Difference In Scrubber PH Value Circulating Water Inlet Pressure



Strengthened 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. TSMC not only adopted the most cutting-edge and suitable pollution reduction technology but also continuously improved the treatment results of existing prevention facilities. Air pollution emission per unit of production in 2018 has decreased by 27.6% from 0.40 (grams / 8-inch wafer equivalent mask layers) in 2015 to 0.29 (grams / 8-inch wafer equivalent mask layers), achieving the 27% reduction goal for 2020 ahead of time. According to TSMC's past sampling results, the concentration of air pollutant emissions has always been below the emission standards set by the Science Park Administration and

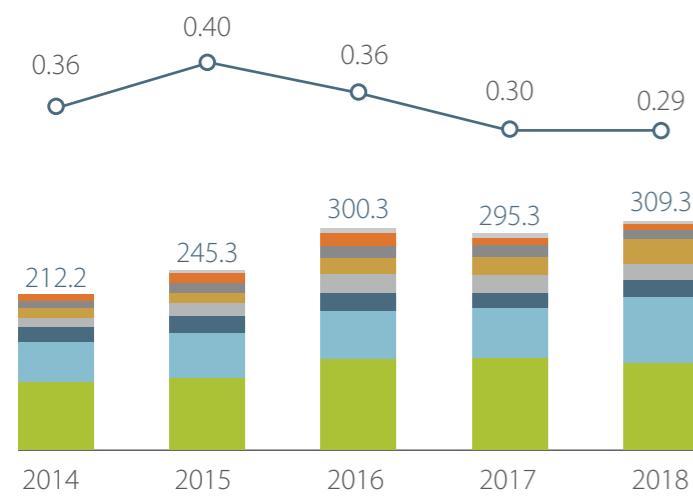
the domestic Environmental Protection Bureau.

In terms of volatile organic gas prevention results, TSMC's average reduction rate of organic waste gas emissions are above 95% and surpassed the 90% reduction rate of regulations for four consecutive years since 2015. In 2018, new "clean-gas-desorbing zeolite rotor concentrators" technology was introduced to Fab 12, Fab 14, and Fab 15, increasing the Company's average reduction rate of organic waste gas emissions to 96.9%. Due to the ever growing prevention efficiency, the total emission of VOCs did not increase with new fabs being constructed. Instead, total emission in 2018 decreased by 1.4% from 2017 to 168.4 tons. The unit emission of VOCs also decreased by 28% to 0.140 (grams / 8-inch wafer equivalent mask layers), compared to 0.195 (grams / 8-inch wafer equivalent mask layers) in 2015.



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 mask layer)

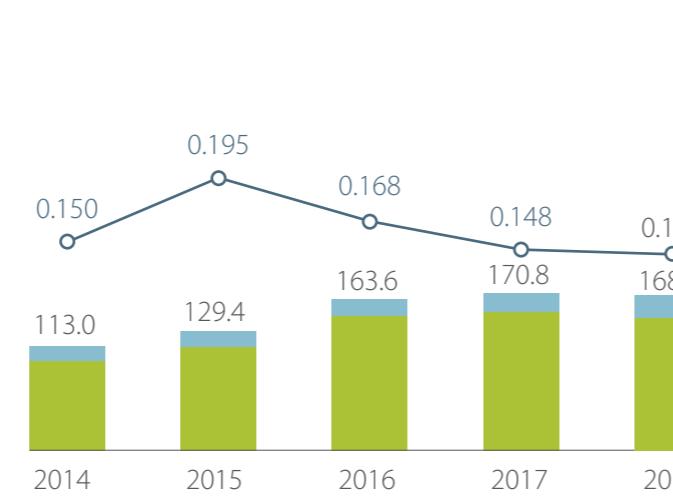
Note 1 Total emission of air pollutants included the emission reported by TSMCs facilities in Taiwan (wafer fabs, testing and assembly plants). Data excluded WaferTech, TSMC (China), TSMC (Nanjing), and VisEra due to different categories to report.

Note 2 Air pollutants emission per unit of production included TSMCs wafer fabs in Taiwan, but excluded testing and assembly plants as there is no wafer production to be calculated.

Note 3 Total emission of air pollutants include the emission of hydrocarbon, sulfuric acid, hydrochloric acid, nitric acid, hydrofluoric acid, phosphoric acid, chlorine, and ammonia

Total Emission and Emission of Volatile Organic Gases Per Unit of Production

Unit : metric ton



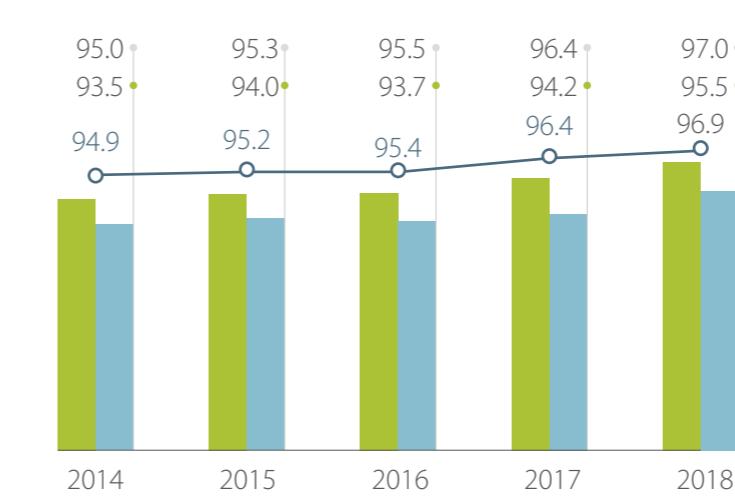
█ Total Emission of volatile Organic Gases (Taiwan facilities)
█ Total Emission of Volatile Organic Gases (Subsidiaries)
—○— Emission of Volatile Organic Gases Per Unit of Production (g / 8-inch equivalent mask layer)

Note 1 TSMC volatile organic gas emissions included data collected from TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing) and VisEra.

Note 2 Emissions per unit of production included data collected from all TSMCs wafer fabs in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra. Data excluded testing and assembly plants as there is no wafer production to be calculated.

Reduction Rates of Volatile Organic Gases

Unit : %



█ Reduction Rates (Taiwan facilities)
█ Reduction Rates (Subsidiaries)
—○— Reduction Rates

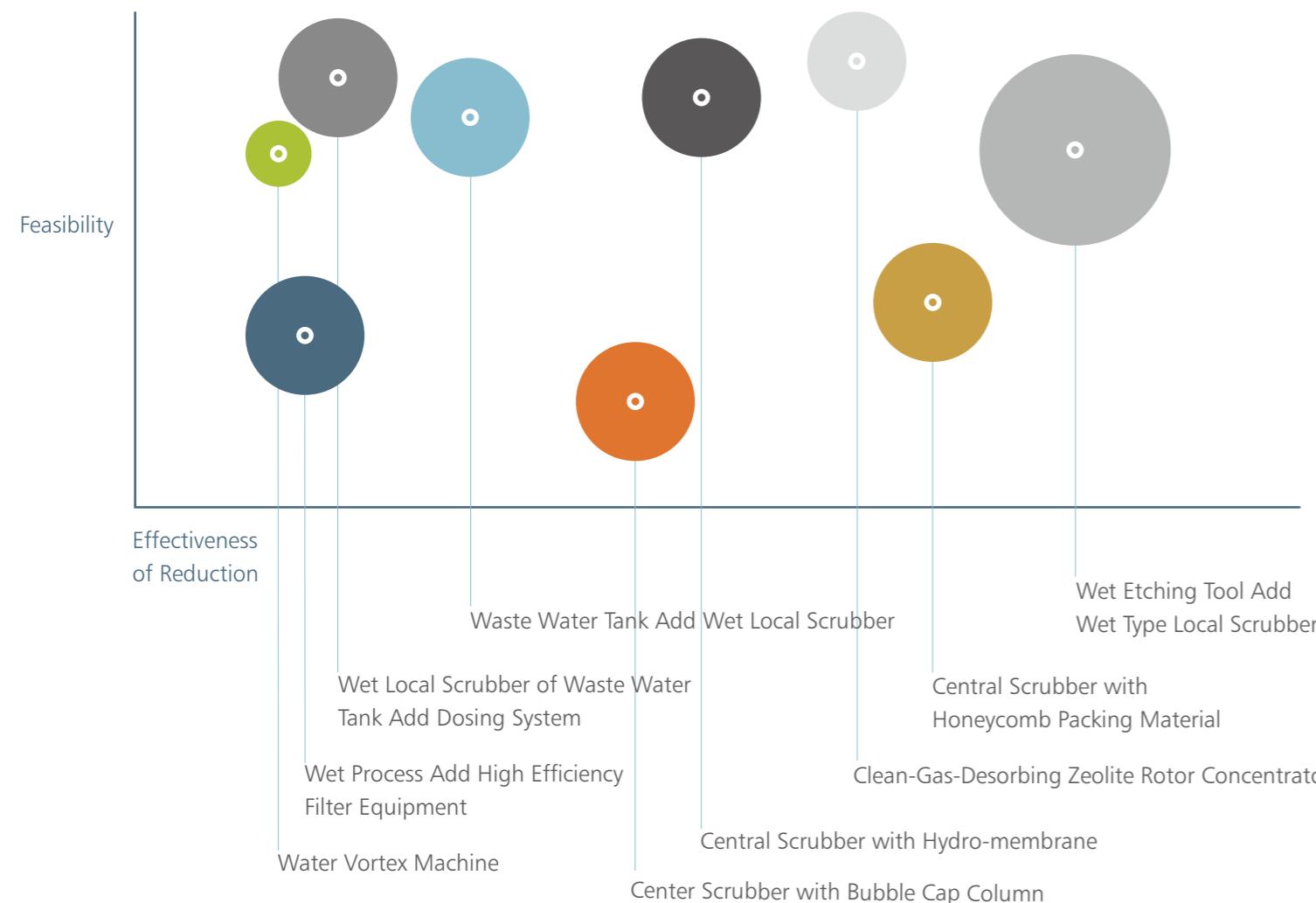
Note 1 Historical emission reduction rates of volatile organic gases included data collected from TSMC's facilities in Taiwan (wafer fabs, testing and assembly plants), TSMC (China), TSMC (Nanjing), and VisEra. Data excluded WaferTech as there is no total hydrocarbon monitor to provide any record of reduction rates.





TSMC Assessment of Best Available 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 of whether to introduce such prevention technology.



Strengthen Monitoring of Prevention Facilities

TSMC's air pollution prevention facilities comply with Taiwan regulations in both treatment capacity and monitoring equipment, and the treatment capacity of relevant prevention facilities in overseas fab sites also meets local regulations. In order to guarantee a 24-hour and 365-day stable operation of pollution prevention facilities, all facilities should be equipped with at least one backup system (N+1 design) and protected by an uninterrupted power supply system to reach the management goal of zero failure and ensure the stable, continuous monitoring of pollution. In addition to the monitoring equipment required by regulations, TSMC has also established an automatic pollutant monitoring system. In 2018, Fab 12, Fab 14, and Fab 15 introduced an "Online IPA Monitor" and "Online Fluorine Gas Monitor," which prevent abnormal odors and reduce the impact of air quality in cleanroom. These online monitors, along with existing hydrocarbon monitors, make waste gas treatment results of all air pollution prevention systems always accessible and allow relevant information to be reported to the facility monitor control center and the industrial safety emergency response center. The dual-track independent monitoring system has been adopted to make sure 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 occurrence was reported to the supervising authorities in 2018.



Facility Monitor Control Center



Industrial Safety Emergency Response Center

Note The size of circles represents the importance of the prevention technology. Higher proportion target pollutants require greater emphasis on reduction

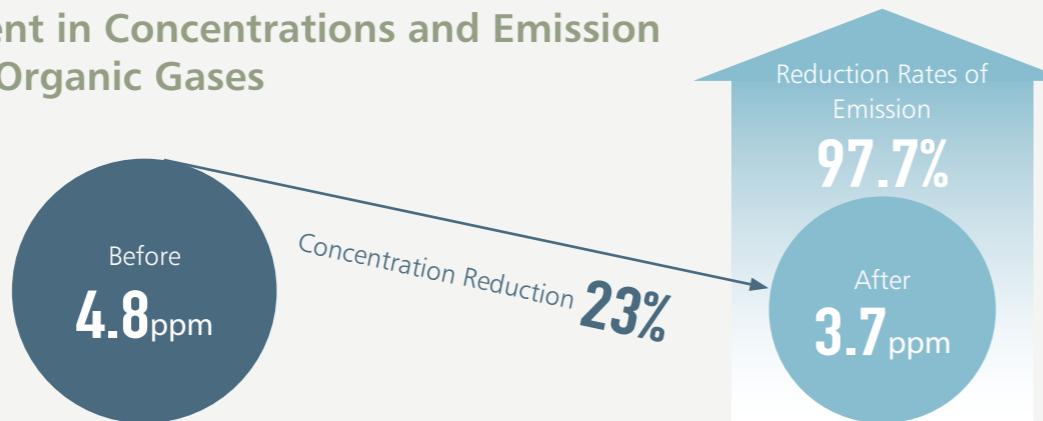
Case
Study

Utilize Zeolite Rotor Concentrators to Introduce Clean Air for Desorption and Reduce the Concentration of Volatile Organic Waste Gas Emission by 23%

TSMC utilizes zeolite rotor concentrators and combustion furnaces to deal with the emission of VOCs, 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 order to promote environmental sustainability and become the world-class benchmark enterprise in environmental protection, TSMC continuously develops new technology to improve prevention results.

TSMC Fab 12A in Hsinchu adopted the technology of "clean-gas-desorbing zeolite rotor concentrators" to refine the existing VOC emission prevention facilities, and the Company's concentration of volatile organic gas emissions decreased considerably by 23% and increased reduction rates by 0.7%. The technology effectively reduced volatile organic gas emission and lowered total emissions of VOCs to below that of 2017, instead of increasing with the growth of production capacity in new fabs. The technology comes from the first air pollution treatment project of Fab 12A in Hsinchu Science Park in 2017. It replaces processed waste gas (concentration of volatile organic gases > 100 ppm) with clean air treated in the absorption zone as the air source that supplies the cooling zone, increasing the efficiency of desorption and effectively decreasing the concentration of VOC emission. All facilities in TSMC Fab 12, Fab 14, and Fab 15 are expected to be refitted by 2020.

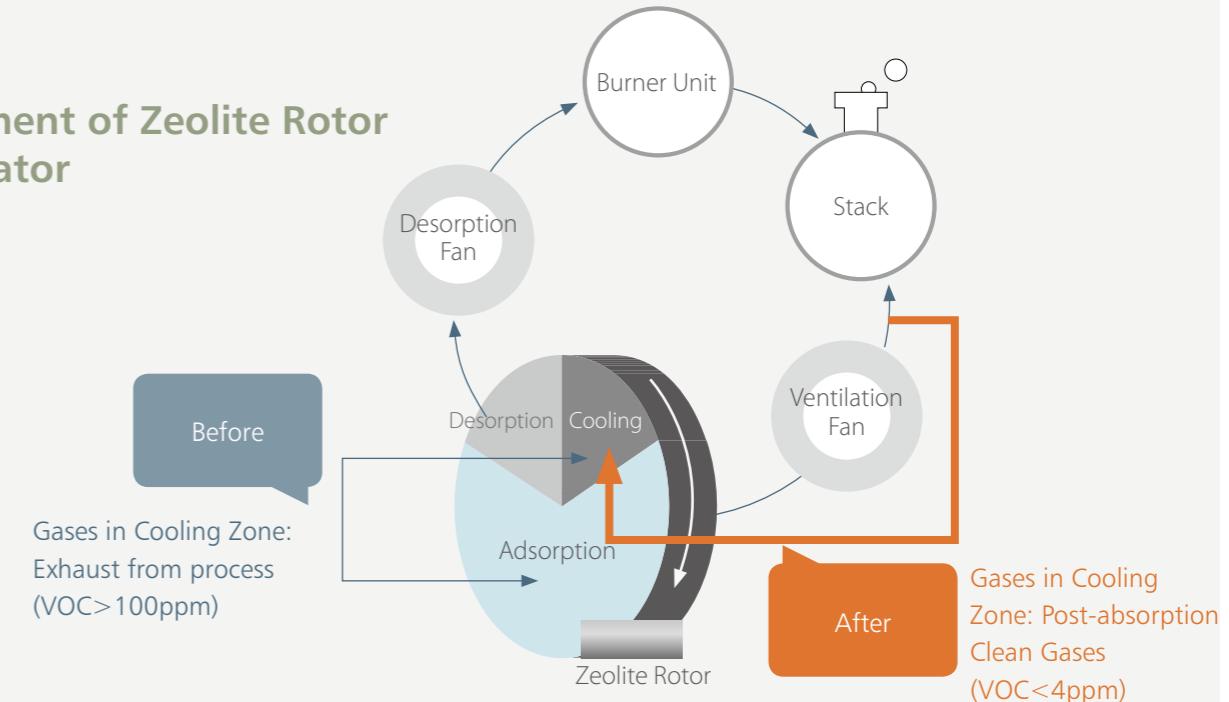
Improvement in Concentrations and Emission of Volatile Organic Gases



Rollout Schedule of Zeolite Rotor Concentrators



Improvement of Zeolite Rotor Concentrator





Focus 5

Inclusive Workplace

An Attractive Employer

Employees are TSMC's most valuable asset and the Company values its commitment to employees, building a friendly workplace exceeding domestic and international standards in safety, health, and human rights. TSMC aims to build a challenging and fun work environment where learning never stops, with the aim of attracting and retaining colleagues with common values willing to stay and grow together with the Company.

>108.2 bn (NT\$)

Global employee compensation and benefits exceeded NT\$108.2 billion

2,323

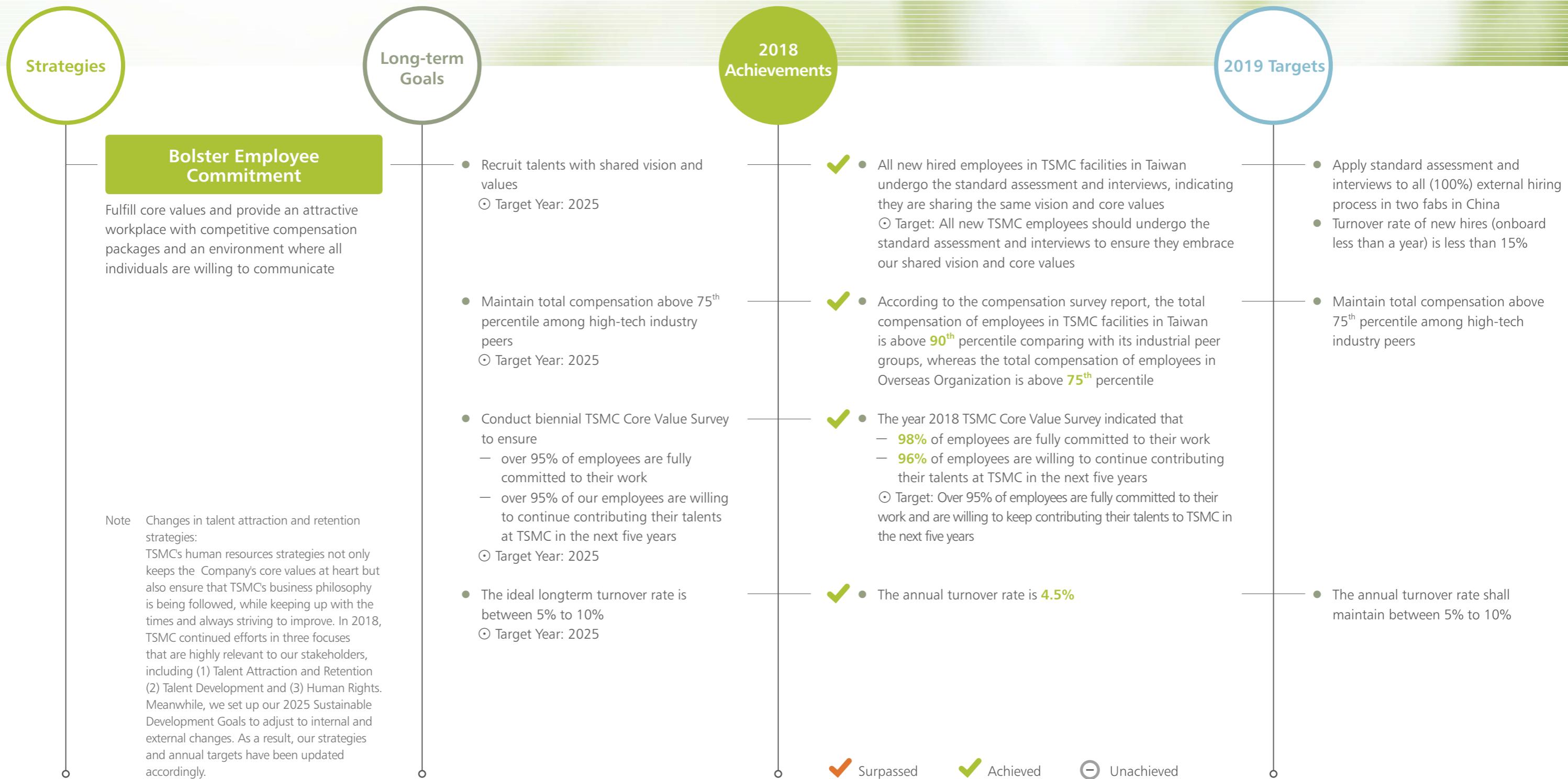
Recruited 2,323 new employees globally and provided excellent working opportunities

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Enhanced OHS control measures, with no reported cases of occupational diseases caused by chemical or physical exposure



Talent Attraction and Retention^{Note}





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Right People with Shared Vision and Values

Recruiting Standards

"Right people with shared vision and values" has always been the Company's guideline for recruiting talent, designing compensation packages, managing employees' performance, and developing training programs. All employees at TSMC are treated equally regardless of their gender, religion, race, nationality, or political affiliation. With shared vision, all of our employees live with the same values and code of conduct. In belief of "right people for the right jobs", the Company is devoted to maximizing employee performance and strengths by fitting them for the right positions, which enables employees' development and company's continuous growth at the same time, creating a win-win situation that makes TSMC a better company.

In recent years, with the development of technology and the rise of young talent, TSMC believes that only through proactive measures in talent attraction and retention can the Company acquire momentum in research and development, manufacturing, and service, and at the same time sustain TSMC's long-term competitive advantages in face of global competition and challenges.

Under the "right people with shared vision and value" guideline, character and qualifications, instead of professional skills, are the most important selection criteria at TSMC. We have established a set of selection criteria to ensure recruitment quality, such as integrity, resilience, initiative, and innovation. Applicants shall be evaluated by the selection criteria assessment and interviews to ensure we find the right people with shared vision and values.

Workforce Structure

At the end of 2018, there were a total of 48,752 employees at TSMC, including 31,688 managers, professional and assistants, and 17,064 technicians on the production lines. Since 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 Taiwan. The remaining 10% in subsidiaries in China, North America, Europe, Japan, South Korea, and other countries.

Global Workforce Structure

Categories	Groups	Male		Female		Subtotal and Percentage by Groups	
		Number	Percentage of Group	Number	Percentage of Group	Number	Percentage of Group
Employee category	Managers	4,625	87.4%	669	12.6%	5,294	10.9%
	Professionals	18,347	82.3%	3,938	17.7%	22,285	45.7%
	Assistant Engineers / Clerical	3,325	80.9%	784	19.1%	4,109	8.4%
	Technicians	3,578	21.0%	13,486	79.0%	17,064	35.0%
Location	Taiwan	26,715	61.4%	16,790	38.6%	43,505	89.2%
	Asia	2,077	56.6%	1,593	43.4%	3,670	7.5%
	North America	1,048	68.9%	474	31.1%	1,522	3.1%
	Europe	35	63.6%	20	36.4%	55	0.1%
Age	18 - 20	19	51.4%	18	48.6%	37	0.1%
	21 - 30	7,566	64.5%	4,160	35.5%	11,726	24.1%
	31 - 40	14,893	61.5%	9,324	38.5%	24,217	49.7%
	41 - 50	6,012	56.8%	4,578	43.2%	10,590	21.7%
	51 - 60	1,257	62.6%	750	37.4%	2,007	4.1%
	60+	128	73.1%	47	26.9%	175	0.4%
	Ph.D	2,063	90.8%	210	9.2%	2,273	4.7%
Education	Master's	16,977	81.7%	3,806	18.3%	20,783	42.6%
	Bachelor's	7,780	61.6%	4,846	38.4%	12,626	25.9%
	Other Higher Education	1,582	29.2%	3,838	70.8%	5,420	11.1%
	High School	1,473	19.3%	6,177	80.7%	7,650	15.7%
Employment Type	Regular	29,875	61.3%	18,877	38.7%	48,752	100.0%
	Total					48,752	

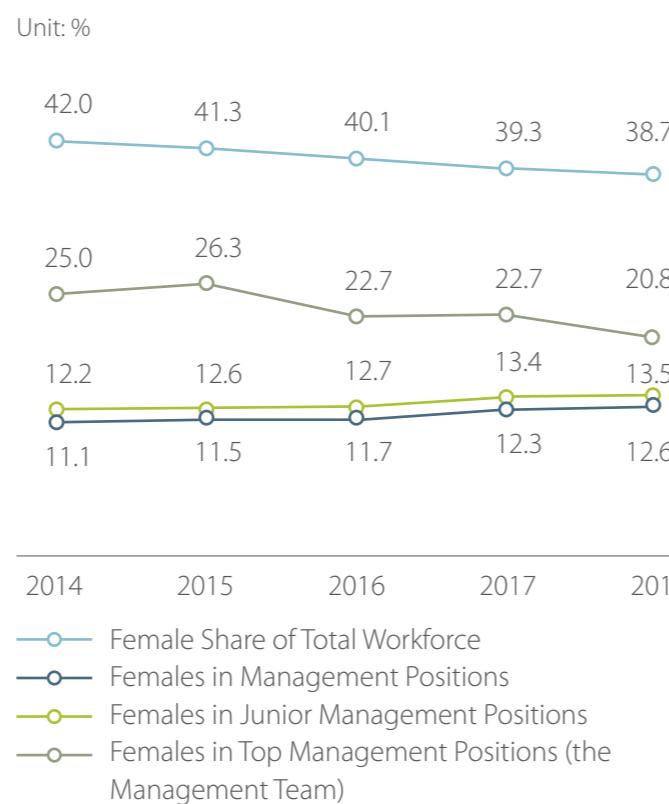


• Female Workers

All employees at TSMC are treated equally regardless of their gender, religion, race, nationality, or political affiliation. Due to the nature of the semiconductor industry, Taiwan's cultures and other factors, over 60% of our employees are male. Going into details, over 80% of our managers, professionals, and assistants are male; over 80% of technicians on production lines are female. With the development of factory automation, the demand for production line technicians, a female-dominated employee category, is decreasing which leads to a gradual decrease in the ratio of female workers in the Company. In view of this trend, TSMC pays attention to this issue and it is among the Company's top priorities to retain both female workers and overseas professionals in order to create an inclusive and encompassing workplace.

Although the ratio of the Company's female employees has been decreasing in recent years, through talent attraction and retention programs, female and male employees at TSMC show similar promotion rates, a ratio of 0.95:1(excluding subsidiary Wafertech, VisEra). In particular, the promotion rate of female managers (excluding the management team) is even slightly higher than their male counterparts, with a ratio of 1.05:1(excluding subsidiary Wafertech, VisEra). In 2019, TSMC will continue working on the issue of gender equality. The Company will adopt all possible measures to strive to retain as many female workers as possible and provide them with the opportunity to live up to their full potentials and make contributions to TSMC.

Ratio of TSMC Female Workers



Note1 Junior management positions include first-line managers; top management positions include Vice President and above, excluding Chairman, board of Directors, and CEO.
 Note2 Females in Junior Management Positions and Top Management Positions exclude VisEra since their definition is different from TSMC.

Compensation Ratio of Global TSMC Male and Female Employees

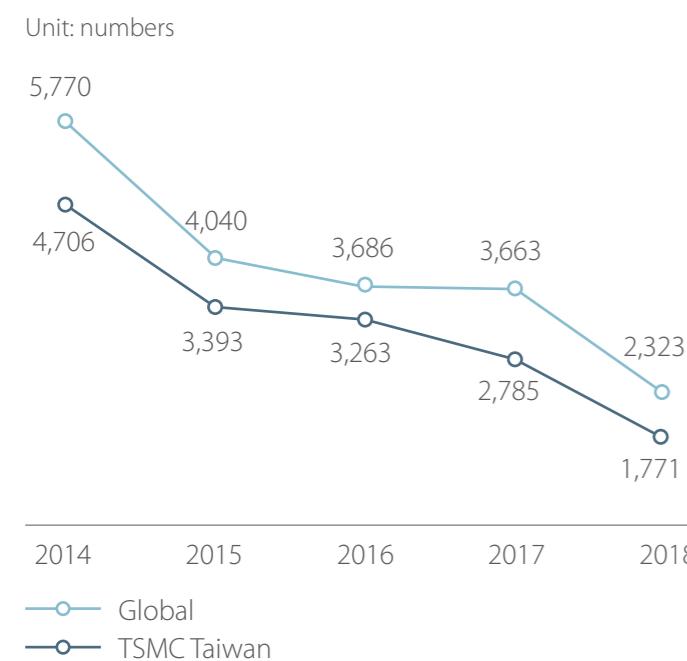
Region / Subsidiary	Position	Male	Female
Taiwan	Managers	1	0.99
	Professionals	1	0.93
	Assistant Engineers / Clerical	1	0.98
	Technicians	1	1.14
China	Managers	1	0.96
	Professionals	1	0.89
	Assistant Engineers / Clerical	1	0.93
	Technicians	1	1.07
North America, Europe, Japan, and South Korea	Managers	1	0.88
	Professionals	1	0.78
	Assistant Engineers / Clerical	1	0.79
	Technicians	1	1.04
VisEra	Managers	1	0.79
	Professionals	1	0.87
	Assistant Engineers / Clerical	1	1.00
	Technicians	1	1.04
WaferTech	Managers	1	0.79
	Professionals	1	0.83
	Assistant Engineers / Clerical	1	0.87
	Technicians	1	1.00



Talent Recruitment

Around 90% of employees at TSMC are based in Taiwan, while overseas employees are mostly based in Asia, accounting for 7.5% of total employees. Recruitments at global branches mainly focus on hiring local residents. However, in Taiwan, due to the demand for research and development talent and a diversified talent pool, we have been targeting both new graduates and overseas professional talent. TSMC believes that recruiting professional talent from around the world will help enhance the Company's growth in the long-term.

New Employees



Campus Recruitment

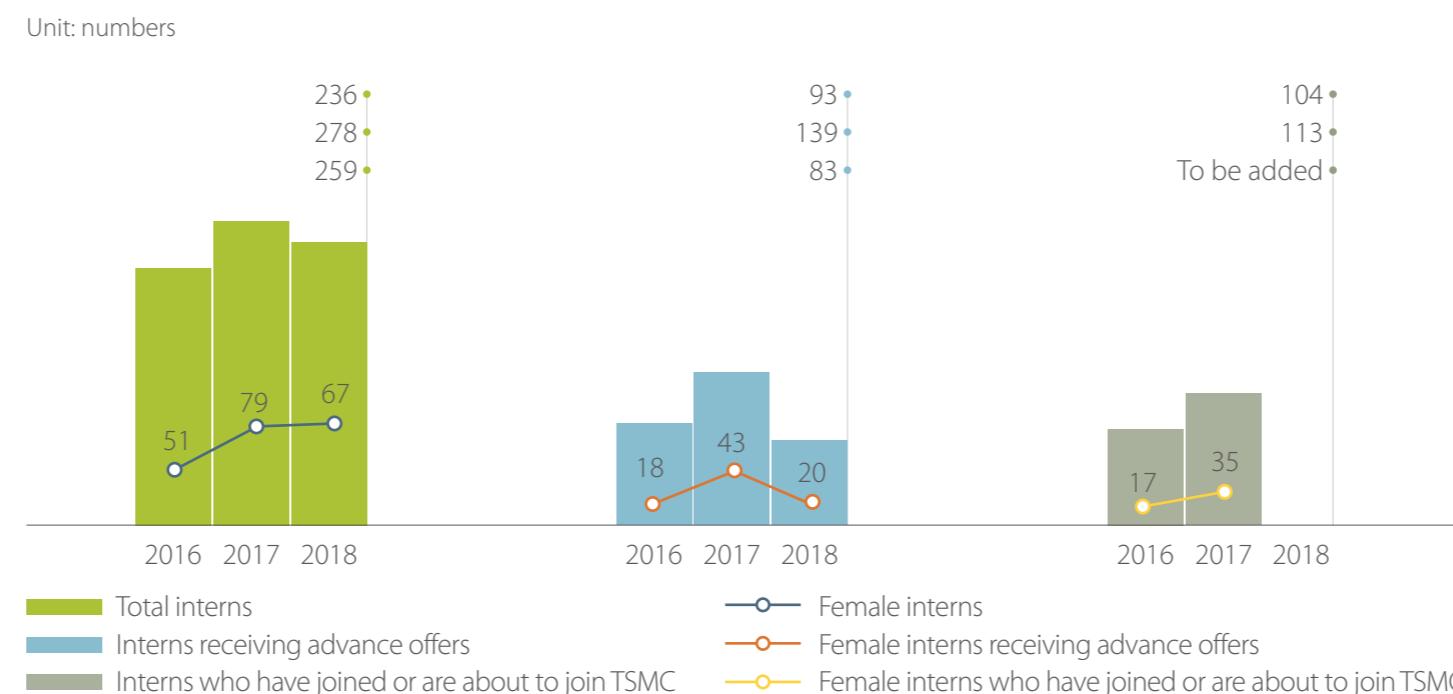
TSMC's core values, corporate culture, and world leading business performance are highly recognized by residents in Taiwan, making it a highly desirable company for young graduates. The Company actively recruits talent with shared vision and values via our official website, campus recruitment, intern programs, JDP (Joint Development Program), RDSS (Research Development Substitute Services), social media, and more. In 2018, TSMC recruited 2,323 new employees, including 79.7% of young generation under 30 years old.

Internship Program is one of the key annual recruitment programs at TSMC, which we obtain referrals from university professors, campus department offices, and internal employees as well as promotions through social media and face-to-face interaction with students at campus job 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 2018, 259 students participated in our internship program, and 67 of them were female, accounting for 25% of total participants. After the internship, 83 interns received advance offers after evaluation, accounting for 32% of total participants. Among them, 24% were female. Ratios of female students participating in the internship program, receiving advance offers, or joining TSMC are higher than the current ratio of 17.7% of female professionals at TSMC, demonstrating the Company's efforts in balancing the gender ratio.

By the end of 2018, an average of 40% of interns from 2016 and 2017 have joined TSMC through either advance offers or regular recruitment, and the ratio is expected to continue to increase in the future. The result indicates that the internship program enables the Company in early recruitment. Through the internship program, students have the opportunity to familiarize themselves with the industry in advance and to discover their own interests and targeted fields. After these students return to schools, they will put more focus on semiconductor-related courses to adapt to the industry better in the future.

Interns Receiving Advance Offers or Hired in TSMC





• Overseas Talent Recruitment

To sustain the Company's diversified talent pool and recruit talent in special fields, TSMC has continuously invested in "Overseas Talent Recruitment", especially in the regions where global Semiconductor elites are located. Over the years, the Company has conducted joint development programs with prestigious universities such as MIT, Stanford University, and

the University of California, Berkeley to cultivate top research talent and scout out exceptional overseas talent, providing TSMC with an edge in attracting fresh graduates to devote their talent to the Company. In addition to overseas students, we recruit experienced semiconductor talent by visiting major tech cities in the U.S. as well as Canada, India, Japan, the UK, Germany, Belgium, and the Netherlands.

Overseas New Hires in TSMC

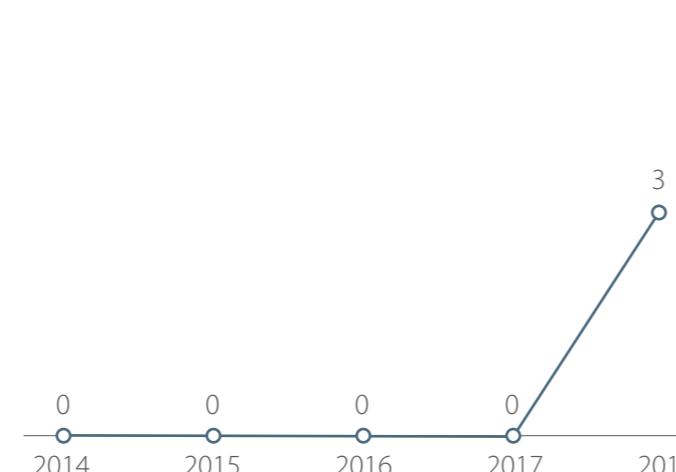
Unit: numbers



Note Data included TSMC's facilities in Taiwan.

Overseas New Hires in VisEra

Unit: numbers



Case Study

Creating a Friendly Workplace and Attracting Outstanding Indian Talent

Over the past few years, TSMC relied on remote communication to recruit Indian talent. In 2018, in order to increase the employer brand recognition of TSMC among Indian talent, TSMC collaborated with the National Chiao Tung University (NCTU) to conduct an International Student Program and host "TSMC Day" at the Indian Institute of Technology. During the workshop, TSMC had face-to-face interactions with outstanding students in the IC design fields and invited them to join advanced semiconductor research projects. TSMC not only encouraged participating students to apply for dual degree programs, but also provided them with summer internships and priority interview opportunities. In 2018, TSMC hired 30 talent from six campuses of the Indian Institute of Technology, significantly enhancing the Company's talent attraction.

In addition to attracting overseas talent to join the semiconductor industry, TSMC is dedicated to creating an inclusive and friendly workplace to retain these talent. Our Indian employees have organized an Indian culture club and created an online social media group "TSMC Indian Family", which our Human Resources Department has been proactively encouraging Indian employees to join the group and become familiar with each other through a variety of activities, such as Picnic Day, Indian Culture Day, Diwali, and cricket Tournament. As a result, the club not only serves as a hub of communication and a platform for resource sharing, but also helps Indian employees overcome language barriers, forge new friendships, and build a home away from home.

TSMC Day





• 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 employability 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.

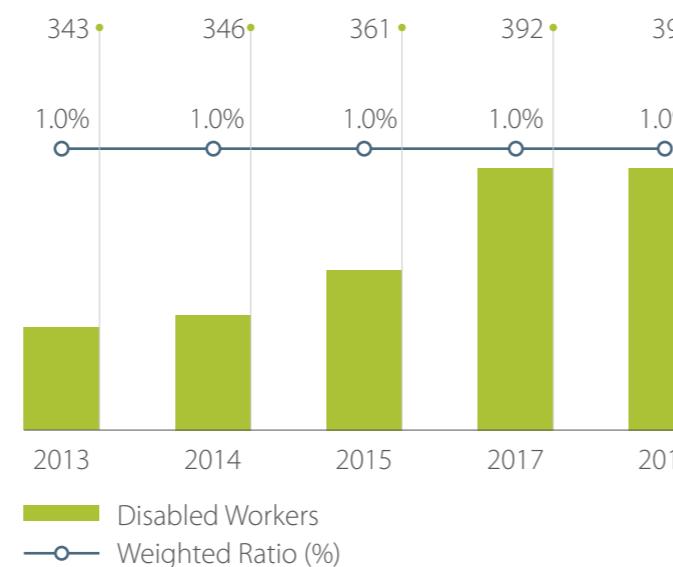
TSMC spares no efforts in following the government's regulation in regards to recruiting disabled workers and provides high quality working opportunities for disabled university students or graduates. In 2018, TSMC continuously collaborated with universities to provide diversified and high quality job opportunities for people with disabilities. In addition to the current jobs available, TSMC continuously develop positions suitable for people with disabilities, such as "Recruitment Service Representatives."

In 2018, TSMC fabs in Taiwan employed 330 people with mild or moderate disabilities, and 62 people with severe disabilities, with the weighted ratio reaching 1% of total employees, which is in line with legal requirements. In addition, our subsidiary in Taiwan, VisEra, provides full-time job opportunities for people with disabilities and employed 3. However, due to the nature of available job vacancies, recruitment was difficult with insufficient applicants. VisEra did not

reach the required 1% weighted ratio of employees with disabilities and has paid the difference in subsidies according to legal requirements. In the future, VisEra will continue with providing job opportunities for people with disabilities and look forward to more applicants.

Disabled Workers Hired in TSMC's Facilities in Taiwan

Unit: numbers

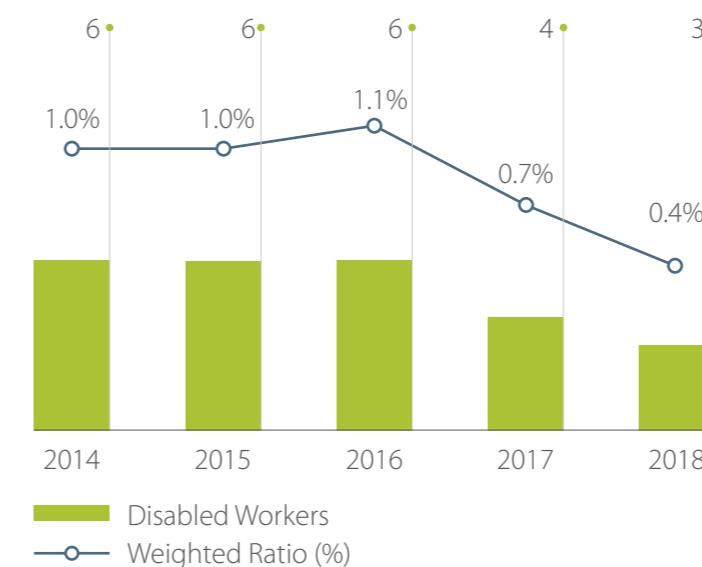


Fulfill Internal Transfer Policy

To help our employees take the initiative in arranging and planning their career path, TSMC has been dedicated to increasing the transparency of internal job opportunities to encourage internal transfers. Our goal is to put right people in the right place and decrease turnover rates. In 2018, we achieved the annual target of 100% internal transfer ratio, and the ratio of positions filled by internal transfer is still increasing at a steady pace.

Disabled Workers Hired in VisEra

Unit: numbers

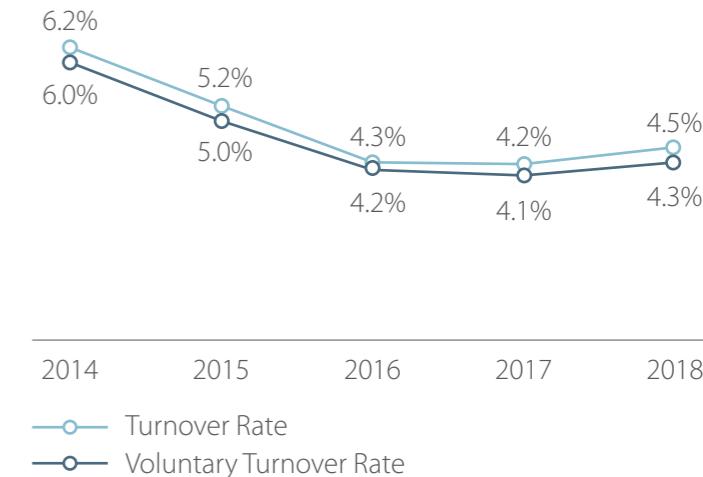


Employee Turnover Rate

TSMC believes that a healthy turnover rate of a company should be maintained between 5% and 10%. In 2018, the turnover rate of the Company was 4.5%, slightly below the healthy range. To maintain healthy employee flows, the Company continuously provides challenging vacancies for potential candidates. The number of new hires has been gradually decreasing due to a decrease in vacancy demand and turnover rate. As a result, the new employee ratio has been declining, and the ratio of job vacancies filled through internal transfer is on a steady rise.

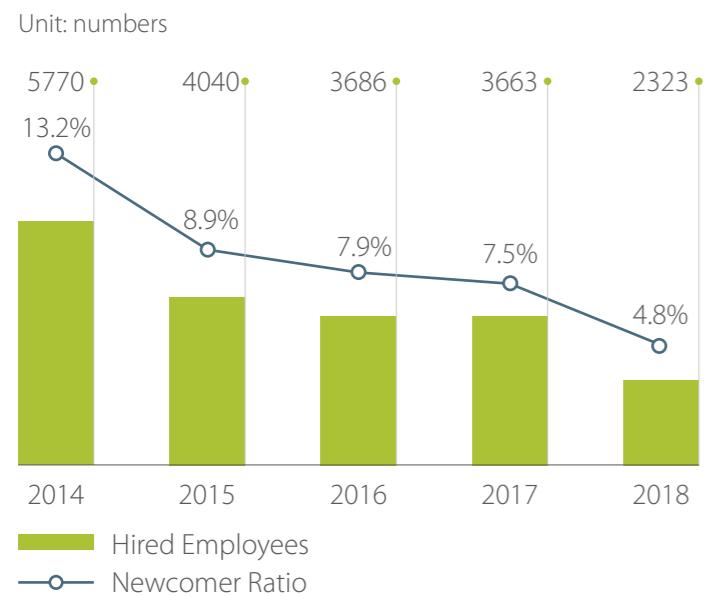
Turnover Rate

Unit: %





New Employee Ratio



Ratio of Vacancies Filled by Internal Employees



Note The data during 2014 -2017 only included TSMC's facilities in Taiwan

Compensation and Benefits

Competitive Total Compensation

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.

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\$81.4 billion to NT\$108.2 billion during the years from 2014 to 2018, and the average annual compensation and benefits per employee increased from NT\$1.87 million to NT\$2.22 million.

TSMC's revenue reached a new record high in 2018. As a result, around NT\$47.1 billion of cash bonuses and profit sharing were granted to TSMC fabs in Taiwan. The total compensation of a fresh engineer with a master degree is about 32 months of base salary, including 12-month base salary, 2-month year-end bonus, as well as approximately 18 months of cash bonuses and profit sharing. The average total compensation of direct labor is about 27 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.

2018 Salary Increase and Bonus

Category	Item
\$↑ Salary Raise	<ul style="list-style-type: none"> 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 2018, TSMC conducted salary raises for employees in Taiwan and overseas subsidiaries. The salary increase rate was 3%-5% for employees in Taiwan, 9% - 10% for employees in China, and 3% - 5% for employees in other regions.
trophy Bonus	<ul style="list-style-type: none"> 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 long-term scheme. In 2018, TSMC employees' compensation and benefits which include salary, allowances, cash bonus, profit sharing, pensions and other benefits, totaled NT\$108,214,943,000. In 2018, the median of global employees' annual compensation (excluding pensions and benefits) was about NT\$1.58 million, and the ratio between the total annual compensation of the CEO and the median employee compensation was about 149:1. Considering the differences in compensation structure across countries, the data of median annual compensation is based on the actual amount paid to full-time employees with full-year seniority

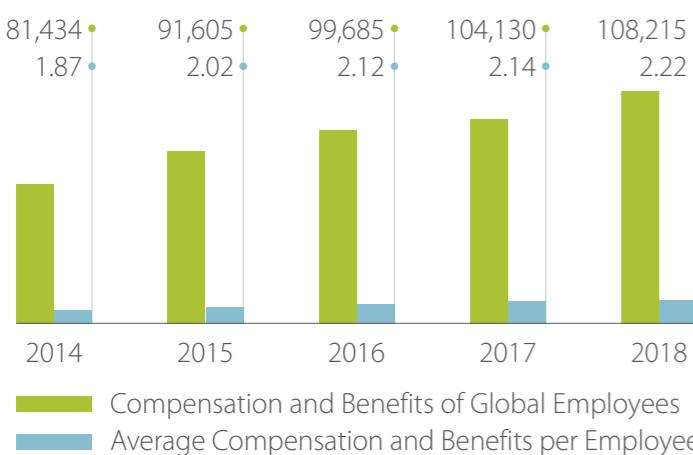


In addition, in accordance with the law amended by the Taiwan Stock Exchange in 2019, listed companies in Taiwan are required to disclose the number and the average compensation of full-time employees in non-executive positions, and the difference comparing to the previous year.

In 2018, the number of full-time employees in non-executive positions of TSMC Taiwan (excluding VisEra) was 42,605, with an average compensation of NT\$2,009,000. In 2017, the number of full-time employees in non-executive positions of TSMC Taiwan (excluding VisEra) was 40,738, with an average compensation of NT\$1,971,000. 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.

Compensation and Benefits Expenses

Unit: NT\$ million



Benefits Exceeding Statutory Requirements

To motivate employees to strive for the Company's long-term development, TSMC offers employees benefits which exceed the statutory requirement, including holidays, insurance, pensions, financial assistance for encountering difficult circumstances, subsidies for marriage / childbirth / funerals, and discounts provided by designated vendors, to name a few. Each fab has

a 24-hour health center with services above the requirements of laws and regulations, including health care management professionals with on-site service doctors and cooperation with medical institutes such as hospitals and Hsinchu Lifeline. Employees' physical and mental health are covered from all aspects.^{Note}

In regards to disaster relief, in August 2018 there was heavy rain in central and southern Taiwan due to a

tropical depression which caused severe damage and many employees' families suffered from the flood. TSMC Employee Welfare Committee set up a disaster relief program which provided 251 employees with a total of NT\$2.61 million to mitigate the impacts of the natural disaster and assist employees to continue working without worry about family affairs.

Note Please refer to the [Occupational Safety and Health](#) chapter for details.

Benefit Practices which Exceed the Statutory Requirements

Item	Labor Law	TSMC Practices
Holidays	12 national holidays per year	<ul style="list-style-type: none"> 12 national holidays and 7 additional memorial days
Annual Leave	3 days for new hires with more than 6 months and less than one year of employment	<ul style="list-style-type: none"> In order to take care of newly hired employees , 1 day annual leave for every 2months of service in the first year
Sick Leave	30 days of half-paid sick leave per year	<ul style="list-style-type: none"> 120 hours fully-paid and 120 hours half-paid sick leave per year
Personal-affairs Leave	14 days of personal-affairs leave per year	<ul style="list-style-type: none"> In addition to personal-affairs leave, employees are entitled to 90 days of special personal leave with approval by authorized supervisors if they must attend to important personal affairs
Insurance Plan	Employee shall be covered by the Labor Insurance and National Health Insurance from the first day on board	<ul style="list-style-type: none"> In addition to the Labor Insurance and National Health Insurance, TSMC provides comprehensive group insurance plans to employees free of charge. Coverage includes life insurance, accident insurance, hospital insurance, cancer insurance, and business travel insurance. Besides, employees have the flexibility to participate in group insurance plans for their families at lower price. The group insurance coverage is extended free of charge to employees on unpaid leave for purposes identified by labor law The group insurance plans that VisEra provides is somewhat different from those mentioned above. VisEra provides group insurance for employee's family free of charge, and group insurance for six months free of charge to employees on unpaid leave for purposes identified by labor law.
Nursing Staff	41 staff, in accordance with the number of company employees	<ul style="list-style-type: none"> In addition to meeting the statutory standards, TSMC partners with hospitals to assign 46 nursing staff to provide employees with emergency care and health management services.
Health Examination	Depending on the age: Once a year for employees above age of 65. Once every three years for employees between 40 to 64. Once every five years for employees under 40.	<ul style="list-style-type: none"> Once a year for all ages.
Counseling Services	None	<ul style="list-style-type: none"> Free psychological, legal, and financial counseling services.

Note TSMC's overseas subsidiaries provide leave and insurance policies in accordance with local regulations and employee's needs. For leave policies, China, North America and Europe subsidiaries all provide more leave days than local statutory requirements. For insurance policies, all subsidiaries provide comprehensive life and medical insurance programs



Parental Benefits

To provide employee with sufficient support facing work-life dilemma, TSMC offers employees parental leaves in accordance with local laws and regulations, sets up four kindergartens in Taiwan, and provides a comprehensive leave policy. Employees have flexibility in making use of their leaves to fulfil both individual and family needs. In addition to paid leaves, employees can also apply for unpaid leaves in cases of taking care

of children, military service or major injuries which require a long recovery period.

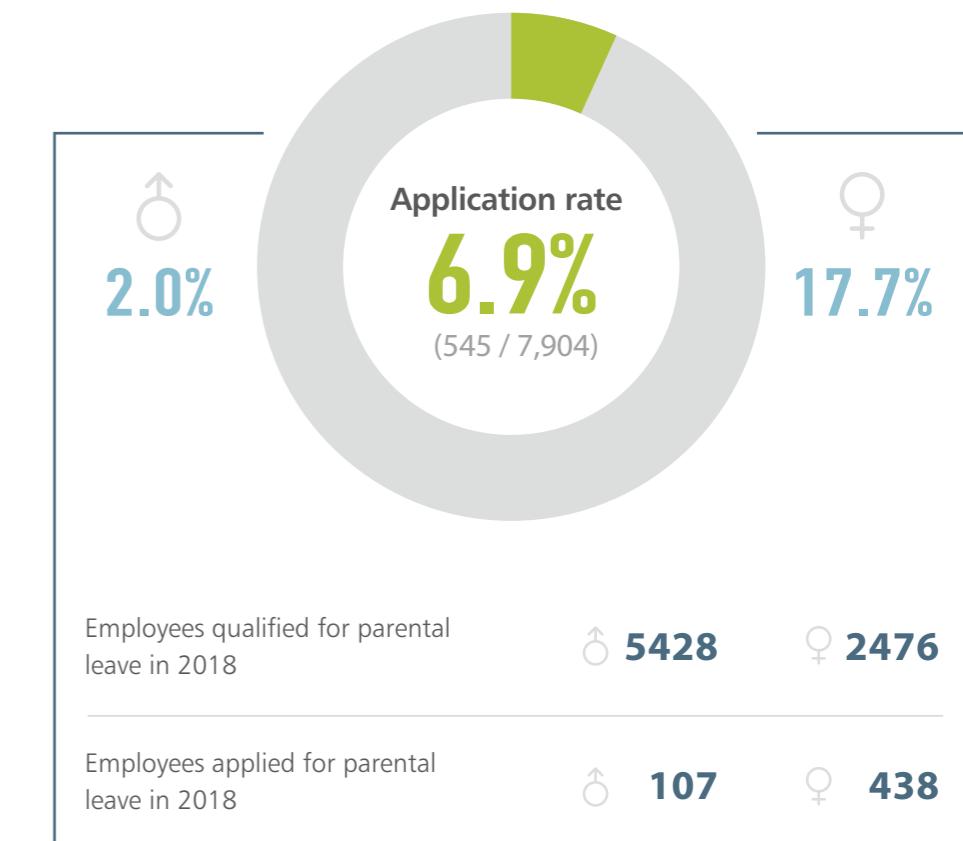
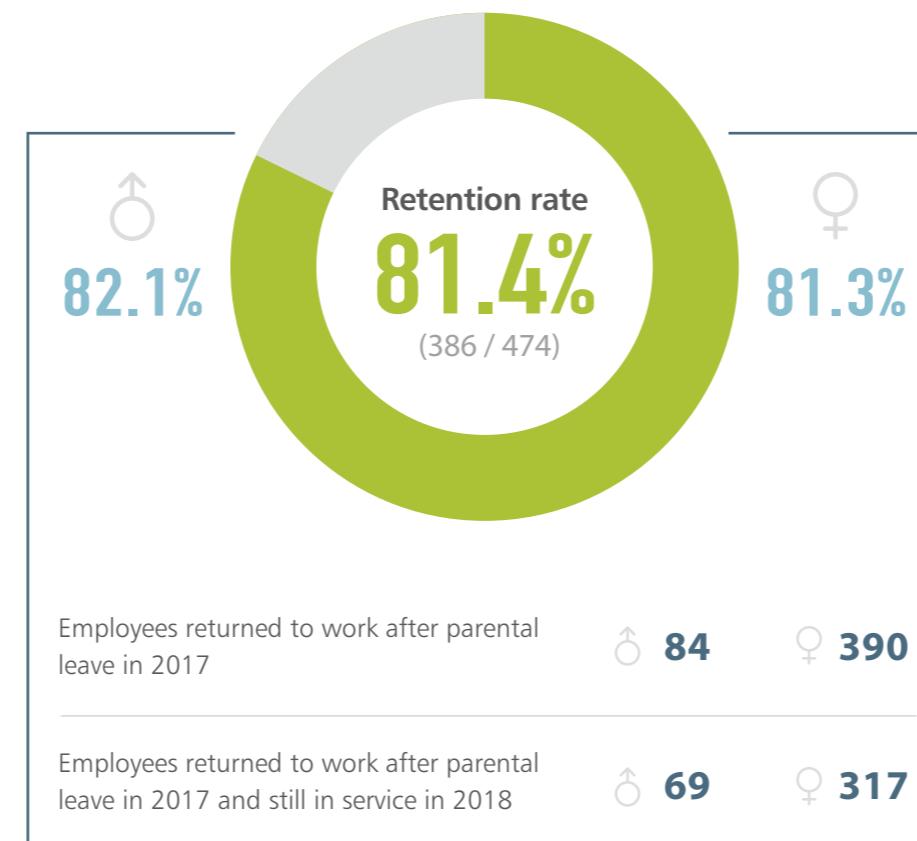
Take unpaid parental leave as an example, there were 545 employees in Taiwan applied for it in 2018.

In 2018, 80.2% of employees returned to work after unpaid parental leaves. 566 employees were expected to return to work, and 454 of them have returned to work as scheduled or in advance.

In 2018, the retention rate after unpaid leaves was 81.4%. The retention rate refers to employees stayed with the Company for more than one year after returning from unpaid parental leaves. Among the 474 employees who returned to work in 2017, 386 of them were still in service at the end of 2018. This shows that TSMC has provided proper assistance to the reinstated employees for them to adapt to their working environment.

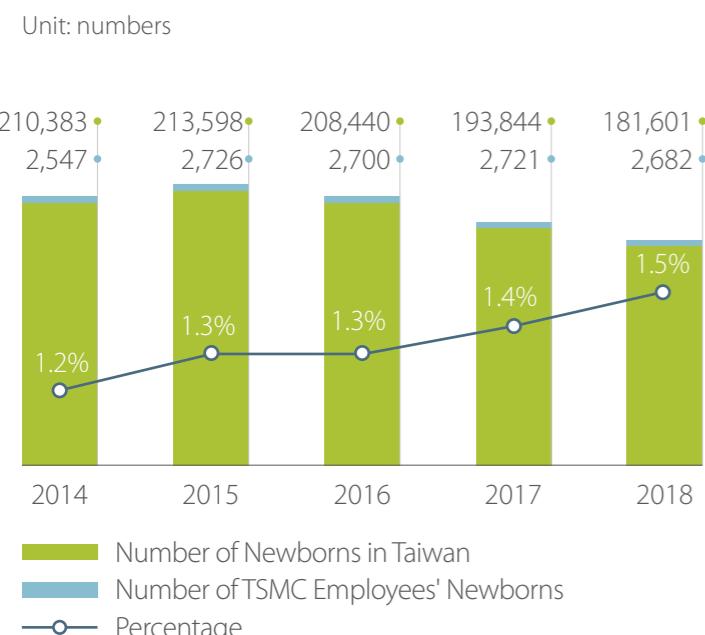
In addition, in 2018 the number of TSMC employees in Taiwan aged between 20 and 64 accounted for 0.28% of Taiwan's population of the same age group. Meanwhile, the number of employees' newborns was 2,682, which accounted for 1.5% of the total newborns in Taiwan. This is a positive result of TSMC's outstanding employee benefits.

The Application Rate for Parental Leave, Return to Work Rate, and Retention Rate





TSMC Employees' Newborns



Note Data were collected from TSMC's facilities in Taiwan and VisEra.



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.

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 practices in overseas regions. In addition to statutory contributions, TSMC hires professional accountants and consultants to conduct precise calculations of the Company's pension fund, so as to assure sufficient funding for employee pension payments in the future.

Encourage Employees' Outstanding Performance

TSMC recognizes and encourages employee performance through performance management, profit sharing bonus system, development system, and promotion system. For outstanding technical talent, 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.

Apart from the above awards, TSMC strives to recommend employees to participate in external awards. In 2018, TSMC employees continued to be recognized through national awards and competitions such as the National Model Labor Award, the Outstanding Engineer Award, the Excellent Young Engineers Award, and the National Management Excellence Award.

Pension Allocation and Preparation

Pension Plan	TSMC's Practices	Preparation in 2018
 Defined Benefit Plans	<ul style="list-style-type: none"> TSMC provides a defined benefits plan based on an employee's length of service and average monthly salary of six-month period prior to retirement in accordance with the Labor Standards Act The money was administered by the Labor Pension Fund Supervisory Committee and deposited in the Committee's name at the Bank of Taiwan. 	<ul style="list-style-type: none"> Each month TSMC contributes an amount equal to 2% of salaries paid to the pension fund. VisEra contributes a fixed amount to the pension fund. The fair value of TSMC's plan assets in Taiwan was NT\$4,011,279,000 at the end of 2018. In accordance with the above provisions, the amount of recognized expenses of TSMC in 2018 was NT\$281,866,000. The amount of accrued pension liabilities to be contributed in accordance with the law was NT\$9,651,405,000 at the end of 2018. VisEra's pension reserve amount was NT\$1,594,760.
 Defined Contribution Plans	<ul style="list-style-type: none"> In accordance with the Labor Pension Act in Taiwan, TSMC contributes to employees' personal accounts in the Bureau of Labor Insurance. TSMC's overseas subsidiaries also make monthly contributions to the pension management department at certain percentages of the base salary of their employees 	<ul style="list-style-type: none"> 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 2018, including contributions from overseas subsidiaries, was NT\$2,568,945,000.



Employee Engagement

Cohere Identity

To retain outstanding talent dedicated to their jobs, TSMC integrates communication channels. With a diverse and innovative way of guidance, including interactive websites, short films, employees' homemade videos, meetings, lectures, and internal reports, etc., TSMC constantly strengthens its four core values, "Integrity", "Commitment", "Innovation", and "Customer Trust" to deepen employees' identity toward the Company and establish a two-way commitment. TSMC also recognizes the contribution of employees by means of internal and external awards, such as, Excellent Young Engineers Award by Chinese Institute of Engineers, National Outstanding Worker Award by Ministry of Labor; and in the Company, several activities are held on Secretary Day, Labor Day, and Engineer's Day for recognition delivery.

Employee Engagement Survey

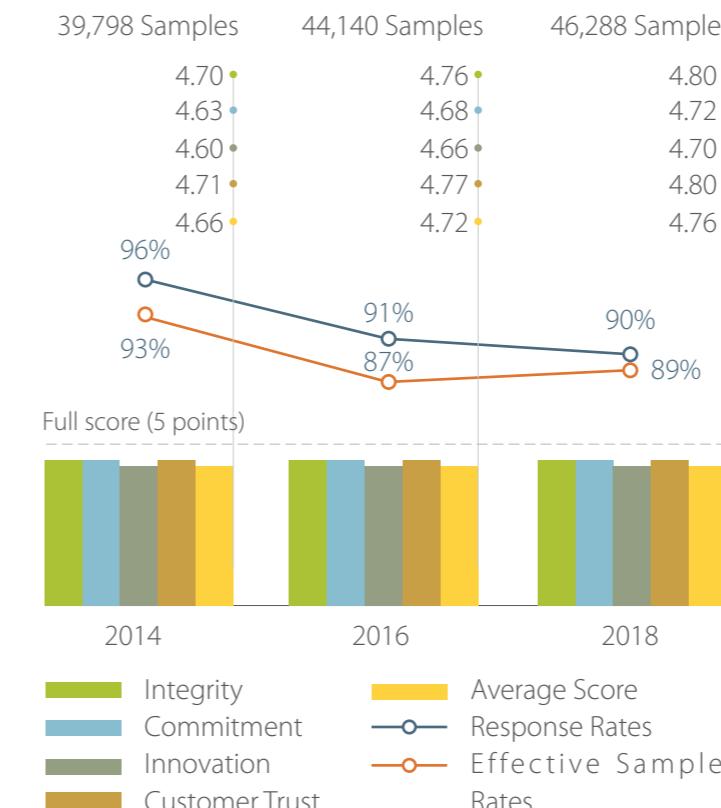
TSMC's core values -- "Integrity", "Commitment", "Innovation" and "Customer Trust" -- have been established since the founding of the Company by Dr. Morris Chang. In June of 2018, Founder Dr. Morris Chang retired. Newly appointed Chairman Mark Liu, and Chief Executive Officer C.C. Wei asked all colleagues to continue to adhere to the Company's core values, and continuously expressed the

Company's vision, core values, and business philosophy through multiple channels such as meetings, speeches, and internal reports to strengthen corporate culture and two-way commitment between the Company and its employees.

Since 1998, TSMC has conducted a biennial survey on employees' opinion on core values to find out the extent of implementation of core values by employees and their degree of engagement. The survey covers TSMC fabs in Taiwan, TSMC China Company Limited, TSMC Nanjing Company Limited, TSMC North America, TSMC Design Technology Canada Inc., TSMC Europe B.V., TSMC Japan Limited, and TSMC Korea Limited. The survey covers 95% of employees in TSMC and its subsidiaries. WaferTech and VisEra are not included in the survey census due to different culture backgrounds.

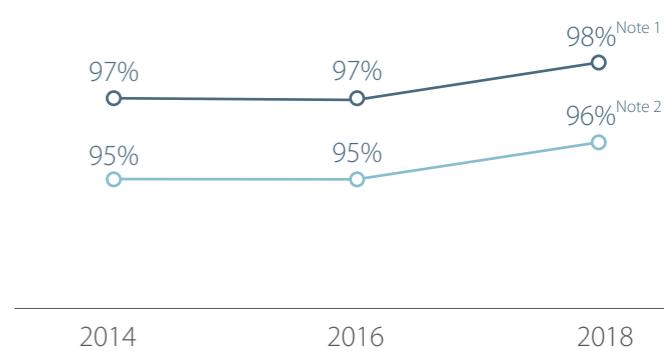
The results of the Employee Opinion Survey on core values conducted in 2018 showed an overall average significant improvement compared with that two years ago. In terms of employee engagement, among the two questions in the "commitment" section, 98% of the staff expressed their willingness to devote 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.

TSMC Core Value Score



Note The questionnaire is composed of five subscales

Questions Regarding "Commitment" in the Employee Opinion Survey on Core Values



- The percentage of respondents who agree and strongly agree on the question of "I am willing to devote myself to work and make the Company better."
- "In the next five years, I am willing to contribute my strengths and grow with the Company."

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^{Note}





Fulfill Talent Development

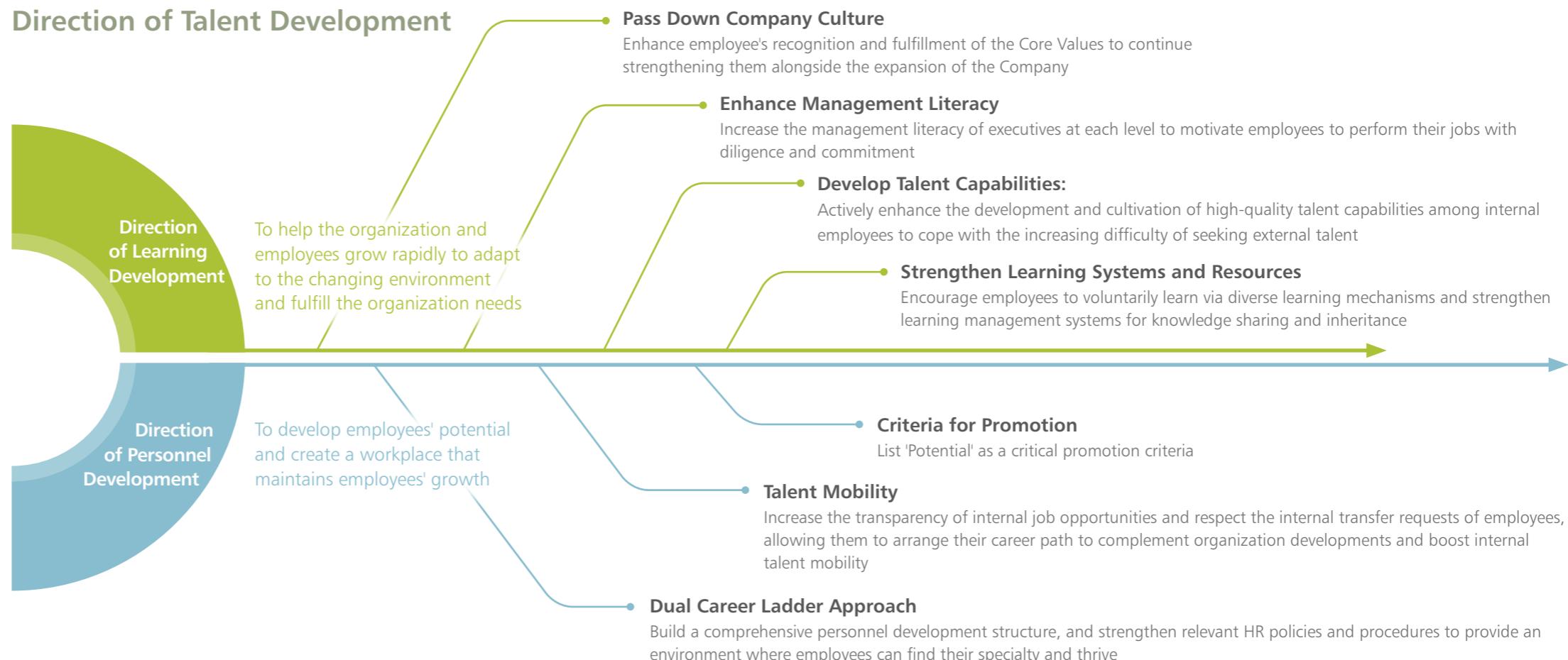
Encouraging job rotations and promoting self-directed learning are important strategies for talent development at TSMC. In terms of encouraging job rotations, TSMC has proactively implemented on-the-job training and certification systems, allowing employees to learn and improve their effectiveness in

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 bring their talents to play and continue to grow.

In regards to self-directed learning, TSMC encourages employees to participate in diverse learning

activities aligned with the Company's development, organization needs, and individual performance. These activities are available whenever where possible and encompass a wide variety of methods and fields. This enables employees to constantly improve their effectiveness in the workplace, gain more momentum for the Company's growth, and uplift the society.

Direction of Talent Development





Diverse and Equal Opportunities for Learning and Development

Given that the Company's growth is closely related to learning and development of its employees, TSMC has planned on its employee training and development with three key elements – Goal, Plan, and Discipline. The Company strives to create a diverse, equal, and sustainable learning environment abundant in learning resources, and has therefore established the "TSMC Employee Training and Education Procedure" to integrate

internal and external resources which will cultivate and improve employee abilities and facilitate their growth alongside the Company.

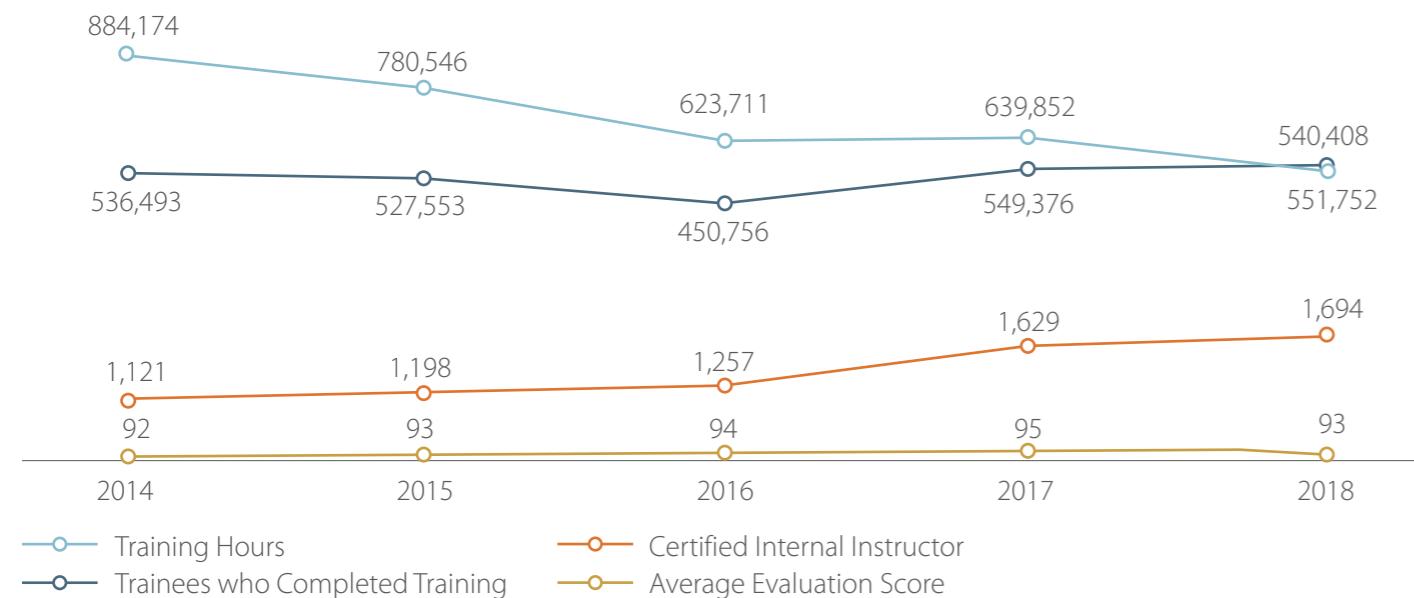
TSMC's employees plan their own Individual Development Plans based on their job requirements and performance assessment results. This is one of the bases of the Company's annual training plan. In 2018, TSMC provided over 540,000 hours in training and activities for learning and development with over 550,000 attendees completing training. On average, each employee has received more than 11 hours of

training, and the Company has invested more than NT\$83 million in these training programs.

In order to verify the effectiveness of training, TSMC measures the success of training through four levels of evaluation — reaction, learning, behavior, and results — based on the theory of American scholar Donald L. Kirkpatrick. All public training courses were evaluated at the reaction level in 2018, with an average satisfaction score of 93. In addition, 2,805 online courses conducted learning evaluations, with a total of 452,435 participants having completed the training

and passed the learning evaluation. Additionally, 18% of public courses and customized training programs were evaluated at the behavior level. Most on-the-job training held by each organization also passed evaluations at the learning level or behavior level. The results of these evaluations have been built into the personnel performance management and development system.

Historical Training Index

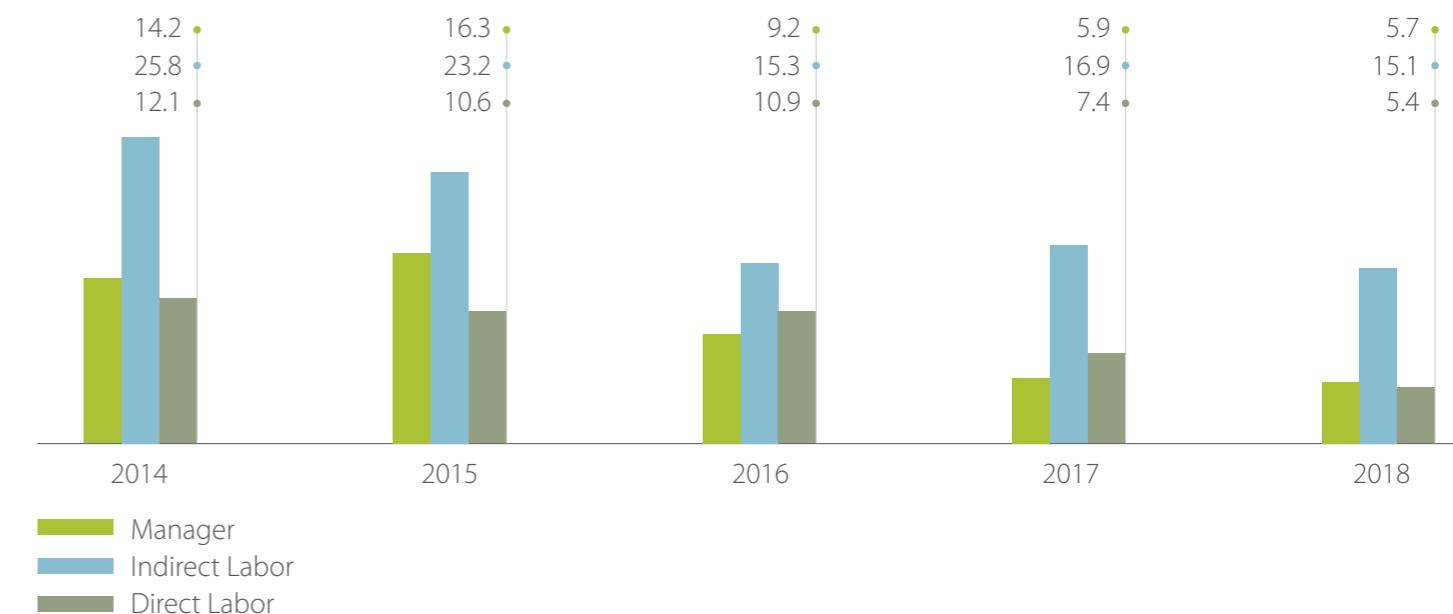


Note 1 Due to the design differences between training systems, the average evaluation score excluded data from TSMC North America.

Note 2 The index, "Newly Certified Internal Instructor," in the 2017 CSR Report, is modified with "Certified Internal Instructors" in the 2018 CSR Report.

Average Training Hours per Manager and per Employee in Direct and Indirect Labor

Unit: hour





There are two distinctive examples that reveal the results of the training programs: one is the Quality Excellence Training Program implemented in fabs in Taiwan, Shanghai, Nanjing, covering a total of over 37,051 employees. The program improved the mindset of different-level employees to pursue technical improvement and excellence in quality. It also reinforced TSMC's image of great quality in customers and further increased the Company's total revenue by 5.5% to over NT\$1 trillion. The second example is transplanting experiences from Taiwan to Nanjing. The Company assisted Fab 16 (Nanjing) in the design of training roadmaps and implementation of on-the-job training in every department for new employees upon completion of orientation training. This enables newcomers to acquire the necessary skills for completing tasks. The Fab successfully entered mass production in October 2018, setting records for the fastest fab construction and the quickest production in TSMC.

In addition to learning and development programs implemented in line with the annual training program, TSMC also sets annual key objectives in learning and development in response to specific organization training or development needs. The top three key focuses in 2018 were as follows: the Quality Excellence Training Program, the Management Capability Enhancement Program for First-line Managers, and Supporting Training at New Fabs.

Key Learning and Development Objectives of 2018

Item	Achievements	Quality Excellence Training Program	Management Capability Enhancement Program for First-line Managers	Training at new fabs
		 78.8% Training participation rate among full-time employees  The program has effectively improved the mindset of employees in different levels to pursue technology improvement and excellence in quality. In addition to helping employees become more quality-conscious, the program also adheres to the belief to "Emphasize Technology, Prioritize Quality, and Honor Customers," thus reinforcing TSMC's image of great quality in its customers.	 9.3% Training participation rate among full-time employees  The program has effectively improved first-line manager abilities which include communication, emotional leadership, management by exception, and personnel sensitivity in order to reduce the risks of problems in personnel management and handling personnel matters	 4.8% Training participation rate among full-time employees  Trained employees with necessary skills quickly, and Fab 16 entered mass production in October 2018, setting records for the fastest fab construction and the quickest production in TSMC. The training emphasized three principles – ingrained techniques, teamwork, and effective management. It also assisted Fab 18 in completing training and forming teams, which allowed for personnel deployment to start fab construction one quarter ahead of schedule.

Case
Study

Quality Excellence Training Program Reinforces TSMC's Image of Great Quality in Customers

TSMC CEO C.C. Wei anticipates that every employee in the Company can offer the best service to become a trusted technology and capacity provider. His philosophy is to "take quality as what you would demand of yourself and be responsible for the reputation and responsibility placed upon you." In order to satisfy customers' needs and fulfill its own expectations, TSMC's Human Resources organization, Operations organization, and the Quality and Reliability organization conducted the Quality Excellence Training Program for over 37,051 employees in fabs located in Taiwan, Shanghai, Nanjing, and other places. By promoting key concepts, conveying ideas, analyzing various cases, and teaching methods of improvement, the program has enhanced the mindset of trainees to pursue technology improvement and excellence in quality to further realize the belief to "Emphasize Technology, Prioritize Quality, and Honor Customers." This has ultimately reinforced TSMC's reputation of great quality among its customers.

Quality Excellence Training Program

Course	Quality Excellence Lectures	Quality Excellence: Quality Transformation (Manager)	Quality Excellence: Quality Transformation (Indirect Labor)	Quality Excellence: Quality Transformation (Direct Labor)
Achievements	 Participants : 1,739 (100% completion rate) Reaction evaluation score : 98 Learning evaluation N/A	 Participants : 2,292 (100% completion rate) Reaction evaluation score : 91 Learning evaluation: 100% passing rate for certification exams	 Participants : 17,499 (99.9% completion rate) Reaction evaluation score : 87 Learning evaluation: 100% passing rate for certification exams	 Participants : 15,521 (99.4% completion rate) Reaction evaluation score : 89 Learning evaluation: 100% passing rate for certification exams
Behavior evaluation: Continual Improvement Team (CIT) completed 2,196 cases, an increase of 8.7% from 2017. Results evaluation: The notarized benefits of the proposal system surpassed NT\$10 billion; the program has reinforced TSMC's reputation of great quality in its customers, boosting the Company's total revenue by 5.5% to more than NT\$1 trillion..				



Transparent Personnel Development Structure and Job Rotation System

TSMC provides employees with a comprehensive personnel development structure and has strengthened the Dual Career Ladder Approach to facilitate employee growth in management, technical, or professional fields based on their attributes and expertise. Moreover, TSMC adheres to two principles of making internal

job opportunities more transparent and respecting employee transfer requests. The Company encourages employees to arrange their career path to complement organization development and has established a promotion mechanism in accordance with the personnel development structure. We have also listed "Potential" as a critical promotion criterion. Employee's potential for promotion is evaluated by supervisors with the promotion procedures handbook and related auxiliary tools.

Chairman Mark Liu and CEO C. C. Wei took office in 2018, and they have since promoted two vice presidents and assigned eight operation team members to either rotate between different positions or expand field boundaries, with a variation rate of 52%. They have invigorated the 23-member management team, accelerated the virtuous cycles among organizations, and fulfilled the purposes of talent development and leadership cultivation.

In addition to the management team, 32.0% of managers and 29.9% of non-manager indirect labor personnel have been transferred or rotated in accordance with individual or organization development. In 2018, 64.7% of job vacancies filled by transferring internal employees increased by 1.3 percentage points from the previous year, showing that TSMC has emphasized on internal talent mobility and comprehensive leadership development. The Company will continue strengthening the Dual Career Ladder Approach and implement internal job transfer management, with the goal of having over 50% of positions be filled by transferring or promoting internal employees in order to support both individual and organization development.

Key Objectives of Personnel Development

Target	Dual Career Ladder Approach		
	 Talent Mobility Respect the internal transfer requests of employees and encourage them to proactively arrange their career path to boost internal talent mobility		
Achievements	 Clarified the differences between managerial jobs and technical jobs, and introduced performance appraisal and development procedures	 Established related managerial policies of internal job position transparency and job transfer effectiveness among transfer procedures. Helped managers better understand and implement regulations via communication.	 Clarified the definition of "Potential" and its evaluation method to make it one of the criteria for promotion
Achievements	 Provided different training courses for managers, and technical / professional managers	 Eight vice presidents have either rotated between different positions or expanded field boundaries, which has set a good example of internal talent mobility.	 Completed the promotion procedures handbook and related auxiliary tools to help managers conduct potential evaluation for employee promotion
Achievements	 Regularly selected academicians and commissioners of TSMC Academy to support the career development of technical staffs	 32.0% of managers and 29.9% of non-manager indirect labors transferred or rotated in accordance with individual or organization development.	

Human Rights^{Note}





Human Rights Policies and Practices

TSMC has always placed great emphasis on human rights and is committed to protecting the human rights of its employees. To ensure that human rights policies are properly implemented throughout the entire company, the TSMC Human Rights Policy was established in 2016 to protect personnel such as employees, contractors, and interns. In order to extend its scope to include suppliers, the human rights policy was amended in 2018.

TSMC Human Rights Policy

TSMC abides by local laws and regulations in all countries and regions where we operate, and upholds the human rights of workers, including regular, contract and temporary employees, and interns. We treat all workers with dignity and respect 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 Code of Conduct. TSMC's Supplier Code of Conduct requires our suppliers to follow the same standards.

TSMC pays vigilant attention to the virtuous cycle of the industry and supply chain. The Company continues to extend its scope of influence to include suppliers with the goal of moving the semiconductor supply chain forward on the track to sustainable development. It also aims to encourage the construction of workplaces where employees are treated with dignity, company operations are executed ethically, and safety is prioritized. For these targets, TSMC requires all key suppliers' fabs in Taiwan to complete third party audits in line with RBA standards. The Company also signed the TSMC's Supplier Code of Conduct with its Tier 1 suppliers in 2018 to ensure that all suppliers make good of their commitments to human rights and the environment, as well as striving for improvements.





Human Rights Policy Concerns and Practices



Provide a Safe and Healthy Work Environment

All employees (0 Under High-risk)

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, and Wellness management section. The meetings are to control five main factors that cause occupational diseases, namely chemical, physical, human, biological, and socio-psychological factors
- 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

- Immediately remove current jobs
- 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



Eradicate Discrimination to Ensure Equal Employment Opportunity

From the beginning of recruitment, all TSMC hiring procedures are to comply with the law and eliminate illegal discrimination (0 Under High-risk)

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

- No action needed by TSMC

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



Forbid Child Labor

From the beginning of recruitment, all TSMC hiring procedures are to comply with the law and eliminate child labor issues (0 Under High-risk)

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

- No action needed by TSMC

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

All employees (0 Under High-risk)

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 Ombudsman System. There are also regular communication meetings for employees to report any issue



Promote Employee Physical and Mental Health and Work-life Balance

All employees / Employees in need (0 Under High-risk)

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
- Provide child care facilities and implement child care measures to assist employees. Additionally, provide educational counselling services to allow employees to work with a sense of security

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

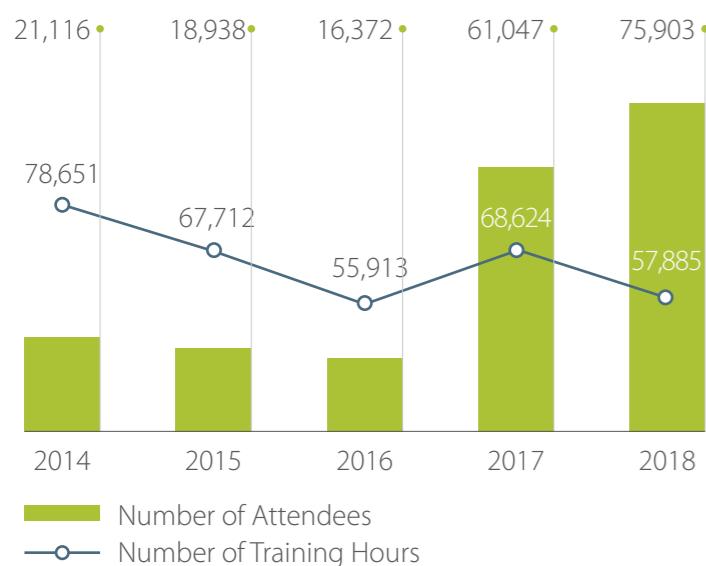
- Internal communication channels include Employee Opinion Box and Ombudsman System. There are also regular communication meetings for employees to report any issues
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Human Rights Risk Mitigation Measures

In 2018, TSMC provided employees with a total of 57,885 hours of human rights protection training. In total, 43,923 employees (75,903 person-time employees) completed the training program, accounting for 90% of TSMC's total employees. In the future, TSMC will continue to focus on human rights protection, promote related training programs, and raise awareness of human rights protection to reduce any possible risks.

Human Rights Protection Training and Participation



Note The data from 2014 to 2016 excluded TSMC (Nanjing) and VisEra.

Employee Communication

TSMC highly values employee opinions and rights and provides several communication channels. A number of channels were managed by the highest level executives of the Human Resources Organization, and operate in a fast and confidential way to create a transparent and conducive environment for communication between managers and their staffs, and colleagues. Moreover, TSMC respects employee rights for collective bargaining and participation in peaceful assembly activities. According to [regulations](#),

TSMC holds regular labor-management meetings, reports business operation updates to employees, and invites employees to discuss labor conditions and labor welfare. In 2018, to ensure effective communication between management level and employee, TSMC implemented the first ever e-voting system in the election of labor representatives at Taichung site, encouraging employees to sign up for the election or to vote. A total of 10 labor representatives were elected. The system increases employee involvement in decision-making.

In 2018, 3,654 cases were reported through internal communication channels, including 3 through the

Sexual Harassment Investigation Committee, 106 through the Ombudsman System, 589 through the Employee Opinion Box, and 2,956 through the Fab Caring Circle. All cases have since been handled by designated teams. Employees can access these internal communication channels via the internal employee portal. These channels are also introduced to new employees to ensure that they are well-informed.

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, communicative and open management 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.



All cases have been handled by designated teams. Cases reported through the Sexual Harassment Investigation Committee and the Ombudsman System were investigated and reviewed by designated teams and committee members. Cases reported through the Employee Opinion Box were handled by corresponding departments whom would then collaborate to draft solutions and countermeasures. Employees can access these internal communication channels via the internal

employee portal. These channels are also introduced to new employees during the training program to ensure they are well-informed in this regard.

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.

TSMC Internal Communications Structure



Employee Voice Channels



Fab Caring Circle

Various Issues in Fabs
Person in Charge: Fab Directors



SMS

Personal and Work-related Issues
Person in Charge: Vice President, Human Resources



Employee Opinion Box

Various Issues in Fabs
Person in Charge: Vice President, Human Resources



Sexual Harassment Investigation Committee

Sexual Harassment Issues
Person in Charge: Deputy Director, Legal



113 Caring Hotline

Personal and Work-related Issues
Person in Charge: Vice President, Human Resources



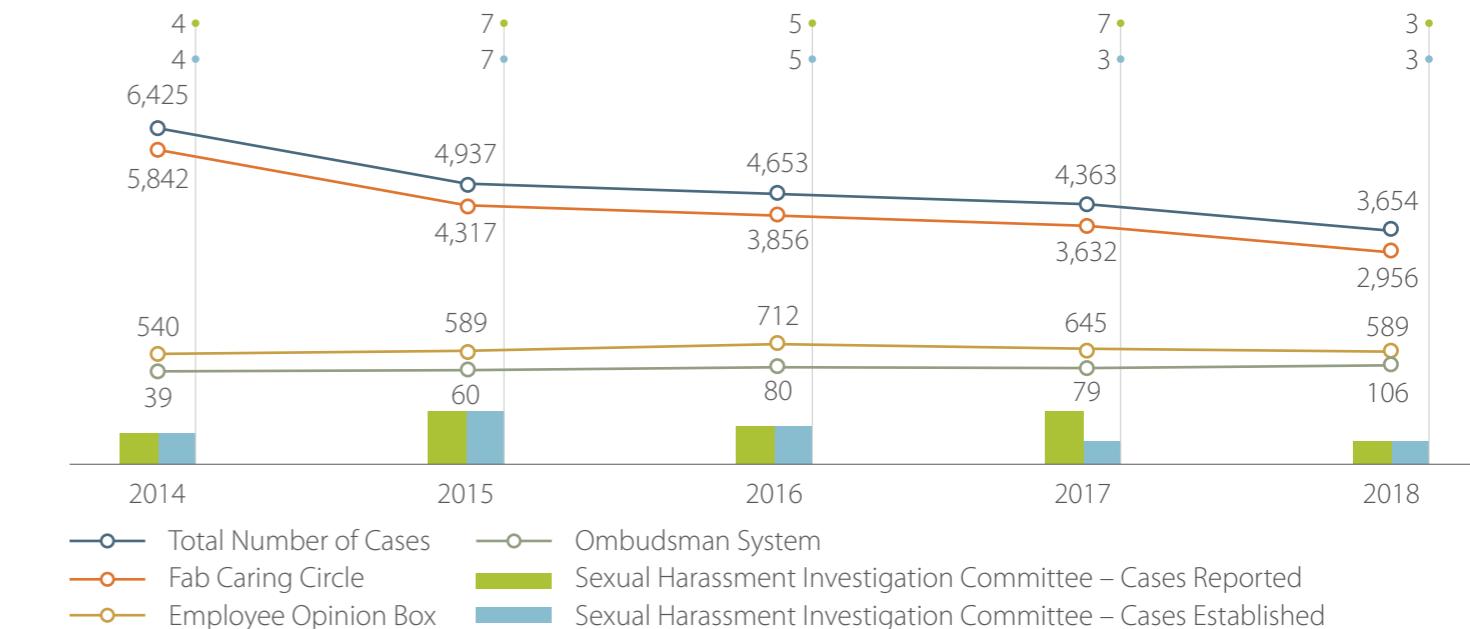
Ombudsman System

Major Management Errors / Workplace Violence and Financial Auditing Issues
Person in Charge: Senior Director

Note Cases reported via 113 Caring Hotline and SMS are handled by designated people and directed to other voice channels.

Number of Cases Reported through Internal Communication Channels

Unit: Number of cases



Note Data of Fab Caring Circle were collected from TSMC's facilities in Taiwan.

Case
Study

E-Voting: Employee Involvement in Labor-Management Meetings

In recent years, there has been an increasing awareness of labor rights, and it is expected to have a better relationship between labor and management in society. To ensure clearer communication and a harmonious relationship between the two parties, TSMC has adopted an e-voting system in the election of labor representatives. This new system utilizes information technology to bring more convenience, increase employee involvement opportunities, and help colleagues better understand the purpose of labor-management meetings and their operation.

E-voting makes voting easier and faster, allowing employees with different work schedules to participate efficiently in the election of labor representatives. In addition, TSMC convenes quarterly fab-level and company-level labor-management meetings. In 2018, more than 60 meetings were convened to reach a consensus between labor and management, improve communication within the Company, create a friendly work environment, and the relationship between labor and management.

Labor-Management Meetings Convened by TSMC in 2018

60 Fab- Level Labor-Management Meetings

Meetings were held every quarter in every fab. Given the amendment of Labor Standards Act effective March 1, 2018, one ad hoc meeting was convened. Overall, with 5 meetings in each of the 12 fabs, a total of 60 meetings were convened

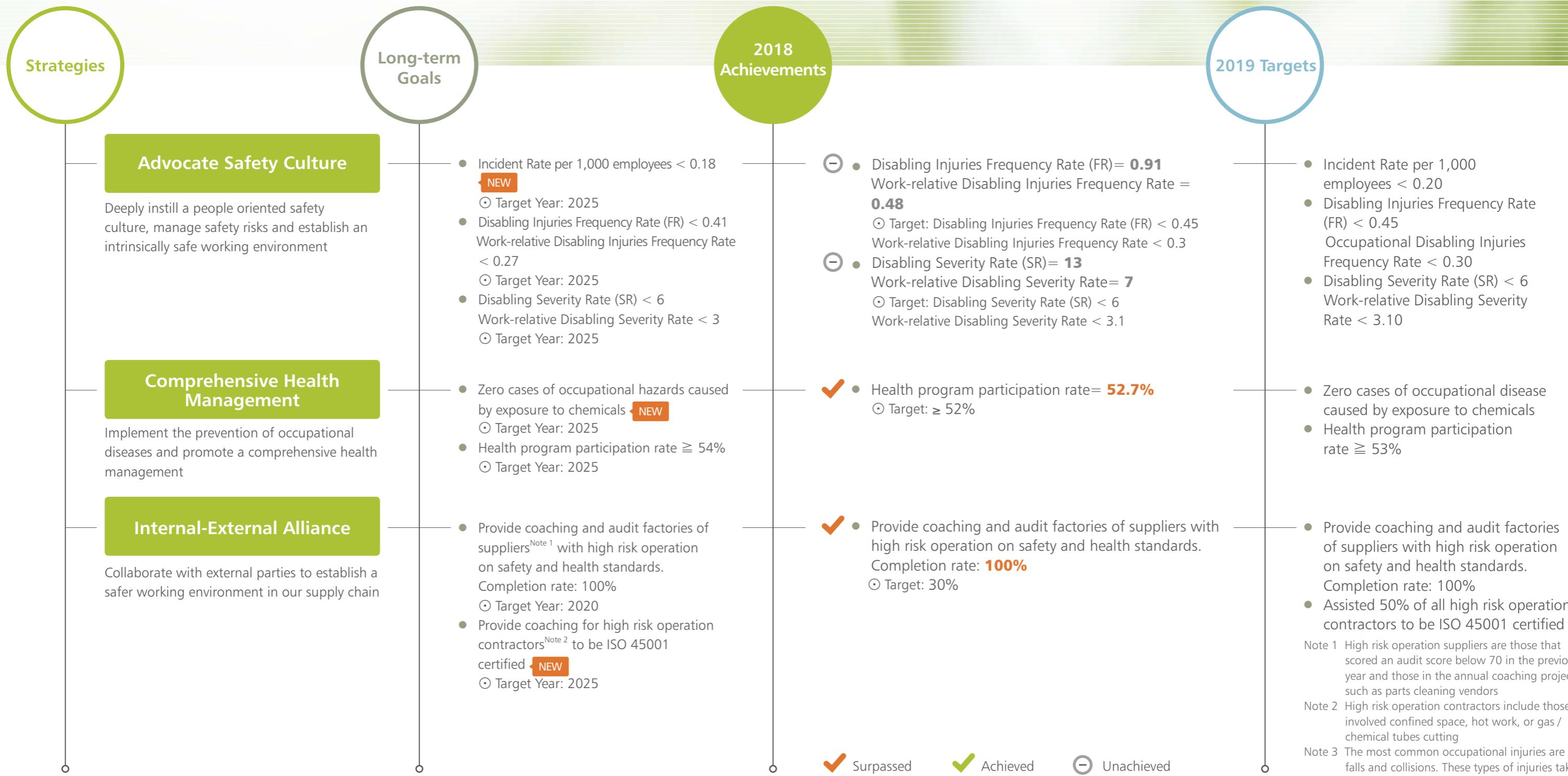
5 Company-Level Labor-Management Meeting

Meetings were held every quarter and attended by one company representative and one labor representative from each fab. Given the amendment of Labor Standards Act effective March 1, 2018, one ad hoc meeting was convened. Overall, a total of 5 meetings were convened





Occupational Safety and Health

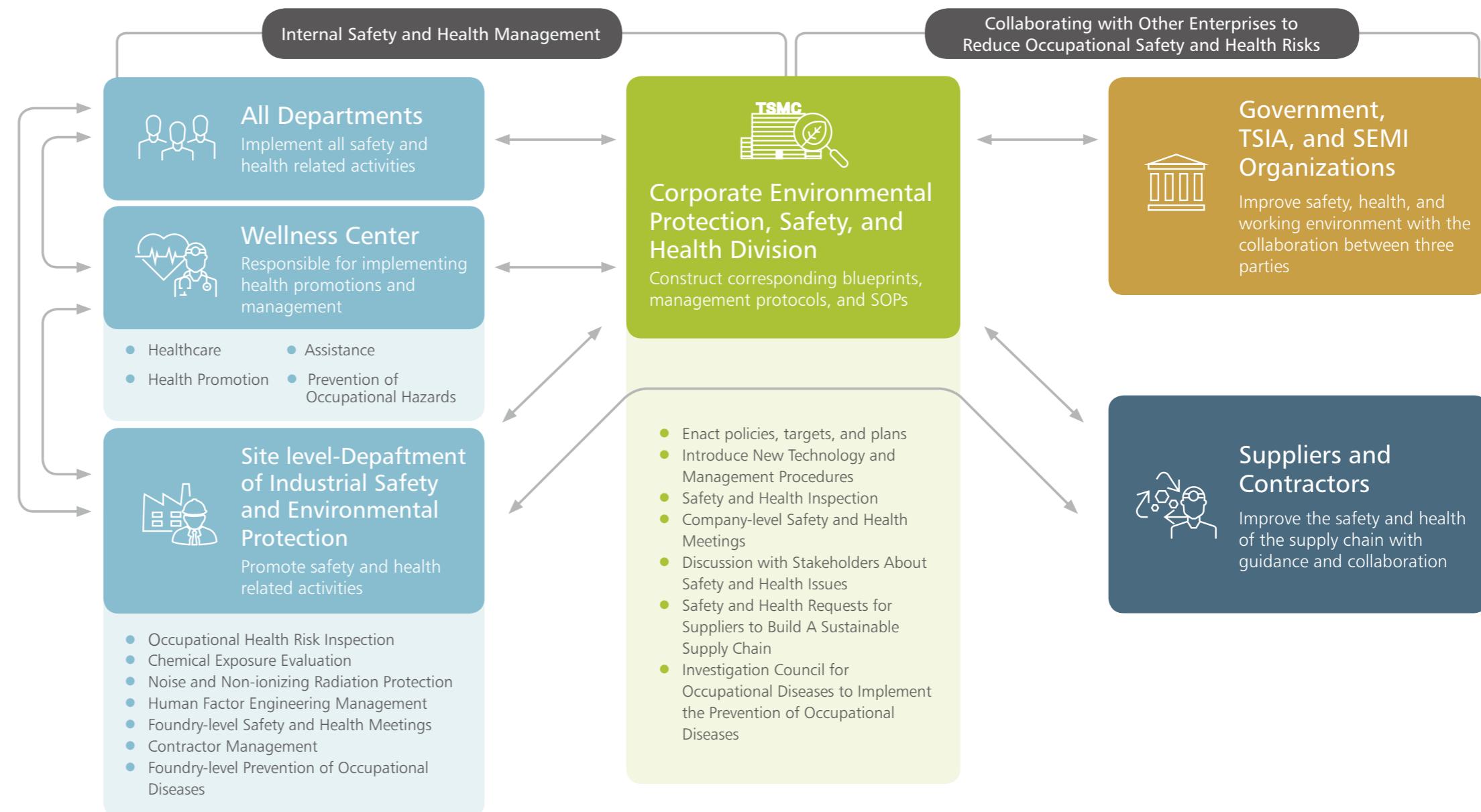




Implementing Environmental Safety and Health Management to Ensure a Healthy Workplace

To closely monitor occupational safety and health, TSMC established an organization with divided roles and responsibilities to meet the requests and expectations from stakeholders. In 2018, TSMC continued to promote its safety culture and improve risk management procedures, and also put efforts into strengthening the prevention of occupational diseases, working towards the goal of the safest and healthiest workplace.

TSMC Safety and Health Organization





Advocate Safety Culture

TSMC believes that the first step to establish a healthy workplace is to think from the perspective of a human-oriented safety culture. In addition to integrating internal resources to promote safety culture, the Company manages safety risks according to responsibility of each organization.

Safety and Health Performance

Following the Company's [Safety and Health Policy](#), TSMC implemented the following actions and used the Safety Performance Index (SPI) to track performances to fulfill safety culture and manage safety risks.

2018 Safety and Health Performances



Category	Actions	SPI	Taiwan Facilities	Overseas Fabs ^{Note 1}	VisEra
Legal Inspection	<ul style="list-style-type: none"> Periodic legal inspections and checkups on all fabs. A total of 6 safety and health related regulations were changed Added a new legal risk inspection form for TSMC (Nanjing) to check on a total of 520 legal documents spanning from the central government to the Nanjing city government 	✓	✓	✓ ^{Note 2}	✓
Standardized Operating Procedures	<ul style="list-style-type: none"> Standardized a total of 54 documents on safety and health management procedures with annual revisions, 158 procedures revised so far Changed the occupational safety and health management system from "OHSAS 18001" to "ISO 45001." All related personnel completed comprehensive safety and health training, with all fabs expected to be certified by 2019 	✓	✓	✓	✓
Safety and Health Training	<ul style="list-style-type: none"> Promoted safety and health training among employees and contractors to meet corresponding regulations and emergency response measures Invited specialists to teach health management for more than 160 participants to strengthen the prevention of occupational hazards 	✓ ^{Note 3}	✓	✓	✓
Hazard Identification	<ul style="list-style-type: none"> Identified 5,079 cases of work hazard regarding working environment and conditions 	✓	✓	✓	✓
Changed Management	<ul style="list-style-type: none"> 4,780 cases of management change have successfully been completed with zero related incidents 	✓	✓	✓	✓
Chemical Management	<ul style="list-style-type: none"> Introduced 266 new chemicals with zero related incidents 	✓	✓	✓	✓
Contractor Management	<ul style="list-style-type: none"> 12,443 cases of high risk procedures were completed by contractors with zero related incidents 	✓	✓	✓	✓
Implementation Inspection	<ul style="list-style-type: none"> Internal Audit recommended 1,212 improvement items, and all recommendations were improved on time 	✓	✓	✓	✓
Emergency Response	<ul style="list-style-type: none"> To strengthen emergency responses to earthquakes, emergency response training has been improved to cope with magnitude 6 or higher earthquakes, with composite emergency responses being promoted 	✓	✓	✓	✓
Occupational Injury Prevention	<ul style="list-style-type: none"> Added an employee injury investigation committee and related revisions were adopted by all fabs to lower cases of occupational injuries 	⊖	✓	✓	✓

Note 1 Data included TSMC (China) and TSMC (Nanjing).

Note 2 In response to regulatory differences, TSMC will establish a legal inspection platform covering all facilities in Taiwan (wafer fabs, testing and assembly plants), TSMC (China) and TSMC (Nanjing).

Note 3 [2018 training achievements](#) (Training scope and statistical logic redefined in 2018).

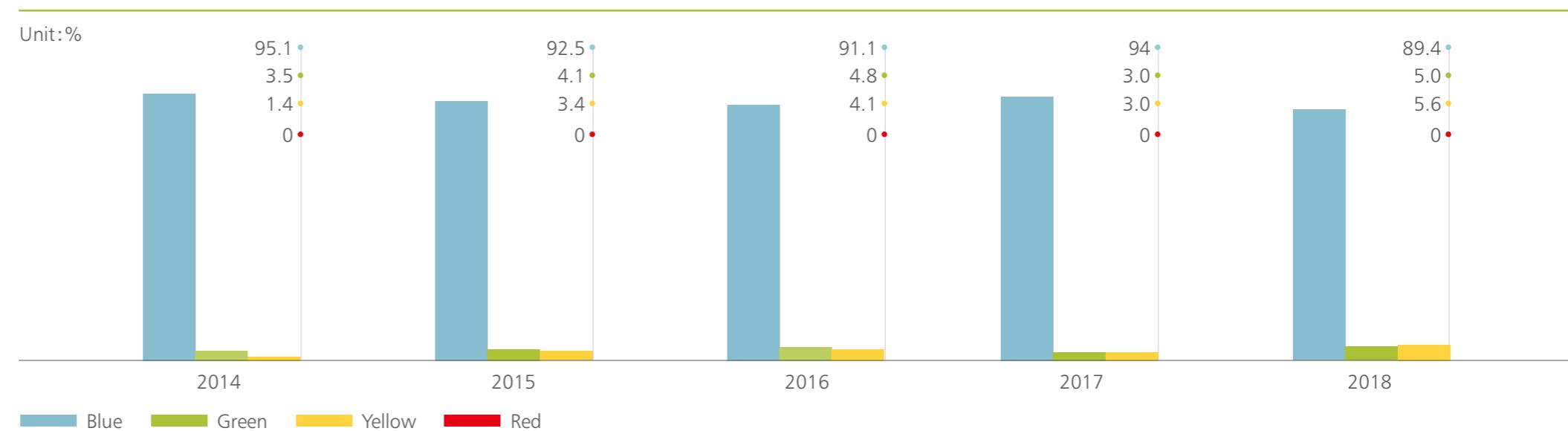


Safety Performance Indicators

TSMC classifies SPI into four categories, including leading and lagging indicators. Leading indicators encourage employees to participate in safety and health activities, while lagging indicators represent errors and false alarms. In 2018, the amount of blue light incidents decreased from 94% to 89.4% since false alarm incidents increased from 6 to 10. Among these false alarm incidents, 6 incidents were triggered by fire alarms, 2 from gas alarms, and the remaining 2 from employee injuries. After analyzing the causes of these false alarms, updated safety and health focuses are as follows:

- Reduced fire false alarm incidents: One case was caused by a short circuit due to a plug constantly being plugged and unplugged. The other five were all due to the malfunction of cast resin transformers, so we formed an expert team to address the issue.
- Reduced gas alarm incidents: Design and textures of equipment now have to meet specific safety standards and these standards have to be included in TSMC's procurement standards.
- Reduced employee injuries: Strengthened equipment examination and strictly adhered to standard operating procedures for maintenance.
- Included incidents to target management, with hopes to reach the target of lowering the incident rate per 1,000 employees to below 0.2%.

Safety Performance Indicators (SPI) Chart



SPI Index

	Active Indicators	Passive Indicators
Before 2018	<ul style="list-style-type: none"> Number of Changed Safety Management within Foundries Target Number of Safety and Health Implementing Projects Completion Rate of Safety and Health Trainings 	<ul style="list-style-type: none"> Numbers of False Alarm Incident Number of Self-evaluated Safety and Health Errors Completion Rate of Legal Inspection Implementation
New Items Added in 2019	<ul style="list-style-type: none"> Number of Safety and Health Promotion Activities Improving Measures of Occupational Hazards Share Improving Actions of Safety and Health with Other Foundries 	<ul style="list-style-type: none"> Number of Errors Found During Safety and Health Inspections Contractor Management (incl. numbers of errors, miss operations, and improving measures) Number of Work-relative Occupational Injury

SPI Diagram

SPI	Performance	Color
$\text{SPI} \geq 95$	Excellent	●
$85 \leq \text{SPI} < 95$	Good	●
$70 \leq \text{SPI} < 85$	Warning	●
$\text{SPI} < 70$	Alarm	●

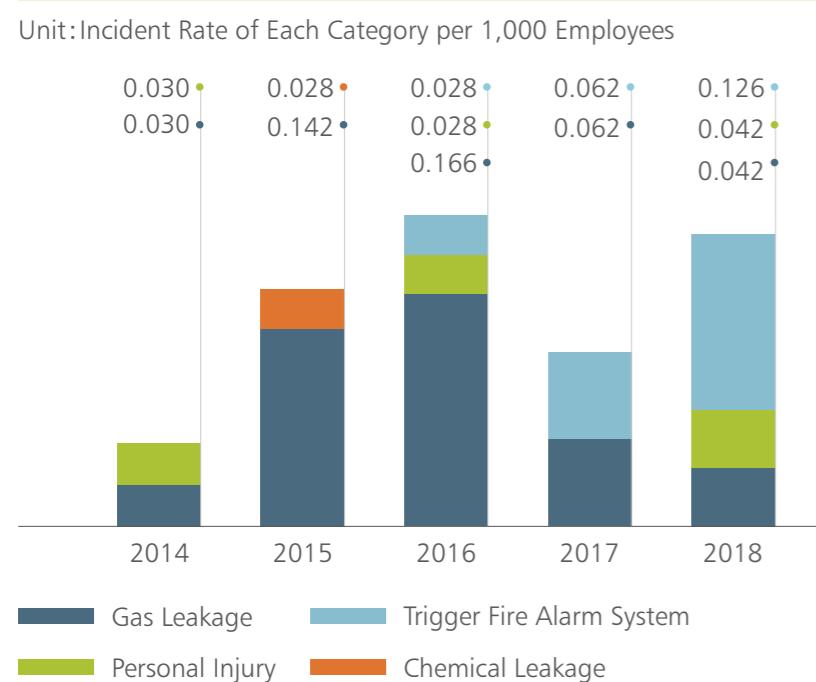


Incidents Throughout the Years

Year	2014	2015	2016	2017	2018
Number of Incidents	3	6	8	6	10
Number of Incidents / Number of People	0.074	0.133	0.170	0.123	0.211

Note Data were collected from all facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China) and TSMC (Nanjing).

Analysis of Past Incidents



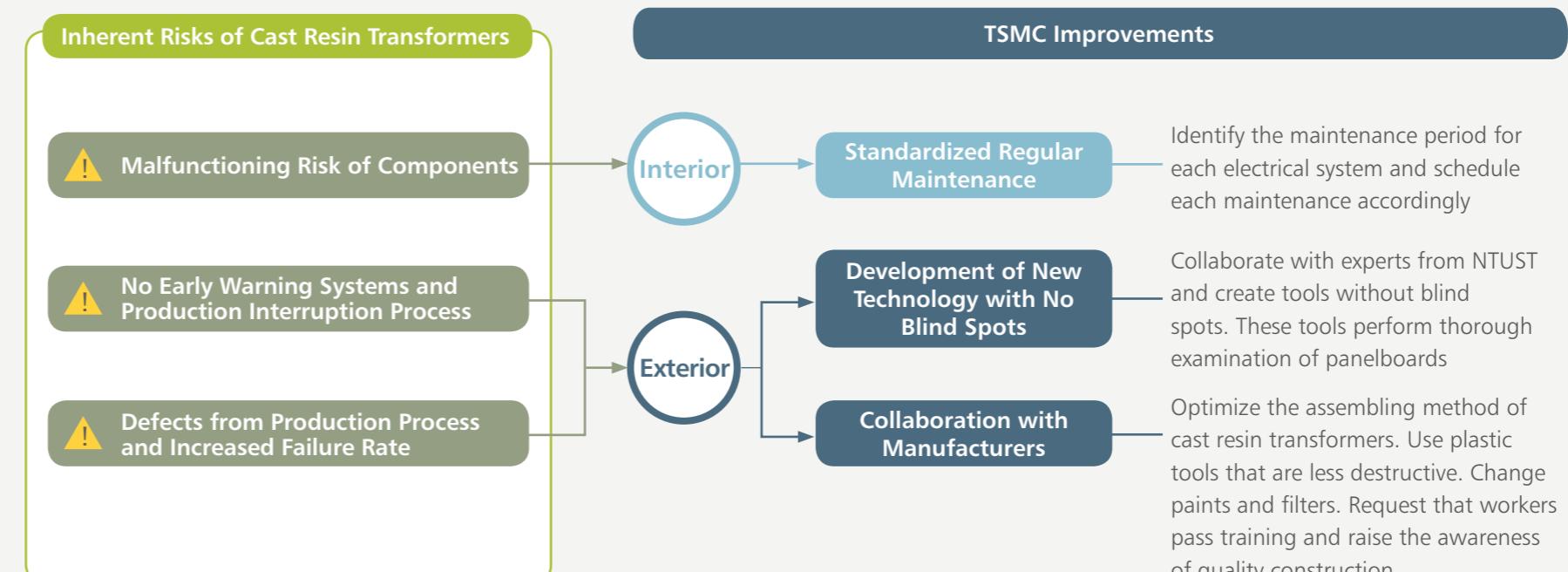
Case Study

Improvement Plans for the Malfunction of Cast Resin Transformers

Cast resin transformers are commonly used in power systems in TSMC. When there is a malfunction caused fab equipment losing power, it may even result in a pause in production. In 2018, multiple fire alarms were set off by cast resin transformers due to their inherent risks. To solve this problem, TSMC experts in power systems

collaborated with the National Taiwan University of Science and Technology and the manufacturers of the cast resin transformers to examine different scenarios the transformers were malfunctioning, and implemented improvement actions to create a win-win situation between the manufacturers and customers.

Potential Risks of Cast Resin Transformers and TSMC's Countermeasures

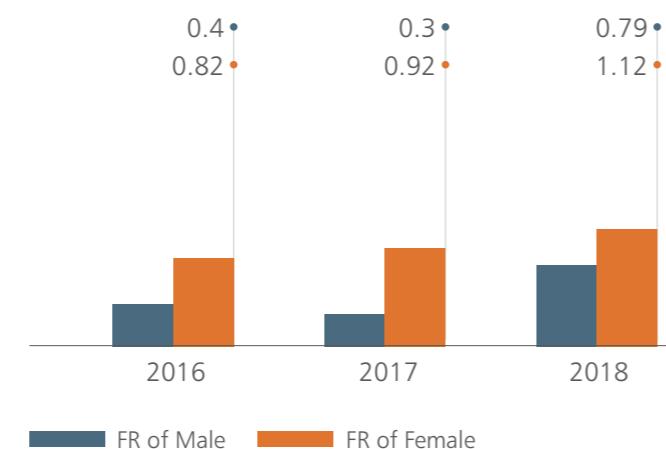




Statistical Analysis of Disabling Injuries

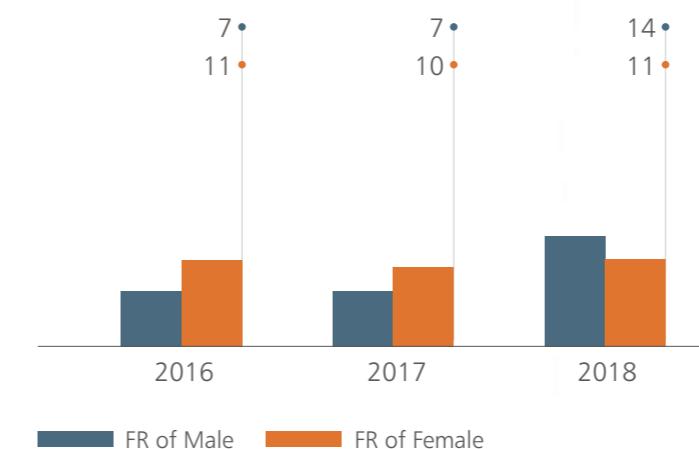
The statistics are calculated according to disabling injury indicators from the Ministry of Labor and GRI Standard and shown in Frequency Rate (FR) and Severity Rate (SR). The data excludes traffic accidents outside the fabs. In 2018, TSMC had a total of 83 occupational hazard incidents that resulted in a loss of 1,244 working days.

FR by Gender



Note Data were collected from all facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing) and VisEra.

SR by Gender



Note Data were collected from all facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing) and VisEra.

Total Working Hours, Injury Cases, and Working Days Lost

	2016			2017			2018		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Total Working Hours	52,379,580	34,144,666	86,524,246	50,557,053	31,558,154	82,115,207	55,971,403	34,866,134	90,837,537
Number of Incidents	21	28	49	15	29	44	44	39	83
Lost Days	367	367	734	330	314	644	828	416	1,244

Note Data were collected from all facilities in Taiwan (wafer fabs, testing and assembly plants), WaferTech, TSMC (China), TSMC (Nanjing) and VisEra.



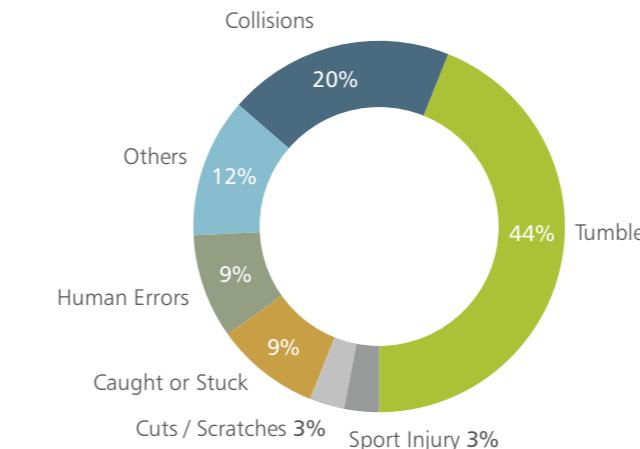


Last year, we did not meet the annual target for both FR and SR due to an increase in employee injury cases. Female employees had a higher FR, while male employees had a higher SR. Most injuries were job-related, including falling down, fractured bones, and sprained ankles due to collision. These injuries take longer time to recover, resulting in the increase in loss of working days. Given the increase of both FR and SR compared to the previous year, the SPI is expected to be revised in 2019 and TSMC encourages colleagues and employees to come up with new injury prevention actions.

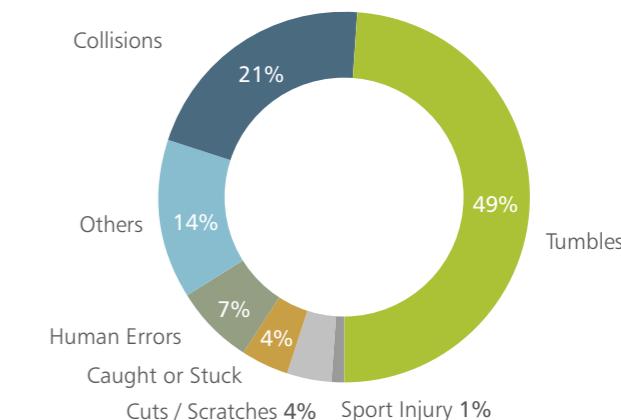
After analyzing the FR and SR between 2016 and 2018, excluding employees who got broken bones from training for the Sports Day in 2017, TSMC found that the most common occupational injuries were caused by a fall or collision. Among these injuries, about 10% were caused by a slippery floor and poor lighting, which was comprehensively addressed later on. The other 90% was a result of personal reasons. In 2019, TSMC will improve safety in these areas, raising employees' safety awareness, and conducting regular reviews in the Safety and Health Committee meetings.

Causes of Occupational FR and SR in 2018

Causes of FR



Causes of SR



Improvement Actions to Prevent Falling Down and Collision

Posters to Raise Colleagues' Awareness

- Do not talk on the phone or use the phone when taking the stairs
- Do not run in the office
- Follow instructions of carts
- Turn on the light and slow down in the parking lot



Analyze and Discuss Injury Cases in Safety and Health Council

- Calculate occupational injury cases every month and promote safety in every foundry
- Inspect on road-smoothing project
- Everyone is a safety inspector
- Safety reports are encouraged

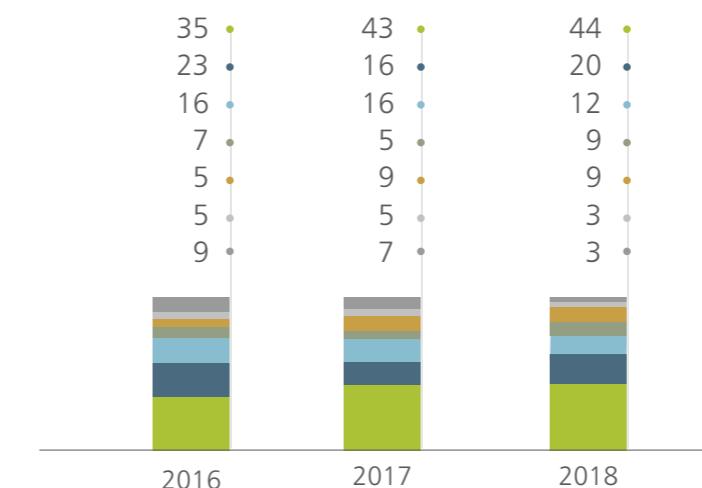
Create a Safer Environment and Avoid Falling Down or Collisions

- Remove barriers on circulation of movement
- Improve the environment with better lighting
- Stabilize and organize cables to avoid tripping over them
- Fixed cart storage areas

Causes of Occupational FR and SR

Disabling Frequency Rate

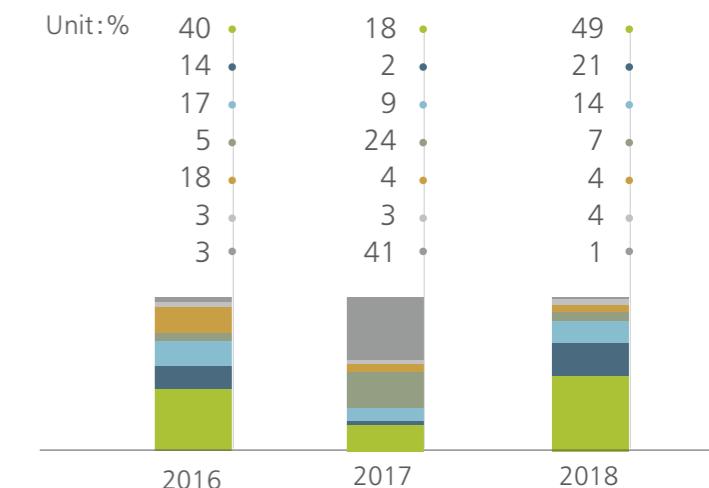
Unit: %



Tumbles
Collisions
Others
Human Errors
Caught or Stuck

Rate of Working Days Lost from Occupational Induced Injuries

Unit: %



Tumbles
Collisions
Others
Human Errors
Caught or Stuck

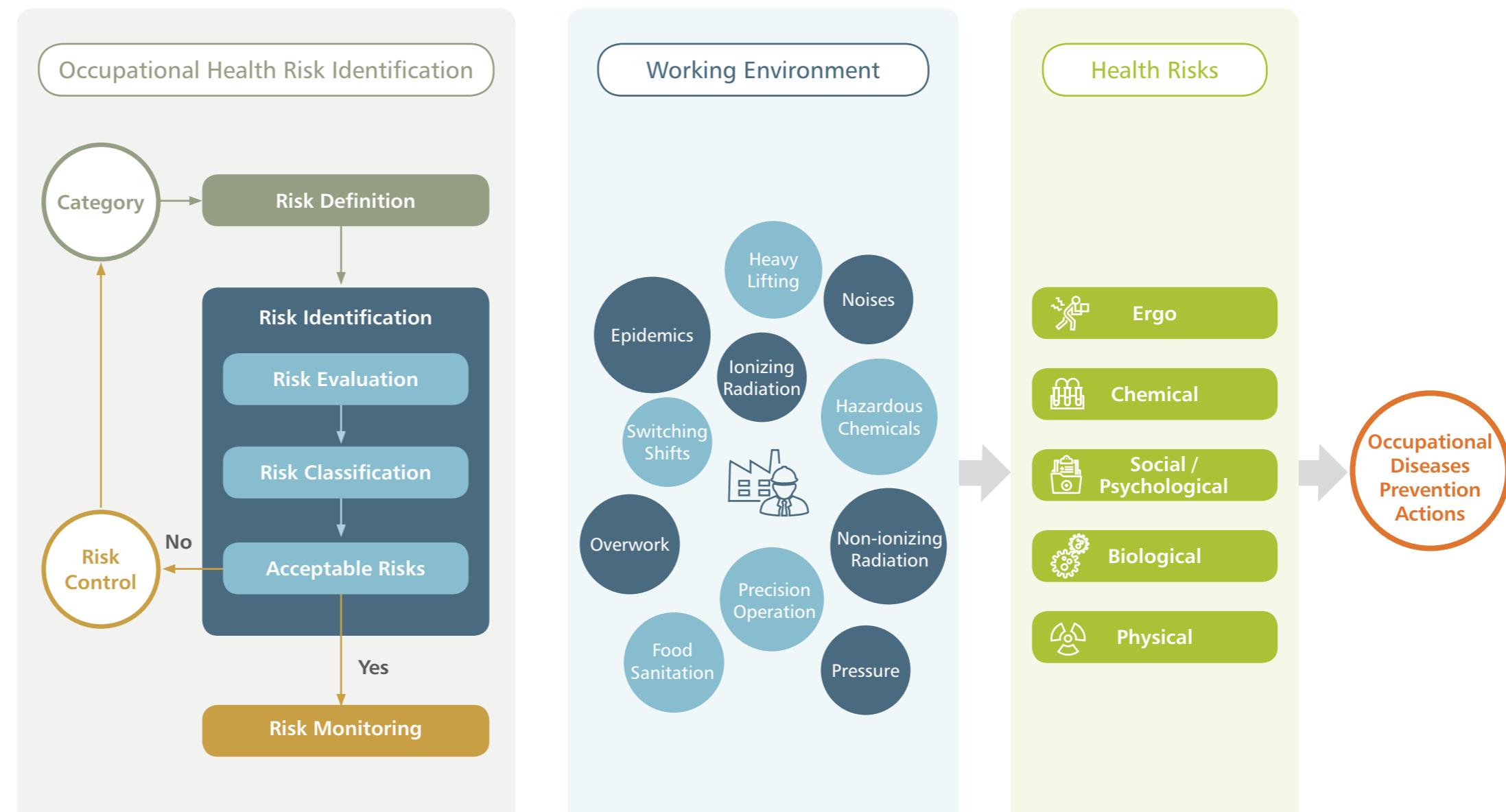


Comprehensive Health Management

Occupational hazards and personal health problems result in a drop in productivity, and the impact to a company cannot be overlooked. Therefore, optimal health management should include health risk identification and corresponding measures to prevent occupational diseases and promote personal, physical, and mental health management.

Health Risk Identification in Preventing Occupational Diseases

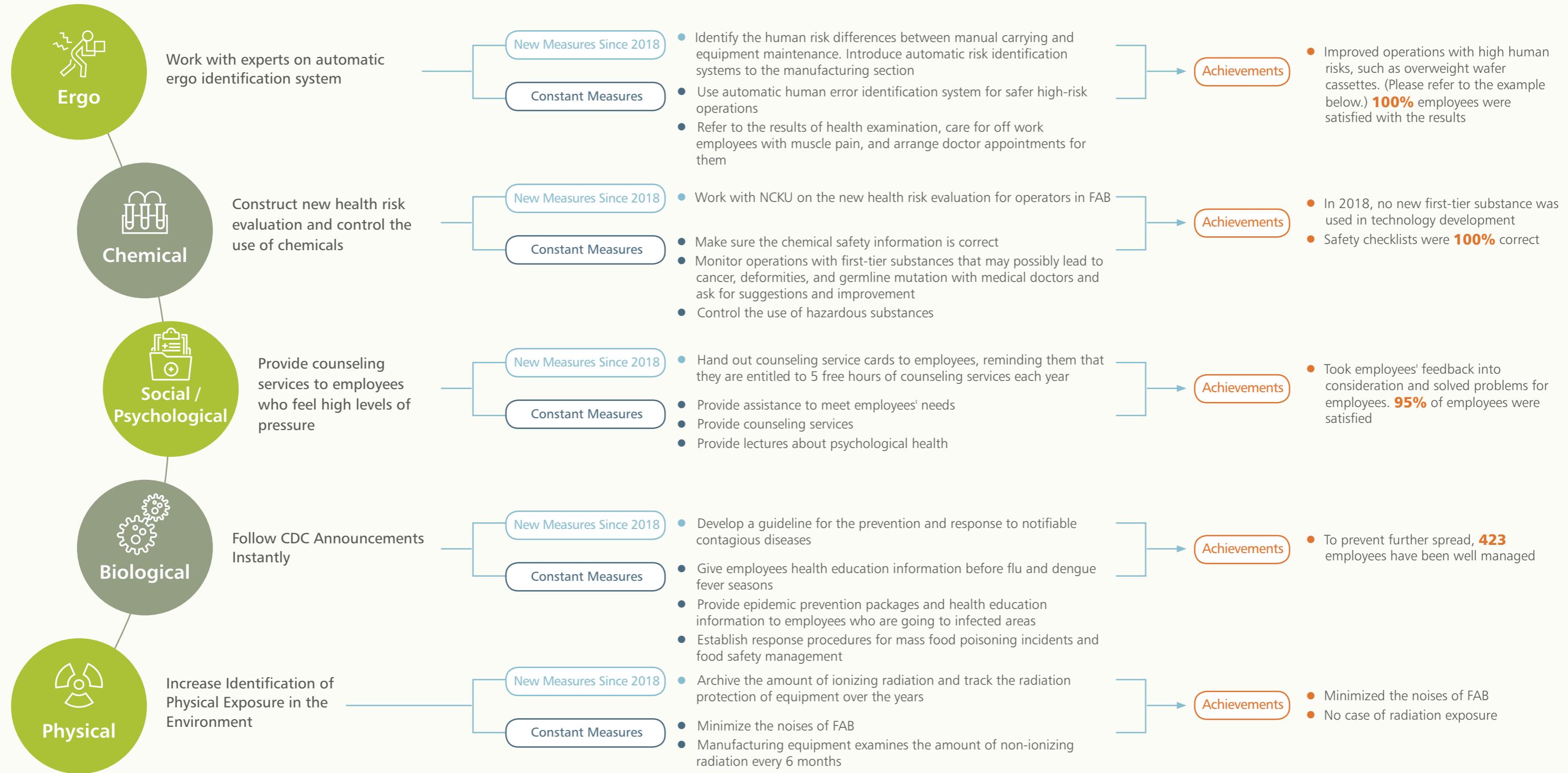
TSMC is committed to making a breakthrough in traditional occupational health policies and building a safe working environment. To promote employee health and better respond to occupational hazards, TSMC established a "Health Management Program for Employees" in 2017, which is supervised by senior vice presidents of Fab Operation and Information Technology, Materials Management & Risk Mgt . The participating members include fab managers, the division of industrial safety and environmental protection, legal and human resources department, and employee healthcare department. Jobs are divided into several categories according to levels of risk. These categories represent the five main causes of occupational diseases, including chemical, physical, ergo, biological, and social / psychological factors. These factors are in the scope of health management plans for employees. According to the statistics from the Occupational Safety and Health Administration of the Ministry of Labor, ROC, TSMC prioritizes the order for occupational disease prevention.



For further information, please refer to the official website of TSMC: [TSMC Goes beyond Regulatory Requirements to Protect Employee Health](#)



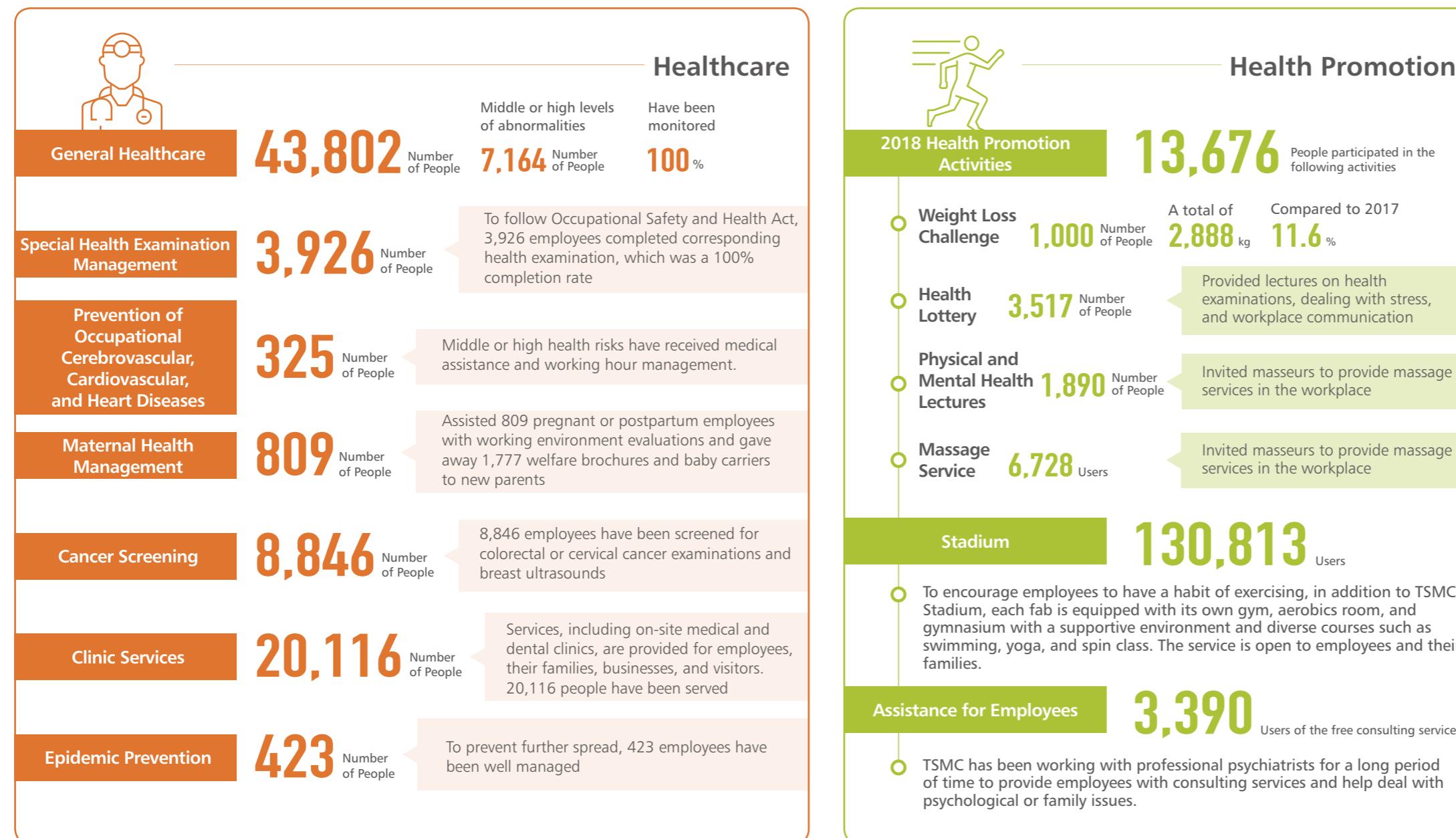
Actions and Achievements of Preventing Occupational Diseases



For further information, please refer to the official website of TSMC: [TSMC Introduces Ergonomics Engineering E-System to Build a Safe Workplace](#)



Assisting Employees with Health Management, Including Healthcare and Health Promotion



Note Data of special health examination management were collected from all facilities in Taiwan, TSMC (China), TSMC (Nanjing), VisEra, and WaferTech; Data of other categories were collected from part of the subsidiaries only.

Innovative Actions

To proactively prevent occupational hazards caused by chemical exposure, TSMC collaborates with occupational medicine and toxicology specialists from the Taipei Veterans General Hospital. In addition to implementing hazardous health examinations based on hazardous health management regulations, TSMC created a health database of operators who came into contact with hazardous substances in 2018. Data such as physiological indicators, working procedures, and working environment are included in the database. If the biological indicators of employees show signs of increasing year by year, TSMC will arrange a doctor appointment for employees and inspect the working environment to check if there is a risk of exposure.

For further information, please refer to the official website of TSMC: [TSMC Promotes Employees' Well-being to Create a Friendly Workplace](#)



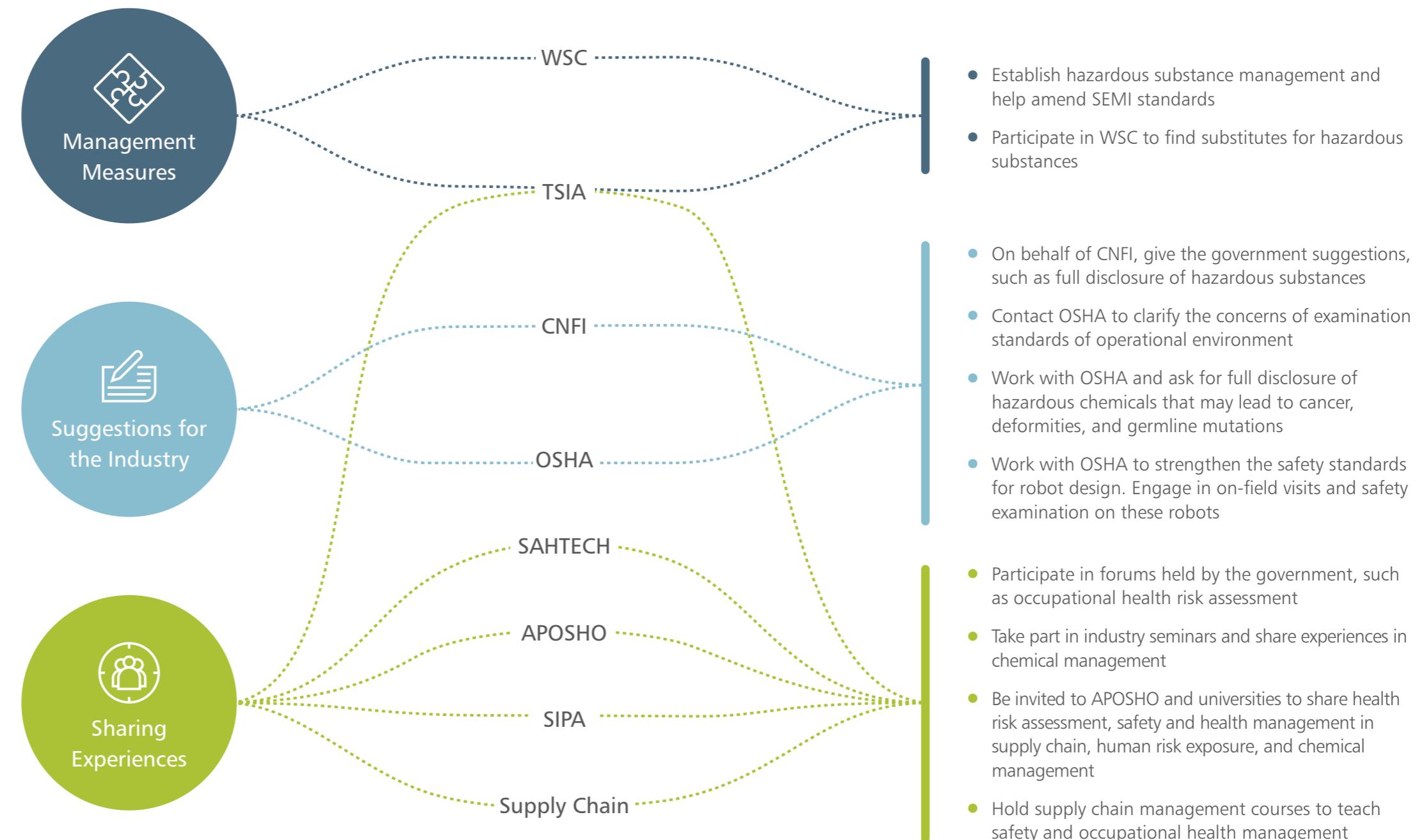


Internal-External Alliance

As the Company grows, TSMC has greater influence on industry and society. It is TSMC's obligation to build a safe working environment along with its suppliers and contractors. Therefore, TSMC partners with other enterprises to proactively learn from one another, shares experiences, and provides training and guidance to reduce safety and health risks in the supply chain.

Collaborating with Other Enterprises to Reduce Occupational Safety and Health Risks

TSMC shares experiences in occupational safety and health risk management with the Taiwan Semiconductor Industry Association(TSIA). Furthermore, on behalf of TSIA, TSMC participates in the annual Joint Steering Committee, a working group of World Semiconductor Council, and shares experiences in occupational risk management.





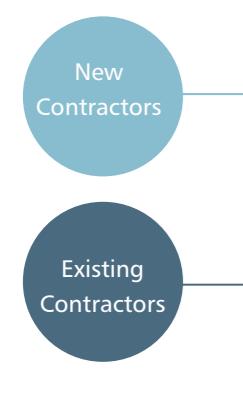
Enhancing Hazard Disclosure of Contractors and Helping Employees Identify Health Risks

Currently, about 75,000 contractors have TSMC working permits. Based on different levels of risk exposure, operating frequency, and operating modes, about 3% of all contractors are defined as high-risk contractors. Since these contractors are on-site contractors, they are required to meet the standards of safety and health training and examination. They are required to take training courses, know how to use personal protective equipment, and attend emergency response drills. In 2019, contractors are required to report all anomalies of workplace-related health examinations to TSMC. In response, TSMC will send occupational physicians to carry out onsite inspections and make sure that all onsite staff's health is secured.

In 2018, TSMC strengthened contractors' awareness of occupational hazard prevention. Several topics were added into the training materials of safety and health, including risk identification methods, prevention of hazardous substances, inspection on the working environment, and personal protective equipment corresponding to each operation. In addition, TSMC put warning signs on components that might be used by contractors and standardized packaging methods to avoid direct contact with hazardous remains.

In 2017, TSMC started to analyze the FR and SR of contractors. In 2018, there was a loss of 8 working days, which was mainly due to a finger injury in the process of carrying equipment. After the accident, TSMC strengthened contractors' training and promotion of industrial safety. Moreover, TSMC requested that contractors and vendors need to follow correct operating procedures.

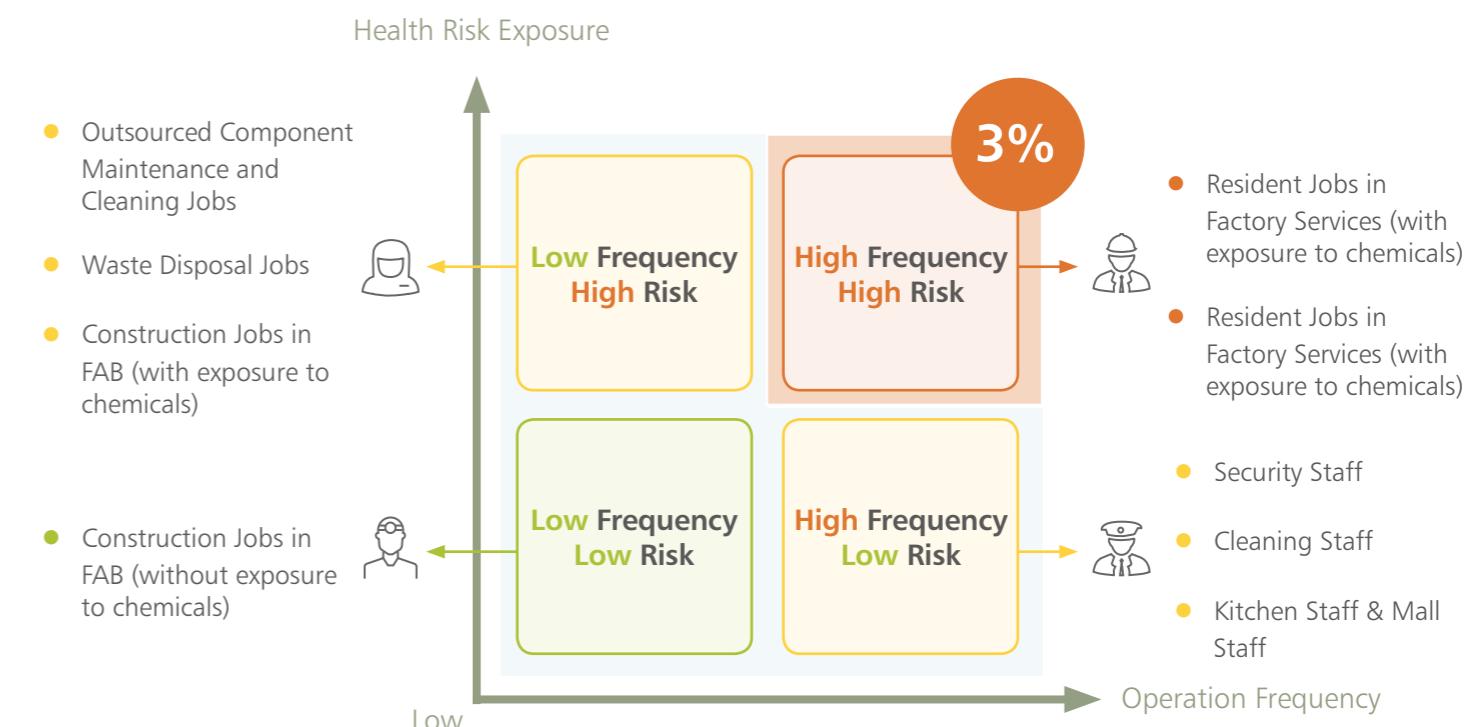
Contractor Training



Training Courses	2015 Number of People	2016 Number of People	2017 Number of People	2018 Number of People	Mandatory Courses	Overseas Data
					<input checked="" type="checkbox"/>	Not Included
Safety and Health Training	16,241	21,370	15,708	21,749	<input checked="" type="checkbox"/>	Not Included
Personal Prevention Equipment Training for Resident Contractors with Exposure to Chemicals	1,998	2,608	1,891	2,011	<input checked="" type="checkbox"/>	Not Included
Annual Emergency Response Drill for Resident Contractors with Exposure to Chemicals	124	205	778	1,344	<input checked="" type="checkbox"/>	Not Included

Note Training scope and statistical logic were redefined in 2018 (Data were collected from all facilities in Taiwan, including wafer fabs, testing and assembly plants).

Risk Identification of Contractor Health Factors



Statistics of Frequency Rate (FR) and Severity Rate of Contractors

Category \ Year	2017	2018
FR	0.03	0.03
SR	2	0

Note Data were collected from all facilities in Taiwan (wafer fabs, testing and assembly plants).



Sustainable Development in the Supply Chain

In 2018, TSMC established the "Guidebook on Environmental Protection, Safety, and Health for Suppliers", which covers TSMC's safety and health standards for suppliers' reference. In 2015, TSMC created an onsite inspection form to monitor environmental protection, safety, health, and damage prevention in the supply chain. The form has been revised annually in response to regulatory changes. Furthermore, in response to suppliers' requests, TSMC holds a "Training Workshop on Safety, Health, and Environmental Protection" in the beginning of each year. In the workshop, inspection forms are given to suppliers for their self-evaluation. In the middle of each year, TSMC conducts inspections and guidance on these suppliers to make sure that safety and health procedures meet regulatory standards. With bilateral communication, TSMC gives suppliers the needed guidance on safety and health. In 2018, three workshops were held covering topics including energy reservation, water reservation, occupational safety and health, fire safety, waste reduction, and emergency response observation. In 2019, TSMC will continue to make follow-up reports on the improvements in these fields.

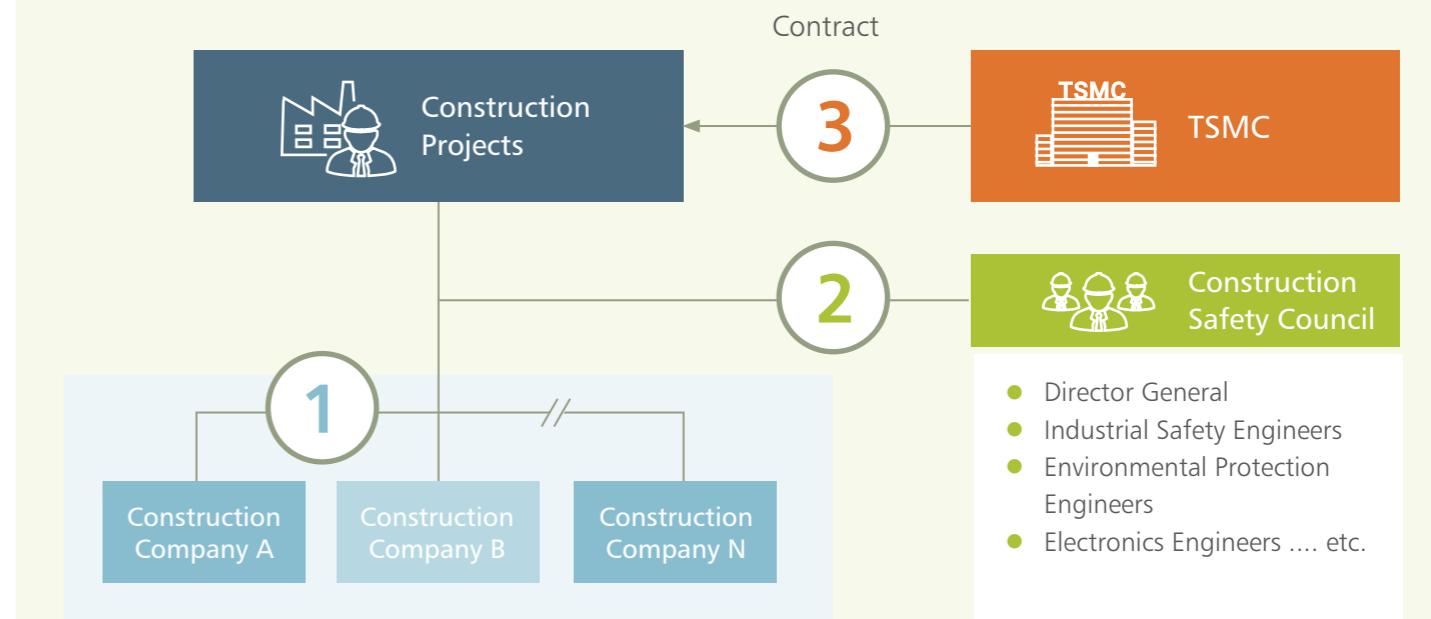
Emergency Response Observation



Strengthening Safety Management of Delivery Contracted Operation

In the past, basic contracting operations were to outsource industrial safety management to other contractors. Due to an ever expanding business, and an accident occurred in the end of 2018, TSMC now demands that these contractors fulfill self-management. In 2019, TSMC will enact new measures to maintain the current actions of industrial safety and build a safe working environment with its contractors.

Actions of Industrial Safety



- 1 Establish and certify occupational safety and health management systems
- 2 Ensure construction quality and make sure that operators are professional and well-trained
- 3 Implement contractor evaluations and interview executive managers to maintain occupational safety:
 - (a) Establish and certify occupational safety and health management systems
 - (b) Ensure construction quality and make sure that operators are professional and well-trained
 - (c) Inspect construction sites, improvement on errors, and preventive measures



Focus 6

Common Good

Power to Change Society

The TSMC Education and Culture Foundation and TSMC Charity Foundation continue to serve as focal points for funds, materials, and people from inside and outside TSMC to devote resources towards caring for the disadvantaged, revitalizing values of filial piety, rural education, cultivation of youths, culture and arts, energy conservation, environmental awareness, and many other activities. The Foundations put resources towards filling the gaps in society, passing on the power of kindness and care.

>373%

Books read by students increased from 19 to 90 per year, a 373% growth brought about by the Hope Reading 2.0 program

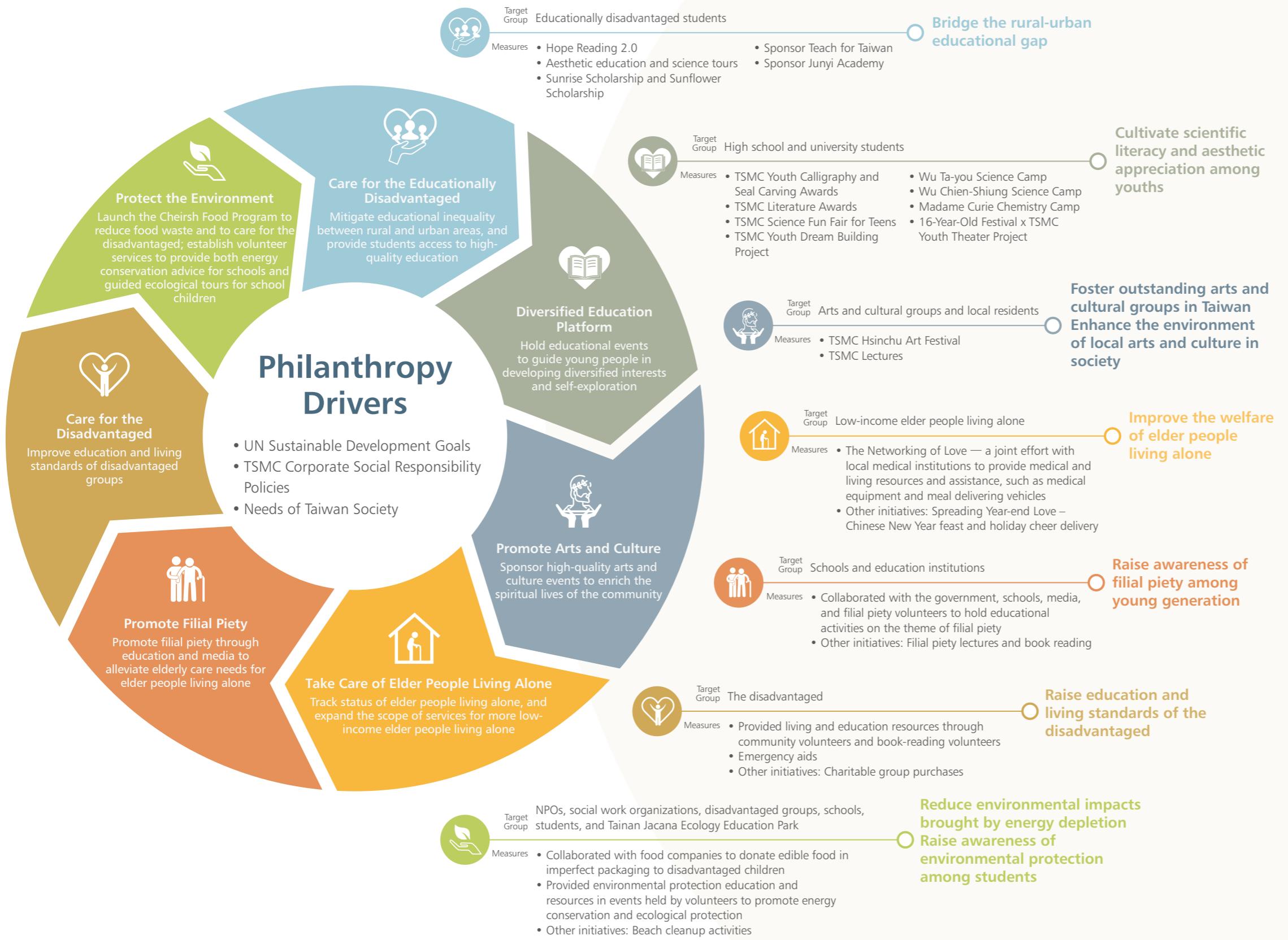
40 million (NT\$)

Over NT\$40 million invested to foster interest in science and the humanities in the next generation

9,000

9,000 seniors living alone have been covered in the Network of Love system; filial piety curriculum has been implemented in 21 educational institutions



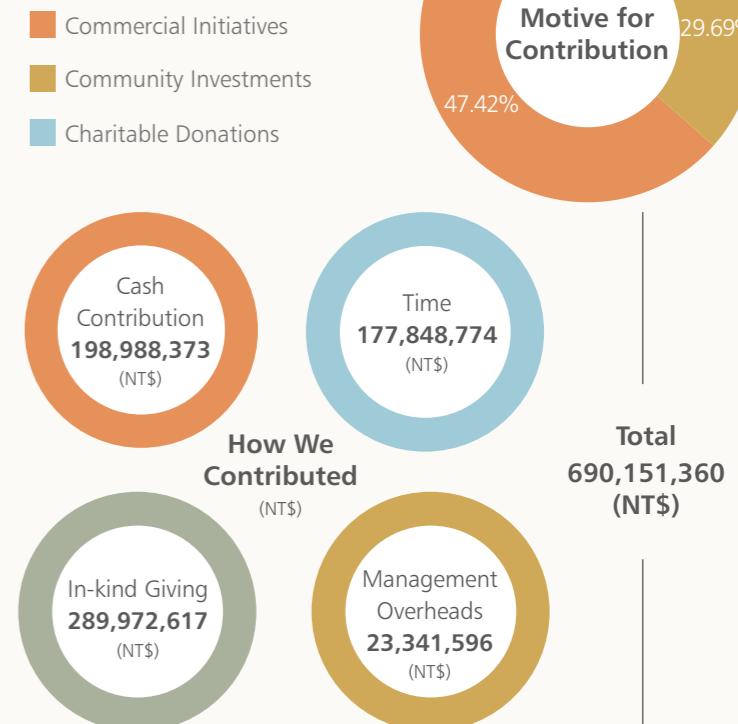
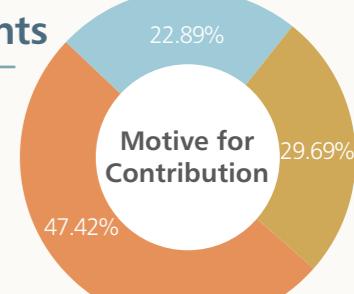


Strengthened by support from across society, TSMC stands by the commitments of its Corporate Social Responsibility Policy, and focuses on the United Nations Sustainable Development Goals (SDGs) and the needs of Taiwan society to invest in many areas of public service to even out disparities in resources and give back to society.

The TSMC Education and Culture Foundation integrates resources from both inside and outside of the system to care for the educationally disadvantaged, support diversified education platform, spread the seeds of art and culture, cultivate artistic appreciation, and provide a platform for youth to realize their dreams, all to accomplish the goals of SDG4 towards educational quality.

The TSMC Charity Foundation helps the poor and young, takes care of seniors living alone, actively promotes filial piety and environmental protection, practices long-term engagement in voluntary service, and shines a light in the dark corners of society to accomplish the goals of SDG1, SDG3 and SDG4 in eliminating of poverty, achieving health and welfare goals and quality education.

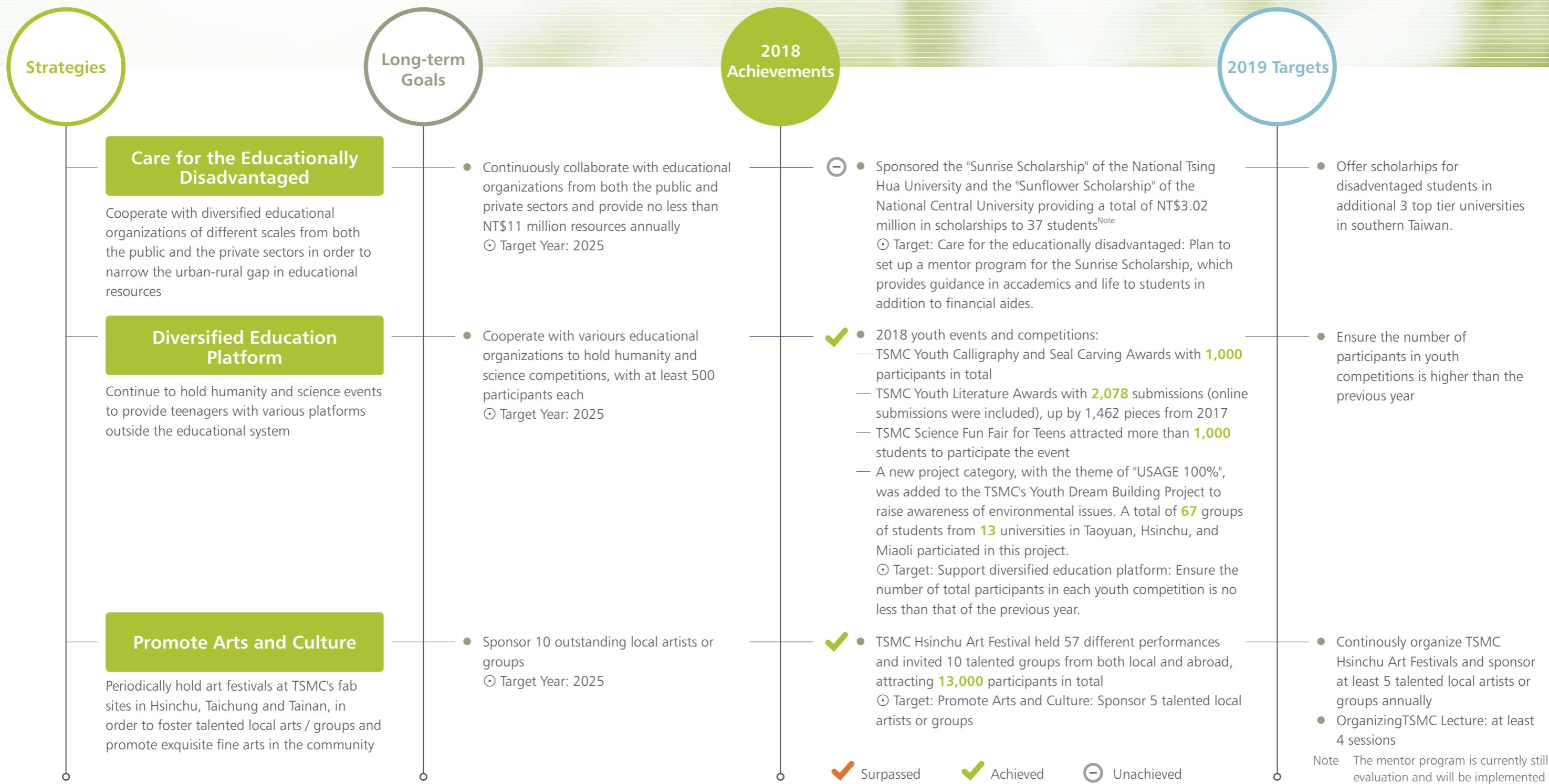
Our Social Investments

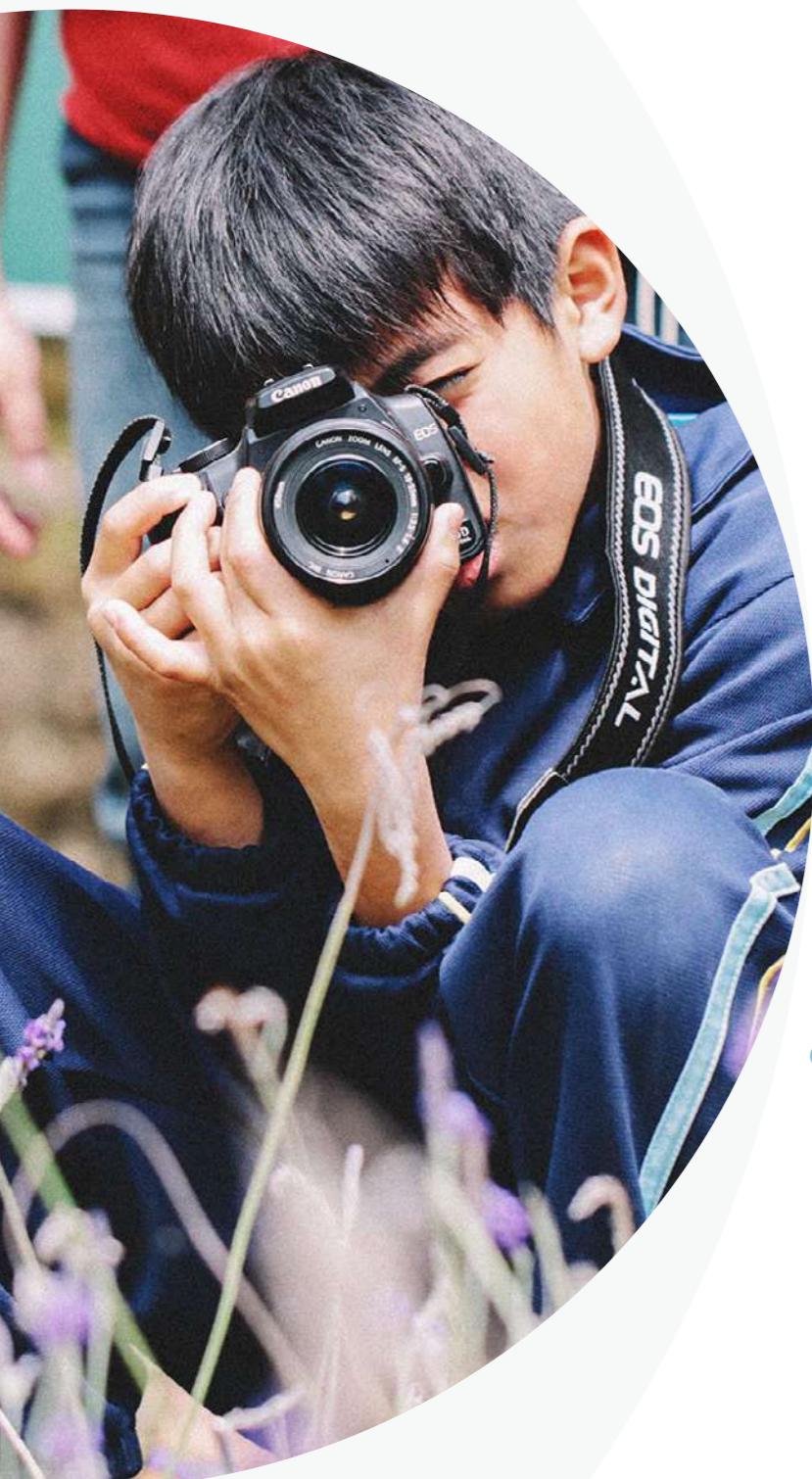


Note Our social investments include endeavors made by the Company (e.g. University Collaboration Programs, etc.), TSMC Education and Culture Foundation, TSMC Charity Foundation, TSMC employees (volunteer services and charity donations) and the Employee Welfare Committee



TSMC Education and Culture Foundation

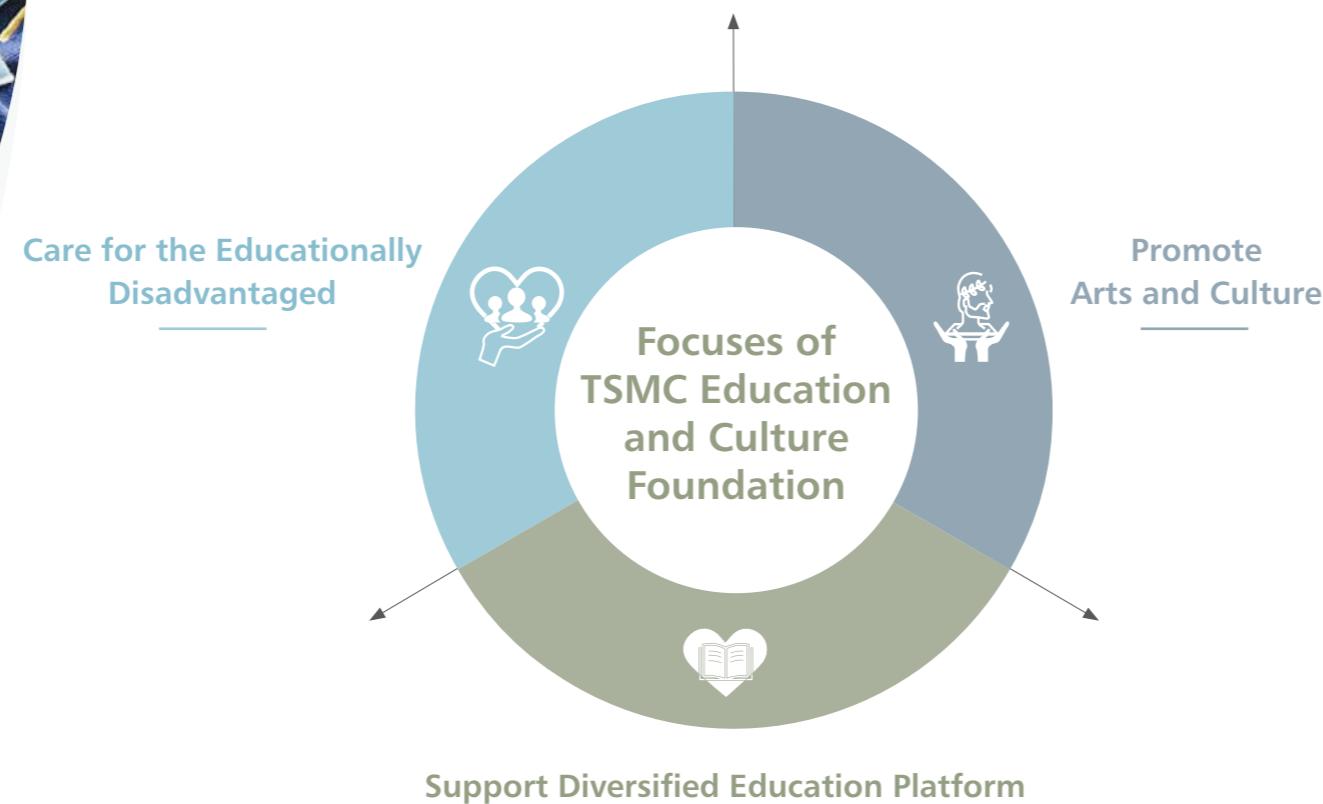




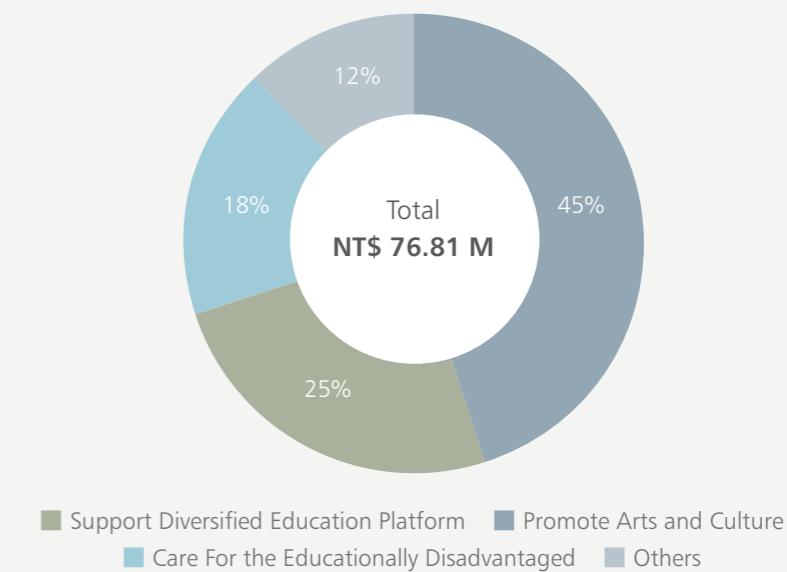
Making Contribution to Society and Enriching People's Spiritual Life

TSMC Education and Culture Foundation (TSMC Foundation) was founded in 1998. In 2018, the TSMC Foundation contributed over NT\$76.81 million into three main areas of our core concerns: caring for the educationally disadvantaged, supporting youth with diversified education platform, and promoting arts and culture. The TSMC Foundation works with educational organizations from both public and private sectors to narrow the urban-rural gap in educational resources. It also holds diversified competitions that guide teens to look inwards and explore their inner selves and encourage them to pursue their dreams. In addition, it holds many art events, cultivating local artists / groups and makes contribution to society and enriches people's spiritual life.

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 2018



Sponsorship by the TSMC Education and Culture Foundation in 2014~2018





What We Want to Solve

Due to the lack of learning resources, poverty, and problems in family structure, the gap in academic achievement between students in rural areas and those in urban areas continues to widen.

Projects
of the YearCaring for the
Educationally
Disadvantaged

TSMC Education and Culture Foundation



How We Respond and Act

The Foundation has long been caring for educational issues since its establishment. The Foundation aimed to motivate disadvantaged students to learn and strive for academic success, and brought in TSMC employees as reading volunteers to help them. With scholarships, the Foundation has successfully assisted outstanding but disadvantaged students in pursuing high education in top universities to shorten the gap in education resources between urban and rural areas.

13 million

With contribution over NT\$13 million, the TSMC Foundation has shortened the gap in education resources between urban and rural areas.



Hope Reading 2.0

Since 2004, the TSMC Foundation has been the first charity partner of the Hope Reading Program from the CommonWealth Education Foundation. Each year, 100 recommended best books are donated to each 200 elementary and junior high schools in remote rural areas. To date, more than 270,000 books have been donated, and more than 280,000 students have benefitted from the program.

In 2017, the Foundation joined the Hope Reading 2.0 program, pledging to sponsor NT\$6 million over 3 years to introduce a digital system to increase students' interest in reading. As of 2018, students participated in the program have read an averaged 90 books per year, compared to 19 books per year before joining the program. Currently, there are more than 1,000 Reading Book Little Lovers. Furthermore, this program also hosted "Elementary School Writing Contest", "Middle School In-Depth Report Contest", and other activities to enhance students' self-learning ability and reading skills.

The Young Authors Writing Contest for Elementary Students encourages students to make a habit out of reading and develop creative writing and public speaking skills. The contest received 214 submissions in 2018 with 30 students receiving awards. The Foundation also hosted a two-day educational trip for the award-winning students and teachers to visit the Taipei Astronomical Museum.

The Junior High School Feature Article Competition encourages junior high school students to learn how to collect information, express their own opinions after interpreting and integrating different information, and write feature articles through teamwork. In 2018 students from 12 remote rural junior high schools participated in the contest.



Projects
of the Year

Scholarships for Disadvantaged Students in Top Universities

To support disadvantaged students go to top universities, the TSMC Foundation sponsors the Sunrise Scholarship by the National Tsing Hua University and the Sunflower Scholarship by the National Central University. These scholarship programs offer students a full 4-year scholarship to ease their financial burdens and provide them with life and academic guidance.

The TSMC Foundation has contributed NT\$ **3.02** million to assist **37** disadvantaged students in their study in top universities.

I would like to thank the help from the TSMC Education and Culture Foundation. I did not need to work part-time and could instead focus on my academics and enjoy a carefree university life just like my classmates. Without your help, I would likely have not been able to complete my degree. I will always be grateful and hopefully in the future be able to help those in need and to contribute and give back to society.

Ms. Tsai

A "Sunrise Scholarship" recipient from the Chemical Engineering Department of the National Tsing Hua University

Being an Important Partner of "Teach for Taiwan" and "Junyi Academy"

To help mitigate the gap in education resources between urban and rural areas, the TSMC Foundation sponsored NT\$1.5 million in "Teach for Taiwan" and "Junyi Academy" respectively in 2018. TSMC hopes to recruit more ambitious and enthusiastic young teachers to teach full-time in remote rural areas where there are lack of teachers. With free online courses, all students can have access to personalized education wherever they are. In addition, 1,275 TSMC employees make regular donations to these two foundations through the "TSMC i-Charity" project, and NT\$9.46 million was raised in 2018. Hopefully, regular and long-term donations can provide more diverse learning opportunities to disadvantaged students in rural areas.



The TSMC Foundation has sponsored NT\$ **1.5** million for five teachers for "Teach for Taiwan" Program

3,600

students

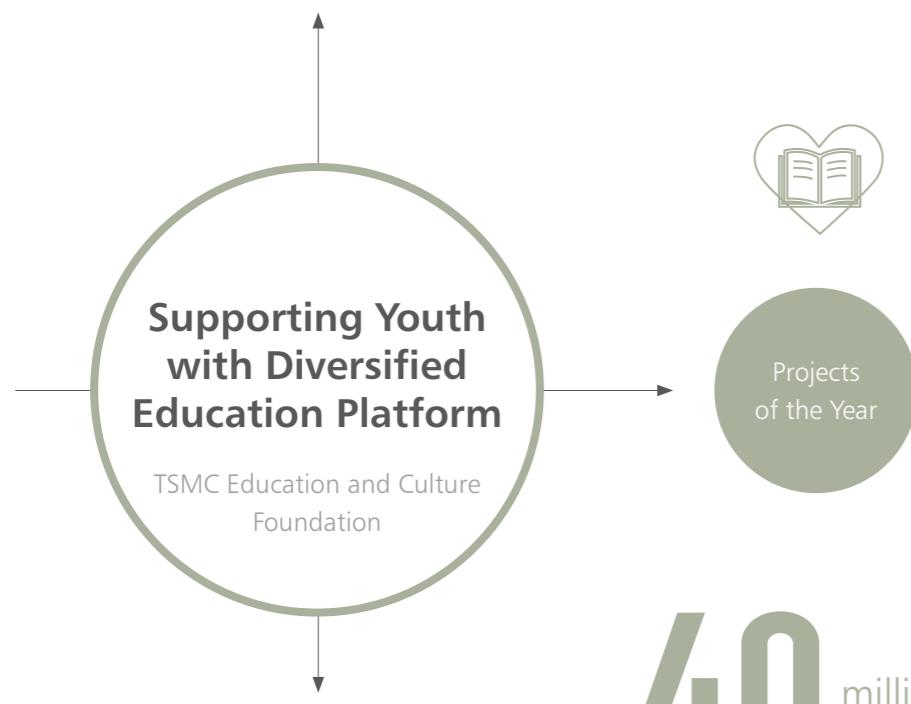
Sponsored 3,600 students from 17 counties and cities to visit science and art galleries all over Taiwan.

Science and Aesthetic Education Tours

In order to raise students' interest in science and aesthetics, the TSMC Foundation led a group of 3,600 students from 17 counties and cities to visit science and art museums all over Taiwan in 2018, including the National Taiwan Science Education Center, the National Museum of Natural Science, the National Science and Technology Museum, the Taipei Astronomical Museum, and the Kaohsiung Museum of Fine Arts.



Nurturing high school students with scientific and humanistic minds and broadening their vision.



40 million

In 2018, the TSMC Foundation contributed more than NT\$40 million in organizing various competitions, camps, and seminars in hopes of inspiring the next generation's interest in science and humanities outside the formal education system. At the university level, the TSMC Foundation provides scholarships and guidance to encourage students to find their goals in life and to pursue their dreams.

More than NT\$40 million was contributed to inspire the next generation's interest in science and humanities.

"Youth Dream Building Project"

Since 2016, the TSMC Foundation has been organizing the "Youth Dream Building Project," a platform that encourages college students' innovation and raises social awareness among the young generation. The Foundation offered NT\$3 million grants to help students pursuing their dreams.

In the third "Youth Dream Building Project" held in 2018, 67 teams of students from 13 universities and colleges from Taoyuan, Hsinchu, and Miaoli areas submitted their proposals. In the end, 7 teams were selected and granted total of NT\$3 million. The proposals from the selected teams included green textile, cultural ecotourism, community-based long-term care, care for the disadvantaged, cultural and creative industries in communities, and more.

I would like to thank the TSMC Youth Dream Building Project for giving us the right to chase our dreams and a chance to challenge our limits. A seed has been sown in our hearts that pushes us to make society a better place. We'll work hard to make our voices heard and speak out for the environment!

Jia-Jin Zou
A Youth Dream Building Project award recipient



Jia-Jin was one of the award-winning students in both the first and second Youth Dream Building Project. From the preservation of Phalaenopsis aphrodite orchid on Orchid Island (Lanyu) to seeking roots in the Philippines, she not only grew more confident, but also found her self-identity. Jia-Jin was not hesitant in sharing her own experiences and inspiring other second-generation Taiwanese youths. This is exactly what TSMC looks for in hosting the Youth Dream Building Project.

TSMC Education and Culture Foundation



Projects
of the Year

Calligraphy and Literary Competitions

In order to provide more opportunities for young people to showcase their talents and enhance humanistic education, the TSMC Foundation has organized the "TSMC Youth Literature Awards" and the "TSMC Youth Calligraphy and Seal Carving Awards" since 2004 and 2008 respectively, to encourage young students in literary and calligraphy creation.



In 2018, there were 2,078 entries towards the "TSMC Youth Literature Awards", up by 1,462 entries from 2017. As the event coincided with its 15th anniversary, 14 event award winners were invited to talk about their life experiences, on the topic of "reminiscing". Many of them had already become writers. At the same time, an online poll campaign on the "top 10 book picks by students" was also launched. The Foundation hoped to inspire the next generations interest in literature and reading by inviting all the participants of the 2018 "TSMC Youth Literature Awards" to nominate their favorite books. In addition, with respect to the "TSMC Youth Literature Awards," four campus touring lectures were held and writers were invited to share their writing experiences to inspire students' interest in literary writing and reading.



The TSMC Youth Literature Award is a platform for young people to be heard and have conversations with society through words.

De-Jun Lin

A poet and judge of the literature contest



The "TSMC Youth Calligraphy and Seal Carving Awards" is the only calligraphy and seal carving educational event for senior high school students in Taiwan. Competitions, workshops, and hands-on activities are held annually, hoping to familiarize students to the art of Chinese characters and reintroduce calligraphy and seal carving back to our daily lives. In 2018, in order to attract more people to attend this event, the age limit of participants for calligraphy imitation practice groups was loosened. As a result, the total participants were near 1,000 people.

The TSMC Youth Calligraphy and Seal-Carving Competition provides high school students a stage to display their artistic talent. Original innovation can still be found in classic artworks. We are willing to be a partner in promoting calligraphy, and calligraphy classes will become one of our important courses.

Chih-Cheng Wang

Principal of Fuhsin Arts & Trade School



"TSMC Science Fun Fair for Teens" Competition

Since 2013, TSMC has been sponsoring "TSMC Science Fun Fair for Teens: Listening, Speaking, Reading and Writing Arena" organized by the Center for the Advancement of Science Education of the National Taiwan University to enhance senior high school students' expressive skills. In the past six years, 3,870 high school students from 1,290 teams have participated in this competition.

Of the three Taiwan campus calligraphy workshops, the Foundation arranged an engaging seal carving workshop in Taichung for 27 teachers and students from Lycée François Magendie high school in Bordeaux, France to give the French exchange students an opportunity to experience Chinese culture.



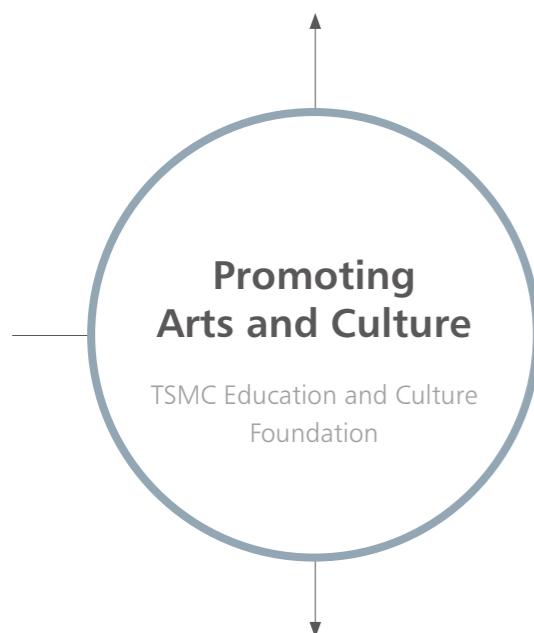
With an aim to arouse people's interest in calligraphy, the Foundation designed and launched "Calligraphy Journey", a mobile art museum event that turned Bus No.265 in Taipei into a mobile calligraphy museum. The bus would roam the streets and roads of Taipei and New Taipei City conveying the beauty of calligraphy and inviting people to dive deeper into the world of calligraphy.





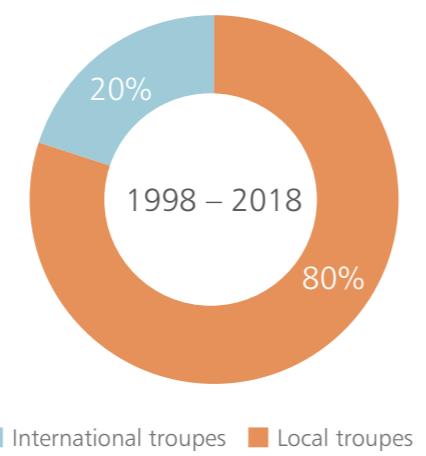
What We Want to Solve

TSMC strives for providing a stage for talented Taiwan artists / groups and hopes to vitalize the art performing environment and enrich the local communities' spiritual life.



How We Respond and Act

In 2018, the TSMC Foundation contributed more than NT\$20 million in organizing high quality theater performances, concerts, children's program, and literature exhibitions.

Investment Ratio by
TSMC Foundation
in International and
Local Art Groups

I would like to thank the TSMC Education and Culture Foundation for its efforts in the promotion of artistic and cultural events, especially the annual TSMC Hsin-Chu Art Festival that injects vitality into the arts and culture scene in Hsinchu and provides a feast of wonderful artistic and cultural performances for Hsinchu citizens.

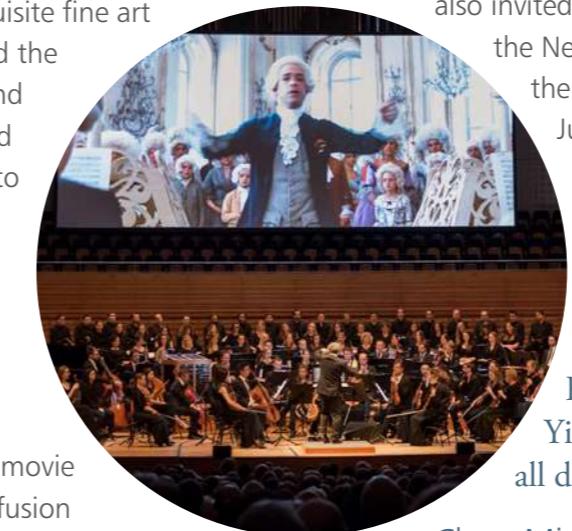
Chih-Chien Lin
Hsinchu City Mayor



TSMC Hsinchu Art Festival

The TSMC Foundation has been holding the TSMC Hsinchu Art Festivals for 16 years. Each year, the festival features a different theme, and large-scale events are staged in Hsinchu, Taichung and Tainan, to offer local community with art and culture experiences. In 2018, the TSMC Hsinchu Art Festival has hosted over 57 exquisite fine art and cultural events centered around the theme of "Behind the Scenes, Beyond Imagination". 9 local Art groups and 1 international group were invited to perform during the art festival and attracted over 13,000 participants. Performances included classical music concerts by live symphony orchestras, concerts and theaters for children, a series of lectures on behind-the-scenes moments in the movie industry, and Peking operas with infusion of Eastern and Western aesthetics, and more.

Through diversified music, opera, children events, creative work, workshops, and many more events, the art festival is undoubtedly a feast for the spirit of the local community.



20

million

Contributed Over NT\$20
million to Hold High Quality
Art and Cultural Events

Sponsoring "The Legacy of Chen Uen: Art Life and Philosophy" Exhibition at the National Palace Museum

The TSMC Foundation has long supported local art groups in Taiwan. In 2018, the Foundation sponsored the "The Legacy of Chen Uen: Art Life and Philosophy" exhibition held at the National Palace Museum. The late Taiwanese master Chen Uen



was the first comic artist whose work was exhibited at the National Palace Museum. He elevated comics into an art. The exhibition featured Chen's manuscripts and received an overwhelming response, with more than 100,000 visitors. To broaden students' vision to the aesthetics, the Foundation

also invited students in remote areas including the Pingxi Junior High School in the New Taipei City, the Jieshou Junior High School in the Taoyuan County, the Yongjing Junior High School in the Changhua County, and the Wujie Junior High School in the Yilan County to visit the exhibition. The TSMC Foundation also sponsored the performances of puppet show master Chen Xi huang and the avant-garde dancer Huang Yi.

I have to thank the TSMC Education and Culture Foundation for supporting and encouraging the children in Yilan. I have repeatedly stressed that all kids have potential. It all depends on what adults are willing to give them.

Chun-Ming Huang
A regional literature author and director of "Little Hunchback presented by Big Fish Huang Children's Theater

99



TSMC Charity Foundation





Building a Better Society for Greater Influence

Since its establishment in 2017, the TSMC Charity Foundation has been putting its efforts in its four focuses, including caring for elder people living alone, promoting filial piety, caring for the disadvantaged, protecting the environment, as well as providing emergency aid in Taiwan. It showcases the pursuit of the Company's goals of building a better society in response to UN Sustainable Development Goals, and bringing warmth to the hearts of our citizens.

In 2018, the TSMC Charity Foundation further expanded its four focuses by launching several new projects. In addition, the Foundation provided first response emergency aid to victims of the Hualien earthquake. The Foundation hopes to further exercise its influence and help build a better society.

Take Care of Elder People Living Alone

Provide care services through the Networking of Love Intelligent Health Systems [NEW](#)
Donation of Ultrasonic Machines to the Penghu Health Center [NEW](#)

Promote Filial Piety

Collaborate with the Ministry of Education to develop teaching materials and provide teacher training. Promote filial piety with media, other enterprises in the science parks, and volunteers
Filial Piety Culture Program with the MoE [NEW](#)
Filial Piety Volunteers [NEW](#)
Promotional Events for Filial Piety [NEW](#)

Care for the Disadvantaged

Provide emergency aids, care for disadvantaged groups' welfare and education, and implement and promote volunteer services
Hualien Earthquake Relief Project [NEW](#)
Ten Thousand Dollars per Household Program and Emergency Aid for Disadvantaged Program [NEW](#)

Focuses of TSMC Charity Foundation

Protect the Environment

Expand service scale of ecology and energy-saving volunteers. Launch Cherish Food Program
Cherish Food Program [NEW](#)

10,266 Volunteers

27,590 Person-time volunteers

109,059 Volunteer service hours

37,400+ Beneficiaries

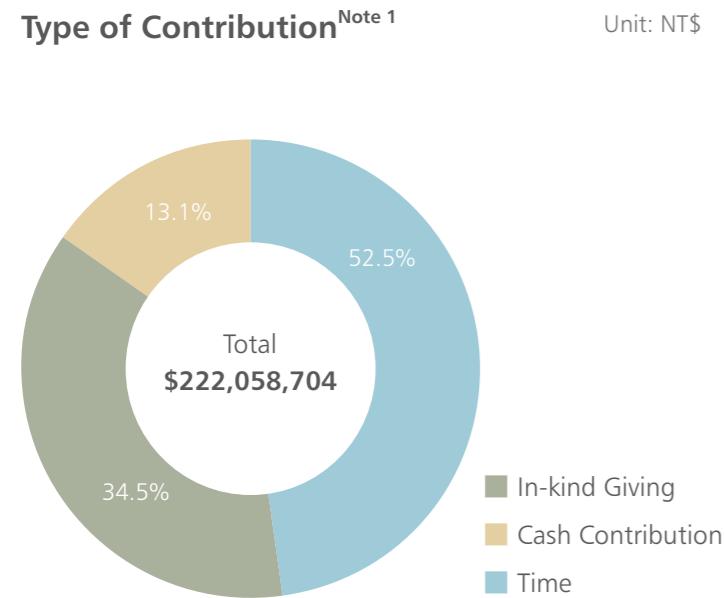
103 Million

22,000+ Donations

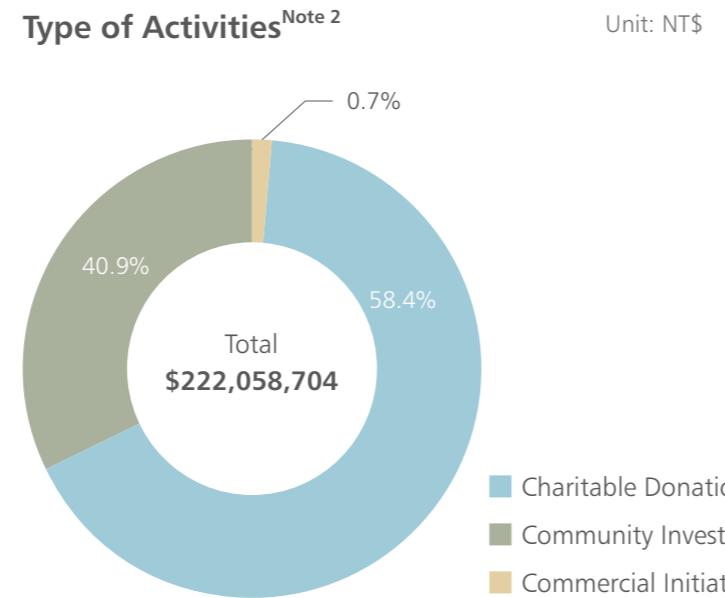


TSMC Charity Foundation Contribution

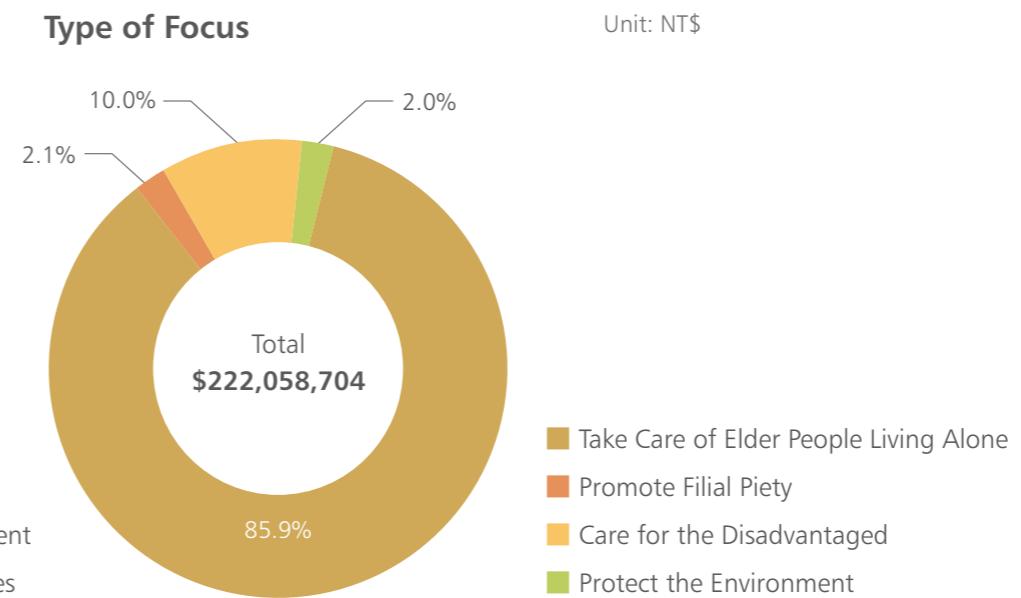
Type of Contribution^{Note 1}



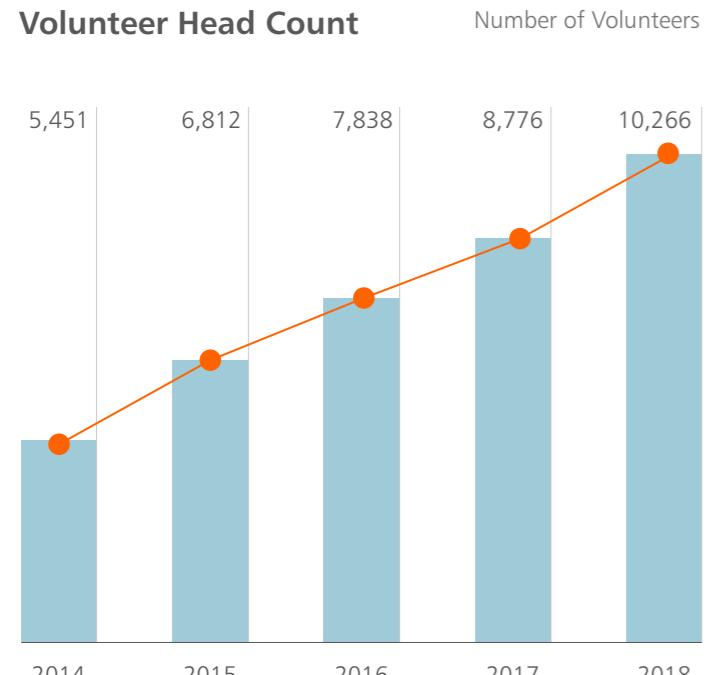
Type of Activities^{Note 2}



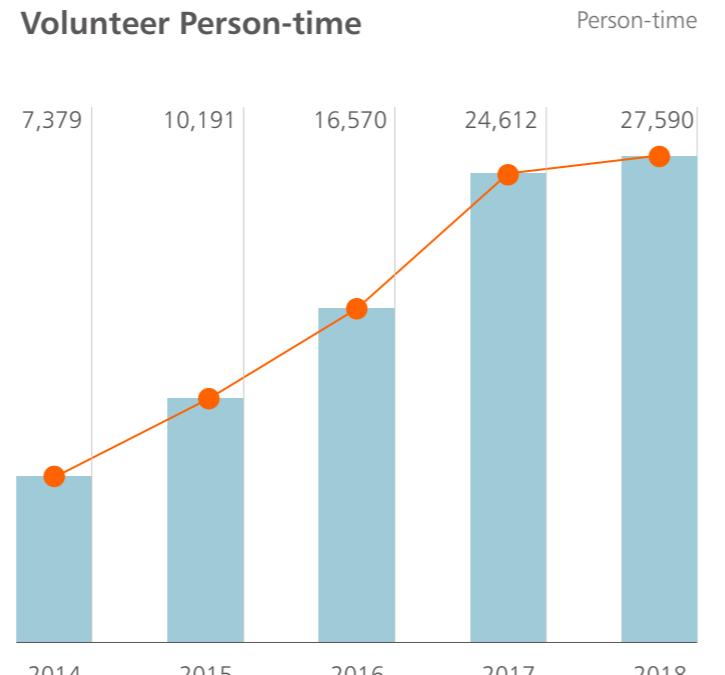
Type of Focus



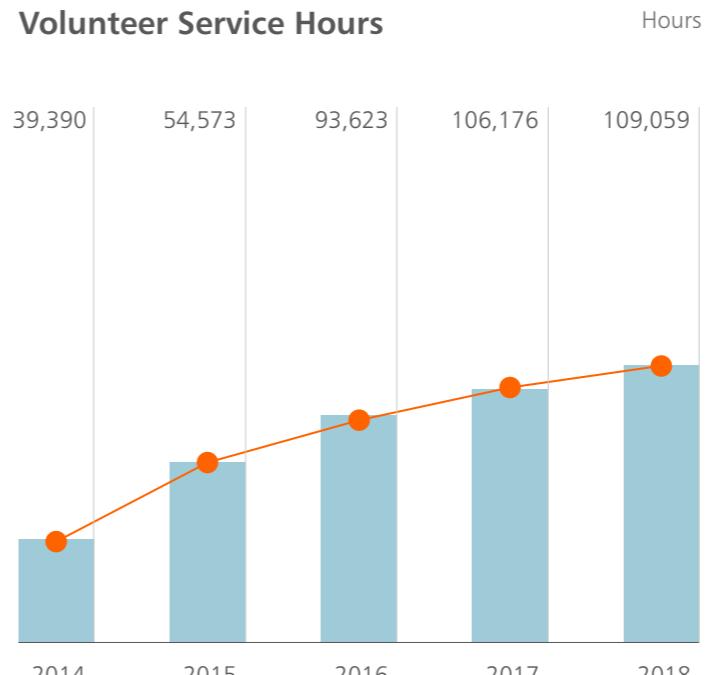
Volunteer Head Count



Volunteer Person-time



Volunteer Service Hours



Note 1 Classify all activities into cash contribution, time, and in-kind giving according to DJSI's definition, and calculate the ratio of each category's investment by monetary value.
Time: volunteer service hours* average hourly wage.
In-kind giving: the dollar amount of the Company offering of such supplies 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

Case
Study

Hualien Earthquake Relief

On Feb. 6th of 2018, a 6.4-magnitude earthquake struck Hualien of Taiwan. Ms. Sophie Chang, Chairperson of TSMC's Charity Foundation, rushed to the disaster area right after the earthquake to express condolence to the victims and coordinate disaster relief resources. At the same time, the Foundation launched a three-stage relief plan to help victims return to normal life as soon as possible.

The relief plan was a joint effort of love and dedication of TSMC's employees, TSMC, individuals and enterprises in the society, and other stakeholders. The TSMC Charity Foundation will continue its resolution to discover requirements for emergency aids and provide assistance in a timely manner.

Three-Stage
Relief Plan

First stage

Emergency Aids and Fundraising Initiative

Assisted in dispatching water trucks and manpower to help disaster relief

Initiated fundraising projects both inside and outside the Company. Over 7,700 donations were collected, raising more than NT\$58 million



Second stage

Renovations and Courage Camp

An engineering team from TSMC's **Facility Division** arrived in Hualien on Feb. 22th, 2018 and helped rebuild home for 439 quake-stricken households

Held "Love, Hope, and Rebuild" Courage Camp. The camp invited 104 children to the Little Ding-Dong Science Theme Park for a series of fun activities, hoping to help children overcome post-quake fear and trauma, and in the end regain laugh, courage, and confidence



Third stage

Boost Tourism Industry in Hualien

Collaborated with the Taiwan Railways Administration to promote tour trains to Hualien. More than 7,500 employees and their family members joined the activity

Called for group purchases within TSMC. Employees of several Fabs and Divisions participated, purchasing over NT\$3.08 million worth of products from shops in Hualien

99

Thank you for everything you have done for us here. Even though we are not blood related, you still give us a hand. We were stranded and adrift in the water until suddenly someone gave us a helping hand. Thank you for all your efforts. Thank you, TSMC!

Hualien Earthquake Victim



11

institutions

Established partnership with 11 medical care and long-term care institutions

9,000

Provided around 9,000 instances of service to elderly citizens living alone

What We Want to Solve

The statistics of MOI showed that the elderly population accounted for more than 14% of the total population in Taiwan in 2018. Taiwan has officially become an aged society. The ratio is expected to be higher than 20% in 2026.

Take Care of Elder People Living Alone

TSMC Charity Foundation



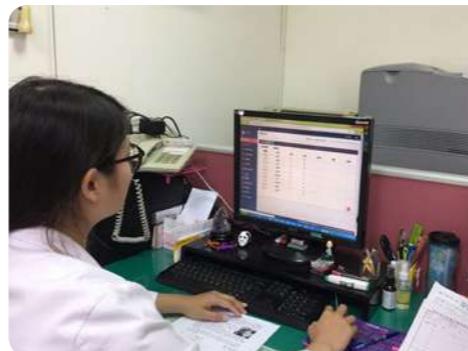
Projects
of the Year

How We Respond and Act

The TSMC Charity Foundation has been collaborating with medical care institutions around Taiwan through the Networking of Love System, providing resources and a platform for communication to allow a more encompassing and better service quality for elder people living alone. As of 2018, TSMC has had 11 partners in the Networking of Love System. In addition, the TSMC Charity Foundation has been sharing results of the care efforts to its employees and providing resources and channels to them, building better mutual trust and a sense of belonging.



Intelligent Health System



Hospital to install intelligent health systems which partly require the integration of TSMC customer products in 2018. The systems connected elder people, doctors, and social workers together, helping medical personnel to understand medical and healthcare needs from elder people, and improve the service efficiency to let elder people receive healthcare and rest at home.

Combining technology with social participation, the TSMC Charity Foundation assisted Miaoli Hospital and Feng Yuan



critical shortage of medical equipment. As for Baisha Township, most people lived in offshore islands and needed adequate instruments for instant diagnoses. After visiting these three places, the TSMC Charity Foundation decided to donate ultrasonic machines to improve the healthcare quality for offshore island residents.

Donation of Ultrasonic Machines

Qimei and Wang'an are among the least populated townships in the Penghu County. Ultrasonic testing instruments in the public health centers were damaged, and these rural areas were in



Donation of Rehabilitation Center

The care center in Mudan of the Pingtung County was destroyed by typhoon in 2016. The TSMC Charity Foundation donated and built a rehabilitation center that officially opened in 2018. Electric stair chairs were installed in the rehabilitation center to help elder people get upstairs and downstairs. In accordance with green energy policies of the government, a solar power system was built on the roof to combine elements of environmental protection and energy conservation into the construction and give back to elder people in a sustainable way. By the end of 2018, more than 500 people visited the rehabilitation center.

Projects
of the Year

Remote Area Medical Services

In 2017, Dr. Yang-wei Kao received the Medical Contribution Award from the Health, Welfare and Environment Foundation of the Legislative Yuan. His clinic became the only private organization approved by MOHW to lead healthcare projects in mountain areas. Seeing how his mobile hospital van was growing too old, the TSMC Charity Foundation launched a donation project for a mobile hospital van in remote areas at the end of 2017, and it started in 2018. Dr. Kao has given medical services in remote mountain areas for more than 3,200 times, home care services more than 1,700 times, fundus examinations more than 500 times, and long-term care services more than 60 times by the end of 2018.

3,200

medical services



Year-end Reunion Dinner with Elder People Living Alone

Colleagues from **Fab 12A** have had year-end reunion dinners with elderly people living alone from the Huashan Social Welfare Foundation for six consecutive years. Throughout the years, over 400 elderly people and volunteers gathered together at the end of the year. Colleagues from **Fab 3, Fab 12B, Fab 15B, Manufacturing Technology Center**, and other departments bought new year dishes to elderly care organizations such as Catholic Society of Jesus Hsinchu Social Service Center, and Old Five Old Foundation, and accompanied these elderly people to celebrate the new year.



Donation of Charity Food Delivery Trucks

Colleagues in **Fab 15A** raised NT\$650,000 to donate trucks to the Buddhist Tzushin Welfare Foundation, which gives meals to disadvantaged and elderly people for a long time. This makes volunteers feel safe when delivering food and 50 elderly people were invited to celebrate the Lunar New Year holiday.

I have never known before that there is a group of people quietly traveling to every remote area and delivering meals to elderly people every day. It is such a hard work to endure all kinds of difficulties every day. I am really touched and thankful for their efforts.

Volunteers from **Fab 15A**

We have always used our funds as efficient as possible, but buying a car is still a nearly unattainable goal. Our volunteer workers are now safer and enjoy better convenience thanks to the donation of this car by TSMC.

Buddhist Tzushin Welfare Foundation



Festival Celebration with Elder People Living Alone

More than 100 volunteers from **Fab 8** accompanied 400 elderly people from Tao-Yuan Jen-I Senior Citizens' Home Miaoli Senior Care Centers and celebrated Dragon Boat Festival, Moon Festival and Christmas together. Our staff not only enjoyed hands-on activities with the elderly but also prepared presents for them.



What We Want to Solve

Many social issues may arise after Taiwan becomes an aged society. TSMC believes that the active measure which can prevent risks from sources is to return the responsibility of caring elderly parents to children. Statistics of MOHW show that the proportion of elder people living alone keeps increasing and there is still huge room for the promotion of filial piety.



Promote Filial Piety

TSMC Charity Foundation

Projects
of the Year

How We Respond and Act

In order to prevent any potential social impacts caused by the aged society from sources, the TSMC Charity Foundation believes that the comprehensive promotion of filial piety can awaken the filial piety consciousness of young generations, improve the mutual understanding and affection between parents and children, and make parents receive more mental support and company from family members.



The Filial Piety Culture Promotion Program with the Ministry of Education

In 2018, the TSMC Charity Foundation continuously collaborated with governments and schools in many places to distribute the teaching materials of filial piety developed together with the K-12 Education Administration to 2,660 elementary schools in Taiwan. In addition, the Ministry of Education has approved the Filial Piety Culture Program, which will promote filial piety education in high schools and below. The program includes a consolidated filial piety resource network, training plans for teachers and volunteers, enhanced curriculum, and a variety of activities to promote filial piety. With supporting policies such as activity design and marketing, the program aims to promote filial piety and awareness of family in the next generation.



Filial Piety Volunteers

The TSMC Charity Foundation convened five enterprises in the Hsinchu Science Park to join the training program of the first group of filial piety volunteers. Currently, there are approximately 100 volunteers, who conduct a variety of activities such as story reading, to spread the spirit of filial piety across Taiwan.

Filial Piety Promotion Activities

To spread the spirit of filial piety and revive this tradition, the TSMC Charity Foundation has collaborated with its fabs and divisions, government agencies, local organizations, media, and companies to launch a series of activities. The efforts include filial piety lectures and workshops, with the objective of teacher training and raising awareness of filial piety promotion and encouraging employees, teachers, parents, and children to become role models in showing love and concerns for elder people.

Collaborated with governments, local organizations, enterprises and media to hold more than **10 promotional campaigns of filial piety**

Filial Piety Promotion Activities

Central Government

Filial Piety Culture Program by the Ministry of Education

Local Organizations

Filial Piety Materials Sharing in Tainan City
Approximately 100 parents and children participated

Media

Literary Awards for Filial Piety
Approximately 700 filial piety quotations submitted

Internal Cooperation

Ecology Tour and Filial Piety Activity
Approximately 100 parents and children participated

External Cooperation

Filial Piety Teacher Training Program
Approximately 150 filial piety teachers completed the training program

Representative of the Filial Piety Awards by the Ministry of the Interior

Farm Village Filial Piety and Eco Tour
Approximately 60 students participatedFilial Piety Volunteer Training Program
5 companies in the Science Park participated. Over 100 volunteers completed the trainingASE Filial Piety Workshop for Family
Approximately 80 parents and children participatedYulon Motor Corporate Lecture on Filial Piety
Approximately 135 managers and employees participated

Projects
of the Year

The program has trained
149 teachers in **98**
of its branches and has
inspired approximately
3,000 students

Filial Piety Teachers

Intelligent Manufacturing Center has collaborated with the After School Association of Taiwan to provide four teacher training programs in 2018 to cultivate filial piety teachers and guide them in seeking family values. The program has trained 149 teachers in 98 of its branches and has inspired approximately 3,000 students to appreciate in heart the value of filial piety.

Searching for family values and traditions passed down through loving memories of family members really inspired me a lot. I realized that we teachers could also serve as a model of filial piety. We are willing to take up these filial values and incorporate them into tutoring lesson plans, and combine filial and familial values into school tutoring. We will be by the children's side throughout their childhood.

Teachers Trained to Teach Filial Piety

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Filial Piety Story Reading

Fab 15B has been putting unceasing efforts in promoting filial piety. In 2018, the fab organized five story reading events on filial piety in the Daming Elementary School, Beishih Elementary School and Hualien Holiday School, with approximately 70 person-time volunteers reading filial piety stories to over 1,200 person-time children, helping them better understand that elder people also need love, care, and inclusiveness.

approximately **70** person-time
volunteers reading filial piety stories
to over **1,200** person-time
children



1,300+

employees were engaged in filial piety lectures

Filial Piety Lectures

Fab 12B invited experts and volunteers to its quarterly meetings to promote filial piety among 400 of the fab's employees through engaging activities.

Meanwhile, **Fab 3** invited inspectors from the Bureau of Education and the Principal of Fenglin Junior High School to give talks on Life with Filial Piety. The lectures attracted more than 900 person-time, who were involved in activities such as sharing of feelings, painting, and watching videos, appreciating the importance of filial piety and how urgent it is to express love to your loved ones before it is too late.



It is my first time expressing my feelings to my parents in front of the crowd. It is quite embarrassing to cry on the stage, but it is nice to be able to convey my gratitude to my parents for the first time in my life.

Employee of Fab 3

99

Winter Fun Farm Village Ecology Tour

Fab 14A collaborated with the Tainan City Government and the Tainan Cultural and Creative Park to organize the Winter Fun Farm Village Ecology Tour, based on the core concept of starting environmental protection and filial piety education from TSMC. The eco tour of 60 children was led by experienced and lively team leaders and provided a variety of activities to help children learn more about environmental protection and respect for elder people, such as hands-on farm village activities, reading activity of Di Zi Gui, adventure activities with local elder people, and drama performances.





What We Want to Solve

According to data from the Ministry of Finance, the average income gap of every household has nearly doubled, showing the gap between urban and rural living quality and learning resources. The lack of educational resources will bring more negative effects to the society, which is an issue that needs urgent attention.



How We Respond and Act

TSMC actively pays attention to the local needs, establishing connections and mutual relationships with the communities, and encouraging volunteer activities to improve the balance between employees' life and work. The TSMC Charity Foundation takes the initiative to contact vulnerable groups in various places, and cooperates with the organizations for a long time to help them improve their living conditions and educational quality by investing funds, materials and volunteer services.

8,400 hours

Book reading volunteer provided book reading, English reading and math teaching services for children



Book Reading Volunteers

To provide children in rural areas with more comprehensive educational resources and companionship, TSMC's book reading volunteers regularly visit primary schools in remote areas of Hsinchu, Taichung and Tainan to tell stories, teach

English and math to children. In 2018, there were about 1,300 person-time book reading volunteers, providing over 8,400 hours of volunteer service. In 2018, nearly 500 person-time students in the Hexing Elementary School received 1,224 hours of math instruction. In addition, over 400 students in the Yuandong Elementary School received English reading service, allowing the children to be more willing to speak English, and to foster their interest in English reading.



Community Volunteers

Community volunteers regularly visit the Veteran's Home and Children's Home to accompany the elderly and children, connecting them with events and activities. In 2018, there were about 900 person-time community volunteers, providing over 6,300 hours of volunteer service. In 2018, the **Quality and Reliability** volunteers organized four hand-making activities for children in Hsinchu Renai children's home, with about 100 participants in total. With the original intention of assisting skill exploration and establishing vocational hope, we hope to inspire children's confidence and interest in vocational development through the creating process.

900 person-time
community volunteers,
providing over **6,300**
hours of volunteer
service

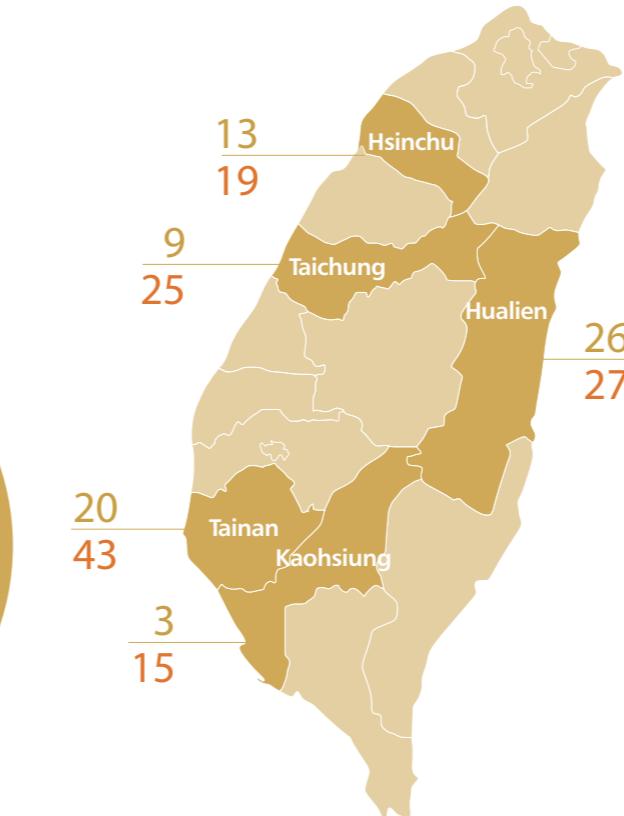
Projects
of the Year

Ten Thousand Dollars Per Household Program and Emergency Aid for Disadvantaged Program

In the process of assisting Hualian disaster relief in 2018, TSMC Charity Foundation Chairperson Sophie Chang saw the real economic difficulties of many disadvantaged families. Therefore, the TSMC Charity Foundation launched the Sending Love Program. Through the Ten Thousand Dollars Per Household Program and Emergency Aid for Disadvantaged Program, TSMC acted as a media to find the disadvantaged who are in urgent need of financial and living assistance. The benevolent individuals inside and outside TSMC would be called on to pledge and make regular donations every month to help vulnerable cases improve their living conditions. By the end of 2018, the TSMC Charity Foundation had visited more than 120 families in Taiwan and registered 71 cases, all of which had received pledges and donations.



Welcome to the website of
Sending Love Program.
Join us in making change
<http://www.520.org.tw>



2,300+

assisted victims of floods
in southern Taiwan
repairing their homes

Heavy Rain Reconstruction Project

In August 2018, cities and counties in southern Taiwan, including Kaohsiung, Tainan, and Chiayi, suffered from heavy rainfall. Several houses were damaged by torrential rain. The



Facility Division soon invested more than NT\$2.8 million and spent more than 170 hours assisting 11 elementary schools and 3 senior citizen centers in 9 districts in the Tainan City. The assistance included fixing kitchen stoves and appliances, installing floodgates, repairing water

leakage, making waterproof improvements, and elevating bookshelves and library floors to make sure that children and senior citizens had a safe and comfortable environment. Overall, more than 2,300 people benefited from the assistance provided.

99

It is with a thankful and grateful heart that we thank TSMC for the help their volunteers and repair teams gave to restore our campus as quickly as they did.

Victims of Floods in Southern Taiwan in August 2018



Caring for Local Farmers

Volunteers from the **Human Resources** organization helped Mr. Huang pick



tangerines at his tangerine farm and placed orders for tangerines within the Company. Mr. Huang's tangerines were even used by

TSMC cafeterias. This project allowed farmers to maintain a stable income and taught colleagues to be grateful for farmers' hard work and the passion of volunteers.



"Jianshi-Grace from Above Between Spring and Summer" 1-Day Store Manager

Fab 2 and **Fab 5** organized a "Jianshi-Grace from Above Between Spring and Summer" event and invited children to be 1-day store managers. These children in rural areas from Yu Feng and Shih Lei elementary schools introduced their hometown and sold fruits and products from their tribes in the expo on Engineer's Day.



St. Camillus Center for Intellectual Disability

St. Camillus Center for Intellectual Disability is the first institution for individuals with intellectual disabilities in Yilan. The center was founded by Italian Father Lu Jo-Se and it accommodates more than 130

children. Colleagues from the **Product Development** organization raised a total of about NT\$1 million to help the center purchase patient lifts and bathing beds to provide better care for these children.



Grocery Store Run by Children with Developmental Delays

The **Manufacturing Technology Center** helped start a grocery store for the Holy Family for Special Education from 2015. The grocery store was run by children with developmental delays, combining living, learning, and working together. Recently, the store's revenue has decreased, adding pressure on operations. Therefore, the Manufacturing Technology Center and the TSMC Charity Foundation called on departments and units in TSMC to purchase goods from the grocery store. Eventually, its revenue became stable and these children were able to continue learning.

GreenLight Seed Classrooms

The **Corporate Planning Organization** had accompanied students in the GreenLight Seed Classrooms for a long time. The organization helped paint the classrooms, performed equipment maintenance, and purchased air purifiers to improve students' learning environment. In addition, the organization purchased 10 ukuleles, giving about 150 students an opportunity to learn other talents.

We did not have a clean classroom before nor such a good electric fan because we did not have the money. Now the walls look so bright, and there are circulating fans installed on the walls. It looks like we have a brand-new classroom. Thank you for cleaning the classroom for us and letting us study in such a good environment. Thank you for all the love that you have given us.

Students in GreenLight Seed Classrooms



Science Camp with National Tsing Hua University for Mei Hua Elementary School

In 2018, the **Operations Technical Board** collaborated with the National Tsing Hua University to organize 2 science camps for the Mei Hua elementary school in the Hsinchu County. Around 335 person-time students participated in the camps. The school even included science classes and outdoor science camps as featured classes in its curriculum.



Although the commute takes two hours, it is all worth it to be able to see children learning science and having fun.

Operations Technical Board Volunteers

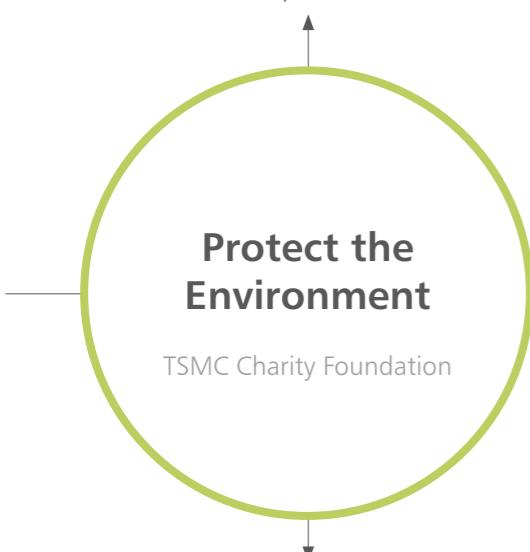
Taiko Drum Team

The **Advanced Packaging Technology and Service** organization raised a total of NT\$220,000 to buy new Taiko drums for Hsincheng and Jiangong elementary schools. Around 120 person-time students were benefitted, giving them an opportunity for self-fulfillment.



What We Want to Solve

Climate change has been garnering global attention, and it is crucial that we raise the general public's awareness of environmental protection.



How We Respond and Act

The TSMC Charity Foundation recruits energy-saving and ecology volunteers to assist the community with the Company energy-saving technology in operations and experiences in ecological conservation. By doing so, the community can practice environmental protection and sustainability. At the same time, with constant promotion of environmental protection knowledge, the general public will be more aware of ecological conservation. Moreover, TSMC launched the Cherish Food Program by working with food companies. The program aims to provide underprivileged children with edible food in rejected imperfect packaging to reduce food waste, and combat hunger.



1,400 hours

Energy-saving volunteers provided around 1,400 hours of energy-saving consulting services



Energy-saving Volunteers

The energy-saving volunteer team consists of TSMC technical engineers. They brought state-of-the-art equipment to schools of all levels and help them helped assess and improve the efficiency of energy use. In 2018, around 175 person-time energy-saving volunteers provided around 1,400 hours of energy-saving consulting services. In 2018, energy-saving volunteers from **Fab 6** provided 4 instances of consulting services in Tainan. The engineers made technical assessments for the schools' reference. Energy-saving volunteers even made teaching materials and educated students on environmental protection.

2,000 hours

Ecology volunteers provided more than 2,000 hours of tour services

Ecology Volunteers

When building fabs, TSMC follows green engineering and builds an ecologically diversified working environment for employees. Meanwhile, Fab 12B, Fab 15, and Tainan Jacana Sanctuary provided tour services and promoted green living to students from remote areas. In 2018, about 480 person-time volunteers provided more than 2,000 hours of tour services. **Fab 12B** also provided several ecology tours for children. The children got the chance to wear clean room suits and participate in DIY activities. Volunteers also taught them to be more responsible to the environment by teaching the children how to recycle rainwater and incorporate ball floats in water-saving methods.



Projects
of the Year

Cherish Food Program

According to the United Nations Food and Agriculture Organization, food production consumes about 30% of global energy. However, about one third of global food, as well as 38% of energy, are wasted. The inefficient use of food resources also increases the emission of greenhouse gases. In 2018, the TSMC Charity Foundation launched the Cherish Food Program in response to the goal of the UN Food and Agriculture Organization. TSMC donated 4 freezers to facilities that help underprivileged people. Our partner CHIMEI regularly delivered over 186 boxes of edible food in rejected imperfect packaging to the underprivileged. In the future, TSMC will follow suits in the operations of the "Food Bank", invite more business partners to join the program, and make more strides in extending influence.



TSMC Charity Foundation
Launched the Cherish Food Program

CHIMEI's Factories
Provided fresh edible food in rejected imperfect packaging

TSMC
provided freezers to 4 institutions

12 long-term partner elementary schools (all across Taiwan)

St. Joseph Church (Wufeng, Taichung)

Chiayi Shuishang After-school Academy (Chiayi)

Tainan Madou After-school Academy (Tainan)

Hualien East Coast Holiday School (Hualien)

Shandao Academy (Pingtung)

Earth Day

Fab 14 and the Advanced Packaging Technology and Service organization attended the beach cleanup activity hosted by the Environmental Protection Administration, Executive Yuan. More than 150 person-time people joined the cleanup. Colleagues from Longtan Fab even took children from orphanages to the beach cleanup activity near Zhuwei fishing harbor. By doing so, the children can understand the threats marine debris pose and become aware of the importance of environmental protection.



Tour Volunteers

TSMC believes that sharing technology knowledge with people is one of the most important ways to make contribution to the society. In 2018, TSMC provided tour services of "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 2018, about 560 person-time volunteers have provided over 2,000 hours of tour services.





Appendix

About This Report [185](#)

Participation in Industry Associations and
Non-Profit Organizations [187](#)

CSR Performance Summary [188](#)

GRI Standards Comparison Table [190](#)

Independent Third Party Assurance Statement [203](#)

Contact Information [204](#)



About This Report

TSMC continues down the road to greater sustainability along with its employees, shareholders and investors, customers, suppliers, society, and all other stakeholders. For TSMC, the CSR Report is an important tool for aligning with international standards, and managing internal sustainability performance. Since the publication of an Environment, Health and Safety (EHS) Report in 2000, TSMC has issued non-financial reports for 20 consecutive years. Starting from 2007, the Company followed the standards set by the Global Reporting Initiative, issuing its Corporate Social Responsibility (CSR) Report every year in response to topics of interest to stakeholders, and transparently revealing its sustainability plans, performance process, and achievement status, encouraging the Company to be a driving force of positive social change.

Reporting Period

The reporting period is between January 1 and December 31, 2018. This report is published in June, 2019 in both English and Chinese, and is available on [TSMC's CSR website](#). It mainly covers the topics identified with materiality, and TSMC's practices in economic, environmental, and social dimensions as well.

Reporting Scope

This report has included TSMC's facilities in Taiwan (corporate headquarters, wafer fabs, testing and assembly plants), WaferTech, TSMC China Company Limited, TSMC Nanjing Company Limited, VisEra, and other subsidiaries. Compared to last year, a new Fab15B expanded the facilities in Taiwan, and TSMC Nanjing Company Limited also joined manufacturing. If the scope of reporting is different from above statements, a note will be added to explain any difference in that paragraph.



Responsible Unit
Corporate Social Responsibility Committee

CSR Website :
<http://www.tsmc.com.tw/csr/en/index.html>

E-mail :
csr@tsmc.com

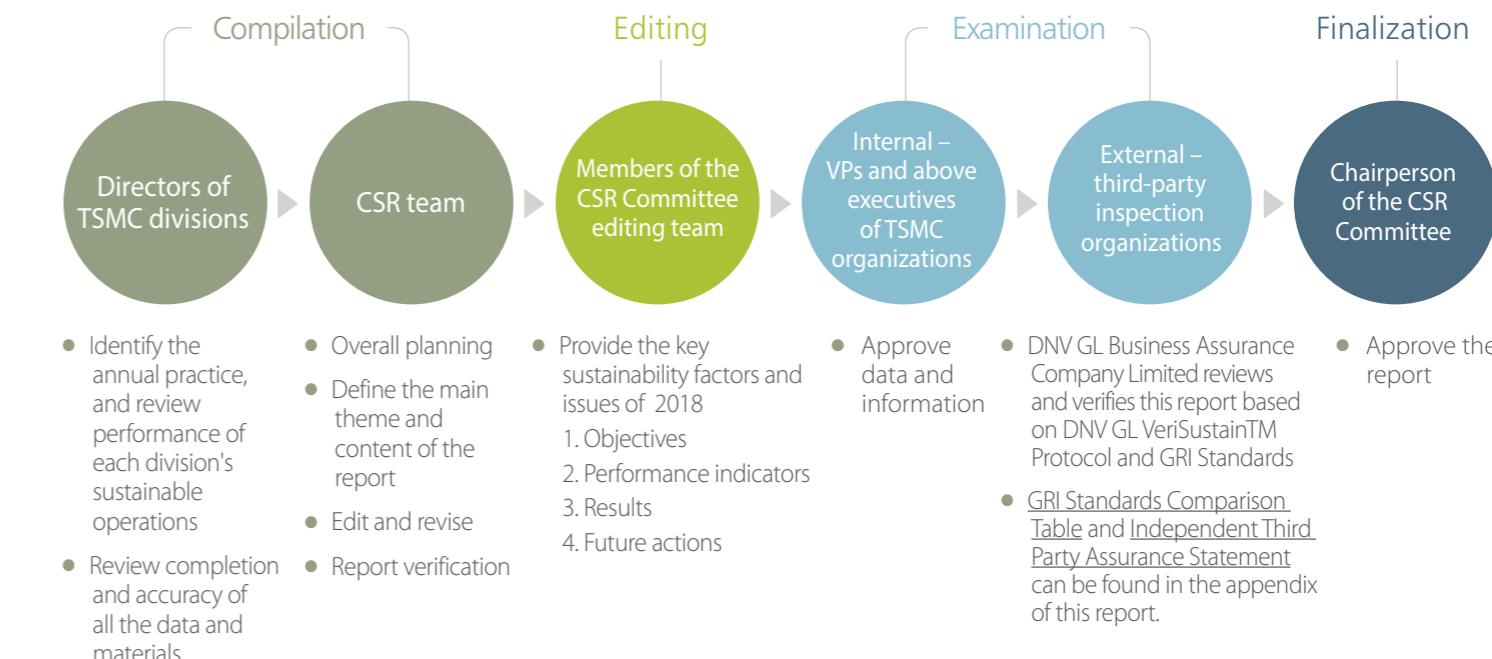
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Hsinchu 30078

Reporting Guidelines and Principles

Sustainability	Financial	Environmental
Standard <ul style="list-style-type: none"> ✓ GRI Standards: Comprehensive Option ✓ AA 1000 Accountability Principle Certification Organization DNV GL Business Assurance	Standard <ul style="list-style-type: none"> ✓ IFRSs approved and issued by the Financial Supervisory Commission (FSC) ✓ Regulations Governing the Preparation of Financial Reports by Securities Issuers Certification Organization Deloitte & Touche	Standard <ul style="list-style-type: none"> ✓ ISO 14001 Environmental Management System ✓ ISO 14064 Greenhouse Gas Inventory Certification Organization DNV GL Business Assurance

Report Writing and Quality Management Process



Note 1 DNV GL VeriSustainTM Protocol is consistent with AA 1000 Accountability Principles (AA1000AP) and ISAE 3000.

Note 2 Please visit [TSMC's CSR website](#) for [United Nation Global Compact Comparison Table](#) and other related certification and verification documents.



Data Collection Boundaries for Sustainable Development Issues

● Collected complete data

○ Collected partial data

— The issue lacks materiality to the institution and is not included in the boundary of data collection as a result

Issue	Boundary	Taiwan Facilities ^{Note 1}	WaferTech	TSMC China Company Limited	TSMC Nanjing Company Limited	VisEra	Other Subsidiaries ^{Note 2}
Ethics and Regulatory Compliance		●	●	●	●	●	●
Innovation Management		●	—	○	●	—	○
Sustainable Products		●	○	○	○	○	—
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



Participation in Industry Associations and Non-Profit Organizations

Note 1

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^{Note 2}. In 2018, TSMC participated in about 30 industry associations and non-profit organizations, with expenditures of over NT\$21.7 million^{Note 3}. Total expenditures in the past five years (2013~2017) were about NT\$114 million^{Note 4}.



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

TSMC CEO C.C. Wei has served as Chairman of The TSIA since 2017, and Senior Vice President J.K. Lin currently serves as standing Board member 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 has served as the President of the TTSP, and was a driving force in the founding of the association.



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 31 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)

TSMC's Senior Director of the Corporate Communications Division, Elizabeth Sun currently serves as a member of the ACGA Council



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 and Chief Financial Officer Lora Ho currently serves as member of the Taiwan Center for Corporate Sustainability board of directors.



Human Rights and Supply Chain Management

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

Note 1 Non-profit organizations in the areas of charity and education are not included here. For details of TSMCs participation in the TSMC Charity Foundation and TSMC Education and Culture Foundation, please see pages 162 to 183 of this report.

Note 2 By law, TSMC is not permitted to make political donations as the Company is majority-owned by foreign shareholders. TSMC has always followed this legal requirement and maintained political neutrality, but encourages employees to fulfill their civic duty.

Note 3 The five largest membership fees paid or donations made by TSMC, in descending order, are:

1) Semiconductor Industry Association/NT\$5,918,800

The United States is one of TSMCs 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.

2) Taiwan Semiconductor Industry Association/NT\$5,685,593

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.

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\$1,393,380

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) Asia Business Council/NT\$908,540

TSMC participates in Asia Business Council to have dialogue and understanding among Asian business leaders, and be part of a collective voice to issues regarding corporation, government,

multilateral organization, and social development. Asia Business Council holds two member-only forums in the spring and autumn of each year.

Note 4 TSMC's expenditures of membership and donation for industry associations and non-profit organizations between 2013 and 2017 were NT\$15,467,288, NT\$18,225,979, NT\$22,807,227, NT\$36,296,334, and NT\$21,176,571, respectively.



Note 1

CSR Performance Summary

Key Indicators		2014	2015	2016	2017	2018
Economic	Revenue (NT\$ billion)	763	843	948	977	1,031
	Net Income (NT\$ billion)	264	307	334	343	351
	Income Tax Expense (NT\$ billion)	38	44	52	53	46
	R&D Expenditures (NT\$ billion)	57	66	71	81	86
	Capital Expenditures (NT\$ billion)	289	258	328	331	316
Environmental	Greenhouse Gas Emission (Metric Ton - CO ₂ equivalent) (Scope 1 and Scope 2)	6,356,130	6,670,291	7,413,953	8,156,140	8,475,367
	Scope 1 (Metric Ton - CO ₂ equivalent))	2,113,858	2,027,645	2,035,510	2,075,928	2,125,725
	Taiwan Facilities	1,655,498	1,566,662	1,648,268	1,640,532	1,705,746
	Subsidiaries ^{Note 2}	458,360	460,983	387,242	435,396	419,979
	Scope 2 (Metric Ton - CO ₂ equivalent)	4,242,272	4,642,646	5,378,443	6,080,212	6,349,642
	Taiwan Facilities	3,939,172	4,315,766	5,030,647	5,702,511	6,325,931
	Subsidiaries ^{Note 2}	303,100	326,880	347,796	377,701	23,711
	Scope 3 (Metric Ton - CO ₂ equivalent))	–	3,446,447	3,767,411	4,242,521	4,315,603
	Fluorinated Greenhouse Gas Emission (Metric Ton - CO ₂ equivalent)	1,394,492	1,331,467	1,259,527	1,194,136	1,185,433
	NOx Emissions (Metric Tons)	59.65	54.42	60.54	82.5	118.92
Operational	SOx Emissions (Metric Tons)	43.22	32.55	33.08	43.87	39.71
	Energy Consumption (GWh)(Including electricity, nature gas and diesel)	7,968	8,915	9,848	12,016	13,167
	Direct Energy Consumption (GWh)(Including nature gas and diesel)	423	455	489	628.2	726
	Indirect Energy Consumption (GWh)(Electricity)	7,545	8,460	9,358	11,388	12,441
	Water Consumption (Million Metric Tons)	38.2	37.5	42.0	48.9	56.8
	Taiwan Facilities	34.9	34.0	38.6	45.2	51
	Subsidiaries ^{Note 2}	3.3	3.5	3.4	3.8	5.7
	Process Water Recycling Rate (%) (Taiwan Sites) ^{Note 3}	87.6	87.3	87.4	87.5	87.5
	Total Water Saving (Million Metric Tons) (Taiwan Sites) ^{Note 3}	81.0	85.6	94.3	103.4	129

(Continue on next page)



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Key Indicators		2014	2015	2016	2017	2018
Environmental	Waste Generated (Metric Tons)	208,213	273,096	298,761	369,745	393,784
	General Waste Generated	66,462	137,524	163,584	201,114	213,840
	Taiwan Facilities	61,026	132,427	158,899	196,077	208,340
	Subsidiaries ^{Note 2}	5,436	5,097	4,685	5,037	5,501
	Hazardous Waste Generated	141,751	135,572	135,177	168,631	179,944
	Taiwan Facilities	140,024	133,360	133,085	165,891	169,427
	Subsidiaries ^{Note 2}	1,727	2,212	2,092	2,740	10,516
	Waste Recycling Rate (%)	93	95	95	95	95
	Taiwan Facilities	93	95	95	95	95
	Subsidiaries ^{Note 2}	79	79	79	80	83
Social	ISO 14001 Certified Sites	15	16	18	20	22
	% Sites Certified	100	100	100	100	100
	Numbers of Employee	43,591	45,272	46,968	48,602	48,757
	Employee Training Hours	884,174	780,546	623,711	639,852	540,408
	Women in Workforce (%)	42.00%	41.30%	40.10%	39.30%	38.70%
	Females in Management (%)	11.10%	11.50%	11.70%	12.30%	12.60%
	Females in Junior Management (%) ^{Note 4}	12.20%	12.60%	12.70%	13.40%	13.50%
	Females in Top Management (%) ^{Note 4}	25.00%	26.30%	22.70%	22.70%	20.80%
	Turnover Rate (%)	6.2%	5.2%	4.3%	4.2%	4.5%
	Voluntary Turnover Rate (%)	6.0%	5.0%	4.2%	4.1%	4.3%
Economic	Safety - Injury Frequency Rate ^{Note 5}	0.36	0.47	0.54	0.56	0.88
	Safety - Injury Severity Rate ^{Note 6}	3	5	7	7	13
	Fatalities - Employees	0	0	0	0	0
	Fatalities - Contractors	0	0	0	0	0
	Cash Donation (NT\$ million) ^{Note 7}	99	64.8	89.1	301.2 ^{Note 8}	199.0

Note 1 Data are collected from all of the facilities 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 are collected from all facilities in Taiwan

Note 4 Data excludes VisEra

Note 5 Safety - Injury Frequency Rate=Injury NumberX1,000,000/ Total hours worked

Note 6 Safety - Injury Severity Rate= Lost Work DaysX1,000,000/ Total hours worked

Note 7 Amounts donated by TSMC, TSMC Education and Culture Foundation, TSMC Charity Foundation, TSMC employees and TSMC Employee Welfare Committee

Note 8 In response to the government's renewable energy policy, TSMC has purchased 100 GWh green power in 2017., which was the main reason for the higher amount of annual cash donations. The government green power subscription plan was terminated at the end of 2017. TSMC is currently actively 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	10
102-2	Activities, brands, products, and services	Our Business: About TSMC	10
102-3	Location of headquarters	Our Business: About TSMC	10
102-4	Location of operations	Our Business: About TSMC	10
102-5	Ownership and legal form	Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements	10
102-6	Markets served	Our Business: About TSMC	10
102-7	Scale of the organization	Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements	10
102-8	Information on employees and other workers	Inclusive Workplace: Talent Attraction and Retention- Right People with Shared Vision and Values- Global Workforce Structure Non-employee workers do not perform a significant portion of TSMC's manufacturing.	126
102-9	Supply chain	Responsible Supply Chain: Sustainability Risk Control and Local Supply Chain Optimization	72
102-10	Significant changes to the organization and its supply chain	Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements Responsible Supply Chain: Strategy and Long-term Goals	72
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. Please refer to 2018 TSMC Annual Report : 6.3 Risk Management	80
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	188
102-14	Statement from senior decision-maker	Letter from the CSR Committee chairperson	4
102-15	Key impacts, risks, and opportunities	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-16	Values, principles, standards, and norms of behavior	Ethical Management: Ethic and Regulatory Compliance Please refer to 2018 TSMC Annual Report : 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance	32

(Continue on next page)



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 2018 TSMC Annual Report : 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance 5.5.6 Employee Engagement - Employee Communication	32
102-18	Governance structure	Sustainable Governance: Corporate Governance, Corporate Social Responsibility Committee Please refer to 2018 TSMC Annual Report : 2.3.1 Organization Chart 3 Corporate Governance	17
102-19	Delegating authority	Sustainability Governance	17
102-20	Executive-level responsibility for economic, environmental, and social topics	Letter from the CSR Committee Chairperson Sustainable Governance	4 17
102-21	Consulting stakeholders on economic, environmental, and social topics	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
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 2018 TSMC Annual Report : 2.4.1 Information Regarding Board Members 3 Corporate Governance	17
102-23	Chair of the highest governance body	The Chair of the highest governance body is not an executive officer.	
102-24	Nominating and selecting the highest governance body	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. 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. 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.	



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
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 2018 TSMC Annual Report:</p> <ul style="list-style-type: none">2.4.1 Information Regarding Board Members4.1.4 Major Shareholders4.1.8 Related Party Relationship among Our 10 Largest Shareholders5.3.4 Raw Materials and Supply Chain Management-Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement5.4 Customer Trust-Customers that Accounted for at Least 10% of Annual Consolidated Net Revenue8.1 Subsidiaries <p>Please refer to Consolidated Financial Statements for 2018:</p> <ul style="list-style-type: none">Note 44: Additional DisclosuresTable 6 - Total Purchases from or Sales to Related Parties of at Least NT\$100 Million or 20% of the Paid-in Capital	
102-26	Role of highest governance body in setting purpose, values, and strategy	<p>Sustainable Governance: Corporate Social Responsibility Policy, Corporate Social Responsibility Matrix, Corporate Social Responsibility Committee</p> <p>Board of Directors annually reviews CSR report which includes economic, environmental and social topics. In addition, they 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> <p>TSMC has set "Corporate Social Responsibility Policy" and "Corporate Social Responsibility Matrix", and the "Corporate Social Responsibility Matrix" clearly defines the scope of the TSMC's responsibilities.</p>	15 16 18
102-27	Collective knowledge of highest governance body	<p>Please refer to 2018 TSMC Annual Report:</p> <ul style="list-style-type: none">3. Corporate Governance "Continuing Education/Training of Directors" and "Continuing Education/Training of Management" in 2018 <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 2018 TSMC Annual Report:</p> <ul style="list-style-type: none">3.2 Board of Directors3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission	
102-29	Identifying and managing economic, environmental, and social impacts	<p>Please refer to 2018 TSMC Annual Report:</p> <ul style="list-style-type: none">3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission6.3 Risk Management	

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-30	Effectiveness of risk management processes	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 6.3.1 Risk Management Organization of TSMC Annual Report for details.	
102-31	Review of economic, environmental, and social topics	Please refer to 2018 TSMC Annual Report : 3. Corporate Governance 6.3 Risk Management	
102-32	Highest governance body's role in sustainability reporting	Sustainable Governance: Corporate Governance This report is reviewed and approved by the Company's functional heads and Chairperson of the Corporate Social Responsibility Committee (Chief Financial Officer).	
102-33	Communicating critical concerns	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-34	Nature and total number of critical concerns	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-35	Remuneration policies	Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation Please refer to 2018 TSMC Annual Report : 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 5.5 Human Capital - 5.5.5 Compensation	126
102-36	Process for determining remuneration	Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation Please refer to 2018 TSMC Annual Report : 3.2.2 Compensation Committee 3.2.3 Director and Committees Members'Attendance/ Compensation Committee Meeting Status	126
102-37	Stakeholders' involvement in remuneration	TSMC devotes to do better corporate governance by communicating with stakeholders proactively, collecting suggestions, and taking these into account for operations.	
102-38	Annual total compensation ratio	Inclusive Workplace: Talent Attraction and Retention-Compensation and Benefits-Competitive Total Compensation Please refer to 2018 TSMC Annual Report : 3.1.1 Competitive Compensation Program Median of global employees annual total compensation Annual total compensation ratio between CEO and median	126
102-39	Percentage increase in annual total compensation ratio	Inclusive Workplace: Talent Attraction and Retention-Compensation and Benefits-Competitive Total Compensation Headcount and average annual compensation of non-corporate executive full-time employees, and year-over-year difference	126
102-40	List of stakeholder groups	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
102-41	Collective bargaining agreements	Inclusive Workplace: Human Rights-Employee Communication 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.	143
102-42	Identifying and selecting stakeholders	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-43	Approach to stakeholder engagement	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-44	Key topics and concerns raised	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-45	Entities included in the consolidated financial statements	Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements	10
102-46	Defining report content and topic Boundaries	About This Report	185
102-47	List of material topics	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
102-48	Restatements of information	No significant changes	
102-49	Changes in reporting	About This Report	185
102-50	Reporting period	About This Report	185
102-51	Date of most recent report	June, 2018	
102-52	Reporting cycle	About This Report	185
102-53	Contact point for questions regarding the report	About This Report	185
102-54	Claims of reporting in accordance with the GRI Standards	About This Report	185
102-55	GRI content index	Appendix: GRI Standards Comparison Table	190-202
102-56	External assurance	Appendix: Independent Third Party Assurance Statement	203

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 103:Management Approach			
103-1	Explanation of the material topic and its Boundary	Sustainable Governance: Materiality Analysis and Stakeholder Communication	20
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 Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- TSMC Compensation and Benefits Expenses	7 126
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 and Opportunities Identification, Purchasing Green Power	85
201-3	Defined benefit plan obligations and other retirement plans	Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- TSMC's Pension Allocation and Preparation TSMC defined contribution plan recognized expenses of NT\$2,568,945,000 for the years ended December 31, 2018. 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.	126
201-4	Financial assistance received from government	Financial assistance received from the R.O.C. government: In 2018, TSMC enjoyed a tax benefit of NT\$33.1 billion from five-year tax exemption for capital investments made in previous years, and tax credits of NT\$6.0 billion for research and development expenditures.	
GRI 202:Market Presence			
202-1	Ratios of standard entry level wage by gender compared to local minimum wage	Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation In 2018, the total compensation of a fresh engineer with a master degree is about 32 months of base salary, including 12-month base salary, 2-month year end bonus, as well as approximately 18 months of cash bonuses and profit sharing. The average total compensation of direct labor is about 27 months of base salary, and the average monthly salary is three times higher than Taiwan's minimum wage. 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.	126
202-2	Proportion of senior management hired from the local community	The information of TSMC management team has been fully disclosed in 2018 TSMC Annual Report	

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
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.	171
203-2	Significant indirect economic impacts	Today, TSMC is the world's largest semiconductor foundry, manufacturing 10,436 different products and using 261 distinct technologies for 481 different customers in 2018. Sustainable Governance: Sustainable Value Creation	26
GRI 204:Procurement Practices			
204-1	Proportion of spending on local suppliers	Responsible Supply Chain: Continue Driving Local Supply Chain Upgrade	73
GRI 205:Anti-corruption			
205-1	Operations assessed for risks related to corruption	The Company conducts corruption related risk assessment for all operations.	
205-2	Communication and training about anti-corruption policies and procedures	Integrity is the most important value of TSMC's culture. TSMC provides anti-corruption and ethics training to each new colleague upon hire. 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 promotional articles, etc., to ensure colleagues have access to new knowledge of regulations and deepen their knowledge of various issues. Ethical Management: Ethic and Regulatory Compliance Please refer to 2018 TSMC Annual Report : 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance	
205-3	Confirmed incidents of corruption and actions taken	Ethical Management: Ethic and Regulatory Compliance Please refer to 2018 TSMC Annual Report : 3.5 Code of Ethics and Business Conduct	32
GRI 206:Anti-competitive Behavior			
206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	Please refer to 2018 TSMC Annual Report : 6.3.3 Risks Associated with Litigious and Non-litigious Matters	
GRI 302:Energy			
302-1	Energy consumption within the organization	Increasing energy efficiency	92
302-2	Energy consumption outside of the organization	Climate Change and Energy Management: Greenhouse Gases Inventory	90

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
302-3	Energy intensity	Increasing energy efficiency	92
302-4	Reduction of energy consumption	Increasing energy efficiency	92
302-5	Reductions in energy requirements of products and services	More Advanced and More Energy Efficient Electric Products	55
GRI 303:Water			
303-1	Water withdrawal by source	Risk Management of Water Resources	98
303-2	Water sources significantly affected by withdrawal of water	Risk Management of Water Resources	98
303-3	Water recycled and reused	Risk Management of Water Resources	98
GRI 305:Emissions			
305-1	Direct (Scope 1) GHG emissions	Climate Change and Energy Management: Greenhouse Gases Inventory	90
305-2	Energy indirect (Scope 2) GHG emissions	Climate Change and Energy Management: Greenhouse Gases Inventory	90
305-3	Other indirect (Scope 3) GHG emissions	Climate Change and Energy Management: Greenhouse Gases Inventory	90
305-4	GHG emissions intensity	Climate Change and Energy Management: Greenhouse Gases Inventory	90
305-5	Reduction of GHG emissions	Climate Change and Energy Management: Greenhouse Gases Inventory	90
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 2018, VOC: 166.3 metric tons, NOx: 116.38 metric tons, SOx: 41.26 metric tons	
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 (Naijing): 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.	80
306-2	Waste by type and disposal method	Green Manufacturing: Waste Management	109
306-3	Significant spills	There were no significant spills in all TSMC fabs in 2018.	

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
306-4	Transport of hazardous waste	In 2018, TSMC exported 7.814 tons cadmium battery, which was 0.002% 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 enviromental laws and regulations 2018.	
GRI 308:Supplier Environmental Assessment			
308-1	New suppliers that were screened using environmental criteria	Responsible Supply Chain: 2018 Goals and Achievements 100% new suppliers signed "TSMC Supplier Code of Conduct."	72
308-2	Negative environmental impacts in the supply chain and actions taken	Responsible Supply Chain: Sustainability Risk Control	75
GRI 401:Employment			
401-1	New employee hires and employee turnover	Inclusive Workplace: Talent Attraction and Retention- Right People with Shared Vision and Values- Talent Recruitment-Campus Recruitment Around 90% of employees at TSMC are based in Taiwan, while overseas employees are mostly based in Asia, accounting for 7.5% of total employees. In 2018, TSMC recruited 2,323 new employees, including 79.7% of young generation under 30 years old.	126
401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	Inclusive Workplace: Talent Attraction and Retention-Compensation and Benefits-Benefits Exceeding Statutory Requirements TSMC provides 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.	126
401-3	Parental leave	Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Benefits Exceeding Statutory Requirements	126
GRI 402:Labor/Management Relations			
402-1	Minimum notice periods regarding operational changes	Inclusive Workplace: Human Rights- Employee Communication If the Company terminates employment, the Company will notify employees in advance abide by the law.	143

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
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 55%.	
403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Inclusive Workplace : 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 2018, complying with occupational safety and health regulation, there were 3,922 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.	
GRI 404:Training and Education			
404-1	Average hours of training per year per employee	Inclusive Workplace: Talent Development- Fulfill Talent Development 1. Reveal the average hours of training per employee each year 2. Reveal the average hours of training by different categories of employees per year(manager, non-manager indirector employee, and direct employee)	137
404-2	Programs for upgrading employee skills and transition assistance programs	Inclusive Workplace: Talent Development- Fulfill Talent Development 1. Expose annual key annual projects to enhance employees' capability, such as Quality Excellence Training Programs 2. There is no related transition assistant programs for career endings resulting from retirement or termination of employment.	137
404-3	Percentage of employees receiving regular performance and career development reviews	Inclusive Workplace: Talent Development- Diverse and Equal Opportunities for Learning and 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 2018), 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.	137

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 405:Diversity and Equal Opportunity			
405-1	Diversity of governance bodies and employees	<p>Sustainable Governance: Corporate Governance Please refer to 2018 TSMC Annual Report:</p> <p>2.4.1 Information Regarding Board Members Gender: Two of the nine directors are female (22.22%) Age Group: over 50 years old (100%)</p> <p>Inclusive Workplace: Talent Attraction and Retention- Right People with Shared Vision and Values- Talent Recruitment In 2018, TSMC recruited 2,323 new employees, including young generation, female interns, overseas talents hired in Taiwan area, and disabled workers</p> <ol style="list-style-type: none">1. In 2018, 259 students participated in our internship program, and 67 of them were female, accounting for 25% of total participants. After the internship, 83 interns received advance offers after evaluation, accounting for 32% of total participants. Among them, 24% were female. Ratios of female students participating in the internship program, receiving advance offers, or joining TSMC are higher than the current ratio of 17.7% of female professionals at TSMC, demonstrating the Company's efforts in balancing the gender ratio.2. The table of "Overseas talents hired in Taiwan area"3. In 2018, TSMC fabs in Taiwan employed 330 people with mild or moderate disabilities, and 62 people with severe disabilities, with the weighted ratio reaching 1% of total employees, which is in line with legal requirements. In addition, our subsidiary in Taiwan, VisEra, provides full-time job opportunities for people with disabilities and employed 3. However, due to the nature of available job vacancies, recruitment was difficult with insufficient applicants. VisEra did not reach the required 1% weighted ratio of employees with disabilities and has paid the difference in subsidies according to legal requirements. In the future, VisEra will continue with providing job opportunities for people with disabilities and look forward to more applicants.	17
405-2	Ratio of basic salary and remuneration of women to men	Inclusive Workplace: Talent Attraction and Retention- Right People with Shared Vision and Values- Compensation Ratio of Global TSMC Male and Female Employees	126
GRI 406:Non-discrimination			
406-1	Incidents of discrimination and corrective actions taken	<p>Inclusive Workplace: Human Rights- Employee Communication In 2018, 3,654 cases were reported through internal communication channels, including 3 through the Sexual Harassment Investigation Committee, 106 through the Ombudsman System, 589 through the Employee Opinion Box, and 2,956 through the Fab Caring Circle. All cases have since been handled by designated teams. Employees can access these internal communication channels via the internal employee portal. These channels are also introduced to new employees to ensure that they are well-informed.</p>	143

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
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>Inclusive Workplace: Human Rights- Employee Communication</p> <p>TSMC highly values employee opinions and rights and provides several communication channels. A number of channels were managed by the highest level executives of the Human Resources Organization, and operate in a fast and confidential way to create a transparent and conducive environment for communication between managers and their staffs, and colleagues.</p> <p>TSMC respects employee rights for collective bargaining and participation in peaceful assembly activities. According to regulations, TSMC holds regular labor-management meetings, reports business operation updates to employees, and invites employees to discuss labor conditions and labor welfare.</p>	143
GRI 408:Child Labor			
408-1	Operations and suppliers at significant risk for incidents of child labor	<p>Inclusive Workplace: Human Rights- Human Rights Policy Concerns and Practices</p> <p>According to "Human Rights Policy" - "TSMC Candidate Interview Process Control Instruction", TSMC only accepts applicants who are older than 18 years old, and will ensure by examining the identity of new hires.</p> <p>From the very beginning, all application processes are handled accordingly to the law to eradicate child labor.</p>	143
GRI 409:Forced or Compulsory Labor			
409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	<p>Inclusive Workplace: Human Rights- Human Rights Policies and Practices</p> <p>TSMC Adheres firmly to local regulations, internationally-recognized protocols and "TSMC Human Right Policy", the Company have never forced involuntary labor from any person with.</p>	143
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 Policies and Practices</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 respect 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>	143
412-2	Employee training on human rights policies or procedures	Inclusive Workplace: Human Rights- Human Rights Risk Mitigation Measures	143
412-3	Significant investment agreements and contracts that include human rights clauses or that underwent human rights screening	In 2018, 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.	

(Continue on next page)



Disclosure Number	Disclosure Title	Report Contents or Explanation	Page
GRI 414:Supplier Social Assessment			
414-1	New suppliers that were screened using social criteria	Responsible Supply Chain: 2018 Goals and Achievements 100% new suppliers signed "TSMC Supplier Code of Conduct."	72
414-2	Negative social impacts in the supply chain and actions taken	Responsible Supply Chain: Action Plan "Protect labor and human right" For supply chain's Taiwan employees working in the TSMC factory area, work/safety/labor disputes will be audited, contracted and penalized. Some projects have improved by 51%.	72
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)	
GRI 419:Socioeconomic Compliance			
419-1	Non-compliance with laws and regulations in the social and economic area	The Company complied with the Taiwan Company Law and Securities Trading Act relevant laws and regulations. There were no major violations of the law in the social field. The Company was issued 2 fines totaling NT\$60,000 for violations of the labor-related laws, and 2 fines totaling NT\$100,000 for violations of the occupational safety and health-related laws. (1) One case was due to a few employees' overtime application and approval not being processed in time. The Company has enhanced communication and training on overtime application and management. (2) The second case occurred during a fab's annual maintenance work, where an unexpected maintenance response resulted in excess work hours of 7 employees. (3) The third case involved chemical storage in a non-compliant location. The Company immediately reviewed and completed the necessary process improvements. (4) The fourth case involved subcontractor personnel who accidentally broke a waste chemical pipe while working on electrical cable wiring, which leads to chemical exposure for two workers from leakage of the residual chemical. The Company has reviewed the management of the working environment and safety practices, and strengthened pre-work evaluation and prevention measures.	



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 2018 Corporate Social Responsibility Report (the "Report") for the year ended 31 December 2018.

We performed our work using DNV GL's assurance methodology VeriSustain™, 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 2025 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

¹ The VeriSustain protocol is available on dnvgl.com

management), human resource, safety, purchase, wellness, human resource, product development, and TSMC cultural and educational foundation were chosen to interview;

- Site visits to HQ and 2 production sites in Taiwan, remote meeting with 4 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 and 2 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 and talent attraction and retention. It is suggested to establish specific, relative and measurable objectives/ targets for continuous performance improvement.
- Improving the of reporting data and information to be consistent with each topic requirement of GRI Standards.

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 revalidated based on survey from key stakeholders including employees, customers, suppliers / contractors, NGOs, governments, shareholders, investors, regulatory bodies, local communities and senior management of TSMC and has not missed out any significant and known material issues about the Semiconductor Sector. A methodology has been developed to evaluate the priority of these issues and identified priority issues are fairly covered in the Report. An internal assessment process for monitoring and management on a continual basis for their long term organisational sustainability has been established.

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 6 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 2018 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.
10 May 2019

Wu, Johnny
Lead Verifier
DNV GL – Business Assurance
Statement Number: 00002-2019-ACSR-TWN

Lin, Chun Nan
Reviewer
DNV GL – Business Assurance

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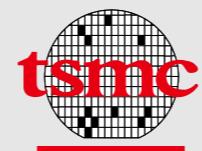
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