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.
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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.
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.

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.

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.

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
   - Reached a record-high net income in 2018
   - 351.13 bn (NT$)

2. 2018 ROE
   - 22.0%

3. 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
   - 8%

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

5. 2018 greenhouse gas emission per unit product reduced to 17% below 2010 levels
   - 17%

6. 2018 perfluorinated compound (PFC) emission per unit product reduced to 60% below 2010 levels – the largest reduction in the industry
   - 1

7. 880 GWh of renewable energy purchased worldwide in 2018, the largest amount purchased in the Taiwan semiconductor industry
   - 880 GWh

8. 2018 water consumption per unit product reduced to 24.7% below 2010 levels
   - 24.7%

9. 2018 waste recycling rate reached 95%, exceeding 90% for 10 consecutive years
   - 95%

10. 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
    - 32 months

11. In 2018, the average monthly salary of direct labor in TSMCs facilities in Taiwan was 3 times higher than the minimum wage in Taiwan
    - 3x minimum wage

12. Person-time of volunteers in 2018
    - 27,590 people-time

13. Hours dedicated to volunteer services in 2018
    - 109,059 hours

14. Total investments in social participation in 2018
    - 690,151,360 (NT$)
Awards, Recognition and Ratings

MSCI ESG Indexes

- MSCI ESG Indexes
- MSCI ACWI ESG Leaders Index component
- FTSE4Good
- FTSE4Good Emerging Index component
- FTSE4Good TIP Taiwan ESG Index component
- 'Prime' rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

IR Magazine

- Forbes Global 2000
- World's Best Employers
- The World's 50 Most Innovative Companies
- Overall Most Outstanding Company in Taiwan
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

Institutional Investor 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
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

FORTUNE

- Fortune Global 500
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

PricewaterhouseCoopers

- Global Top 100 Companies by market capitalization for the 6th consecutive year
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

CommonWealth Magazine

- Corporate Social Responsibility Award
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

Taiwan Institute of Sustainable Energy

- The Most Prestigious Sustainability Awards – Top Ten Domestic Corporates
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

Taiwan Stock Exchange

- Top 5% in Corporate Governance Evaluation of Listed Companies for the 4th consecutive year
- "Prime" rated by ISS-oekom Corporate Rating
- Rated an ESG "Leader" within the Semiconductor Industry

TWSE Corporate Governance 100 Index component

For more details of 2018 CSR awards and recognition, please refer to TSMC's 2018 Annual Report
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.
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.

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.
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.

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.
Tax Policy

TSMC supports tax policies and incentives that encourage innovation and foster economic growth. We aim for our tax approach to be transparent and sustainable over the long term.

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

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

- >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.
- 7.6% of total corporate income taxes collected by the R.O.C. government.

Based on data provided by ‘Bloomberg Professional’, TSMC was the largest corporate income taxpayer among all public listed companies in Taiwan in 2018.
Corporate Social Responsibility Policy

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

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

### Corporate Social Responsibility Matrix

<table>
<thead>
<tr>
<th>TSMC</th>
<th>Society</th>
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<tr>
<td></td>
<td>Morality</td>
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<tr>
<td>Integrity</td>
<td></td>
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<tr>
<td>Law Compliance</td>
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<tr>
<td>Anti-Corruption, Anti-Bribery, Anti-Cronyism</td>
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<tr>
<td>Environmental Protection, Climate Control, Energy Conservation</td>
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<tr>
<td>Corporate Governance</td>
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<tr>
<td>Provide Well-paying Jobs</td>
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<tr>
<td>Good Shareholder Return</td>
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<tr>
<td>Employees' Work-Life Balance</td>
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<tr>
<td>Encourage Innovation</td>
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<tr>
<td>Good Work Environment</td>
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<td>TSMC Charity Foundation</td>
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<tr>
<td>TSMC Education and Culture Foundation</td>
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</table>
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

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 Members.

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 propose representatives.

Major Tasks
Quarterly meetings are held to supervise the performances of issues on sustainability, conduct interdepartmental communication, coordination, resource integration, and establish continuous improvement plans.

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.
- 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.

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. 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.

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.

Jun He  
Senior Director, Quality and Reliability Organization

Quality is a key element in the development of 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.

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.

Sophie Chang  
Chairperson, TSMC Charity Foundation

It is undoubtedly 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.

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.

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.

Our Business  
Sustainable Governance  
Our Focuses and Progress  
Focus 1: Ethical Management  
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Appendix
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.

<table>
<thead>
<tr>
<th>Major Categories of Stakeholders</th>
<th>20 Issues</th>
<th>703 Valid Samples</th>
<th>80 Employees</th>
<th>17 Material Issues</th>
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<tbody>
<tr>
<td>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.)</td>
<td>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.</td>
<td>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.</td>
<td>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&amp;D, revenue, cost, customer satisfaction, brand/repuation, 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.</td>
<td>Based on the analysis results of the six major issues, the Committee identified 9 high impact issues and another 8 as potential issues.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Step 1 Define major stakeholders</th>
<th>Step 2 Identify sustainability issues</th>
<th>Step 3 Investigate the level of interest</th>
<th>Step 4 Analyze operational impact</th>
<th>Step 5 Draft materiality matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>20</td>
<td>703 Valid Samples</td>
<td>80</td>
<td>17 Material Issues</td>
</tr>
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</table>
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

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.

Step 7: Review disclosure content

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.

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.

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.”
<table>
<thead>
<tr>
<th>Focuses</th>
<th>Material Issues</th>
<th>Operational Impact</th>
<th>GRI Standards Aspects</th>
<th>Upstream Note 1</th>
<th>TSMC Operations Note 2</th>
<th>Downstream Note 3</th>
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</thead>
<tbody>
<tr>
<td>Ethical Management</td>
<td>Ethics code</td>
<td></td>
<td>Anti-corruption, anti-competitive behavior</td>
<td></td>
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<td></td>
<td>Regulatory compliance</td>
<td></td>
<td>Environmental compliance, socioeconomic compliance</td>
<td></td>
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<tr>
<td>Innovation and Service</td>
<td>Innovation management</td>
<td></td>
<td>Energy</td>
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<td></td>
<td>Sustainable product</td>
<td></td>
<td>Customer health and safety</td>
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<td></td>
<td>Product quality</td>
<td></td>
<td>Customer health and safety</td>
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<td></td>
<td>Customer service</td>
<td></td>
<td>Customer privacy</td>
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<tr>
<td>Responsible Supply Chain</td>
<td>Supplier sustainability management</td>
<td></td>
<td>Procurement practices, supplier environmental assessment, supplier social assessment</td>
<td></td>
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<tr>
<td>Green Manufacturing</td>
<td>Energy management</td>
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<td>Energy</td>
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<tr>
<td></td>
<td>Climate change</td>
<td></td>
<td>Emissions, economic performance</td>
<td></td>
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<tr>
<td></td>
<td>Water management</td>
<td></td>
<td>Water, effluents, and waste</td>
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<td></td>
<td>Air pollution control</td>
<td></td>
<td>Emissions</td>
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<td></td>
<td>Waste management</td>
<td></td>
<td>Effluents and waste</td>
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</tr>
<tr>
<td>Inclusive Workplace</td>
<td>Talent attraction and retention</td>
<td></td>
<td>Economic performance, employment, diversity and equal opportunity, market status</td>
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<tr>
<td></td>
<td>Talent development</td>
<td></td>
<td>Training and education</td>
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<tr>
<td></td>
<td>Human rights</td>
<td></td>
<td>Labor management relations, non-discrimination, freedom</td>
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<tr>
<td></td>
<td>Occupational safety and health</td>
<td></td>
<td>of association and collective bargaining, child labor, forced or compulsory labor,</td>
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<td>human rights assessment</td>
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<tr>
<td>Common Good</td>
<td>Social participation</td>
<td></td>
<td>Economic performance, indirect economic impacts, local communities</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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

Employees

Brief
- 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
- 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
- Innovation management
- Talent attraction and retention
- Talent development
- Ethics and regulatory compliance
- 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

Focus Areas
- 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.

Responses from TSMC

Shareholders and Investors

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

Communication Channels / Frequency
- General shareholders' meeting / annually
- Investor conference / quarterly
- Domestic and overseas broker conference / as needed, face-to-face meetings and telephone conference calls / as needed
- Email / as needed
- Financial and non-financial statements / annually
- Disclosure of material information to market observation post system / as needed

Issues
- Financial performance
- Risk management
- Innovative management
- Climate change

Focus Areas
- Impact from the geopolitical situation and the Company's response
- Changes in the competitive environment
- Future growth potential and profitability
- Dividend policy
- Energy policy and response measures to climate change

Responses from TSMC

In 2018, through quarterly investor conferences and 229 investor meetings, TSMC communicated with its investors about market trends, growth strategies, and profitability, and expressed its opinions on changes in the business environment.

With the support of strong operating performance and future growth potential, TSMC has been providing positive return to investors for 10 consecutive years.

The Board of Directors also proposed that all shareholders of TSMC common shares will receive a total of NT$10 cash dividend per share in 2019, a 25% increase from that of 2018.

In 2018, TSMC completed the TSMC Climate Change Statement. It has also purchased renewable energy, participated in the Global Climate Action Summit, and identified climate risks and opportunities within the TCFD framework.
**Customers**

- **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**

- **Brief**
  - Focus on TSMC's technology development plans, production planning, and the protection of customer information.

- **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 minimalization.

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**Government**

**Brief**
- Focus on TSMC’s patent applications and overall technology, energy and water demands of new fabs, and understand TSMC’s promotions and experience sharing on Occupational Safety and Health.

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

**Issues**
- Protection of intellectual property rights
- Energy management
- Water management
- Development trends of advanced semiconductor technology and the current situation of TSMC technologies
- Additional electricity and renewable energy required to build new fabs
- Additional water, including recycled water required to build new fabs
- Regulations, technology and capacity of waste management
- Improve occupational safety and health management in supply chain

**Focus Areas**
- TSMC shared its technology developments and patent strategy with Taiwan Intellectual Property Office and United States Patent and Trademark Office to jointly create a high-quality environment for patent applications.
- Due to the additional need for electricity, a voluntary commitment was made to use renewable energy for 20% of energy demands of the new 3nm fab under the condition that supply is stable and sufficient.
- TSMC cooperated with the government to promote reclaimed water projects. It is estimated that, if it proceeds as planned, the phase one water supply of the Yongkang water regeneration facility will be operational by the end of 2020.
- On behalf of the Taiwan Semiconductor Industry Association, TSMC set up a waste disposal platform for high-tech industries to discuss and solve relevant problems with the Environmental Protection Administration, the Industrial Development Bureau, and the Ministry of Science and Technology.
- TSMC published a “Environment, Safety, and Health Guidance for Suppliers Booklet”. It has also held three educational training and experience sharing-sessions, where suppliers were invited to visit and learn from TSMC.

**Responses from TSMC**
- Promote culture, education, and charity together to strengthen social influence. The TSMC Charity Foundation makes social contributions through emergency relief, volunteer activities, and various public welfare projects. The TSMC Education and Culture Foundation focuses on three main aspects — caring for the disadvantaged, supporting diversified education platform, and promoting arts and culture — to fulfill its corporate social responsibility.

**Society**

**Brief**
- Number of cooperating charity groups
- Cumulative number of beneficiaries

**Communication Channels / Frequency**
- Volunteer service / at least once a week
- TSMC, Love, Action” official Facebook fan page / as needed
- Foundation websites / as needed
- Project cooperation and visits / as needed

**Issues**
- Charity and public welfare projects and activities
- Increase donations and supplies (such as rehabilitation centers, ultrasound machines, etc.)
- Increase the number of volunteers and their person-time
- Increase the number of beneficiaries and serviced individuals and their person-time

**Focus Areas**
- In 2018, the TSMC Charity Foundation completed the Hualien Relief and Care Project and continued to work on four main aspects: caring for elder people living alone, promoting filial piety, caring for the disadvantaged, and protecting the environment. The number of volunteers was 10,226, the number of total service hours exceeded 109,000 hours; and over NT $103 million was invested.

**Responses from TSMC**
- In 2018, the TSMC Education and Culture Foundation invested more than NT$76.81 million towards caring for the disadvantaged, supporting diverse education, and promoting arts and culture. Additionally, a new project category, with the theme of “USAGE 100%”; was introduced to the TSMC Youth Dream Building Project to raise awareness of environmental issues. A total of 67 teams from 13 universities from Taoyuan, Hsinchu, and Miaoli participated in this project.
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.

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### Six Main Capitals

#### Finance
- Generate economic value and return by effectively managing financial resources.

#### Manufacturing
- Provide products that meet the needs of each client by carefully maintaining equipment and infrastructure manufacturing resources.

#### Intelligence
- Strengthen the power of knowledge capital through constant dedication in innovative developments and patents.

#### Human Resource
- Create key assets for the Company by nurturing outstanding, like-minded colleagues and strengthening talent development.

#### Environment
- Reduce consumption of natural resources and maintain optimal usage efficiency by managing sources.

#### Society
- Give back to society and obtain its trust through community participation.

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### Process and Methods

#### Senior Management Support
The chairman personally participates in the promotion of corporate social responsibilities, inviting senior executives to lead functional organizations to propose sustainable solutions based on the core competencies of TSMC to tackle environmental and social problems and create greater positive influences.

#### Committee of Corporate Social Responsibility
The CSR Committee generates sustainable momentum within organizations by holding quarterly meetings focused on cross-functional communication / facilitation, resource integration and monitoring projects' execution progress and performance.

#### Mid-Level Management Involvement
Mid-Level managers are the driving force behind the Company’s advocacy for sustainability, conducting inter-organizational and inter-departmental cooperation in the face of complex sustainability issues in order to bring about material changes.

#### Organization Culture
Foster an organization culture that doesn't commit easily, but make all efforts to fulfill the commitment when it does. Set long-term goals and periodically review results on key issues that are in line with international sustainability trends and operational needs.

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### Sustainable Value

In 2018, TSMC continued to carry out economic and social impact assessments, and developed environmental profit and loss methodologies to complete impact assessments based on the Topline Bottom Line (TBL). By referring to the monetary valuation of environmental impacts and related environmental aspects (ISO 14008), Natural Capital Protocol, and the framework for the IMPACT White Paper, TSMC has developed environmental profit and loss coefficient methodologies with the assistance of academic units. Environmental impact assessments were conducted by the Impact Pathway Approach for all TSMC operations sites around the world through describing the possible environmental externalities of operating activities and their intricate relationships. In addition, since TSMC's main operations are located in Taiwan, and in order to truly reflect the local environmental characteristics, the Company has also started to develop localized coefficients applicable to Taiwan for a comprehensive analysis.

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### Notes

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.

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 the “Environmental Cost” in TSMC’s 2018 annual report. For the methodologies of environmental profit and loss, please refer to the TSMC 2016-2017 Social Impact Valuation Report.

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.

**Step One**
Understanding SDGs and Defining Priorities

9 items TSMC responds to SDGs

- Based on TSMC's core and operational capabilities, SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions) are all highly correlated with the Company's business drivers. SDG 1 (Solve Poverty), SDG 3 (Good Health and Well-being), and SDG 4 (Quality Education) are two areas that TSMC's two major Foundations can focus and make meaningful contributions.

**Step Two**
Integrating and Setting Goals

7 Newly added Sustainable Development Indicators

In 2018, TSMC adopted guidelines from Business Reporting on the SDGs: An Analysis of the Goals and Targets to learn how to use feasible solutions to achieve the SDGs. We added 7 new sustainable development indicators and set up a long-term goal for 2025 to build concrete plans based on our connections with the SDGs and bring the SDGs into practice.

**Step Three**
Reporting and Communicating

25 Sustainable Approaches in Response to SDGs

In 2018, TSMC adopted 25 sustainable approaches in response to the SDGs. The Company will continue to follow the reporting and communicating principles prescribed by the UN SDG Compass, and explore potential opportunities for further application of SDGs in relation to innovative and development abilities of the Company in response to external expectations. At the same time, we continue to make changes and incorporate SDGs into our sustainable DNA, making contributions to society with our long-term goals.
Ethical Management
Fulfill the core value of "integrity" keeping in mind that corruption and bribery can fundamentally undermine the foundation of corporate sustainability. Our open reporting system allows TSMC’s code of conduct to be deeply rooted in the daily operations of employees and suppliers.

Innovation and Service
Responding to rapid technology changes and global sustainability trends, TSMC introduces new technology applications through innovation, and resolves climate change issues through product and process innovation.

Responsible Supply Chain
As a leader in the semiconductor industry, TSMC aims to increase the dollar value of local purchases through purchasing power, and incorporate corporate sustainability mindset and requirements into supply chain management to uplift the entire supply chain.

Green Manufacturing
Building clean production fabs is a basic responsibility of corporate sustainability. The spirit of responsibility motivates TSMC to build green manufacturing fabs that emphasize dematerialization, decarbonization, and dehazardization across all aspects of our products, processes, and supply chain.

Inclusive Workplace
Employees are the most valuable assets of TSMC. By recruiting, cultivating and retaining the right people with shared vision and values, the Company is committed to building a diverse and encompassing workplace where each and every employee enjoys human rights, skill development, and a safe work environment.

Common Good
Society and Companies are interdependent. Through the TSMC Education and Culture Foundation and the TSMC Charity Foundation, TSMC has been deeply involved in issues such as education, the disadvantaged, elder people living alone, and culture. We aim to send the power of love and influence to society.
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

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

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
Increase urban recycled water use
Goal: Replace tap water with recycled water for up to 50,000 metric tons per day
Replace PFDA-related substances
Goal: 100% compliance with hazardous waste regulations and customer requirements

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)
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
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

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
Goal: 100% of outsourced waste treatment and recycling companies obtain international environmental safety management certificates such as ISO
Support local suppliers
Goal: Coach 38 local suppliers to improve manufacturing processes and quality (base year: 2016)

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

Climate Action
Implement climate change strategies
Goal: Reduce GHG emission per unit of production by 18% from 2010
Goal: Days of manufacturing operations halted by natural disasters: 0 days
Strengthen supply chain climate change resilience
Goal: Organize supplier emergency response drills for a total of 200 suppliers beginning in 2016
Enhance environmental protection
Goal: At least 1,000 hours of person-time from environment related volunteers per year

Peace, Justice and Strong Institutions
Mitigate corruption and bribery
Goal: 100% annual ethics and regulatory compliance
Goal: 98% of suppliers in compliance with the “TSMC Supplier Code of Conduct”

Note 2020 Goals
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.

Ethics and Regulatory Compliance

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

**Conduct ethics and regulatory compliance training to employees on an annual basis, with a completion rate of 100%**
- **Target Year:** 2025

- **No material regulatory violation (where fines exceed NT$1 million)**
  - **Target Year:** 2025

- **Overall completion rate reached 98.57%; completion rate of non-production employees reached 99.23%; completion rate of production staff reached 96%**
  - **Target:** >95%

- **100% completion rate for communicating Supplier Code of Conduct with 229 Tier 1 suppliers**
  - Among them, a total of 321 of critical suppliers and high-risk suppliers were invited to face-to-face training, and 313 participated, achieving a 97.5% participation rate.
  - **Target:** >95%

- **No material regulatory violation**
  - **Target:** No material regulatory violation (where fines exceed NT$1 million)

- **98% completion rate for annual employee training on 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.

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.

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

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

Note: Some overseas subsidiaries, employees assigned abroad, and employees with specific responsibilities are provided with face-to-face training.
TSMC’s Action on Suppliers Management

2017 (Year)
- Developed in accordance with the "Responsible Business Alliance Code of Conduct" and with reference to the UN ‘Guiding Principles on Business and Human Rights’ and the UN ‘Universal Declaration of Human Rights’, which are recognized internationally
- The ‘Suppliers Code of Conduct’ contains 5 parts: labor, health and safety, environmental protection, code of business conduct, and management of guidelines
- Six face-to-face forums were held, with 888 out of 906 invited suppliers participating in the forums, reaching a participation rate of 98%

2018
- According to the Supplier Code of Conduct, TSMC provides suppliers with Guidance on Supplier Business Conduct, including topics such as the business code of conduct, avoidance of conflict of interest, labor rights, regulatory requirements of environment, health and safety, as well as having a reporting system
- The Guidance on Supplier Business Conduct was provided to 1,229 Tier 1 suppliers, with a participation rate of 100%. 321 critical suppliers and high-risk suppliers were invited to face-to-face training, with 313 participating for a participation rate of 97.5%

2019
- Through a supplier survey, the Company receives feedback on the Guidance on Supplier Business Conduct to improve methods for training and promotion

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
- 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

<table>
<thead>
<tr>
<th>Reporting Channels</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Parties</strong></td>
<td>- Irregular Business Conduct Reporting System</td>
</tr>
<tr>
<td><strong>Employees</strong></td>
<td>- Ombudsman System</td>
</tr>
<tr>
<td></td>
<td>- Audit Committee Whistleblower System</td>
</tr>
<tr>
<td></td>
<td>- Sexual Harassment Reporting Channel</td>
</tr>
</tbody>
</table>

#### Ethics Committee
- Supervise investigation of reported incidents.
- Determine disciplinary action for violations.

#### Reporting
- Periodically report investigation results and related disciplinary action to the Board, Audit Committee, and Management.

#### Improvement and Prevention
- Review cause of violations, identify risks, improve management policies and internal controls, and enhance promotion and training in order to avoid recurrence of similar incidents.

---

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidents Reported</th>
<th>Incidents Related to Ethics</th>
<th>Incidents Reported</th>
<th>Incidents Related to Ethics</th>
<th>Incidents Reported</th>
<th>Incidents Related to Ethics</th>
<th>Incidents Reported</th>
<th>Incidents Related to Ethics</th>
<th>Incidents Reported</th>
<th>Incidents Related to Ethics</th>
<th>Incidents Investigated as Founded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>0</td>
<td>22</td>
<td>0</td>
<td>61</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>0</td>
<td>0</td>
<td>60</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>76</td>
<td>0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2016</td>
<td>1</td>
<td>1</td>
<td>80</td>
<td>0</td>
<td>35</td>
<td>15</td>
<td>116</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>2</td>
<td>2</td>
<td>79</td>
<td>0</td>
<td>32</td>
<td>18</td>
<td>113</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>1</td>
<td>0</td>
<td>106</td>
<td>0</td>
<td>43</td>
<td>14</td>
<td>150</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Strategies

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

Intellectual Property Protection
- Patent protection: TSMC continuously updates the Company’s patent portfolio to fully protect its R&D achievement through expanding its portfolio
- Trade secret protection: TSMC strengthens the Company’s operations and intellectual property innovation through the registration and management of trade secrets, which involves recording and integrating applications for trade secrets that are competitive advantages for the Company

Long-term Goals

- 5nm process technology in volume production
  - Target Year: 2020
- Maintain a 5% increase in the number of global patent filings each year
  - Target Year: 2020
- Maintain a 10% increase in the number of registered trade secrets
  - Target Year: 2020

2018 Achievements

- Volume ramp-up of industry-leading 7nm process technology, the 4th generation technology to make use of 3D FinFET transistors
  - Target: 7nm process technology in risk production
- Approved global patent applications >5,100
  - Target: >5,100
- Registered trade secrets >8,800
  - Target: >8,800

2019 Targets

- Risk production of 5nm, the 5th generation finFET CMOS platform technology for SoC
- Approved global patent applications >5,100
  - Target: >5,100
- Registered trade secrets >10,000
  - Target: >10,000
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

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

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
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

- Led the industry in volume manufacturing of 16nm technology, the first integrated technology platform to make use of 3D FinFET transistors.
- Completed the transfer to manufacturing of industry-leading 10nm technology, the 3rd generation of technology platform to make use of 3D FinFET transistors.
- Completed the transfer to manufacturing of the industry leading 7nm technology, the 4th generation of technology to make use of 3D FinFET transistors.
- 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.
- Successfully qualified InFO PoP (Integrated Fan-Out Package on Package) advanced packaging technology, low cost solution for mobile customers.
- Completed the transfer to manufacturing of Industry-leading 10nm technology, the 3rd generation of technology platform to make use of 3D FinFET transistors.
- Completed the transfer to manufacturing of the industry leading 7nm technology, the 4th generation of technology to make use of 3D FinFET transistors.
- The world’s leading volume production of InFO PoP Gen-2 for mobile application processor packaging.
- Achieved the world’s first high-volume production of InFO PoP for mobile application processor packaging, 0.18 µm 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-3 for mobile application processor packaging.
- 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 InFO PoP technology, which integrated 7nm SoC (System on Chip) and DRAM for advanced mobile devices, began volume production in the second quarter.
- 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.
- The world’s leading volume production of InFO PoP Gen-2 for mobile application processor packaging.
- Achieved the world’s first high-volume production of InFO PoP for mobile application processor packaging.
- The world’s leading 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.

2018 Corporate Social Responsibility Report
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.
• 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

Detailed online records of invention, technology innovation or improvement

Enabling prompt collection of relevant evidence in cases of misappropriation

Monitoring and prevention of trade secret leakage

Integration with other systems for maximum synergy

Strategic Management of IP Portfolio

Advantages of the Trade Secret Registration and Management System

Enhancing Competitiveness
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.
Manufacturing Excellence

Enhanced Intelligent Pool 2018
- Research pool consisting of 1,000 IT experts and 300 machine learning experts built
- Efforts to develop advanced technologies and potential applications through the intelligent system continued

Enhanced Intelligent System 2017
- Machine learning development platform constructed to accelerate development and expand scale of application
- A program to cultivate 300 machine learning experts launched

Cross-field Talent Development 2013-2016
- Big Data Analytics for Semiconductor Manufacturing Contest held for three consecutive years in collaboration with MoST and NTHU, with 300 teams from 50 universities
- Big data courses collaborated and improved together with NTU, NTHU, and NCTU, providing both theoretical and practical teaching in class

Intelligent Manufacturing Launched 2011
- Wafer Big Data Infrastructure constructed
- Analysis results produced by artificial intelligence introduced to the manufacturing system

Enhanced Automation 2010
- Productivity of employees at mature manufacturing process foundries increased by 10% to 15% annually

Automation Launched 2000
- First automated 12-inch GIGAFAB® facilities in the industry built
- 100% automated wafer fabrication achieved
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 customers' 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.
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 universities from 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

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

Featured Projects and Partners

<table>
<thead>
<tr>
<th>Projects</th>
<th>Our Partners</th>
</tr>
</thead>
</table>
| 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

**Product Life Cycle Management**

Based on the Company’s comprehensive strategy on product life cycle management, TSMC assesses the environmental and social impacts its products will bring at every state of the life cycle in order to provide customers with products that have low environmental, carbon, and water footprints.

**Hazardous Substance Management**

Continue to execute projects on the substitution of hazardous raw materials used in the manufacturing process.

**2018 Achievements**

- Complete life cycle assessments on all factory-wide products.
  - Target Year: 2019

- 100% compliance with legal regulations and customer standards on hazardous-substance-free products.
  - Target: 100%
  - Target Year: In progress

- Reduce the use of N-methylpyrrolidone (NMP) by 95%, compared to 2016.
  - Target Year: 2020

**2019 Targets**

- Complete life cycle assessments on all factory-wide products.

- 100% compliance with legal regulations and customer standards on hazardous-substance-free products.
  - Target: 100%

- 86% completion of substituting all PFOA-related substances.
  - Target: 100%

- 48% reduction in the use of NMP.
  - Target: 70%

**Note**

Since the substitute chemicals have been found to affect the yield of certain products, further adjustments and testing are needed.
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.
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)

<table>
<thead>
<tr>
<th>Category</th>
<th>Raw Material</th>
<th>Manufacturing</th>
<th>Transporation</th>
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</thead>
<tbody>
<tr>
<td>Specific emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate change</td>
<td>26.12%</td>
<td>71.43%</td>
<td>2.45%</td>
</tr>
<tr>
<td>Ozone depletion</td>
<td>0.00%</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Evaluation of Human toxicity, cancer effects</td>
<td>100%</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Particulate matter</td>
<td>25.68%</td>
<td>73.61%</td>
<td>0.70%</td>
</tr>
<tr>
<td>Ionizing radiation HH</td>
<td>25.61%</td>
<td>79.11%</td>
<td>0.28%</td>
</tr>
<tr>
<td>Ionizing radiation E (interim)</td>
<td>25.00%</td>
<td>75.00%</td>
<td></td>
</tr>
<tr>
<td>Photochemical ozone formation</td>
<td>26.12%</td>
<td>71.43%</td>
<td>2.45%</td>
</tr>
<tr>
<td>Acidification</td>
<td>25.82%</td>
<td>71.22%</td>
<td>0.95%</td>
</tr>
<tr>
<td>Terrestrial eutrophication</td>
<td>26.14%</td>
<td>71.32%</td>
<td>2.54%</td>
</tr>
<tr>
<td>Freshwater eutrophication</td>
<td>21.68%</td>
<td>78.22%</td>
<td>0.10%</td>
</tr>
<tr>
<td>Marine eutrophication</td>
<td>26.23%</td>
<td>71.72%</td>
<td>2.05%</td>
</tr>
<tr>
<td>Freshwater ecotoxicity</td>
<td>29.14%</td>
<td>69.75%</td>
<td>1.11%</td>
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<tr>
<td>Land use</td>
<td>29.32%</td>
<td>65.74%</td>
<td>4.94%</td>
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<tr>
<td>Water resource depletion</td>
<td>81.84%</td>
<td>18.13%</td>
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<tr>
<td>Mineral, fossil &amp; ren resource depletion</td>
<td>80.68%</td>
<td>15.91%</td>
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</tr>
</tbody>
</table>

Water Footprint of Wafer Products
(12-inch wafers)

- Raw material extraction and production: 27%
- In-fab direct water use: 42%
- In-fab energy consumption: 31%
- In-fab energy consumption: 25%
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

<table>
<thead>
<tr>
<th>International Regulations / Customer Requirements</th>
<th>Description of Legal Compliance</th>
</tr>
</thead>
</table>
| European Union Restriction of Hazardous Substance (EU RoHS) | • 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 | • All TSMC products are compliant |
| Perfluorooctanesulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA) Restriction in Process | • 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 | • All TSMC products are compliant |
| EU REACH Substances of Very High Concern (SVHC) | • All TSMC products are compliant |
| EU Waste Electrical and Electronic Equipment (WEEE) Directive | • 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 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, perfluoralkyl 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

**International Laws and Regulations**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Year(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOS</td>
<td>2010</td>
<td>Stockholm Convention on Persistent Organic Pollutants Usage restricted in various countries starting 2010</td>
</tr>
<tr>
<td>PFOA</td>
<td>Listed by the European Chemicals Agency (ECHA) as a substance of very high concern (SVHC) Starting 2013, any products imported into EU that are found to contain PFOA must be disclosed</td>
<td></td>
</tr>
<tr>
<td>PFOA-related substances</td>
<td>Listed by the ECHA as a SVHC Starting 2015, any products imported into EU that are found to contain PFOA-related substances must be disclosed</td>
<td></td>
</tr>
<tr>
<td>Short-chain PFASs</td>
<td>The EU and the Environmental Protection Agency (EPA) of the United States have begun assessing whether the substances pose any harm</td>
<td></td>
</tr>
</tbody>
</table>

**TSMC's Responsive Action**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Year(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOS</td>
<td>2010</td>
<td>Completed implementation of substitutes</td>
</tr>
<tr>
<td>PFOA</td>
<td>2015</td>
<td>Completed implementation of substitutes ahead of legal regulations</td>
</tr>
<tr>
<td>Short-chain PFASs</td>
<td>Starting 2017, monitor assessments conducted by the EU and EPA Conduct research plans for substitutes</td>
<td></td>
</tr>
<tr>
<td>PFOA-related substances</td>
<td>2019</td>
<td>Expected completion of substitute implementation, ahead of legal regulations</td>
</tr>
</tbody>
</table>
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 technology continue to boost the energy efficiency of computers, communication, data centers, power plants, and ultimately the whole of Taiwan.

In the past five years, 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.

13% in Taiwan's industrial electric energy savings

10% in Taiwan's industrial electric energy savings

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

1993
- Pioneered to install an independent NMP waste liquid collection system.

2015
- Listed NMP and other CMR substances as controlled substances to avoid in the production of new materials.

2016
- Created and implemented a new liquid photoresist in the photoresist stripping and cleaning process.

2017
- Substituted NMP with ultrapure water combined with carbon dioxide, effectively reducing the use of NMP.

2018
- Company-wide use of NMP reduced by 48%.

2019
- Company-wide use of NMP reduced by 70%.

2020
- Company-wide use of NMP reduced by 95%.
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 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)

Chip Die Size Cross-Technology Comparison

Die size is shrinking as line width shrinks

<table>
<thead>
<tr>
<th>Die Size</th>
<th>55 nm</th>
<th>40 nm</th>
<th>28 nm</th>
<th>16 / 12FFC</th>
<th>10 nm</th>
<th>7 nm</th>
<th>5 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>N55LP</td>
<td>1.2V</td>
<td>0.48</td>
<td>0.25</td>
<td>0.11</td>
<td>0.063</td>
<td>0.047</td>
<td>0.035</td>
</tr>
<tr>
<td>N40LP (1.1V)</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N28HPM (0.9V)</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N16 / 12FFC (0.8V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10 nm (0.75V)</td>
<td></td>
<td></td>
<td>0.07</td>
<td></td>
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</tr>
<tr>
<td>7 nm (0.75V)</td>
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<td></td>
</tr>
<tr>
<td>5 nm (0.75V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>N55LP (1.2V)</th>
<th>N40LP (1.1V)</th>
<th>N28HPM (0.9V)</th>
<th>N16 / 12FFC (0.8V)</th>
<th>10 nm (0.75V)</th>
<th>7 nm (0.75V)</th>
<th>5 nm (0.75V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.3</td>
<td>0.07</td>
<td>0.056</td>
<td>0.034</td>
<td>0.022</td>
<td></td>
</tr>
</tbody>
</table>

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

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

- 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.

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.

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.
Product Quality

Long-term Goals

- Create an annual benefit of NT$10 billion from the enhancement programs
  - Target: 41,228 suggestions

- Encourage 100% local supplier participation in Taiwan Continuous Improvement Competition and 60% advancing to the finals
  - Target: 1,957 cases

- Attained NT$10.25 billion in combined benefits from CIT and suggestion programs
  - Target: NT$10 billion

- Local supplier participation reached 94%
  - Target: 80%

2018 Achievements

- 43,005 suggestions from grassroots level
  - Target: 41,228 suggestions

- 2,196 continuous improvement cases
  - Target: 1,957 cases

- Attained NT$10.25 billion in combined benefits from CIT and suggestion programs
  - Target: NT$10 billion

- Local supplier participation reached 94%
  - Target: 80%

- The monthly productivity of each 12-inch wafer visual inspector reached 4,928 pieces
  - Target: 4,860 pieces

- Developed the ability to analyze 62% of CMR substances
  - Target: 49%

- Complete reliability qualification for N7+ technology and specialty technologies

- Completed integrated Fan-Out (InFO) packaging technology and reliability qualification for third generation application processors and integrated passive components

- Completed process development reliability qualification for the second generation Diffractive Optical Element (DOE), which supports mobile phone 3D induction and facial recognition
  - Target: Complete reliability qualification for N7+ technology and specialty technologies

2019 Targets

- 41,367 suggestions from grassroots level
  - Target: 41,228 suggestions

- 1,996 continuous improvement cases
  - Target: 1,957 cases

- Attained NT$10.25 billion in combined benefits from CIT and suggestion programs
  - Target: NT$10 billion

- 100% of local suppliers participate in Taiwan Continuous Improvement Competition

- Increase the monthly productivity of each 12-inch wafer visual inspector to 5,250 pieces
  - Target: 4,928 pieces

- Develop the ability to analyze 77% of CMR substances

Note: The original goal for 2020 of 100% participation is expected to be reached in 2019. Therefore, the goal was updated with the percentage of finals participation as part of the goal.
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

- **Design Service**
  - IP / Library Development Quality Assurance
  - Design Kits Deliverables Management

- **Tech Development**
  - SPICE Model Management
  - Process Technology Development Management
  - Build In Reliability Test
  - Process Release Standard

- **Mask Making**
  - Remote Mask DB Check
  - eTapeOut
  - Mask Defect Inspection

- **Wafer Manufacturing**
  - Incoming Quality Control
  - Advanced Process Control
  - EQ Real Time Monitor
  - Process Reliability Monitor
  - Wafer Acceptance Test
  - Outgoing Quality Gating

- **Backend Service**
  - Subcontractor Quality Management
  - Package Reliability Monitor
  - Outgoing Quality Gating

**Quality Tools Application**

- Change Control Platform
- Potential Failure Mode & Effect Analysis
- Control Plan
- Statistical Process Control
- Measurement System Analysis
- Supplier / Subcontractor Quality Management
- Continual Improvement – 8Ds
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.
Highlight Cases in the 2018 Total Quality Excellence (TQE) & Innovation Conference

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

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.
**Participating TSMC Cases in 2018 Taiwan Continuous Improvement Competition**

<table>
<thead>
<tr>
<th>Case</th>
<th>Benefit</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct a machine maintenance automatic scheduling system and an intelligent information center</td>
<td>● Increased employee productivity by 49%, with a total benefit of NT$670 million</td>
<td>Gold Award</td>
</tr>
</tbody>
</table>
| Develop 10nm wafer probe cards and automatic needle implanters       | ● 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 | Gold Award, Best Improvement and Innovation Award |
| Develop Near-InfraRed (NIR) sensor special structure process technology | ● 3 time improvement of sensor quantum efficiency; helped customers win the annual new products award | Gold Award, Best Improvement and Innovation Award |
| Improve old piping and management system                             | ● Reduce the number of abnormal pipeline leakage to 0 per season, and reduce the cost of pipeline maintenance downtime by NT$9.4 billion | Gold Award                     |
| Improve AI defect image recognition systems                          | ● 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 | Silver Award                   |

**Total benefit of NT$670 million**

**Total benefit of NT$389 million**

**Helped customers win the annual new products award**

**Reduce the cost of pipeline maintenance downtime by NT$9.4 Billion**

**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 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.
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>4,076</td>
<td>4,000</td>
</tr>
<tr>
<td>2015</td>
<td>4,247</td>
<td>4,160</td>
</tr>
<tr>
<td>2016</td>
<td>4,441</td>
<td>4,325</td>
</tr>
<tr>
<td>2017</td>
<td>4,747</td>
<td>4,500</td>
</tr>
<tr>
<td>2018</td>
<td>4,928</td>
<td>4,860</td>
</tr>
</tbody>
</table>

Materials tested for CMR substances

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>62</td>
<td>0</td>
</tr>
</tbody>
</table>
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 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.
- **After improvement**: Use a mechanical roller to remove the frame label, tape and dirt, and use pure water for automatic cleaning.

| 14.6 | Saves 14.6 metric tons of chemical use per year |
| 77%  | Improves productivity and yield rate by 77% |
Customer Service

Strategies

Precise Response
Provide excellent customer service through close collaboration with customers and customer meetings and surveys on a regular basis to understand and respond to their requirements and feedback.

Virtual Fab
Provide comprehensive information in a timely manner to ensure the success of customer’s final products; strengthen processes and systems to hold the highest standards to protect customer product information.

Long-term Goals

Maintain customer satisfaction ratings of over 90% (Note 1) 
Target: Over 90% 
Target Year: 2025

In line with TSMC’s technology roadmap, provide customers with over 1,000 types of available manufacturing technology (Note 2) 
Target: 1,000 
Target Year: 2025

Pass customer product information audit with no major flaws
Target: 2025

2018 Achievements

According to quarterly evaluations, customer service satisfaction ratings reached 74%
Target: >72%

Customer satisfaction ratings reached 93%
Target: >90%

In line with TSMC’s technology roadmap, TSMC-Online provided customers with over 339 types of manufacturing and process technologies
Target: 330

Provided customers with 701 types of available manufacturing and process technologies 
Target: 700

Passed customer product information audit with no major flaws
Target: No flaw

2019 Targets

Maintain a customer satisfaction rating of over 90%

Provide customers with over 750 types of available manufacturing and process technologies

Pass customer product information audit with no major flaws

Note 1 Since 2019, the range of customer service satisfaction has been extended from quarterly service satisfaction review and rating to the satisfaction with TSMC.

Note 2 Starting from 2019, types of available manufacturing and processing technology will also include technologies under development.
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 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

Unit: %

2014 2015 2016 2017 2018
64 70 72 71 74

Annual Customer Satisfaction

Unit: %

2014 2015 2016 2017 2018
93 93 95 93 93

9,000 Sets of technical files and production design kits to assist in customer component design, and improve the integration of product design and manufacturing process.

400,000 People visited TSMC-Online.

100,000 Downloads of technical files and production design kits.
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 as a safe IC provider. 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

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**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.

<table>
<thead>
<tr>
<th>Easier Access to Information</th>
<th>Days</th>
<th>Less Time to Customize Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wafer Status (Engineering Goods)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Sheet Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tested Wafer Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wafer Status (Mass Production)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Packaging WIP Status</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Manual Information Collection into Process Reports

Customer recognition of TSMC's excellence in customer service
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.
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.

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

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

1.1% Employee PIP violation rate: 1.1%
Cause: individual negligence of 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

2018 Proprietary Information Protection Enforcement Status
TSMC Delivers Unrivalled Manufacturing Flexibility

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

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

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% of commodities purchased are DRC conflict-free.
Supplier Sustainability Management

**Strategies**

**Sustainability Risk Management**

All suppliers are required to comply with the Code of Ethics and Business Conduct, and to follow regulations on human rights and conflict-free minerals. TSMC continues to conduct sustainability risk assessments, and encourages major critical suppliers to join the Responsible Business Alliance (RBA).

**Long-term Goals**

- Tier 1 suppliers have to sign and comply with TSMC’s Code of Ethics and Business Conduct.
  - Awareness rate of Supplier Business Conduct: 98% (NEW)
  - Target: 2025
- Awareness rate of the Whistle Blower System: 95%
  - Target: 2025
- Critical suppliers perform annual self-assessments of their upstream suppliers: sign the Suppliers Code of Conduct and Self-Assessment Questionnaire of Sustainability Management: 100% (NEW)
  - Target: 2025
- Constantly perform sustainability risk assessments, and encourage critical suppliers to join the RBA.
  - Require critical suppliers to accept third-party audit firms that have been approved by the RBA to conduct sustainability risk audit. The completion rate is targeted to reach 100% (NEW)
  - Target: 2025
- Strengthen supply chain resilience:
  - Keep dispersing manufacturing bases and evaluating the introduction of new suppliers. Complete 64 items of the single source reduction scheme (NEW)
  - Target: 2020
- School suppliers to observe and learn from TSMC annual emergency response drill: 200 suppliers in total (compared to 2016)
  - Target: 2025

**2018 Achievements**

- 100% of Tier 1 suppliers have signed the Suppliers Code of Conduct, TSMC Guidance on Supplier Business Conduct, and the Self-Assessment Questionnaire of Sustainability Management
  - Target: 100%
- Conducted quarterly audit on supplier’s employees that work at TSMC factory sites for 7 consecutive days and other labor issues. The proportion in 2018 has dropped by 51% compared to 2017
  - Target: Ensure suppliers’ employees who work at TSMC factory sites comply with laws and regulations
- A total of 33 suppliers have completed the audit.
  - Target: 30 critical suppliers
- The achievement rate for serious violation improvement reached 90.9%
  - Target: 80%
- 20 suppliers were invited to observe TSMC annual emergency response drills
  - Target: 20 suppliers
- Purchased 100% conflict-free minerals
  - Target: 100%
- Completed audits of 2 conflict mineral suppliers
  - Target: Audit 3 direct suppliers of conflict minerals
- Surpassed
- Achieved
- Unachieved

**2019 Targets**

- 100% of Tier 1 suppliers to sign the Suppliers Code of Conduct
- 100% of Tier 1 suppliers to sign the Self-Assessment Questionnaire of Sustainability Management
- 100% of Tier 1 suppliers to sign the TSMC Guidance on Supplier Business Conduct and to carry out internal training
- Continue to audit supplier employees that work at factory sites for compliance with laws and regulations on working hours
- Continuously require critical suppliers to accept a professional audit of sustainability risks by third-party audit firms that have been approved by the RBA. The target of completion rate is to reach 100% in 2021
- The target of suppliers’ participation in emergency response drill: At least invite 20 suppliers (88 suppliers as a cumulative sum) to observe and learn from TSMC annual emergency response drill
- Purchase 100% conflict-free minerals
### Local Supply Chain Optimization

Enhance the core capability of local suppliers, protect the rights of entry-level local labor, and increase local sourcing. Cooperate with suppliers to conserve electricity and water, and reduce waste.

#### Strategies

- Coach suppliers to keep improving
  - The number of suppliers participating in the training program of Environmental, Safety and Health (ESH): 400 in total (with base year of 2016)
  - Target Year: 2025
  - The number of suppliers coached to advance processes and improve quality: 38 in total (with base year of 2016)
  - Target Year: 2025
- Increase local sourcing rate:
  - Over 57.5% for indirect raw materials\(^{Note8}\)
  - Over 50% for spare parts\(^{Note9}\)
  - Over 38% for backend equipment
  - Target Year: 2020
- Coach 30 suppliers to save electricity, and the total accumulated energy savings is 2% higher than the annual energy consumption in 2018\(^{Note10}\)
  - Target Year: 2025
- Reduce waste volume of major local waste-producing suppliers by 28% (compared to 2014)\(^{Note11}\)
  - Target Year: 2015
- Reduce waste volume by major local waste-producing suppliers by 26.2%\(^{Note12}\)
  - Target: 21.5%

#### Long-term Goals

- Coach 7 local materials suppliers (33 as a cumulative sum) to improve manufacturing processes and increase yield rate
- Local sourcing achievements
  - 42.5% for indirect raw materials\(^{Note8}\)
  - 57.7% for spare parts\(^{Note9}\)
  - 48.9% for spare parts
  - Target: 67%\(^{Note10}\)
  - 33.4% for backend equipment
  - Target: 33%
- Coach 8 suppliers to take action on energy-saving. Energy-saving to be 0.5% higher than the consumption
- Reduce waste volume by major local waste-producing suppliers by 28% (compared to 2014)

#### 2018 Achievements

- The plan to increase local sourcing rate targets Taiwan as its primary operation location
- 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

#### Note

- **Note 8**: The plan to increase local sourcing rate targets Taiwan as its primary operation location.
- **Note 9**: 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.
- **Note 10**: Currently a higher proportion of advanced processes are required for spare parts. The quality of suppliers in Taiwan failed to meet TSMC requirements; therefore, the local sourcing target has been reset from 70% to 50%.
- **Note 11**: The suppliers of local raw materials produce 80% of waste. Calculation method: the numerator is the waste volume of a given month, and the denominator is the total production volume of the factory of the given month. The calculation is based on volume after output.
- **Note 12**: TSMC raises auditing standards, and Mainland China will continue to improve in 2019.
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.

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.
Supplier Risk Management Process

Risk Assessment
TSMC continues to conduct Tier 1 supplier risk assessments through four major assessment methods, including SAQ, 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.

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

- 1,229 Tier 1 suppliers attended supplier ethics training (100%)
- 113 high-risk suppliers received on-site audit (100%)
- 1,229 Tier 1 suppliers signed the Supplier Code of Conduct (100%)

TSMCs New Supplier Risk Assessment

- TSMC needs new suppliers
- TSMC confirms the partnership with new suppliers
- New suppliers sign the TSMC Supplier Code of Conduct
- TSMC conducts risk assessment and periodic audit
- New suppliers commit to becoming sustainable

Supplier Risk Management Process

2018 Risk Assessment Results

<table>
<thead>
<tr>
<th>Suppliers Assessed</th>
<th>Assessment Methods</th>
<th>Assessment Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1 Suppliers</td>
<td>SAQ + on-site audit + serious violation assessments + TSMC team of experts' identification of high-risk suppliers</td>
<td>113 high-risk suppliers</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Supplier Audited</th>
<th>Audit Methods</th>
<th>Audit Score</th>
<th>Audit Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>74</strong> TSMC Audit Team</td>
<td>On-site audit and evaluation: 74 in total</td>
<td>78</td>
<td>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</td>
</tr>
<tr>
<td><strong>33</strong> Third-party Audit</td>
<td>Audit on sustainability risks was conducted by RBA-certified third-party audit firms</td>
<td></td>
<td>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’</td>
</tr>
</tbody>
</table>

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.
Published an updated version of the Supplier Code of Conduct
- 100% of the Tier 1 suppliers signed the Supplier Code of Conduct
- 100% of the Tier 1 suppliers signed the SQA
- 100% of the Tier 1 suppliers signed the Supplier Code of Practice and implemented internal trainings
- 100% of the high-risk suppliers were audited by TSMC or third-party audit firms and continued improvements
- Required critical suppliers to conduct annual self-assessments of their upstream suppliers

Provide coaching services to local raw material suppliers in order to improve their manufacturing processes and increase their yield rate: 9 suppliers (an accumulated total of 38 suppliers)
- Targeted increase rate of local sourcing:
  - Indirect raw materials: 57.5%
  - Local spare parts: 50%
  - Local backend equipment: 38%

100% of critical suppliers will be audited by RBA-certified third-party audit firms

Critical suppliers in all three aspects will disclose and report their upstream suppliers’ current performance on responsible sustainability
- The waste output of major local waste-producing suppliers will be reduced by 24% compared to 2014
- The number of suppliers that will take part in environmental safety and health (ESH) training program will accumulate to a total of 200 compared to 2016
- Provide counseling services to the factories of 30 suppliers to implement energy-saving programs. The cumulative amount of energy saved will have to be 3% higher than the energy used in 2018
**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.

<table>
<thead>
<tr>
<th>Problems / Challenges</th>
<th>Action Plans</th>
<th>Tactics / Actions</th>
<th>Number of Suppliers</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSMC’s supply chain is located in a seismic zone; bad emergency response will lead to a higher risk of supply disruptions caused by natural disasters</td>
<td>Improve supply chain resiliency</td>
<td>Continue to mitigate the situation of single sourcing in procurement</td>
<td>–</td>
<td>Through cross-functional cooperation, TSMC makes an annual action plan that requires suppliers to separate their manufacturing bases in different locations, and assesses the new suppliers. The plan effectively lowered the risk of supply disruptions caused by single sourcing. TSMC also developed 37 programs in 2018</td>
</tr>
<tr>
<td>The issue of consecutively working for 7 days</td>
<td>Protect labor rights</td>
<td>Invite suppliers to observe and learn from TSMC’s annual emergency response drills</td>
<td>20</td>
<td>20 suppliers participated in observation and learning programs for emergency response drill in 2018, bringing the total number to 68 suppliers</td>
</tr>
<tr>
<td>Contractors and their operational subcontractors at TSMC factory sites do not implement proper workplace safety rules</td>
<td></td>
<td>Require suppliers to be audited by RBA-certified third-party audit firms</td>
<td>33</td>
<td>33 suppliers were audited in 2018</td>
</tr>
<tr>
<td>Contractors do not pay their subcontractors on time</td>
<td></td>
<td>quarterly audit on suppliers’ employee working-hours management at TSMC factory sites to check if there is any issue of employees working consecutively for 7 days</td>
<td>–</td>
<td>Weekly audit on supplier’s employee attendance at TSMC factory sites. Compared to the baseline year (Dec. 2017), the rate decreased by 51% in 2018</td>
</tr>
<tr>
<td>Suppliers do not sign the Code of Ethics and the Supplier Code of Conduct</td>
<td></td>
<td>Strengthen contractor workplace safety management, especially for on-site operational subcontractors and further downstream subcontractors. Establish clear penalties, and fines for violations of workplace safety rules</td>
<td>–</td>
<td>Add violation penalties to the order form. Once suppliers accept the order, they are also considered as accepting the violation penalties</td>
</tr>
<tr>
<td>Whether suppliers comply with regulation on sourcing conflict-free mineral raw materials</td>
<td></td>
<td>Require contractors and subcontractors at all levels to sign the statement of Contract Labor Payment Implementation Measures provided by TSMC</td>
<td>–</td>
<td>Require contractors who did not pay their employees on time to improve the situation immediately and sign a statement to ensure that this situation will never recur</td>
</tr>
<tr>
<td>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</td>
<td></td>
<td>Require Tier 1 suppliers to sign and comply with the Code of Ethics and the Supplier Code of Conduct</td>
<td>1,229</td>
<td>100% of Tier 1 suppliers have signed the statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to conduct due diligence in order to ensure 100% conflict-free mineral sourcing</td>
<td>31</td>
<td>The supply chain achieved 100% conflict-free mineral sourcing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require material suppliers to source conflict-free minerals for products containing cobalt and actively disclose the list of cobalt smelters</td>
<td>8</td>
<td>8 cobalt material suppliers have disclosed their smelters</td>
</tr>
</tbody>
</table>

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.

### Action Plans

- **Problems / Challenges**
  - Challenges of metrology technology improvement in advanced manufacturing process, quality improvement, and capacity expansion
  - There is still a wide gap for some small-sized local suppliers' performance to meet TSMC's requirements on OSH

- **Tactics / Actions**
  - Organized the 2018 Materials of Advanced Manufacturing Process Forum
  - Provided coaching services to assist suppliers in gaining three important capabilities: capacity building, advanced metrology technology improvement, and manufacturing quality
  - Continued to provide on-site coaching services to suppliers via third-party consultants in order to improve suppliers' occupational health performance
  - Added labor rights and business-related ethical issues in the original agenda of the Supply Chain ESH Forum and renamed it to the Responsible Supply Chain Forum
  - Provided on-site coaching services to suppliers and gave suggestions on ESH. Moreover, TSMC required suppliers to take action to improve their ESH performance

- **Number of Suppliers**
  - 29
  - 17
  - 74
  - 31
  - 10

- **Performance**
  - Invited 29 materials suppliers for advanced manufacturing process to participate in the forum
  - Completed quality improvements for 50 materials used in advanced manufacturing process. 20 suppliers fulfilled the requirements of 10nm mass production and 100% of them completed capacity building
  - A total of 31 suppliers participated in the Supply Chain Occupational Health Promotion Program
  - The average supplier's ESH score increased from 77 in 2017 to 78 in 2018 out of a full score of 100
  - Created booklets of ESH guidelines for suppliers
  - Required the top 10 suppliers that produce the most business waste per unit (+) to continue to reduce their waste and update their progress every year
  - Required suppliers to properly dispose their waste. In addition to the random audit, TSMC also required suppliers to sign a statement to ensure that they will properly dispose the waste produced by their factories

### Notes

**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

- 31 Tier 1 Suppliers
- 259 Smelters
- 100% Conflict-free Mineral Sourcing

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 VisTea.
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

- May: 60
- June: 50
- July: 32
- August: 32
- September: 21
- October: 18
- November: 21
- December: 8

Graph showing the number of instances tank truck loading time exceeded 8 hours in 2018.
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 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)¹, 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Spare Parts</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>65</td>
<td>44</td>
</tr>
<tr>
<td>2017</td>
<td>66</td>
<td>44</td>
</tr>
<tr>
<td>2018</td>
<td>49</td>
<td>42</td>
</tr>
<tr>
<td>2019</td>
<td>50</td>
<td>36</td>
</tr>
</tbody>
</table>

### United States

<table>
<thead>
<tr>
<th>Year</th>
<th>Spare Parts</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>78</td>
<td>56</td>
</tr>
<tr>
<td>2017</td>
<td>73</td>
<td>34</td>
</tr>
<tr>
<td>2018</td>
<td>94</td>
<td>68</td>
</tr>
<tr>
<td>2019</td>
<td>94</td>
<td>68</td>
</tr>
</tbody>
</table>

### China

<table>
<thead>
<tr>
<th>Year</th>
<th>Spare Parts</th>
<th>Raw Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>32</td>
<td>9</td>
</tr>
<tr>
<td>2017</td>
<td>33</td>
<td>11</td>
</tr>
<tr>
<td>2018</td>
<td>37</td>
<td>9</td>
</tr>
<tr>
<td>2019</td>
<td>37</td>
<td>9</td>
</tr>
</tbody>
</table>
## Case Study

### 2018 Local Supplier Coaching Results

<table>
<thead>
<tr>
<th>Scope of Coaching Services</th>
<th>Category / Number of Suppliers</th>
<th>Problems</th>
<th>Improvement Methods</th>
<th>Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide coaching services to local spare parts processing and manufacturing companies in order to assist them in developing high-end spare parts made by advanced manufacturing process</td>
<td>Spare parts maintenance / 2</td>
<td>The import rate of some high-end spare parts made by advanced manufacturing process is quite high, and domestic suppliers lack certain critical processing technologies</td>
<td>Form a professional team to provide coaching services to local companies. Define products needed to be developed, and provide technical support in order to assist suppliers in completing the verification and to create a win-win situation</td>
<td>Has developed 307 projects and completed 31 verifications</td>
</tr>
<tr>
<td>Capacity Building</td>
<td>Chemicals / 1</td>
<td>Capacity fails to meet the requirements of advanced manufacturing processing</td>
<td>production line expansion</td>
<td>Capacity has increased by 4 times</td>
</tr>
<tr>
<td>Improving Advanced Metrology Technology</td>
<td>Chemicals / 3</td>
<td>Metrology technology fails to meet the requirements of advanced manufacturing processing</td>
<td>Add analytical instruments and optimize manufacturing processing</td>
<td>Equipped with the capacity to analyze IC materials</td>
</tr>
<tr>
<td></td>
<td>Photoreisits / 2</td>
<td>Product impurity is too high</td>
<td>Improve the nature of the production line</td>
<td>Impurity index has been reduced by 50%</td>
</tr>
<tr>
<td>Product Quality Improvement</td>
<td>Chemicals / 4</td>
<td>Bad transportation quality</td>
<td>Manufacturing processing standardization</td>
<td>Zero return rate</td>
</tr>
<tr>
<td></td>
<td>Photoreisits / 3</td>
<td>Environmental pollution and unprofessional performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gases / 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESH Performance Improvement</td>
<td>Gases / 1</td>
<td>A proper ESH procedure has not yet been established</td>
<td>Invite professionals to establish an ESH policy and provide training programs</td>
<td>ESH score has improved by 21%</td>
</tr>
<tr>
<td></td>
<td>Chemicals / 1</td>
<td>Inadequate safety protection from hazardous gases</td>
<td>Examine and improve gas safety protection systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Communicate with senior supervisors to gain their full support</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ESH supervisor holds a concurrent post</td>
<td>Hire a professional fire engineering company to improve the fire protection system and to conduct daily maintenance</td>
<td>ESH score has improved by 22%</td>
</tr>
</tbody>
</table>


**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

**Strategies**

- **Drive Low-Carbon Manufacturing**
  - Use best available technology to reduce emissions of greenhouse gases (GHG), becoming an industry leader in low-carbon manufacturing.

- **Use Renewable Energy**
  - Continue to purchase renewable energy while establishing a solar-energy power system, increasing the use of renewable energy.

- **Increase Energy Efficiency**
  - Plan for new energy-saving measures each year and actively implement energy-saving measures, increasing the efficiency of power consumption.

- **Strengthen Climate Resilience**
  - Establish climate change countermeasures and preemptive precautions, lowering the risks of climate change.

**Long-term Goals**

- **Greenhouse gas emissions per unit of production (metric ton of carbon dioxide equivalents (MTCO₂e) / 8-inch equivalent wafers mask layers): down 18% (base year of 2010)**
  - Target: 2020

- **Fluorinated greenhouse gas (F-GHG) emissions per unit of production (MTCO₂e / 8-inch equivalent wafers mask layers): down 60% (base year of 2010)**
  - Target: 2020

- **Total fluorinated greenhouse gas emissions: down 10% (base year of 2010)**
  - Target: 2020

**2018 Achievements**

- **Greenhouse gas emissions per unit of production down 7.5%**
  - Target: 2018

- **Fluorinated greenhouse gas emissions per unit of production down 9.0%**
  - Target: 2018

- **Total fluorinated greenhouse gas emissions down 2.8%**
  - Target: 2018

- **Energy consumption per unit of production (kWh / 8-inch equivalent wafers-mask layer): down 12% (base year of 2010)**
  - Target: 2020

- **Save 2.8 billion total kWh between 2016 and 2025 through implementation of new energy-saving measures**
  - Target: 2025

**2019 Targets**

- **Greenhouse gas emissions per unit of production down 16.5% (base year of 2010)**
- **Fluorinated greenhouse gas emissions per unit of production down 60% (base year of 2010)**
- **Total fluorinated greenhouse gas emissions down 15% (base year of 2010)**
- **880 GWh in Renewable Energy, Renewable Energy Certificates (REC), & Carbon Credit purchased (including all overseas fabs & offices)**
  - Target: Continuous purchasing of renewable energy
- **Signed long-term contracts for 90 MW (Megawatts) of renewable power in Taiwan**
  - Target: 2025
- **Energy consumption per unit of production down 11.5% (base year of 2010)**
- **Energy saving goal of 200 GWh, and total energy savings of 1,100 GWh**
- **0 days of lost production due to climate disasters**
  - Target: 2025
- **Note**
  - Process technologies of IC foundries are growing increasingly complex, and consequently power consumption used in production is also increasing. In the future, TSMC will continue to increase the ratio of renewable energy in the Company's energy portfolio to offset rising energy consumption.
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

<table>
<thead>
<tr>
<th>Green House Gas Regulatory Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
</tr>
<tr>
<td>Nov. Published CSR policy</td>
</tr>
<tr>
<td>Jul. GHG Reduction &amp; Management Acts</td>
</tr>
<tr>
<td>Nov. CDP21 in Paris</td>
</tr>
<tr>
<td>Nov. COP21 in Paris</td>
</tr>
<tr>
<td>Feb. Trial Procedures of Shanghai Municipality on Carbon Emission Administration (Shanghai, China)</td>
</tr>
<tr>
<td>Sep. Clean Air Rule (Washington State, U.S.)</td>
</tr>
<tr>
<td>Nov. The Paris Agreement</td>
</tr>
<tr>
<td>Jun. Created TSMC (China) carbon credit &amp; trade flow</td>
</tr>
<tr>
<td>Aug. Energy and Carbon Reduction Committee launched</td>
</tr>
<tr>
<td>Feb. Created TSMC (China) carbon credit &amp; trade flow</td>
</tr>
<tr>
<td>Mar. Renewable Energy Task launched</td>
</tr>
<tr>
<td>Aug. Energy and Carbon Reduction Committee launched</td>
</tr>
<tr>
<td>Jul. Joined Science Based Target initiative</td>
</tr>
<tr>
<td>Mar. Joined the Industrial Development Bureau Voluntary Carbon Reduction Platform</td>
</tr>
<tr>
<td>May Launched the Green Tools Certification Project</td>
</tr>
<tr>
<td>Nov. Launched TSIA Energy-Saving Work Platform</td>
</tr>
<tr>
<td>Dec. Overseas Locations Completed Purchases of Renewable Energy</td>
</tr>
</tbody>
</table>

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.
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)
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

<table>
<thead>
<tr>
<th>Climate Risks</th>
<th>Potential Financial Impact</th>
<th>Climate Opportunities</th>
<th>Potential Financial Impact</th>
<th>2018 Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG emissions cap and carbon trading system</td>
<td>Restriction on capacity expansion, increase in operation costs</td>
<td>Participation in carbon trading and renewable energy plans</td>
<td>Early purchases of renewable energy, successfully increasing capacity</td>
<td>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</td>
</tr>
<tr>
<td>GHG Voluntary Reduction Commitments</td>
<td>Increased cost of installation for carbon reduction facilities and operating costs</td>
<td>Win public recognition / cooperation</td>
<td>Accumulate carbon credits in preparation for future expansion</td>
<td>Application to exchange increased compressor system efficiency for project rewards was approved</td>
</tr>
<tr>
<td>Unstable Utility Supply</td>
<td>Impact on production, increase in operating costs</td>
<td>Construct green buildings</td>
<td>Lower utility costs</td>
<td>Built two additional green fabs and six LEED-certified buildings, built new fabs (Fab 15, Fab 16, and Fab 18) while maintaining a water recycling rate greater than 85%</td>
</tr>
<tr>
<td>Cost of developing low-carbon energy saving products</td>
<td>Increased cost of developing low-carbon energy saving products</td>
<td>Develop or increase energy-saving products or services</td>
<td>Satisfy customer demands for energy-saving products, increase in revenue</td>
<td>Investing in the development of energy-saving products</td>
</tr>
<tr>
<td>Impact on the Company’s Image</td>
<td>Unable to satisfy the expectations of stakeholders, impacting the Company’s reputation or image</td>
<td>Increase investors’ willingness for long-term investment</td>
<td>Stabilize stakeholder structure, lessen the risk of large stock fluctuations</td>
<td>Boost green production</td>
</tr>
<tr>
<td>Typhoon, Flooding</td>
<td>Production is affected, causing financial losses and a decrease in revenue</td>
<td>Increase resilience against natural disasters</td>
<td>Strengthened climate resilience, lowering risk of operations being disrupted and potential losses</td>
<td>Installed flood doors in Fab 18, raised the building base of Fab 18 two meters higher</td>
</tr>
<tr>
<td>Drought</td>
<td></td>
<td></td>
<td></td>
<td>Fab 18 is committed to using and developing renewable water, established a comprehensive water monitoring system</td>
</tr>
<tr>
<td>Rising Temperatures</td>
<td>Increase in energy demand, cost, and carbon emissions</td>
<td>Driving low-carbon green manufacturing</td>
<td>Save energy and cut cost</td>
<td>Conserved 300 GWh of electricity through energy-saving projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2018 Actions**

- 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
- Application to exchange increased compressor system efficiency for project rewards was approved
- Built two additional green fabs and six LEED-certified buildings
- 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
- Boost green production
- Installed flood doors in Fab 18
- Raised the building base of Fab 18 two meters higher
- Fab 18 is committed to using and developing renewable water
- Established a comprehensive water monitoring system
- 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

- GHG Emission of Taiwan Facilities
- GHG Emission of Subsidiaries
- GHG Emission Intensity (tCO₂e / wfr-layer)

Unit: metric ton CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>GHG Emission of Taiwan Facilities</th>
<th>GHG Emission of Subsidiaries</th>
<th>GHG Emission Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>458,360</td>
<td>303,100</td>
<td>0.0022</td>
</tr>
<tr>
<td>2015</td>
<td>460,983</td>
<td>326,880</td>
<td>0.0024</td>
</tr>
<tr>
<td>2016</td>
<td>387,242</td>
<td>347,796</td>
<td>0.0024</td>
</tr>
<tr>
<td>2017</td>
<td>435,396</td>
<td>377,700</td>
<td>0.0027</td>
</tr>
<tr>
<td>2018</td>
<td>419,979</td>
<td>377,700</td>
<td>0.0027</td>
</tr>
</tbody>
</table>

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.

Scope 2 – GHG Emissions

- GHG Emission of Taiwan Facilities
- GHG Emission of Subsidiaries
- GHG Emission Intensity (tCO₂e / wfr-layer)

Unit: metric ton CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>GHG Emission of Taiwan Facilities</th>
<th>GHG Emission of Subsidiaries</th>
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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.

Scope 3 – GHG Emissions

- GHG Emission of Taiwan Facilities
- GHG Emission of Subsidiaries
- GHG Emission Intensity (tCO₂e / wfr-layer)

Unit: metric ton CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>GHG Emission of Taiwan Facilities</th>
<th>GHG Emission of Subsidiaries</th>
<th>GHG Emission Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>3,446,138</td>
<td>4,346,138</td>
<td>0.0029</td>
</tr>
<tr>
<td>2015</td>
<td>3,770,912</td>
<td>4,315,766</td>
<td>0.0027</td>
</tr>
<tr>
<td>2016</td>
<td>4,242,521</td>
<td>4,139,212</td>
<td>0.0026</td>
</tr>
<tr>
<td>2017</td>
<td>4,315,497</td>
<td>4,315,497</td>
<td>0.0026</td>
</tr>
<tr>
<td>2018</td>
<td>4,315,497</td>
<td>4,315,497</td>
<td>0.0026</td>
</tr>
</tbody>
</table>

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.
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

- In response to the Electricity Act opening the electricity market, a renewable energy team was established to evaluate renewable energy purchases.
- Joined the Taiwan Renewable Energy Certification Platform, and 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.

GHG Reduction Standard Practices

Table: GHG Reduction Standard Practices

<table>
<thead>
<tr>
<th>TSMC Standard Practices</th>
<th>2018 Implementation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 14064-1 inventory and third party verification</td>
<td>100% All fabs and subsidiaries underwent inventory and third party verification</td>
</tr>
<tr>
<td>Optimization of gas quantity used in fabrication</td>
<td>Optimization process parameters</td>
</tr>
<tr>
<td>Substitute high-GWP fabrication gases</td>
<td>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</td>
</tr>
<tr>
<td>Install Point-Of-Use abatement equipment for fluorinated GHGs</td>
<td>100% 100% installed POU abatement equipment on new process tools using F-GHG in new and existing fabs (including subsidiaries)</td>
</tr>
<tr>
<td>Continue to develop on-site nitrous oxide removal technology</td>
<td>87% Continued to replace and upgrade 127 POU abatement equipment in 2018, install rate increased to 87%</td>
</tr>
<tr>
<td>ISO 50001 energy management and third party verification</td>
<td>ISO 50001 The Company underwent ISO 50001 inspection and third party verification</td>
</tr>
<tr>
<td>New-generation fab tools use energy-saving, carbon-reducing designs</td>
<td>Only semiconductor foundry in the world</td>
</tr>
<tr>
<td>Introduce renewable energy</td>
<td>880 GWh Leading semiconductor manufacturer in Taiwan, with 880 GWh in Renewable Energy, Renewable Energy Certificates (REC), &amp; Carbon Credit purchased</td>
</tr>
<tr>
<td>Energy efficiency standards</td>
<td>524 Energy efficiency of advanced-technology fab tools leads industry peers, with 524 energy saving measures implemented and 300 GWh saved</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>1,090</td>
</tr>
<tr>
<td>2015</td>
<td>1,301</td>
</tr>
<tr>
<td>2016</td>
<td>1,313</td>
</tr>
<tr>
<td>2017</td>
<td>1,893</td>
</tr>
<tr>
<td>2018</td>
<td>3,007</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Diesel Consumption</th>
<th>Total Natural Gas Consumption</th>
<th>Total Non-renewable Energy Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>3.1 GWh</td>
<td>5.1 GWh</td>
<td>4.5 GWh</td>
</tr>
<tr>
<td>2015</td>
<td>4.2 GWh</td>
<td>4.5 GWh</td>
<td>4.8 GWh</td>
</tr>
<tr>
<td>2016</td>
<td>5.1 GWh</td>
<td>4.8 GWh</td>
<td>5.1 GWh</td>
</tr>
<tr>
<td>2017</td>
<td>6.2 GWh</td>
<td>6.2 GWh</td>
<td>4.8 GWh</td>
</tr>
<tr>
<td>2018</td>
<td>7.2 GWh</td>
<td>7.2 GWh</td>
<td>6.3 GWh</td>
</tr>
</tbody>
</table>

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

Total Power Consumption and Goal Completion

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit Power Consumption – Target</th>
<th>Unit Power Consumption – Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>9.4 kWh/8-inch e wafer-layer</td>
<td>9.5 kWh/8-inch e wafer-layer</td>
</tr>
<tr>
<td>2015</td>
<td>9.8 kWh/8-inch e wafer-layer</td>
<td>9.7 kWh/8-inch e wafer-layer</td>
</tr>
<tr>
<td>2016</td>
<td>9.9 kWh/8-inch e wafer-layer</td>
<td>9.6 kWh/8-inch e wafer-layer</td>
</tr>
<tr>
<td>2017</td>
<td>9.6 kWh/8-inch e wafer-layer</td>
<td>9.5 kWh/8-inch e wafer-layer</td>
</tr>
<tr>
<td>2018</td>
<td>9.4 kWh/8-inch e wafer-layer</td>
<td>9.3 kWh/8-inch e wafer-layer</td>
</tr>
</tbody>
</table>

Note: 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.

**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.

**TSMC 10-year Energy-Saving Targets**

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Annual Energy Savings Rate from 2016 - 2025</th>
<th>Unit: GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>90 GWh</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>600 GWh</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>900 GWh</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>300 GWh</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>2,800 GWh of total energy saved by 2025</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>2018 Additional Energy Saved</th>
<th>2018 Accumulated Energy Saved</th>
<th>Increase of 300 GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>600 GWh</td>
<td>2018 Additional Energy Saved</td>
<td>300 GWh</td>
</tr>
<tr>
<td>2017</td>
<td>300 GWh</td>
<td>2018 Accumulated Energy Saved</td>
<td>1,000 GWh of total energy saved by 2025</td>
</tr>
</tbody>
</table>

Note: Carbon dioxide emission is 0.554 kg CO2e / kWh
### 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.

### 2018 New Foundries in Compliance

<table>
<thead>
<tr>
<th>Adaptive Actions</th>
<th>2018 New Foundries in Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 12-inch wafers fabs are US LEED certified</td>
<td>✔</td>
</tr>
<tr>
<td>- Contingency measures for power restrictions and backup emergency power generators able to provide more than 15% of normal full capacity power during maximum electricity restrictions</td>
<td>✔</td>
</tr>
<tr>
<td>- Foundations of newly-built fabs in Southern Taiwan Science Park raised by 2 meters, lowering risks of flooding</td>
<td>✔</td>
</tr>
<tr>
<td>- Inspect external public facilities and major suppliers for potential flooding risks and supervise them to mitigate risks</td>
<td>✔</td>
</tr>
<tr>
<td>- Install flood doors for existing fabs and buildings in areas with high flooding risk</td>
<td>✔</td>
</tr>
<tr>
<td>- Promote water saving within the Company and increase water recycling rate from manufacturing processes</td>
<td>✔</td>
</tr>
<tr>
<td>- Support government-recommended recycled water policies, commit to developing and using recycled water</td>
<td>✔</td>
</tr>
<tr>
<td>- Establish emergency water shortage measures: maintain water storage facilities in each fab with 2 days water usage capacity, prepare water tankers and sources of water that can provide 20% of water supplies during maximum water restrictions</td>
<td>✔</td>
</tr>
<tr>
<td>- Strengthen wind resistance standards for outdoor facilities (water cooling towers, decontamination facilities, etc.)</td>
<td>✔</td>
</tr>
</tbody>
</table>
Collaborating with Government, Industry and Academia to Build Sustainability for the Next Generation

- Revised relevant materials and rules for the revision of IPCC Greenhouse Gas Inventory Guidelines with the WSC
- Collaborated with TSIA to apply ‘Emission reduction methodology for fluorinated greenhouse gases and N₂O from treatment equipment in the semiconductor industry,’ which gained approval as a reduction methodology from the Environmental Protection Agency
- Awarded 2018 Voluntary Carbon Reduction Model Corporation by the Industrial Development Bureau, participated and shared carbon and GHG reduction experiences and results during a government-hosted performance showcase and forum
- Participated in water resources conferences and energy summits held by the government
- Represented the Chinese National Federation of Industries to give policy and legislation suggestions to the government
- Represented TSIA in participating in the Industrial Development Bureau-hosted GHG industries response team in exploring industry carbon reduction methods
- Represented TSIA in regular discussions of water and electricity issues with public and private sectors
- Participated in the energy saving team’s policy discussions for the Bureau of Energy's 2018 Energy transformation white paper
- Awarded 2018 Voluntary Carbon Reduction Model Corporation by the Industrial Development Bureau, participated and shared carbon and GHG reduction experiences and results during a government-hosted performance showcase and forum
- Participated in CNFI-hosted industry discussions and shared chilled water system and energy-saving experience in manufacturing
- Participated in a research think tank and forum, sharing challenges within the industry when controlling GHG emissions, new energy policies, and other issues
- Hosted supply chain energy-saving and carbon reduction training courses with onsite tours of TSMC energy-saving and carbon reduction facilities
- Since the launch of the energy-saving carbon reduction project platform under TSIA supervision in November of 2018, TSMC has shared energy-saving and management experience with the industry and led the industry in actively promoting a number of energy-saving projects. Within 2 months, more than 85 cases of feasible energy-saving technology were collected
Case Study

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.

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.

TSMC Four Top Green Achievements

Most LEED Certified Semiconductor Industry Architecture Area in the World

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.

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TSMC Four Top Green Achievements

1. U.S. LEED Green Architecture
   - Number 1 semiconductor industry in the world with the largest LEED-certified building area, number 1 most LEED-certified company in Taiwan

2. Taiwan Green Architecture EEWH
   - Largest EEWH-certified building area in Taiwan

3. Green Factory
   - Most green factory certifications in Taiwan

4. Exceptional Smart Building
   - Most exceptional smart building-certified building area in Taiwan
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.
**Water Management**

**Strategies**

- **Risk Management of Water Resources**
  - Enforce climate change mitigation policies, implement water conservation and water shortage adaptation measures

- **Develop Diverse Water Sources**
  - Integrate internal and external company resources to develop regenerated water technology; implement water conservation and the use of regenerated water in the manufacturing process

- **Develop Preventive Measures**
  - Improve the efficiency of water pollution prevention and removal of water pollutants

**Long-term Goals**

- Reduce unit water consumption (liter / 8-inch wafer equivalent number of reticles) to 30% (2010 as the base year)
  - Target Year: 2020

- Save up to 12.77 million tons of water between 2016 to 2025 by adopting new water conservation measures
  - Target Year: 2025
  - Use regenerated water to replace 50,000 tons of tap water per day
  - Target Year: 2025

- Meet effluent water quality standards for wastewater discharge
  - Target Year: 2025
  - Increase the usage rate of regenerated water by more than 20%
  - Target Year: 2030

**2018 Achievements**

- Reduced water consumption (liter / 8-inch e wafer-layer) by 24.7% (2010 as the base year) with an achievement rate of 95%
  - Target: 26%

- Saved 1.274 million tons of water after adopting new water conservation measures with an achievement rate of 99.5%
  - Target: 1.8 million tons

- The average concentration of NH₄-N in company wastewater discharge was 21 ppm
  - Target: <30ppm

- Tetramethylammonium hydroxide (TMAH) < 8 ppm
  - Copper ion (Cu²⁺) < 0.15 ppm

**2019 Targets**

- Reduce water consumption (liter / 8-inch e wafer-layer) by 26% (2010 as the base year)

- Save an additional 1.14 million tons of water through newly-adopted water conservation measures

- Tetramethylammonium hydroxide (TMAH) < 8 ppm
  - Copper ion (Cu²⁺) < 0.15 ppm

**Notes**

- There was an increase in water usage from newly-built fabs, but production has not yet started.

- A portion of water saving projects were completed in January 2019, and as a result were not included in total water saved in 2018.
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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish a comprehensive water use monitoring system</td>
<td>Blue</td>
<td>Stabilize supply and demand</td>
<td>Constantly monitored the water supply of every reservoir as reported by the Water Resources Agency, and held periodic drills</td>
</tr>
<tr>
<td>→ Early warning of long-term water use trends</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ Assess water installations for any improvements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create a contingency group</td>
<td>Green</td>
<td>Encourage farmers to leave lands fallow</td>
<td>Created a contingency group to take inventory of water sources and water tanker capacity</td>
</tr>
<tr>
<td>→ Assess the demand for water tankers / reserve water sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ Formulate and negotiate water conservation guidelines between fabs</td>
<td>Slight Water Shortage</td>
<td></td>
<td>Lowered water supply pressure by voluntarily reducing water use by 3%</td>
</tr>
<tr>
<td>Voluntarily reduce water consumption by 3%</td>
<td>Yellow</td>
<td>Decrease water supply pressure during specific time intervals</td>
<td>Did not occur</td>
</tr>
<tr>
<td>→ Formulate a systematic water conservation mode</td>
<td>Stage One</td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ Practice drills in using water tankers to transport water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement water restrictions at all levels and enforce necessary water conservation measures</td>
<td>Orange</td>
<td>Industrial Consumers 5-20% cut in water supply</td>
<td>Did not occur</td>
</tr>
<tr>
<td>→ Cross-organizational drought emergency response team</td>
<td>Stage Two</td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ Systematic water conservation and water transportation via water tankers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotating Water Outages</td>
<td>Red</td>
<td></td>
<td>Did not occur</td>
</tr>
<tr>
<td>Stage Three</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix

Sustainable Governance

Our Focuses and Progress

Ethical Management

Innovation and Service

Responsible Supply Chain

Green Manufacturing

Inclusive Workplace

Common Good

Appendix
**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.

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**Main Water Cell and On-site Recycling System**

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**How one drop of water can be used 3.5 times?**

\[
\text{Tap water + Recycled water} \div \text{Tap water} = \text{Water usage times}
\]

---

**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

- Increase the water production rate of RO recycling systems
- Improve usage efficiency by allocating recycled water
- Recycle discharged water from cooling towers
- Increase the water production rate of RO recycling systems
- Reduce water discharge loss from the system

Water Conservation Effectiveness

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

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 Baochan 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Hsinchu Science Park</th>
<th>Central Taiwan Science Park</th>
<th>Southern Taiwan Science Park</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>141</td>
<td>54</td>
<td>91</td>
</tr>
<tr>
<td>2017</td>
<td>338</td>
<td>145.6</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>465</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unit: Ten thousand tons

### Water Recycling and Usage Efficiency

- **Total amount of water recycled (Million metric tons):**
  - 2014: 338
  - 2015: 341
  - 2016: 141
  - 2017: 103.4
  - 2018: 129.0

- **Average Process Water Recycling Rate (%):**
  - 2014: 87.6%
  - 2015: 87.4%
  - 2016: 87.5%
  - 2017: 87.5%
  - 2018: 87.5%

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

- **Total tap water consumption of subsidiaries (Million metric tons):**
  - 2014: 3.3
  - 2015: 3.5
  - 2016: 3.4
  - 2017: 3.8
  - 2018: 5.7

- **Water Consumption Per Wafer-Layer (liter / 8-inch e wafer-layer):**
  - 2014: 46.3
  - 2015: 44.6
  - 2016: 47.7
  - 2017: 47.2
  - 2018: 47.1

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.

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.
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.

### Develop Diverse Water Sources

- **Supply 37,500 tons of water from the water reclamation plant in Anping, Tainan**
- **Establish a water reclamation plant in Yongkang, Tainan**
- **Establish a water reclamation plant in STSP**
- **Supply 20,000 tons of water from the water reclamation plant in STSP**
- **Supply 9,500 tons of water from the water reclamation plant in Yongkang, Tainan**

### Timeline of Highlights for Regenerated Water

- **2015**
  - Began the development of water reclamation techniques

- **2016**
  - Fab 14 (P5) establishes Wastewater Effluent Recycling Pilot Plant
  - Reached production line standards for regenerated water quality

- **2017**
  - 40% reduction in the unit cost of water production

- **2018**
  - Find partner firms for the establishment of a water reclamation plant in STSP

- **2019**
  - Supply 20,000 tons of water from the water reclamation plant in STSP
  - Supply 9,500 tons of water from the water reclamation plant in Yongkang, Tainan
  - Establish a water reclamation plant in STSP
  - Establish a water reclamation plant in Yongkang, Tainan

- **2021**
  - Supply 20,000 tons of water from the water reclamation plant in STSP

- **2022**
  - Supply 37,500 tons of water from the water reclamation plant in Anping, Tainan

**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 to 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. At 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 resourceing 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.
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.

Preventive Techniques on Key Pollutants of Wastewater Quality and Improvement Achievements

<table>
<thead>
<tr>
<th>Item</th>
<th>Standards set by Science Park Administration</th>
<th>TSMC Long-term Goals (2025)</th>
<th>Status in 2018</th>
<th>Improvement Achievements in 2018</th>
<th>Preventive Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMAH</td>
<td>HSP : 30 CTSP: 20 STSP: 60</td>
<td>1.0</td>
<td>13.1</td>
<td>Reduced by 57% from the previous year</td>
<td>Recycle low-concentration liquid waste</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Establish anion exchange resin towers</td>
</tr>
<tr>
<td>copper ion</td>
<td>HSP : 1 CTSP: 0.8 STSP: 3</td>
<td>0.1</td>
<td>0.18</td>
<td>Reduced by 53% from the previous year</td>
<td>Distribute copper-containing liquid waste</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Concentrate and recycle in resin towers (under planning)</td>
</tr>
<tr>
<td>NH4-N</td>
<td>HSP : 30 CTSP: 20 STSP: 60</td>
<td>20</td>
<td>21.0</td>
<td>Reduced by 87% from the previous year</td>
<td>Expand ammonia treatment systems</td>
</tr>
<tr>
<td>chemical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oxygen demand</td>
<td>HSP : 500 CTSP: 500 STSP: 450</td>
<td>100</td>
<td>177.5</td>
<td>Raised by 47% from the previous year</td>
<td>Implement combustion treatment in strippers (under planning)</td>
</tr>
<tr>
<td>suspended</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Establish biological treatment systems (Bioprocess) (under planning)</td>
</tr>
<tr>
<td>solids</td>
<td>HSP : 300 CTSP: 300 STSP: 250</td>
<td>30</td>
<td>29.4</td>
<td>Achieved long-term goals ahead of schedule</td>
<td>Recycle backwash wastewater after coagulation and precipitation</td>
</tr>
</tbody>
</table>

Note 1  Total wastewater volume included numbers from TSMC’s 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
### Pollutant Discharge Trends

#### TMAH

<table>
<thead>
<tr>
<th>Year</th>
<th>TMAH (Taiwan facilities)</th>
<th>TMAH (Subsidiaries)</th>
<th>TMAH (TSMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>30.5</td>
<td>19.1</td>
<td>16.3</td>
</tr>
<tr>
<td>2015</td>
<td>30.5</td>
<td>19.1</td>
<td>16.3</td>
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<tr>
<td>2016</td>
<td>12.9</td>
<td>13.1</td>
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<tr>
<td>2017</td>
<td>13.1</td>
<td></td>
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</tr>
<tr>
<td>2018</td>
<td>12.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Cu²⁺

<table>
<thead>
<tr>
<th>Year</th>
<th>Cu²⁺ (Taiwan facilities)</th>
<th>Cu²⁺ (Subsidiaries)</th>
<th>Cu²⁺ (TSMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>0.432</td>
<td>0.226</td>
<td>0.385</td>
</tr>
<tr>
<td>2015</td>
<td>0.005</td>
<td>0.192</td>
<td>0.201</td>
</tr>
<tr>
<td>2016</td>
<td>0.210</td>
<td>0.222</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>0.201</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### NH₄-N

<table>
<thead>
<tr>
<th>Year</th>
<th>NH₄-N (Taiwan facilities)</th>
<th>NH₄-N (Subsidiaries)</th>
<th>NH₄-N (TSMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>168.8</td>
<td>21.0</td>
<td>41.5</td>
</tr>
<tr>
<td>2015</td>
<td>43.9</td>
<td>25.2</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>21.2</td>
<td>29.4</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>46.7</td>
<td>21.0</td>
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</tr>
<tr>
<td>2018</td>
<td>21.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Statistics on the Chemical Oxygen Demand of Wastewater

<table>
<thead>
<tr>
<th>Year</th>
<th>Chemical Oxygen Demand of Wastewater (Taiwan facilities)</th>
<th>Chemical Oxygen Demand of Wastewater (Subsidiaries)</th>
<th>Chemical Oxygen Demand of Wastewater (TSMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>66.2</td>
<td>86.5</td>
<td>94.6</td>
</tr>
<tr>
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<td>94.6</td>
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<td>2016</td>
<td>95.2</td>
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<td>112.5</td>
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<td>2017</td>
<td>119.9</td>
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<td>115.9</td>
</tr>
<tr>
<td>2018</td>
<td>194.2</td>
<td>126</td>
<td>177.5</td>
</tr>
</tbody>
</table>

#### Statistics on Suspended Solids in Wastewater

<table>
<thead>
<tr>
<th>Year</th>
<th>Suspended Solids in Wastewater (Taiwan facilities)</th>
<th>Suspended Solids in Wastewater (Subsidiaries)</th>
<th>Suspended Solids in Wastewater (TSMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>28.2</td>
<td>29.1</td>
<td>124</td>
</tr>
<tr>
<td>2015</td>
<td>28.2</td>
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<td>2016</td>
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</tr>
<tr>
<td>2017</td>
<td>28.6</td>
<td>33.6</td>
<td>112.5</td>
</tr>
<tr>
<td>2018</td>
<td>25.8</td>
<td>29.4</td>
<td>177.5</td>
</tr>
</tbody>
</table>

**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 (all 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.
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 0.1 mg/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.

**Distribute Low-Concentration Wastewater and Reduce Chemical Use During Treatment**

**TSMC Treatment Procedures of Copper-Containing Liquid Waste**

**Case Study**

2018 Achievement: Reduces copper Concentration by 53%

1. **NEW**
   - high-concentration copper sulfate liquid waste (>1,000 ppm)
   - general copper-containing chemicals or liquid waste (2 < Cu < 1,000 ppm)

2. **Under Planning**
   - concentrate and regenerate high-concentration copper-containing liquid waste via resin tower (>1,000 ppm)
   - discharge wastewater (<0.5 ppm)
   - water treatment plants in science parks

3. **Processing equipment**
   - liquid waste collection tank
   - wastewater treatment system
   - distribute high- and low-concentration copper wastewater
   - wastewater recycling system
   - copper electroplating recycling system
   - produce copper bars
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.

TSMC's Refined Procedures of TMAH Treatment

**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 (TMAH<1,000 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 (SO4^2-) 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.
Waste Management

Strategies
- Source Reduction
  Promote waste reduction by waste source separation and demand low consumption chemical equipments from our suppliers

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

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

Long-term Goals
- Source Reduction
  Outsourced unit waste disposal per wafer (kilogram / 8-inch equivalent wafer-mask) ≤ 0.30
    ○ Target Year: 2025

- Circular Economy
  Collaborate with raw material suppliers to develop electronic-grade materials to enhance TSMC's resource circulation
    ○ Target Year: 2025

- Audit and Guidance
  Waste treatment and recycling vendors are 100% ISO certified
    ○ Target Year: 2025

2018 Achievements
- Source Reduction
  Outsourced unit waste disposal per wafer (kilogram / 8-inch equivalent wafer-mask) = 0.35
    ○ Target: ≤ 0.35

- Circular Economy
  Recycling rate: 95%. Percentage of waste sent to landfills: 0.17%. In-house reuse rate of resources: 25%
    ○ Target: Recycling rate ≥ 95%. Percentage of waste sent to landfills ≤ 1%. In-house reuse rate of resources ≥ 30%
  More equipment installed for the reuse of resources

- Audit and Guidance
  Waste treatment and recycling vendors are 100% audited and given guidance
  Waste treatment and recycling vendors are 68% ISO certified

2019 Targets
- Source Reduction
  Outsourced unit waste disposal per wafer (kilogram / 8-inch equivalent wafer-mask) ≤ 0.34

- Circular Economy
  Recycling rate ≥ 95%. Percentage of waste sent to landfills ≤ 1%. In-house reuse rate of resources ≥ 30%

- Audit and Guidance
  Waste treatment and recycling vendors are 100% audited and given guidance
  More than 70% of Waste treatment and recycling vendors are ISO certified

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 interanlly 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
### Waste Quantity and Treatment Status Statistics

#### Waste from Outsourced Businesses

<table>
<thead>
<tr>
<th>Year</th>
<th>General Business Waste</th>
<th>Unit: tons/year</th>
<th>Hazardous Business Waste</th>
<th>Unit: tons/year</th>
<th>Percentage of Recycled Waste</th>
<th>Unit: %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>201,050</td>
<td>61,026</td>
<td>140,024</td>
<td>103,168</td>
<td>93</td>
<td>93.79</td>
</tr>
<tr>
<td>2015</td>
<td>265,787</td>
<td>133,360</td>
<td>133,085</td>
<td>125,937</td>
<td>95</td>
<td>94.79</td>
</tr>
<tr>
<td>2016</td>
<td>291,984</td>
<td>133,085</td>
<td>133,085</td>
<td>166,598</td>
<td>95</td>
<td>94.79</td>
</tr>
<tr>
<td>2017</td>
<td>361,968</td>
<td>165,891</td>
<td>165,891</td>
<td>204,792</td>
<td>95</td>
<td>94.79</td>
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<tr>
<td>2018</td>
<td>377,767</td>
<td>169,427</td>
<td>169,427</td>
<td>238,851</td>
<td>95</td>
<td>94.79</td>
</tr>
</tbody>
</table>

#### General Business Waste

- **2014**: 61,026 tons, 5,436 tons
- **2015**: 132,427 tons, 5,097 tons
- **2016**: 158,899 tons, 4,685 tons
- **2017**: 196,077 tons, 5,037 tons
- **2018**: 208,340 tons, 5,501 tons

#### Reused Resources

- **2014**: 0 tons, 0 tons
- **2015**: 18,804 tons, 0 tons
- **2016**: 46,889 tons, 0 tons
- **2017**: 63,658 tons, 0 tons
- **2018**: 95,989 tons, 0 tons

#### Rate of Buried Waste

- **2014**: 0.2%, 16.3%
- **2015**: 0.2%, 15.8%
- **2016**: 0.1%, 16.1%
- **2017**: 0.1%, 15.9%
- **2018**: 0.2%, 12.6%

#### Note

- **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.
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.

"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.

<table>
<thead>
<tr>
<th>Chemicals Reduction Project</th>
<th>Big Green</th>
</tr>
</thead>
</table>

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

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
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

With the development and introduction of resource renewal technology, TSMC converts waste into various products and reduces waste production.

Regenerated products include copper and ammonium sulfate.

Used in Other Industries

Waste Recycle / Disposal Vendors

30 types of recycled products include industrial grade sulfuric acid, industrial grade solvent, etc.

368,700 (thousand NT$) Income from waste recycling

354,000 (thousand NT$) Cost saving from waste reduction
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.

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

<table>
<thead>
<tr>
<th>Raw Materials</th>
<th>Production Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric Acid Waste</td>
<td>AmmoniumNitrogen Wastewater</td>
</tr>
<tr>
<td>Damage to Marine Animals</td>
<td></td>
</tr>
<tr>
<td>Retrieval: Ammonium Nitrogen from Wastewater</td>
<td></td>
</tr>
<tr>
<td>Renewal: Eliminate Hydrogen Peroxide</td>
<td></td>
</tr>
<tr>
<td>Treatment for Reuse</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid + Ammonium Nitrogen = Ammonium Sulfate</td>
<td></td>
</tr>
<tr>
<td>Remanufacture ammonium sulfate from ammonium nitrogen wastewater, which can be used to produce leather products and dyeing materials</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid Waste Recycling System</td>
<td>Used in Other Businesses</td>
</tr>
<tr>
<td>Drying System for Ammonium Sulfate</td>
<td>Mechanical Vapor Recompression System</td>
</tr>
<tr>
<td>Crystallization of Ammonium Sulfate</td>
<td></td>
</tr>
<tr>
<td>Ammonium Sulfate</td>
<td></td>
</tr>
</tbody>
</table>
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.
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. 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.
Waste Cleanup and Disposal Vendor Management Process

New Waste Vendors

1. Vendor Selection
   - Environmental Safety & Health Department
   - Waste Management Section

2. Vendor Inspection
   - Purchasing Department
   - Industrial Safety and Environmental Protection

All Existing Waste Vendors

1. Vendor Inspection
   - Waste Management Section

2. Annual Evaluation
   - Environmental Safety & Health Department
   - Waste Management Section
   - Purchasing Department
   - Legal Department

Vendor Selection:
- Workplace Safety, Environmental Protection, and Operation Assessment
- On-site Audit for Logistic Records, Invoice, and Operation
- Follow-ups on Products, Waste Management, and Regulation Penalties
- Tracking of Waste and GPS Anomalies

Vendor Inspection:
- Onsite Audit
- Document and Operation Confirmation
- Waste Production Confirmation
- Input-output Balance in Production
- Product Specs and Flow Examination
- Test Data Examination

Evaluation Result:

Yearly
- 63% (Excellent)
- 42% (Good)
- 38% (Acceptable)
- 2% (Under observation)
- 1% (Disqualified vendor)

Quarterly
- 64% (Excellent)
- 36% (Good)
- 0% (Acceptable)
- 2% (Under observation)
- 2% (Disqualified vendor)

Monthly
- 60% (Excellent)
- 40% (Good)
- 0% (Acceptable)
- 0% (Under observation)
- 0% (Disqualified vendor)

Weekly
- 58% (Excellent)
- 42% (Good)
- 0% (Acceptable)
- 0% (Under observation)
- 0% (Disqualified vendor)

Cease transactions with vendors scored as "under observation" and showing no improvement.
Air Pollution Control

**Strategies**

**Use Best Available Technology**
Adapt best available technology to deal with pollution caused by operations and mitigate environmental impact.

**Strengthen Monitoring of Prevention Facilities**
Leverage backup systems and dual-track management, along with pollutant monitors, to ensure that equipment functions as intended and prevents abnormal occurrences.

**Long-term Goals**

- Reduce air pollutant emissions per unit of production by 27% (base year of 2015) - Target Year: 2020
- Reduce air pollutant emissions per unit of production by 30% (base year of 2015) - Target Year: 2025

**2018 Achievements**

- Reduction rate of volatile organic gases was **96.9%**
  - Targets > 90%
- Reduced air pollutant emissions per unit of production by **27.6%** (base year of 2015) - Target Year: 2025
- Reported abnormal occurrences to supervising authorities < 1 case - Target Year: 2020

**2019 Targets**

- Reduction rate of volatile organic gases > 90%
- Reduce air pollutant emissions per unit of production by 27% (base year of 2015)
- Reported 0 cases of abnormal occurrences to supervising authorities - Targets < 1 case

Note: Air pollutant emissions data encompasses the total emissions of eight gases: hydrocarbons, sulfuric acid, hydrochloric acid, nitric acid, hydrofluoric acid, phosphoric acid, chlorine, and ammonia.
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.

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.

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.

Advanced Manufacturing Process - Dry Process Equipment

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.

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Air Pollution Prevention Treatment Procedures

Source of Pollutants

- Dry Process
  - Adsorption
- Wet Process
  - Condensation
- Organic Process

Local Scrubbers

- Chemical Storage Tank
  - Plasma + Wet
- Wet (Facility Site)
  - Burn + Wet
- Wet (Process Site)
  - Acid and Alkaline Gases

Central Scrubbers

- Dual-stage Wet Scrubber
  - Monitor Operating Conditions
  - Monitor Fluorine Gas Online
- Organic Gases
  - Monitor Reduction Rates of Emission
  - Monitor IPA Online
- Emission by Stack

Dual-track Emission Monitoring

- Zeolite Rotor Concentrator
  - Emission by Stack
### Local Scrubbers Categories

<table>
<thead>
<tr>
<th>Process Type</th>
<th>Semiconductor Manufacturing Process</th>
<th>Target Pollutants</th>
<th>Technology</th>
<th>Equipment Pictures</th>
<th>Reduction Rates</th>
<th>Real-time Monitoring Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Epitaxial Dry Etching |                                    | Corrosive Gases         | Burn-Wet   | PFCs               | >99%            | • Natural Gas Flow  
|                       |                                    |                         |            |                    |                 | • Oxygen Flow  
|                       |                                    |                         |            |                    |                 | • Circulating Water  
|                       |                                    |                         |            |                    |                 | • Inlet Pressure  |
| Wet Process           |                                    | Corrosive Gases         | Thermal-Wet|                    | >95%            | • Reactor Temperature  
|                       |                                    |                         |            |                    |                 | • Circulating Water  
|                       |                                    |                         |            |                    |                 | • PH Value  
|                       |                                    |                         |            |                    |                 | • Inlet Pressure  |
| Organic Process       |                                    | Corrosive Gases         | Wet (Process Site) | Organic Gases | >95%            | • Pressure Difference In Scrubber  
|                       |                                    |                         |            |                    |                 | • Circulating Water  
|                       |                                    |                         |            |                    |                 | • Inlet Pressure  
|                       |                                    |                         |            |                    |                 | • PH Value  |
| Storage Tank          |                                    | Corrosive Gases         | Wet (Facility Site) | Specific High Boiling Point Organics | >95%            | • Pressure Difference In Scrubber  
|                       |                                    |                         |            |                    |                 | • Circulating Water  
|                       |                                    |                         |            |                    |                 | • PH Value  
|                       |                                    |                         |            |                    |                 | • 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% to 168.4 tons. The unit emission of VOCs also decreased by 28% to 0.140 (grams / 8-inch wafer equivalent mask layers) from 0.195 (grams / 8-inch wafer equivalent mask layers) in 2015.
Note 1 Total emission of air pollutants included the emission reported by TSMC’s 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 TSMC’s 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.

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 TSMC’s 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.

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.

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.
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 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Rollout Schedule of Zeolite Rotor Concentrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Introduce clean-gas-desorbing zeolite rotor concentrators to Fab 12A</td>
</tr>
<tr>
<td>2018</td>
<td>Continue to test clean-gas-desorbing zeolite rotor concentrators in other 12-inch wafer fabs in Hsinchu Science Park</td>
</tr>
<tr>
<td>2019</td>
<td>Introduce clean-gas-desorbing zeolite rotor concentrators to all 12-inch fabs in Hsinchu Science Park</td>
</tr>
<tr>
<td>2020</td>
<td>Introduce clean-gas-desorbing zeolite rotor concentrators to all 12-inch fabs in TSMC</td>
</tr>
</tbody>
</table>

Rollout Schedule of Zeolite Rotor Concentrators

Improvement of Zeolite Rotor Concentrator

Before<br>4.8 ppm<br>Concentration Reduction 23%<br>After<br>3.7 ppm

Reduction Rates of Emission 97.7%
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 working 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

0

Enhanced OHS control measures, with no reported cases of occupational diseases caused by chemical or physical exposure
### Talent Attraction and Retention

#### Long-term Goals

<table>
<thead>
<tr>
<th></th>
<th>2018 Achievements</th>
<th>2019 Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bolster Employee Commitment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulfill core values and provide an attractive workplace with competitive compensation packages and an environment where all individuals are willing to communicate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recruit talents with shared vision and values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Target Year: 2025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain total compensation above 75th percentile among high-tech industry peers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Target Year: 2025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduct biennial TSMC Core Value Survey to ensure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— over 95% of employees are fully committed to their work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— over 95% of our employees are willing to continue contributing their talents at TSMC in the next five years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Target Year: 2025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ideal longterm turnover rate is between 5% to 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Target Year: 2025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in talent attraction and retention strategies: TSMC's human resources strategies not only keeps the Company's core values at heart but also ensure that TSMC's business philosophy is being followed, while keeping up with the times and always striving to improve. In 2018, TSMC continued efforts in three focuses that are highly relevant to our stakeholders, including (1) Talent Attraction and Retention (2) Talent Development and (3) Human Rights. Meanwhile, we set up our 2025 Sustainable Development Goals to adjust to internal and external changes. As a result, our strategies and annual targets have been updated accordingly.</td>
<td></td>
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</tr>
</tbody>
</table>

#### Strategies

- **Apply standard assessment and interviews to all (100%) external hiring process in two fabs in China**
- **Turnover rate of new hires (onboard less than a year) is less than 15%**
- **Maintain total compensation above 75th percentile among high-tech industry peers**
- **Target Year: 2025**
- **Conduct biennial TSMC Core Value Survey to ensure**
  - over 95% of employees are fully committed to their work
  - over 95% of our employees are willing to continue contributing their talents at TSMC in the next five years
  - Target Year: 2025
- **The annual turnover rate is 4.5%**
- **Target Year: 2018**

#### 2019 Targets

<table>
<thead>
<tr>
<th></th>
<th>2019 Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apply standard assessment and interviews to all (100%) external hiring process in two fabs in China</strong></td>
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<td><strong>Turnover rate of new hires (onboard less than a year) is less than 15%</strong></td>
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<tr>
<td><strong>Maintain total compensation above 75th percentile among high-tech industry peers</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Target Year: 2025</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The year 2018 TSMC Core Value Survey indicated that</strong></td>
<td></td>
</tr>
<tr>
<td>— 98% of employees are fully committed to their work</td>
<td></td>
</tr>
<tr>
<td>— 96% of employees are willing to continue contributing their talents at TSMC in the next five years</td>
<td></td>
</tr>
<tr>
<td>○ Target: Over 95% of employees are fully committed to their work and are willing to keep contributing their talents to TSMC in the next five years</td>
<td></td>
</tr>
<tr>
<td><strong>The annual turnover rate is 4.5%</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Target Year: 2018</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### Note

- All new hired employees in TSMC facilities in Taiwan undergo the standard assessment and interviews, indicating they are sharing the same vision and core values.
- Target: All new TSMC employees should undergo the standard assessment and interviews to ensure they embrace our shared vision and core values.
- According to the compensation survey report, the total compensation of employees in TSMC facilities in Taiwan is above 90th percentile comparing with its industrial peer groups, whereas the total compensation of employees in Overseas Organization is above 75th percentile.
- The year 2018 TSMC Core Value Survey indicated that:
  - over 95% of employees are fully committed to their work
  - over 95% of our employees are willing to continue contributing their talents at TSMC in the next five years
- The annual turnover rate shall maintain between 5% to 10%
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

<table>
<thead>
<tr>
<th>Categories</th>
<th>Groups</th>
<th>Male</th>
<th>Female</th>
<th>Subtotal and Percentage by Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percentage of Group</td>
<td>Number</td>
<td>Percentage of Group</td>
</tr>
<tr>
<td>Employee category</td>
<td>Managers</td>
<td>4,625</td>
<td>87.4%</td>
<td>669</td>
</tr>
<tr>
<td></td>
<td>Professionals</td>
<td>18,347</td>
<td>82.3%</td>
<td>3,938</td>
</tr>
<tr>
<td></td>
<td>Assistant Engineers / Clerical</td>
<td>3,325</td>
<td>80.9%</td>
<td>784</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>3,578</td>
<td>21.0%</td>
<td>13,486</td>
</tr>
<tr>
<td>Location</td>
<td>Taiwan</td>
<td>26,715</td>
<td>61.4%</td>
<td>16,790</td>
</tr>
<tr>
<td></td>
<td>Asia</td>
<td>2,077</td>
<td>56.6%</td>
<td>1,593</td>
</tr>
<tr>
<td></td>
<td>North America</td>
<td>1,048</td>
<td>68.9%</td>
<td>474</td>
</tr>
<tr>
<td></td>
<td>Europe</td>
<td>35</td>
<td>63.6%</td>
<td>20</td>
</tr>
<tr>
<td>Age</td>
<td>18 - 20</td>
<td>19</td>
<td>51.4%</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>21 - 30</td>
<td>7,566</td>
<td>64.5%</td>
<td>4,160</td>
</tr>
<tr>
<td></td>
<td>31 - 40</td>
<td>14,893</td>
<td>61.5%</td>
<td>9,324</td>
</tr>
<tr>
<td></td>
<td>41 - 50</td>
<td>6,012</td>
<td>56.8%</td>
<td>4,578</td>
</tr>
<tr>
<td></td>
<td>51 - 60</td>
<td>1,257</td>
<td>62.6%</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>60+</td>
<td>128</td>
<td>73.1%</td>
<td>47</td>
</tr>
<tr>
<td>Education</td>
<td>Ph.D</td>
<td>2,063</td>
<td>90.8%</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>Masters</td>
<td>16,977</td>
<td>81.7%</td>
<td>3,806</td>
</tr>
<tr>
<td></td>
<td>Bachelors</td>
<td>7,780</td>
<td>61.6%</td>
<td>4,846</td>
</tr>
<tr>
<td></td>
<td>Other Higher Education</td>
<td>1,582</td>
<td>29.2%</td>
<td>3,838</td>
</tr>
<tr>
<td></td>
<td>High School</td>
<td>1,473</td>
<td>19.3%</td>
<td>6,177</td>
</tr>
<tr>
<td>Employment Type</td>
<td>Regular</td>
<td>29,875</td>
<td>61.3%</td>
<td>18,877</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Female Share of Total Workforce</th>
<th>Females in Management Positions</th>
<th>Females in Junior Management Positions</th>
<th>Females in Top Management Positions (the Management Team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>42.0%</td>
<td>41.3%</td>
<td>40.1%</td>
<td>39.3%</td>
</tr>
<tr>
<td>2015</td>
<td>26.3%</td>
<td>25.0%</td>
<td>22.7%</td>
<td>22.7%</td>
</tr>
<tr>
<td>2016</td>
<td>22.7%</td>
<td>21.2%</td>
<td>13.4%</td>
<td>13.4%</td>
</tr>
<tr>
<td>2017</td>
<td>20.8%</td>
<td>17.7%</td>
<td>13.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>2018</td>
<td>12.6%</td>
<td>11.5%</td>
<td>12.3%</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

Note 1: Junior management positions include first-line managers; top management positions include Vice President and above, excluding Chairman, board of Directors, and CEO.

Note 2: 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

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

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.

Interns Receiving Advance Offers or Hired in TSMC

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.
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

Overseas New Hires in VisEra

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

Case Study
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.

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.

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.
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.

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.

The employee incentive programs take into consideration of TSMC’s financial and operational performance, future development and the operational performance of each subsidiary, with linkage to employees’ 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

<table>
<thead>
<tr>
<th>Unit: NT$m</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>81,434</td>
<td>91,605</td>
<td>99,685</td>
<td>104,130</td>
<td>108,215</td>
<td></td>
</tr>
</tbody>
</table>

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.

### 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.

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.

### Benefit Practices which Exceed the Statutory Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Labor Law</th>
<th>TSMC Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Holidays</strong></td>
<td>12 national holidays per year</td>
<td>• In order to take care of newly hired employees, 1 day annual leave for every 2 months of service in the first year</td>
</tr>
<tr>
<td><strong>Annual Leave</strong></td>
<td>3 days for new hires with more than 6 months and less than one year of employment</td>
<td>• 120 hours fully-paid and 120 hours half-paid sick leave per year</td>
</tr>
<tr>
<td><strong>Sick Leave</strong></td>
<td>30 days of half-paid sick leave per year</td>
<td>• 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</td>
</tr>
<tr>
<td><strong>Personal-affairs Leave</strong></td>
<td>14 days of personal-affairs leave per year</td>
<td>• Employee shall be covered by the Labor Insurance and National Health Insurance from the first day on board</td>
</tr>
<tr>
<td><strong>Insurance Plan</strong></td>
<td>• 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.</td>
<td>• The group insurance coverage is extended free of charge to employees on unpaid leave for purposes identified by labor law.</td>
</tr>
<tr>
<td><strong>Nursing Staff</strong></td>
<td>41 staff, in accordance with the number of company employees</td>
<td>• The group insurance plans that VisEra provides is somewhat different from those mentioned above. VisEra provides group insurance for employees’ family free of charge, and group insurance for six months free of charge to employees on unpaid leave for purposes identified by labor law.</td>
</tr>
<tr>
<td><strong>Health Examination</strong></td>
<td>Depending on the age:</td>
<td>• Once a year for all ages.</td>
</tr>
<tr>
<td><strong>Counseling Services</strong></td>
<td>None</td>
<td>• Free psychological, legal, and financial counseling services.</td>
</tr>
</tbody>
</table>

Note: Please refer to the Occupational Safety and Health chapter for details.
Parental Benefits
To provide employees 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 fulfill 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

- **Return-to-work rate**: 80.2% (454 / 566) 77.6% 80.9%
- **Retention rate**: 81.4% (386 / 474) 82.1% 81.3%
- **Application rate**: 6.9% (545 / 7,904) 2.0% 17.7%

Note: Data were collected from TSMC’s facilities in Taiwan and Visma.

| Employees qualified for parental leave in 2018 | 5428 | 2476 |
| Employees applied for parental leave in 2018 | 107 | 438 |
| Employees returned to work after parental leave in 2017 and still in service in 2018 | 69 | 317 |
| Employees returned to work after parental leave in 2017 | 84 | 390 |
| Employees expected to return to work after parental leave in 2018 and returned as scheduled or in advance | 116 | 450 |
| Employees expected to return to work after parental leave in 2018 | 90 | 364 |
TSMC Employees' Newborns

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Newborns in Taiwan</th>
<th>Number of TSMC Employees' Newborns</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>210,383</td>
<td>2,547</td>
<td>1.2%</td>
</tr>
<tr>
<td>2015</td>
<td>213,598</td>
<td>2,726</td>
<td>1.3%</td>
</tr>
<tr>
<td>2016</td>
<td>208,440</td>
<td>2,700</td>
<td>1.3%</td>
</tr>
<tr>
<td>2017</td>
<td>193,844</td>
<td>2,721</td>
<td>1.4%</td>
</tr>
<tr>
<td>2018</td>
<td>181,601</td>
<td>2,682</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

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

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

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.

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.

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.

TS麦在台湾每个月都为员工缴纳月工资6%的养老金，包括海外子公司每月的养老贡献金额，总计为NT$2,568,945,000。根据劳动保险法的规定，TSMC在台湾为员工缴纳个人养老金账户。TSMC的海外子公司也按照一定的比例为养老金管理部门缴纳养老金。
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

<table>
<thead>
<tr>
<th>TSMC Core Value Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>39,798 Samples</td>
</tr>
<tr>
<td>4.70</td>
</tr>
<tr>
<td>4.63</td>
</tr>
<tr>
<td>4.66</td>
</tr>
<tr>
<td>4.69</td>
</tr>
<tr>
<td>4.72</td>
</tr>
</tbody>
</table>

2014 2016 2018
Integrity
Commitment
Innovation
Customer Trust
Average Score
Response Rates
Effective Sample Rates
96%
91%
90%
99%
95%
96%
95%
98%
97%
97%
98%
96%

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.

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."
Talent Development

**Encourage Job Rotation**

Underscore on-the-job training with systematic job rotations to cultivate future talent.

**Enable Self-directed Learning**

Provide diverse learning resources and channels to encourage self-directed learning among employees. This will enhance individual performance and potential.

**Note**

Explanation of changes in talent development strategies:

All actions of TSMC human resources are required to align with the Company’s Core Values and Business Philosophy. They must also strive for continuous improvement and keep pace with advances in society. In 2018, TSMC continued to manage three important issues of great concern to stakeholders: (1) talent attraction and retention, (2) talent development, and (3) human rights. In response to internal and external changes, the Company has renewed its Sustainable Development Goals for 2025 and has made appropriate adjustments to their Strategies and Annual Targets.
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

To help the organization and employees grow rapidly to adapt to the changing environment and fulfill the organization needs.

To develop employees’ potential and create a workplace that maintains employees’ growth.

Pass Down Company Culture
Enhance employees’ recognition and fulfillment of the Core Values to continue strengthening them alongside the expansion of the Company.

Enhance Management Literacy
Increase the management literacy of executives at each level to motivate employees to perform their jobs with diligence and commitment.

Develop Talent Capabilities:
Actively enhance the development and cultivation of high-quality talent capabilities among internal employees to cope with the increasing difficulty of seeking external talent.

Strengthen Learning Systems and Resources
Encourage employees to voluntarily learn via diverse learning mechanisms and strengthen learning management systems for knowledge sharing and inheritance.

Criteria for Promotion
List ‘Potential’ as a critical promotion criteria.

Talent Mobility
Increase the transparency of internal job opportunities and respect the internal transfer requests of employees, allowing them to arrange their career path to complement organization developments and boost internal talent mobility.

Dual Career Ladder Approach
Build a comprehensive personnel development structure, and strengthen relevant HR policies and procedures to provide an environment where employees can find their specialty and thrive.
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Manager</th>
<th>Indirect Labor</th>
<th>Direct Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>14.2</td>
<td>25.8</td>
<td>12.1</td>
</tr>
<tr>
<td>2015</td>
<td>16.3</td>
<td>23.2</td>
<td>10.6</td>
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<tr>
<td>2016</td>
<td>15.3</td>
<td>9.2</td>
<td>6.9</td>
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<tr>
<td>2017</td>
<td>5.9</td>
<td>16.9</td>
<td>7.4</td>
</tr>
<tr>
<td>2018</td>
<td>5.7</td>
<td>15.1</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Historical Training Index

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trainees who Completed Training</td>
<td>1,121</td>
<td>1,198</td>
<td>1,257</td>
<td>1,629</td>
<td>1,694</td>
</tr>
<tr>
<td>Training Hours</td>
<td>53,649</td>
<td>527,553</td>
<td>450,756</td>
<td>549,376</td>
<td>551,752</td>
</tr>
</tbody>
</table>

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.
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

#### Quality Excellence Training Program

- **Objective:** Improve employees’ mindsets of pursuing technology improvement and quality management
- **Achievement:** 78.8% Training participation rate among full-time employees
- **Description:** 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.

#### Management Capability Enhancement Program for First-line Managers

- **Objective:** Enhance personnel management abilities of first-line managers
- **Achievement:** 9.3% Training participation rate among full-time employees
- **Description:** 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.

#### Training at new fabs

- **Objective:** Train employees in Fab 16 and Fab 18, and enable organizations and their personnel to complete tasks in these new fabs
- **Achievement:** 4.8% Training participation rate among full-time employees
- **Description:** 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.
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.

Objective: Improve the mindset of employees at different levels to pursue technology improvement and excellence in quality, as well as enhance their understanding of practical affairs.

Quality Excellence: Quality Transformation (Manager)
Departmental managers and above
Participants: 1,739 (100% completion rate)
Reaction evaluation score: 98
Learning evaluation: N/A

Quality Excellence: Quality Transformation (Indirect Labor)
Managers / section managers
Participants: 2,292 (100% completion rate)
Reaction evaluation score: 91
Learning evaluation: 100% passing rate for certification exams

Quality Excellence: Quality Transformation (Direct Labor)
Non-manager indirect labor
Participants: 17,499 (99.9% completion rate)
Reaction evaluation score: 87
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

Dual Career Ladder Approach

- Build a diverse and comprehensive personnel development structure, and strengthen HR policies and procedures to create an environment for employees to find their specialty and thrive
- Clarified the differences between managerial jobs and technical jobs, and introduced performance appraisal and development procedures
- Provided different training courses for managers, and technical / professional managers
- Regularly selected academicians and commissioners of TSMC Academy to support the career development of technical staffs

Talent Mobility

- Respect the internal transfer requests of employees and encourage them to proactively arrange their career path to boost internal talent mobility
- 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.
- Eight vice presidents have either rotated between different positions or expanded field boundaries, which has set a good example of internal talent mobility.
- 32.0% of managers and 29.9% of non-manager indirect labors transferred or rotated in accordance with individual or organization development.

Promotion Criteria - Potential

- Emphasize the importance of development potential among all promotion criteria and enhance the quality of promotion decisions
- Clarified the definition of ‘Potential’ and its evaluation method to make it one of the criteria for promotion
- Completed the promotion procedures handbook and related auxiliary tools to help managers conduct potential evaluation for employee promotion
Abide by local laws and regulations
- No material regulatory violation (where fines exceeds NT$1 million)
  ○ Target Year: 2025

Implement the "TSMC Human Rights Policy" and "RBA Code of Conduct"
- To reinforce "collective bargaining" practice, each Taiwan branch office, including wafer fabs, testing and assembly plants, and Visera, has to adopt an e-voting system in re-elections of labor representatives
  ○ Target Year: 2025

In addition to fully implementing the RBA Code of Conduct, there are two Taiwan branch offices' labor representatives’ term expired, and it’s the first time the e-voting system was adopted for re-election

2019 Targets
Abide by local laws and regulations
- No material regulatory violation (where fines exceeds NT$1 million)

Follow the Guidance of UN Guiding Principles Reporting Framework and Disclose the Status Quo
Examine the results through customer and external auditing

Note Explanation of human rights policy amendments:
All actions of TSMC human resources are required to align with the Company’s Core Values and Business Philosophy. They must also strive for continuous improvement and keep pace with advances in society. In 2018, TSMC continued to manage three important issues of great concern to stakeholders: (1) talent attraction and retention, (2) talent development, and (3) human rights. In response to internal and external changes, the Company has renewed its Sustainable Development Goals for 2025 and has made appropriate adjustments to their Strategies and Annual Targets.
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 (© Under High-risk)
  - Implement occupational disease prevention and promote physical and mental health of employees

**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 (© Under High-risk)
  - 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

**Forbid Child Labor**
- All employees (© Under High-risk)
  - 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

**Prohibit Forced Labor**
- All employees (© Under High-risk)
  - 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

**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**
- All employees / Employees in need (© Under High-risk)
  - Examine participation rates
  - Set a reminder function in both time clock and overtime systems. Conduct monthly inspections of working hours in company facilities

**Develop Internal Communication Channels for Employees**
- All employees
  - There are also regular communication meetings for employees to report any issues
  - 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

**Work-life Balance**
- All employees / Employees in need (© Under High-risk)
  - Collaborate with members of the TSMC Employee Welfare Committee and activity organizers to promote activities and encourage participation
  - 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
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, 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.

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

Human Rights Protection Training and Participation

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.

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

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

### Employees
- **Face-to-Face Meeting**
  - Chairman’s / CEO’s Communication Meeting
  - Labor-Management Meeting
  - Communication Meetings in Individual Functions / Divisions
  - Functional Activity

- **Employee Portal**
- **Employee Survey**
- **HR Area Service Team**
- **Communication Meeting**
- **eSilicon Garden**
- **Announcement**
- **Company-Wide Activity**

### Board of Directors and Management Team
- Managers of All Levels
- Human Resources

### Employee Voice Channels
- **Ombudsman System**
- **Internal Audit Committee**
- **Sexual Harassment Investigation Committee**
- **Employee Opinion Box**
- **Fab Caring Circle**

### Employee Voice Channels

- **Fab Caring Circle**
  - Various Issues in Fabs
  - Person in Charge: Fab Directors

- **Employee Opinion Box**
  - Various Issues in Fabs
  - Person in Charge: Vice President, Human Resources

- **113 Caring Hotline**
  - Personal and Work-related Issues
  - Person in Charge: Vice President, Human Resources

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

- **Sexual Harassment Investigation Committee**
  - Sexual Harassment Issues
  - Person in Charge: Deputy Director, Legal

- **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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number of Cases</th>
<th>Ombudsman System</th>
<th>Sexual Harassment Investigation Committee – Cases Reported</th>
<th>Sexual Harassment Investigation Committee – Cases Established</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>6,425</td>
<td></td>
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</tr>
<tr>
<td>2015</td>
<td>5,842</td>
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<tr>
<td>2016</td>
<td>4,937</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>4,317</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>3,856</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Note:** Data of Fab Caring Circle were collected from TSMC’s facilities in Taiwan.
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

**Strategies**

- **Advocate Safety Culture**
  - Deeply instill a people-oriented safety culture, manage safety risks, and establish an intrinsically safe working environment.
  - **2018 Achievements**
    - Incident Rate per 1,000 employees < 0.18 (Target: 2025)
    - Disabling Injuries Frequency Rate (FR) < 0.41 (Target: 2025)
    - Work-relative Disabling Injuries Frequency Rate < 0.27 (Target: 2025)
    - Disabling Severity Rate (SR) < 6 (Target: 2025)
    - Work-relative Disabling Severity Rate < 3 (Target: 2025)

- **Comprehensive Health Management**
  - Implement the prevention of occupational diseases and promote a comprehensive health management.
  - **2018 Achievements**
    - Zero cases of occupational hazards caused by exposure to chemicals (Target: 2025)
    - Health program participation rate ≥ 54% (Target: 2025)

- **Internal-External Alliance**
  - Collaborate with external parties to establish a safer working environment in our supply chain.
  - **2018 Achievements**
    - Provide coaching and audit factories of suppliers with high risk operation on safety and health standards. Completion rate: 100% (Target: 2020)
    - Provide coaching for high risk operation contractors to be ISO 45001 certified. (Target: 2025)

**2019 Targets**

- Incident Rate per 1,000 employees < 0.18
- Disabling Injuries Frequency Rate (FR) < 0.41
- Work-relative Disabling Injuries Frequency Rate < 0.27
- Disabling Severity Rate (SR) < 6
- Work-relative Disabling Severity Rate < 3
- Health program participation rate ≥ 52%
- Provide coaching and audit factories of suppliers with high risk operation on safety and health standards. Completion rate: 100%

**Note 1**
- High risk operation suppliers are those that scored an audit score below 70 in the previous year and those in the annual coaching project, such as parts cleaning vendors.

**Note 2**
- High risk operation contractors include those involved confined space, hot work, or gas/chemical tubes cutting.

**Note 3**
- The most common occupational injuries are falls and collisions. These types of injuries take longer time to recover from and result in the increase of working days lost.
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

**Corporate Environmental Protection, Safety, and Health Division**
- Construct corresponding blueprints, management protocols, and SOPs

**Wellness Center**
- Responsible for implementing health promotions and management
  - Healthcare
  - Health Promotion
  - Assistance
  - Prevention of Occupational Hazards

**Site level-Department of Industrial Safety and Environmental Protection**
- Promote safety and health related activities
  - Occupational Health Risk Inspection
  - Chemical Exposure Evaluation
  - Noise and Non-ionizing Radiation Protection
  - Human Factor Engineering Management
  - Foundry-level Safety and Health Meetings
  - Contractor Management
  - Foundry-level Prevention of Occupational Diseases

**All Departments**
- Implement all safety and health related activities

**Internal Safety and Health Management**

**Collaborating with Other Enterprises to Reduce Occupational Safety and Health Risks**

**Government, TSIA, and SEMI Organizations**
- Improve safety, health, and working environment with the collaboration between three parties
  - Enact policies, targets, and plans
  - Introduce New Technology and Management Procedures
  - Safety and Health Inspection
  - Company-level Safety and Health Meetings
  - Discussion with Stakeholders About Safety and Health Issues
  - Safety and Health Requests for Suppliers to Build A Sustainable Supply Chain
  - Investigation Council for Occupational Diseases to Implement the Prevention of Occupational Diseases

**Suppliers and Contractors**
- Improve the safety and health of the supply chain with guidance and collaboration
  - Occupational Health Risk Inspection
  - Chemical Exposure Evaluation
  - Noise and Non-ionizing Radiation Protection
  - Human Factor Engineering Management
  - Foundry-level Safety and Health Meetings
  - Contractor Management
  - Foundry-level Prevention of Occupational Diseases
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.

### Advocate Safety Culture

<table>
<thead>
<tr>
<th>Category</th>
<th>Actions</th>
</tr>
</thead>
</table>
| Legal Inspection          | • 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 |
| Standardized Operating Procedures | • 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| • 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 participators to strengthen the prevention of occupational hazards |
| Hazard Identification     | • Identified 5,079 cases of work hazard regarding working environment and conditions |
| Changed Management        | • 4,780 cases of management change have successfully been completed with zero related incidents |
| Chemical Management       | • Introduced 266 new chemicals with zero related incidents |
| Contractor Management     | • 12,443 cases of high risk procedures were completed by contractors with zero related incidents |
| Implementation Inspection | • Internal Audit recommended 1,212 improvement items, and all recommendations were improved on time |
| Emergency Response        | • 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 | • Added an employee injury investigation committee and related revisions were adopted by all fabs to lower cases of occupational injuries |

### Safety and Health Performances

- **2018 Safety and Health Performances**

### Note

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

### SPI Index

<table>
<thead>
<tr>
<th>Active Indicators</th>
<th>Passive Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Changed Safety Management within Foundries</td>
<td>Numbers of False Alarm Incident</td>
</tr>
<tr>
<td>Target Number of Safety and Health Implementing Projects</td>
<td>Number of Self-evaluated Safety and Health Errors</td>
</tr>
<tr>
<td>Completion Rate of Safety and Health Trainings</td>
<td>Completion Rate of Legal Inspection Implementation</td>
</tr>
<tr>
<td>Number of Safety and Health Promotion Activities</td>
<td>Number of Errors Found During Safety and Health Inspections</td>
</tr>
<tr>
<td>Improving Measures of Occupational Hazards</td>
<td>Contractor Management (incl. numbers of errors, miss operations, and improving measures)</td>
</tr>
<tr>
<td>Share Improving Actions of Safety and Health with Other Foundries</td>
<td>Number of Work-relative Occupational Injury</td>
</tr>
</tbody>
</table>

### SPI Diagram

<table>
<thead>
<tr>
<th>SPI</th>
<th>Performance</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPI ≥ 95</td>
<td>Excellent</td>
<td>Blue</td>
</tr>
<tr>
<td>85 ≤ SPI &lt; 95</td>
<td>Good</td>
<td>Green</td>
</tr>
<tr>
<td>70 ≤ SPI &lt; 85</td>
<td>Warning</td>
<td>Yellow</td>
</tr>
<tr>
<td>SPI &lt; 70</td>
<td>Alarm</td>
<td>Red</td>
</tr>
</tbody>
</table>
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.

**Improvement Plans for the Malfunction of Cast Resin Transformers**

- Identify the maintenance period for each electrical system and schedule each maintenance accordingly
- Collaborate with experts from NTUST and create tools without blind spots. These tools perform thorough examination of panelboards
- Optimize the assembling method of cast resin transformers. Use plastic tools that are less destructive. Change paints and filters. Request that workers pass training and raise the awareness of quality construction

**Potential Risks of Cast Resin Transformers and TSMC’s Countermeasures**

**Inherent Risks of Cast Resin Transformers**

- Malfunctioning Risk of Components
- No Early Warning Systems and Production Interruption Process
- Defects from Production Process and Increased Failure Rate

**TSMC Improvements**

- Standardized Regular Maintenance
- Development of New Technology with No Blind Spots
- Collaboration with Manufacturers

---

**Incidents Throughout the Years**

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Incidents</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Number of Incidents / Number of People</td>
<td>0.074</td>
<td>0.133</td>
<td>0.170</td>
<td>0.123</td>
<td>0.211</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Leakage</td>
<td>0.030</td>
<td>0.142</td>
<td>0.166</td>
<td>0.126</td>
<td>0.042</td>
</tr>
<tr>
<td>Trigger Fire Alarm System</td>
<td>0.028</td>
<td>0.028</td>
<td>0.062</td>
<td>0.042</td>
<td>0.062</td>
</tr>
<tr>
<td>Personal Injury</td>
<td>0.028</td>
<td>0.126</td>
<td>0.042</td>
<td>0.062</td>
<td>0.042</td>
</tr>
<tr>
<td>Chemical Leakage</td>
<td>0.030</td>
<td>0.062</td>
<td>0.042</td>
<td>0.062</td>
<td>0.042</td>
</tr>
</tbody>
</table>

Unit: Incident Rate of Each Category per 1,000 Employees
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>52,379,580</td>
<td>34,144,666</td>
<td>86,524,246</td>
</tr>
<tr>
<td>2017</td>
<td>50,557,053</td>
<td>31,558,154</td>
<td>82,115,207</td>
</tr>
<tr>
<td>2018</td>
<td>58,241,017</td>
<td>35,905,346</td>
<td>94,146,363</td>
</tr>
</tbody>
</table>

Notes:
- 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

Notes:
- 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.

### 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

**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

**Management**
- 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

### Analysis and Discuss Injury Cases in Safety and Health Council

**Disabling Frequency Rate**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tumbles</th>
<th>Collisions</th>
<th>Others</th>
<th>Cuts / Scratches</th>
<th>Sport Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>35</td>
<td>23</td>
<td>16</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>2017</td>
<td>43</td>
<td>16</td>
<td>16</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>2018</td>
<td>44</td>
<td>20</td>
<td>12</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

**Rate of Working Days Lost from Occupational Induced Injuries**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tumbles</th>
<th>Collisions</th>
<th>Others</th>
<th>Cuts / Scratches</th>
<th>Sport Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>40</td>
<td>14</td>
<td>2</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>2017</td>
<td>18</td>
<td>17</td>
<td>9</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>2018</td>
<td>49</td>
<td>18</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
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

**Ergo**
- Work with experts on automatic ergo identification system
  - New Measures Since 2018
  - Constant Measures
  - Identify the human risk differences between manual carrying and equipment maintenance. Introduce automatic risk identification systems to the manufacturing section
  - Use automatic human error identification system for safer high-risk operations
  - Refer to the results of health examination, care for off work employees with muscle pain, and arrange doctor appointments for them

**Chemical**
- Construct new health risk evaluation and control the use of chemicals
  - New Measures Since 2018
  - Constant Measures
  - Work with NCKU on the new health risk evaluation for operators in FAB
  - Make sure the chemical safety information is correct
  - Monitor operations with first-tier substances that may possibly lead to cancer, deformities, and germline mutation with medical doctors and ask for suggestions and improvement
  - Control the use of hazardous substances

**Social / Psychological**
- Provide counseling services to employees who feel high levels of pressure
  - New Measures Since 2018
  - Constant Measures
  - Hand out counseling service cards to employees, reminding them that they are entitled to 5 free hours of counseling services each year
  - Provide assistance to meet employees’ needs
  - Provide counseling services
  - Provide lectures about psychological health

**Biological**
- Follow CDC Announcements Instantly
  - New Measures Since 2018
  - Constant Measures
  - Develop a guideline for the prevention and response to notifiable contagious diseases
  - Give employees health education information before flu and dengue fever seasons
  - Provide epidemic prevention packages and health education information to employees who are going to infected areas
  - Establish response procedures for mass food poisoning incidents and food safety management
  - Archive the amount of ionizing radiation and track the radiation protection of equipment over the years
  - Minimize the noises of FAB
  - Manufacturing equipment examines the amount of non-ionizing radiation every 6 months
  - Establish a mechanism that controls the source of radiation

**Physical**
- Increase Identification of Physical Exposure in the Environment
  - New Measures Since 2018
  - Constant Measures
  - Identify the human risk differences between manual carrying and equipment maintenance. Introduce automatic risk identification systems to the manufacturing section
  - Use automatic human error identification system for safer high-risk operations
  - Refer to the results of health examination, care for off work employees with muscle pain, and arrange doctor appointments for them

**Achievements**
- Improved operations with high human risks, such as overweight wafer cassettes. (Please refer to the example below.) 100% employees were satisfied with the results
- In 2018, no new first-tier substance was used in technology development
- Safety checklists were 100% correct
- Took employees’ feedback into consideration and solved problems for employees. 95% of employees were satisfied
- To prevent further spread, 423 employees have been well managed
- Minimized the noises of FAB
- No case of radiation exposure

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

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.

Innovative Actions

To prevent further spread, 423 employees have been well managed. 8,846 employees have been screened for colorectal or cervical cancer examinations and breast ultrasounds. Assisted 809 pregnant or postpartum employees with working environment evaluations and gave away 1,777 welfare brochures and baby carriers to new parents. 325 Middle or high health risks have received medical assistance and working hour management. 809 Maternal Health Management.

General Healthcare 43,802 Number of People. Middle or high levels of abnormalities 7,164 Number of People. Have been monitored 100. Special Health Examination Management 3,926 Number of People. To follow Occupational Safety and Health Act, 3,926 employees completed corresponding health examination, which was a 100% completion rate.

Prevention of Occupational Cerebrovascular, Cardiovascular, and Heart Diseases 325 Number of People. Middle or high health risks have received medical assistance and working hour management. Maternal Health Management 809 Number of People. Assisted 809 pregnant or postpartum employees with working environment evaluations and gave away 1,777 welfare brochures and baby carriers to new parents.

Cancer Screening 8,846 Number of People. 8,846 employees have been screened for colorectal or cervical cancer examinations and breast ultrasounds.

Clinic Services 20,116 Number of People. Services, including on-site medical and dental clinics, are provided for employees, their families, businesses, and visitors. 20,116 people have been served.

Epidemic Prevention 423 Number of People. To prevent further spread, 423 employees have been well managed.

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.

For further information, please refer to the official website of TSMC: TSMC Promotes Employees’ Well-being to Create a Friendly Workplace.
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.

**Internal-External Alliance**

- Establish hazardous substance management and help amend SEMI standards
- Participate in WSC to find substitutes for hazardous substances
- On behalf of CNFI, give the government suggestions, such as full disclosure of hazardous substances
- Contact OSHA to clarify the concerns of examination standards of operational environment
- Work with OSHA and ask for full disclosure of hazardous chemicals that may lead to cancer, deformities, and germline mutations
- Work with OSHA to strengthen the safety standards for robot design. Engage in on-field visits and safety examination on these robots
- Participate in forums held by the government, such as occupational health risk assessment
- Take part in industry seminars and share experiences in chemical management
- Be invited to APOSIO and universities to share health risk assessment, safety and health management in supply chain, human risk exposure, and chemical management
- Hold supply chain management courses to teach safety and occupational health management

**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 staffs' 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

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

<table>
<thead>
<tr>
<th>Existing Contractors</th>
<th>Training Courses</th>
<th>2015 Number of People</th>
<th>2016 Number of People</th>
<th>2017 Number of People</th>
<th>2018 Number of People</th>
<th>Mandatory Courses</th>
<th>Overseas Data</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Category \ Year</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>SR</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

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.

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
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 SDG1, SDG3 and SDG4 in eliminating education gaps, improving the welfare goals and quality education.

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 poverty, achieving health and welfare goals and quality education.

Our Social Investments

- Commercial Initiatives
- Community Investments
- Charitable Donations

Cash Contribution 198,988,373 (NTS)
Time 177,848,774 (NTS)
In-kind Giving 289,972,617 (NTS)
Management Overheads 23,341,596 (NTS)

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

**Care for the Educationally Disadvantaged**
- Continuously collaborate with educational organizations from both the public and private sectors to provide no less than NT$11 million resources annually.
  - Target Year: 2025
- Offer scholarships for disadvantaged students in additional 3 top-tier universities in southern Taiwan.

**Diversified Education Platform**
- Cooperate with various educational organizations to hold humanity and science competitions, with at least 500 participants each.
  - Target Year: 2025
- Continue to hold humanity and science events to provide teenagers with various platforms outside the educational system.

**Promote Arts and Culture**
- Sponsor 10 outstanding local artists or groups.
  - Target Year: 2025
- Ensure the number of participants in youth competitions is higher than the previous year.

**2018 Achievements**
- Sponsored the “Sunrise Scholarship” of the National Tsing Hua University and the “Sunflower Scholarship” of the National Central University providing a total of NT$3.02 million in scholarships to 37 students.
  - Target: Care for the educationally disadvantaged: Plan to set up a mentor program for the Sunrise Scholarship, which provides guidance in academics and life to students in addition to financial aids.
- TSMC Youth Calligraphy and Seal Carving Awards with 1,000 participants.
- TSMC Youth Literature Awards with 2,078 submissions (online submissions were included), up by 1,462 pieces from 2017.
- TSMC Science Fun Fair for Teens attracted more than 1,000 students to participate the event.
- A new project category, with the theme of “USAGE 100%”, was added to the TSMC’s Youth Dream Building Project to raise awareness of environmental issues. A total of 67 groups of students from 13 universities in Taoyuan, Hsinchu, and Miaoli participated in this project.
  - Target: Support diversified education platform: Ensure the number of total participants in each youth competition is no less than that of the previous year.

**2019 Targets**
- Offer scholarships for disadvantaged students in additional 3 top-tier universities in southern Taiwan.
- Continuously organize TSMC Hsinchu Art Festivals and sponsor at least 5 talented local artists or groups annually.
- Organizing TSMC Lecture: at least 4 sessions.

Note: The mentor program is currently still under evaluation and will be implemented once the program is finalized.
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.
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.
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
What We Want to Solve
Nurturing high school students with scientific and humanistic minds and broadening their vision.

Projects of the Year
"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

Supporting Youth with Diversified Education Platform
TSMC Education and Culture Foundation

How We Respond and Act
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.

40 million

In order to raise the interest of the next generation towards this project, the TSMC Foundation launched a pilot project called "Aesthetics of Sea Waste" with the Department of Arts and Design of the National Tsing Hua University, combining social concerns with innovation.
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 generation’s 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

“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.

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.

Chih-Cheng Wang
Principal of Fuhsin Arts & Trade School

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.

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.
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.

Projects of the Year

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 "Beyond 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.

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.

Investment Ratio by TSMC Foundation in International and Local Art Groups

<table>
<thead>
<tr>
<th>Year</th>
<th>International troupes</th>
<th>Local troupes</th>
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</thead>
<tbody>
<tr>
<td>1998-2018</td>
<td>20%</td>
<td>80%</td>
</tr>
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</table>

I would like 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.

I have to thank the TSMC Education and Culture Foundation for its efforts in the promotion of artistic and cultural events, especially the annual TSMC Hsinchu 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 Charity Foundation

Strategies

- **Take Care of Elder People Living Alone**
  We work with hospitals across Taiwan through the Networking of Love system and provide a variety of medical resources to support medical cares for elder people living alone.

- **Promote Filial Piety**
  We collaborate with the Ministry of Education, schools, media, and other enterprises to promote filial piety education at schools and organize promotional events. Meanwhile, we cultivate filial piety volunteers to hold activities and spread the notion of filial piety.

- **Care for the Disadvantaged**
  We provide living and educational resources to the disadvantaged through book reading, community, and corporate volunteers. We are also committed to providing emergency aids in Taiwan.

- **Protect the Environment**
  We aim to reduce waste of resources through the Cherish Food Program. We also promote environmental protection and energy conservation through our energy-saving, ecology, and corporate volunteers.

Long-term Goals

- **Take Care of Elder People Living Alone**
  Provide service to 10,000 person-time elder people living alone through the Networking of Love system
  - Target Year: 2025

- **Promote Filial Piety**
  Promote filial piety education in 100 educational institutions
  - Target Year: 2025

- **Care for the Disadvantaged**
  Donate at least NT$10 million for disadvantaged groups per year
  - Provide at least 8,000 hours of reading service per year
  - Target Year: 2025

- **Protect the Environment**
  Provide more than 1,000 person-time in environmental protection volunteer service
  - Target Year: 2025

2018 Achievements

- **Take Care of Elder People Living Alone**
  Exceeded the goal by providing service to 9,000 person-time elder people living alone through the Networking of Love system
  - Target: 7,500 person-time

- **Promote Filial Piety**
  Exceeded the goal and promoted filial piety education in 21 institutions
  - Target: 20 elementary schools

- **Care for the Disadvantaged**
  Exceeded the goal and donated over NT$ 20 million to disadvantaged groups, and provided more than 8,400 hours of reading service
  - Target: Donate at least NT$10 million to disadvantaged groups
  - Provide at least 8,000 hours of reading service per year

- **Protect the Environment**
  Failed to achieve the goal
  - Provided over 950 person-time in environmental protection volunteer service
  - Target: More than 1,000 person-time

2019 Targets

- **Take Care of Elder People Living Alone**
  Provide service to 9,000 person-time elder people living alone through the Networking of Love system

- **Promote Filial Piety**
  Promote filial piety education in 35 institutions

- **Care for the Disadvantaged**
  Donate at least NT$10 million to disadvantaged groups
  - Provide at least 8,000 hours of reading service per year

- **Protect the Environment**
  Provide more than 1,000 person-time in environmental protection volunteer service

Note: Due to adjustment of the 2018 eco-tour program and cancellation of multiple volunteer services caused by weather conditions, person-time in volunteer service did not meet the target of the year.
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 to the Penghu Health Center

- **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
  - Filial Piety Volunteers
  - Promotional Events for Filial Piety

- **Care for the Disadvantaged**
  - Provide emergency aids, care for disadvantaged groups' welfare and education, and implement and promote volunteer services
  - Hualien Earthquake Relief Project
  - Ten Thousand Dollars per Household Program
  - Emergency Aid for Disadvantaged Program

- **Protect the Environment**
  - Expand service scale of ecology and energy-saving volunteers
  - Launch Cherish Food Program

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.
TSMC Charity Foundation Contribution

Type of Contribution\(^{\text{Note 1}}\)

- In-kind Giving: 13.1%
- Cash Contribution: 52.5%
- Time: 34.5%

Total: $222,058,704

Type of Activities\(^{\text{Note 2}}\)

- Charitable Donation: 40.9%
- Community Investment: 58.4%
- Commercial Initiatives: 0.7%

Total: $222,058,704

Type of Focus

- Take Care of Elder People Living Alone: 10.0%
- Promote Filial Piety: 2.0%
- Care for the Disadvantaged: 2.1%
- Protect the Environment: 85.9%

Total: $222,058,704

Volunteer Head Count

- 2014: 5,451
- 2015: 6,812
- 2016: 7,838
- 2017: 8,776
- 2018: 10,266

Volunteer Person-time

- 2014: 7,379
- 2015: 10,191
- 2016: 16,570
- 2017: 24,612
- 2018: 27,590

Volunteer Service Hours

- 2014: 39,390
- 2015: 54,573
- 2016: 93,623
- 2017: 106,176
- 2018: 109,059

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.
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

1. **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

2. **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

3. **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

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
Intelligent Health System

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

Donation of Ultrasonic Machines

Qimei and Wangan 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 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 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.
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.

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 elder people for a long time. This makes volunteers feel safe when delivering food and 50 elder 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 elder 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

Year-end Reunion Dinner with Elder People Living Alone

Colleagues from Fab 12A has had year-end reunion dinners with elder people living alone from the Huashan Social Welfare Foundation for six consecutive years. Throughout the years, over 400 elder 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 elder care organizations such as Catholic Society of Jesus Hsinchu Social Service Center, and Old Five Old Foundation, and accompanied these elder people to celebrate the new year.

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 elder 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.
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 awareness of family in the next generation.

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.
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.

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.

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.

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.

Projects of the Year

Filial Piety Teachers

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

Employees were engaged in filial piety lectures

Winter Fun Farm Village Ecology Tour

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
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.

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.

Projects of the Year
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.
Ten Thousand Dollars Per Household Program and Emergency Aid Program

In the process of assisting Hualien 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 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.

Projects of the Year

Ten Thousand Dollars Per Household Program and Emergency Aid Program

Welcome to the website of Sending Love Program. Join us in making change http://www.520.org.tw

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.

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
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.

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.

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.

Projects of the Year

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 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.

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.

1,400 hours

Energy-saving volunteers provided around 1,400 hours of energy-saving consulting services.

2,000 hours

Ecology volunteers provided more than 2,000 hours of tour services.
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 (Pintung)

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.

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.
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.

Feedback
If you have any feedback, advice or suggestions on this report or TSMC’s sustainable development, please feel free to contact us.

Responsible Unit
Corporate Social Responsibility Committee
E-mail: csr@tsmc.com
Phone: +886-3-5636688
Address: 8, Li-Hsin Rd. 6, Hsinchu Science Park, Hsinchu 30078

Reporting Guidelines and Principles

Sustainability
- GRI Standards: Comprehensive Option
- AA 1000 Accountability Principle
- ISO 14001 Environmental Management System
- ISO 14064 Greenhouse Gas Inventory

Financial
- IFRSs approved and issued by the Financial Supervisory Commission (FSC) Regulations Governing the Preparation of Financial Reports by Securities Issuers
- GRI Standards: Comprehensive Option
- AA 1000 Accountability Principle

Environmental
- ISO 14001 Environmental Management System
- ISO 14064 Greenhouse Gas Inventory

Certification Organization
- DNV GL Business Assurance
- Deloitte & Touche

Report Writing and Quality Management Process

Compilation
- Identify the annual practice, and review performance of each division’s sustainable operations
- Review completion and accuracy of all the data and materials

Editing
- Overall planning
- Define the main theme and content of the report
- Edit and revise
- Report verification

Internal – VPs and above executives of TSMC organizations
- Provide the key sustainability factors and issues of 2018
  1. Objectives
  2. Performance indicators
  3. Results
  4. Future actions

External – third-party inspection organizations
- Approve data and information
- DNV GL Business Assurance Company limited reviews and verifies this report based on DNV GL VeriSustainTM Protocol and GRI Standards
- GRI Standards Comparison Table and Independent Third Party Assurance Statement can be found in the appendix of this report.

Chairperson of the CSR Committee
- Approve the report
### Data Collection Boundaries for Sustainable Development Issues

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<td>Social Participation</td>
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</table>

[^1]: TSMC’s facilities in Taiwan include corporate headquarters, wafer fabs, testing and assembly plants.

[^2]: TSMC subsidiaries or offices in North America, Europe, Japan, South Korea, and other countries.

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*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

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.

In 2018, TSMC participated in about 30 industry associations and non-profit organizations, with expenditures of over NT$21.7 million.

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, but 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
- Taiwan IC Industry & Academia Research Alliance

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 Senior Director of the Corporate Communications Division, Elizabeth Sun currently serves as a member of the ACGA Council

As a leading semiconductor company, TSMC aims to use its influence in the industry to join hands with other enterprises to work for our mutual benefit in order to adapt to changes in the industry and the international environment, as well as improve the Company’s quality and competitiveness. The issues covered by the industry associations and non-profit organizations which TSMC participates in are categorized as follows:

- Technology Innovation
- Corporate Governance
- Environmental Sustainability
- Human Rights and Supply Chain Management

Note 1: Non-profit organizations in the areas of charity and education are not included here. For details of TSMC’s participation in the TSMC Charity Foundation and TSMC Education and Culture Foundation, please see pages 162 to 183 of this report.

Note 2: By law, TSMC is 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
2. The Science and Technology in Society Forum (STSF): NT$5,756,000
3. The Responsible Business Alliance (formerly Electronics Industry Citizenship Coalition): NT$5,393,380
4. The Responsible Business Alliance (RBA): NT$4,590,000

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.

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.

TSMC participates in the Responsible Business Alliance 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.
## CSR Performance Summary

### Economic

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<tr>
<th>Key Indicator</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>Revenue (NT$ billion)</td>
<td>763</td>
<td>843</td>
<td>948</td>
<td>977</td>
<td>1,031</td>
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<tr>
<td>Net Income (NT$ billion)</td>
<td>264</td>
<td>307</td>
<td>334</td>
<td>343</td>
<td>351</td>
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<tr>
<td>Income Tax Expense (NT$ billion)</td>
<td>38</td>
<td>44</td>
<td>52</td>
<td>53</td>
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<tr>
<td>R&amp;D Expenditures (NT$ billion)</td>
<td>57</td>
<td>66</td>
<td>71</td>
<td>81</td>
<td>86</td>
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<tr>
<td>Capital Expenditures (NT$ billion)</td>
<td>289</td>
<td>258</td>
<td>328</td>
<td>331</td>
<td>316</td>
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<tr>
<td>Greenhouse Gas Emission (Scope 1 and Scope 2) (Metric Ton - CO2 equivalent)</td>
<td>6,356,130</td>
<td>6,670,291</td>
<td>7,413,953</td>
<td>8,156,140</td>
<td>8,475,367</td>
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<td>Scope 1 (Metric Ton - CO2 equivalent)</td>
<td>2,113,858</td>
<td>2,027,645</td>
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<td>Taiwan Facilities</td>
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<td>1,566,662</td>
<td>1,648,268</td>
<td>1,640,532</td>
<td>1,705,746</td>
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<td>Subsidiaries</td>
<td>458,360</td>
<td>460,983</td>
<td>387,242</td>
<td>435,396</td>
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<td>Scope 2 (Metric Ton - CO2 equivalent)</td>
<td>4,242,272</td>
<td>4,642,646</td>
<td>5,378,443</td>
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<td>6,349,642</td>
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<tr>
<td>Taiwan Facilities</td>
<td>3,939,172</td>
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<td>Subsidiaries</td>
<td>303,100</td>
<td>326,880</td>
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<td>Scope 3 (Metric Ton - CO2 equivalent)</td>
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<td>3,446,447</td>
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<td>Fluorinated Greenhouse Gas Emission (Metric Ton - CO2 equivalent)</td>
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### Environmental

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<td>NOx Emissions (Metric Tons)</td>
<td>59.65</td>
<td>54.42</td>
<td>60.54</td>
<td>82.5</td>
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<td>SOx Emissions (Metric Tons)</td>
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<td>32.55</td>
<td>33.08</td>
<td>43.87</td>
<td>39.71</td>
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<td>Energy Consumption (GWh)(Including electricity, nature gas and diesel)</td>
<td>7,968</td>
<td>8,915</td>
<td>9,848</td>
<td>12,016</td>
<td>13,167</td>
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<td>Direct Energy Consumption (GWh)(Including nature gas and diesel)</td>
<td>423</td>
<td>455</td>
<td>489</td>
<td>628.2</td>
<td>726</td>
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<td>Indirect Energy Consumption (GWh)(Electricity)</td>
<td>7,545</td>
<td>8,460</td>
<td>9,358</td>
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<td>Water Consumption (Million Metric Tons)</td>
<td>38.2</td>
<td>37.5</td>
<td>42.0</td>
<td>48.9</td>
<td>56.8</td>
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<td>Taiwan Facilities</td>
<td>34.9</td>
<td>34.0</td>
<td>38.6</td>
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<td>Subsidiaries</td>
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<td>3.5</td>
<td>3.4</td>
<td>3.8</td>
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<tr>
<td>Process Water Recycling Rate (%) (Taiwan Sites)</td>
<td>87.6</td>
<td>87.3</td>
<td>87.4</td>
<td>87.5</td>
<td>87.5</td>
</tr>
<tr>
<td>Total Water Saving (Million Metric Tons) (Taiwan Sites)</td>
<td>81.0</td>
<td>85.6</td>
<td>94.3</td>
<td>103.4</td>
<td>129</td>
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### Key Indicators

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<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
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<tr>
<td>Waste Generated (Metric Tons)</td>
<td>208,213</td>
<td>273,096</td>
<td>298,761</td>
<td>369,745</td>
<td>393,784</td>
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<td>General Waste Generated</td>
<td>66,462</td>
<td>137,524</td>
<td>163,584</td>
<td>201,114</td>
<td>213,840</td>
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<td>Taiwan Facilities</td>
<td>61,026</td>
<td>132,427</td>
<td>158,899</td>
<td>196,077</td>
<td>208,340</td>
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<td>Subsidiaries</td>
<td>5,436</td>
<td>5,097</td>
<td>4,685</td>
<td>5,037</td>
<td>5,501</td>
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<tr>
<td>Hazardous Waste Generated</td>
<td>141,751</td>
<td>135,572</td>
<td>135,177</td>
<td>168,631</td>
<td>179,944</td>
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<td>Taiwan Facilities</td>
<td>140,024</td>
<td>133,360</td>
<td>133,085</td>
<td>165,891</td>
<td>169,427</td>
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<td>Subsidiaries</td>
<td>1,727</td>
<td>2,212</td>
<td>2,092</td>
<td>2,740</td>
<td>10,516</td>
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<td>Waste Recycling Rate (%)</td>
<td>93</td>
<td>95</td>
<td>95</td>
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<tr>
<td>Taiwan Facilities</td>
<td>93</td>
<td>95</td>
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<td>Subsidiaries</td>
<td>79</td>
<td>79</td>
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<td>80</td>
<td>83</td>
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<tr>
<td>ISO 14001 Certified Sites</td>
<td>15</td>
<td>16</td>
<td>18</td>
<td>20</td>
<td>22</td>
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<tr>
<td>% Sites Certified</td>
<td>100</td>
<td>100</td>
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<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Numbers of Employee</td>
<td>43,591</td>
<td>45,272</td>
<td>46,968</td>
<td>48,602</td>
<td>48,757</td>
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<td>Employee Training Hours</td>
<td>884,174</td>
<td>780,546</td>
<td>623,711</td>
<td>639,852</td>
<td>540,408</td>
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<td>Women in Workforce (%)</td>
<td>42.00%</td>
<td>41.30%</td>
<td>40.10%</td>
<td>39.30%</td>
<td>38.70%</td>
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<tr>
<td>Females in Management (%)</td>
<td>11.10%</td>
<td>11.50%</td>
<td>11.70%</td>
<td>12.30%</td>
<td>12.60%</td>
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<tr>
<td>Females in Junior Management (%)</td>
<td>12.20%</td>
<td>12.60%</td>
<td>12.70%</td>
<td>13.40%</td>
<td>13.50%</td>
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<tr>
<td>Females in Top Management (%)</td>
<td>25.00%</td>
<td>26.30%</td>
<td>22.70%</td>
<td>22.70%</td>
<td>20.80%</td>
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<tr>
<td>Turnover Rate (%)</td>
<td>6.2%</td>
<td>5.2%</td>
<td>4.3%</td>
<td>4.2%</td>
<td>4.5%</td>
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<tr>
<td>Voluntary Turnover Rate (%)</td>
<td>6.0%</td>
<td>5.0%</td>
<td>4.2%</td>
<td>4.1%</td>
<td>4.3%</td>
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<td>Safety - Injury Frequency Rate</td>
<td>0.36</td>
<td>0.47</td>
<td>0.54</td>
<td>0.56</td>
<td>0.88</td>
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<td>Safety - Injury Severity Rate</td>
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<td>5</td>
<td>7</td>
<td>7</td>
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<td>Fatalities - Employees</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Fatalities - Contractors</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Cash Donation (NT$ million)</td>
<td>99</td>
<td>64.8</td>
<td>89.1</td>
<td>301.2</td>
<td>199.0</td>
</tr>
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#### Notes
- **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 Number X 1,000,000 / Total hours worked.
- **Note 6** Safety - Injury Severity Rate = Lost Work Days X 1,000,000 / 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

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<td>102-1</td>
<td>Name of the organization</td>
<td>Our Business: About TSMC</td>
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<td>102-2</td>
<td>Activities, brands, products, and services</td>
<td>Our Business: About TSMC</td>
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<td>102-3</td>
<td>Location of headquarters</td>
<td>Our Business: About TSMC</td>
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<tr>
<td>102-4</td>
<td>Location of operations</td>
<td>Our Business: About TSMC</td>
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<td>102-5</td>
<td>Ownership and legal form</td>
<td>Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements</td>
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<td>Markets served</td>
<td>Our Business: About TSMC</td>
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<td>Scale of the organization</td>
<td>Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements</td>
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<td>Information on employees and other workers</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Right People with Shared Vision and Values- Global Workforce Structure</td>
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<td>102-9</td>
<td>Supply chain</td>
<td>Responsible Supply Chain: Sustainability Risk Control and Local Supply Chain Optimization</td>
<td>72</td>
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<tr>
<td>102-10</td>
<td>Significant changes to the organization and its supply chain</td>
<td>Our Business: About TSMC; Please refer to 2018 TSMC Annual Report (II) Financial Statements</td>
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<tr>
<td></td>
<td></td>
<td>Responsible Supply Chain: Strategy and Long-term Goals</td>
<td></td>
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<tr>
<td>102-11</td>
<td>Precautionary Principle or approach</td>
<td>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</td>
<td>72</td>
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<td>102-12</td>
<td>External initiatives</td>
<td>Responsible Business Alliance (RBA, the previous EICC) and Responsible Minerals Assurance Process (RMAP, the previous Conflict-free Smelter Program)</td>
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<td>102-13</td>
<td>Membership of associations</td>
<td>Appendix: Participation in Industry Associations and Non-Profit Organizations</td>
<td>188</td>
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<td>102-14</td>
<td>Statement from senior decision-maker</td>
<td>Letter from the CSR Committee chairperson</td>
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<td>Key impacts, risks, and opportunities</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>102-16</td>
<td>Values, principles, standards, and norms of behavior</td>
<td>Ethical Management: Ethic and Regulatory Compliance</td>
<td>32</td>
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<tr>
<td></td>
<td></td>
<td>Please refer to 2018 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance</td>
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| 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    |
| 102-21             | Consulting stakeholders on economic, environmental, and social topics          | Sustainable Governance: Materiality Analysis and Stakeholder Communication                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 17   |
| 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. |      |

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<tr>
<td>102-25</td>
<td>Conflicts of interest</td>
<td>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. Please refer to 2018 TSMC Annual Report: 2.4.1 Information Regarding Board Members 4.1.4 Major Shareholders 4.1.8 Related Party Relationship among Our 10 Largest Shareholders 5.3.4 Raw Materials and Supply Chain Management-Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement 5.4 Customer Trust-Customers that Accounted for at Least 10% of Annual Consolidated Net Revenue 8.1 Subsidiaries Please refer to Consolidated Financial Statements for 2018: Note 44: Additional Disclosures Table 6 - Total Purchases from or Sales to Related Parties of at Least NT$100 Million or 20% of the Paid-in Capital</td>
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<td>102-26</td>
<td>Role of highest governance body in setting purpose, values, and strategy</td>
<td>Sustainable Governance: Corporate Social Responsibility Policy, Corporate Social Responsibility Matrix, Corporate Social Responsibility Committee 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.” 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. 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.</td>
</tr>
<tr>
<td>102-27</td>
<td>Collective knowledge of highest governance body</td>
<td>Please refer to 2018 TSMC Annual Report: 3. Corporate Governance “Continuing Education/Training of Directors” and “Continuing Education/Training of Management” in 2018 Through quarterly management report and annually CSR report to develop and enhance the Board of Directors' collective knowledge of economic, environmental and social topics.</td>
</tr>
<tr>
<td>102-28</td>
<td>Evaluating the highest governance body's performance</td>
<td>Please refer to 2018 TSMC Annual Report: 3.2 Board of Directors 3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission</td>
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<tr>
<td>102-29</td>
<td>Identifying and managing economic, environmental, and social impacts</td>
<td>Please refer to 2018 TSMC Annual Report: 3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission 6.3 Risk Management</td>
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<tr>
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<td>Report Contents or Explanation</td>
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<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>102-30</td>
<td>Effectiveness of risk management processes</td>
<td>The risk management organization periodically briefs the Audit Committee on the ever-changing risk environment facing TSMC, the focus of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Company's enterprise risk management, and risk assessment and mitigation efforts. The audit committee's chairperson also reports on the risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>environment and risk mitigation actions to be taken. TSMC's risk management organization is composed of RM Steering Committee, RM Executive</td>
</tr>
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<td>Council, and RM Program. Refer section 6.3.1 Risk Management Organization of TSMC Annual Report for details.</td>
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<td>102-32</td>
<td>Highest governance body's role in sustainability reporting</td>
<td>Sustainable Governance: Corporate Governance</td>
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<td></td>
<td>This report is reviewed and approved by the Company's functional heads and Chairperson of the Corporate Social Responsibility Committee (Chief</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial Officer).</td>
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<tr>
<td>102-33</td>
<td>Communicating critical concerns</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<tr>
<td>102-34</td>
<td>Nature and total number of critical concerns</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>102-35</td>
<td>Remuneration policies</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation</td>
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<tr>
<td></td>
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<td>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</td>
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<td>Employees' Profit Sharing Bonus Paid to Management Team 5.5 Human Capital - 5.5.5 Compensation</td>
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<td>102-36</td>
<td>Process for determining remuneration</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation</td>
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<td></td>
<td>Please refer to 2018 TSMC Annual Report: 3.2.2 Compensation Committee 3.2.3 Director and Committees Members/Attendance/ Compensation Committee</td>
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<td></td>
<td></td>
<td>Meeting Status</td>
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<tr>
<td>102-37</td>
<td>Stakeholders' involvement in remuneration</td>
<td>TSMC devotes to do better corporate governance by communicating with stakeholders proactively, collecting suggestions, and taking these into</td>
</tr>
<tr>
<td></td>
<td></td>
<td>account for operations.</td>
</tr>
<tr>
<td>102-38</td>
<td>Annual total compensation ratio</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits-Competitive Total Compensation</td>
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<tr>
<td></td>
<td></td>
<td>Please refer to 2018 TSMC Annual Report: 3.1.1 Competitive Compensation Program 5.5 Median of global employees annual total compensation</td>
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<tr>
<td></td>
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<td>Annual total compensation ratio between CEO and median</td>
</tr>
<tr>
<td>102-39</td>
<td>Percentage increase in annual total compensation</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits-Competitive Total Compensation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Headcount and average annual compensation of non-corporate executive full-time employees, and year-over-year difference</td>
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<tr>
<td>102-40</td>
<td>List of stakeholder groups</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>Disclosure Number</td>
<td>Disclosure Title</td>
<td>Report Contents or Explanation</td>
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<td>-------------------</td>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>102-41</td>
<td>Collective bargaining agreements</td>
<td>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.</td>
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<tr>
<td>102-42</td>
<td>Identifying and selecting stakeholders</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>102-43</td>
<td>Approach to stakeholder engagement</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>102-44</td>
<td>Key topics and concerns raised</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>Entities included in the consolidated financial statements</td>
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<td>102-46</td>
<td>Defining report content and topic boundaries</td>
<td>About This Report</td>
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<td>List of material topics</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>Restatements of information</td>
<td>No significant changes</td>
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<td>102-49</td>
<td>Changes in reporting</td>
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<td>Date of most recent report</td>
<td>June, 2018</td>
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<td>About This Report</td>
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<td>GRI 103: Management Approach</td>
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<td>103-1</td>
<td>Explanation of the material topic and its Boundary</td>
<td>Sustainable Governance: Materiality Analysis and Stakeholder Communication</td>
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<td>103-2</td>
<td>The management approach and its components</td>
<td>Please refer to the contents of related topics</td>
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<td>103-3</td>
<td>Evaluation of the management approach</td>
<td>Please refer to the contents of related topics</td>
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<td>GRI 201: Economic Performance</td>
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<td>201-1</td>
<td>Direct economic value generated and distributed</td>
<td>Our Business: Financial Performance</td>
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<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- TSMC Compensation and Benefits Expenses</td>
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<tr>
<td>201-2</td>
<td>Financial implications and other risks and opportunities due to climate change</td>
<td>Green Manufacturing: Climate Change and Energy Management- TSMC TCFD Framework, Climate Risks and Opportunities Identification, Purchasing Green Power</td>
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<tr>
<td>201-3</td>
<td>Defined benefit plan obligations and other retirement plans</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- TSMC’s Pension Allocation and Preparation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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 overseas subsidiaries also make monthly contributions at certain percentages of the basic salary of their employees in accordance with local practices.</td>
</tr>
<tr>
<td>201-4</td>
<td>Financial assistance received from government</td>
<td>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.</td>
</tr>
<tr>
<td>GRI 202: Market Presence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>202-1</td>
<td>Ratios of standard entry level wage by gender compared to local minimum wage</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits- Competitive Total Compensation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>202-2</td>
<td>Proportion of senior management hired from the local community</td>
<td>The information of TSMC management team has been fully disclosed in 2018 TSMC Annual Report</td>
</tr>
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<tr>
<td>GRI 203:Indirect Economic Impacts</td>
<td>203-1 Infrastructure investments and services supported</td>
<td>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.</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>203-2 Significant indirect economic impacts</td>
<td>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</td>
<td>26</td>
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<tr>
<td>GRI 204:Procurement Practices</td>
<td>204-1 Proportion of spending on local suppliers</td>
<td>Responsible Supply Chain: Continue Driving Local Supply Chain Upgrade</td>
<td>73</td>
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<tr>
<td>GRI 205:Anti-corruption</td>
<td>205-1 Operations assessed for risks related to corruption</td>
<td>The Company conducts corruption related risk assessment for all operations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>205-2 Communication and training about anti-corruption policies and procedures</td>
<td>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</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>205-3 Confirmed incidents of corruption and actions taken</td>
<td>Ethical Management: Ethic and Regulatory Compliance Please refer to 2018 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct</td>
<td></td>
</tr>
<tr>
<td>GRI 206:Anti-competitive Behavior</td>
<td>206-1 Legal actions for anti-competitive behavior, anti-trust, and monopoly practices</td>
<td>Please refer to 2018 TSMC Annual Report: 6.3.3 Risks Associated with Litigious and Non-litigious Matters</td>
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<td>GRI 302:Energy</td>
<td>302-1 Energy consumption within the organization</td>
<td>Increasing energy efficiency</td>
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<td>302-2 Energy consumption outside of the organization</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
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## GRI 302: Energy

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<td>302-3</td>
<td>Energy intensity</td>
<td>Increasing energy efficiency</td>
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<tr>
<td>302-4</td>
<td>Reduction of energy consumption</td>
<td>Increasing energy efficiency</td>
</tr>
<tr>
<td>302-5</td>
<td>Reductions in energy requirements of products and services</td>
<td>More Advanced and More Energy Efficient Electric Products</td>
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## GRI 303: Water

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<td>303-1</td>
<td>Water withdrawal by source</td>
<td>Risk Management of Water Resources</td>
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<tr>
<td>303-2</td>
<td>Water sources significantly affected by withdrawal of water</td>
<td>Risk Management of Water Resources</td>
</tr>
<tr>
<td>303-3</td>
<td>Water recycled and reused</td>
<td>Risk Management of Water Resources</td>
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## GRI 305: Emissions

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<td>305-1</td>
<td>Direct (Scope 1) GHG emissions</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
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<tr>
<td>305-2</td>
<td>Energy indirect (Scope 2) GHG emissions</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
</tr>
<tr>
<td>305-3</td>
<td>Other indirect (Scope 3) GHG emissions</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
</tr>
<tr>
<td>305-4</td>
<td>GHG emissions intensity</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
</tr>
<tr>
<td>305-5</td>
<td>Reduction of GHG emissions</td>
<td>Climate Change and Energy Management: Greenhouse Gases Inventory</td>
</tr>
<tr>
<td>305-6</td>
<td>Emissions of ozone-depleting substances (ODS)</td>
<td>TSMC doesn't use Montreal Protocol Class I &amp; II ODS</td>
</tr>
<tr>
<td>305-7</td>
<td>Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions</td>
<td>Green Manufacturing: Air Pollution Control- Air emissions in 2018, VOC: 166.3 metric tons, NOx: 116.38 metric tons, SOx: 41.26 metric tons</td>
</tr>
</tbody>
</table>

## GRI 306: Effluents and Waste

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<tr>
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<tr>
<td>306-1</td>
<td>Water discharge by quality and destination</td>
<td>TSMC (China): On-site treated water discharges to Industrial District Wastewater Treatment Plant (IDWWPT). Discharge destination of IDWWPT treated water is Youdun Harbor. TSMC (Nanjing): On-site treated water discharges to Industrial District Wastewater Treatment Plant (IDWWPT). Discharge destination of IDWWPT treated water is Yangtze River. US WafarTech: On-site treated water discharges to the City of Camas Publically Owned Treatment Works (POTW). Discharged destination of POTW treated water is Columbia River.</td>
</tr>
<tr>
<td>306-2</td>
<td>Waste by type and disposal method</td>
<td>Green Manufacturing: Waste Management</td>
</tr>
<tr>
<td>306-3</td>
<td>Significant spills</td>
<td>There were no significant spills in all TSMC fabs in 2018.</td>
</tr>
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<tr>
<td>306-4</td>
<td>Transport of hazardous waste</td>
<td>In 2018, TSMC exported 7.814 tons cadmium battery, which was 0.002% of total disposed wastes.</td>
</tr>
<tr>
<td>306-5</td>
<td>Water bodies affected by water discharges and/or runoff</td>
<td>TSMC's treated wastewater is discharged to the Science Park wastewater treatment plant, and there is no significant environmental impact.</td>
</tr>
<tr>
<td>GRI 307: Environmental Compliance</td>
<td></td>
<td>Company has no significant fines and non-monetary sanctions for non-compliance of environmental laws and regulations 2018.</td>
</tr>
<tr>
<td>GRI 308: Supplier Environmental Assessment</td>
<td></td>
<td>Responsible Supply Chain: 2018 Goals and Achievements 100% new suppliers signed &quot;TSMC Supplier Code of Conduct.&quot;</td>
</tr>
<tr>
<td>308-1</td>
<td>New suppliers that were screened using environmental criteria</td>
<td>Responsible Supply Chain: Sustainability Risk Control 75</td>
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<tr>
<td>308-2</td>
<td>Negative environmental impacts in the supply chain and actions taken</td>
<td>Responsible Supply Chain: 2018 Goals and Achievements 100% new suppliers signed &quot;TSMC Supplier Code of Conduct.&quot;</td>
</tr>
<tr>
<td>GRI 401: Employment</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>401-1</td>
<td>New employee hires and employee turnover</td>
<td>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.</td>
</tr>
<tr>
<td>401-2</td>
<td>Benefits provided to full-time employees that are not provided to temporary or part-time employees</td>
<td>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.</td>
</tr>
<tr>
<td>401-3</td>
<td>Parental leave</td>
<td>Inclusive Workplace: Talent Attraction and Retention- Compensation and Benefits-Benefits Exceeding Statutory Requirements</td>
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<tr>
<td>GRI 402: Labor/Management Relations</td>
<td></td>
<td>Inclusive Workplace: Human Rights- Employee Communication If the Company terminates employment, the Company will notify employees in advance abide by the law.</td>
</tr>
<tr>
<td>402-1</td>
<td>Minimum notice periods regarding operational changes</td>
<td>Inclusive Workplace: Human Rights- Employee Communication If the Company terminates employment, the Company will notify employees in advance abide by the law.</td>
</tr>
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</table>
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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, chronic 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 indirect employee, and direct employee) |
 | 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. |
 | 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. |
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### GRI 405: Diversity and Equal Opportunity

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</table>
| 405-1             | Diversity of governance bodies and employees | Sustainable Governance: Corporate Governance  
Please refer to [2018 TSMC Annual Report](#):  
2.4.1 Information Regarding Board Members  
Gender: Two of the nine directors are female (22.22%)  
Age Group: over 50 years old (100%)  
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  
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. |

### GRI 406: Non-discrimination

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| 406-1             | Incidents of discrimination and corrective actions taken | 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. |
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<tr>
<td>GRI 407: Freedom of Association and Collective Bargaining</td>
<td>407-1 Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk</td>
<td>Inclusive Workplace: Human Rights- 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. 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.</td>
<td>143</td>
</tr>
<tr>
<td>GRI 408: Child Labor</td>
<td>408-1 Operations and suppliers at significant risk for incidents of child labor</td>
<td>Inclusive Workplace: Human Rights- Human Rights Policy Concerns and Practices 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. From the very beginning, all application processes are handled accordingly to the law to eradicate child labor.</td>
<td>143</td>
</tr>
<tr>
<td>GRI 409: Forced or Compulsory Labor</td>
<td>409-1 Operations and suppliers at significant risk for incidents of forced or compulsory labor</td>
<td>Inclusive Workplace: Human Rights- Human Rights Policies and Practices 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.</td>
<td>143</td>
</tr>
<tr>
<td>GRI 412: Human Rights Assessment</td>
<td>412-1 Operations that have been subject to human rights reviews or impact assessments</td>
<td>Inclusive Workplace: Human Rights- Human Rights Policies and Practices TSMC abides local laws and regulations in all countries and regions where we operate, as well as upholds the human rights of workers, including regular, contract and temporary employees, interns, etc. We treat them with dignity and respects as understood by the international human rights standards such as The International Bill of Human Rights, The International Labour Organization’s Declaration on Fundamental Principles and Rights at Work, and Ten Principles of The United Nations Global Compact. We also align our actions with the Responsible Business Alliance (RBA) Code of Conduct. We also establish TSMC’s Supplier Code of Conduct and require our suppliers to adopt the same policy.</td>
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<td></td>
<td>412-2 Employee training on human rights policies or procedures</td>
<td>Inclusive Workplace: Human Rights- Human Rights Risk Mitigation Measures</td>
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<tr>
<td></td>
<td>412-3 Significant investment agreements and contracts that include human rights clauses or that underwent human rights screening</td>
<td>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.</td>
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<tr>
<td>GRI 414: Supplier Social Assessment</td>
<td>414-1 New suppliers that were screened using social criteria</td>
<td>Responsible Supply Chain: 2018 Goals and Achievements 100% new suppliers signed “TSMC Supplier Code of Conduct.”</td>
<td>72</td>
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<td>414-2 Negative social impacts in the supply chain and actions taken</td>
<td>Responsible Supply Chain: Action Plan “Protect labor and human rights” 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%.</td>
<td>72</td>
</tr>
<tr>
<td>GRI 416: Customer Health and Safety</td>
<td>416-1 Assessment of the health and safety impacts of product and service categories</td>
<td>There is no significant health and safety impacts for the products and services that TSMC provided to customers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>416-2 Incidents of non-compliance concerning the health and safety impacts of products and services</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>GRI 418: Customer Privacy</td>
<td>418-1 Substantiated complaints concerning breaches of customer privacy and losses of customer data</td>
<td>Innovation and Service: Customer Service -Customer’s Virtual Fab (no customer complaints in information leakage)</td>
<td></td>
</tr>
<tr>
<td>GRI 419: Socioeconomic Compliance</td>
<td>419-1 Non-compliance with laws and regulations in the social and economic area</td>
<td>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.</td>
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</table>
Independent Third Party Assurance Statement

Scope and approach

We performed our work using DNV-GL’s assurance methodology VeriStuss™, which is based on our professional expertise, independent assurance best practice including International Standard on Assurance Engagements, ISAE 3000 (ISAE 3000) and the Global Reporting Initiative (GRI) Sustainability Reporting Standard.

We evaluated the performance data using the reliability principle together with TSMC’s data吻合度 al the lower the data are measured, recorded and reported. The performance data in scope were against TSMC’s significant CSR issues within the GRI’s aligned content and all of which fell in the GRI standards.

We understood that the reported financial data and information are based on data from TSMC’s Annual Report and Accounts while not linked to a separate independent audit process. The review of material information 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 conclusion. We are providing a reasonable, limited form of assurance.

Responsibilities of the Directors of TSMC and of the assurance providers
The Directors of TSMC have responsibility for the preparation of the Report. In performing our assurance work, our responsibility is to the management of TSMC. However, our report represents our independent opinion on the performance data and information in the Report except as indicated in the Report. DNV-GL provides a range of other services to TSMC, some of which could result in a conflict of interest with its assurance work.

BNP’s assurance engagements are based on the assumption that the data and information provided by the business are as complete and reliable as possible. We independently verify any facility or operations for any decision our client’s or auditors may make based on this assurance work.

Basis of our opinion
A multi-disciplinary team of sustainability and assurance specialists performed work in these areas and obtained the work. We relied on the following activities:

- Review of the current sustainability issues that could affect TSMC and are of interest to stakeholders;
- Review of TSMC’s approach to the collection and management of project-related sustainability data and information;
- Review of the method used to calculate and report the sustainability data and information;
- Review of TSMC’s assurance and reporting policies and processes relating to this Report.

We are independent of and maintain professional and ethical integrity with respect to TSMC and maintenance responsible for sustainability issues and made of substantial engagement to support these data.

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