Building a Mountain of Common Good

An infinite planet where all beings thrive.

TSMC is committed to responsible management. Innovation and sustainability are our guiding principles as we strive to build a world of inclusion and common good from our sphere of IC chips and wafers.

In our pursuit for common good, we have made solid strides with employees, customers, suppliers, investors, and society to scale insurmountable peaks and to strive for better.

We galvanize all positive energy for sustainable management and shared prosperity. Join us. Let us create common good and ascend towards a sustainable future of infinite possibilities.
Letter from the ESG Steering Committee Chairperson

2020 was an extremely challenging year as the world experienced social and economic upheaval brought by the COVID-19 pandemic, and natural disasters occurring under extreme climate conditions left us with a deep impression of the threat and impact of climate change on humanity. The importance of ESG (Environmental, Social, and Governance) is gradually becoming a global consensus. As a responsible corporate citizen, TSMC endeavors to respond to climate change and mitigate climate impact to protect our shared global environment. In addition to signing the world’s largest renewable energy purchase agreement in 2020, we further committed to using 100% renewable energy for global operations before 2050, becoming the world’s first semiconductor company to join the RE100 initiative.

Over the years, TSMC has held its vision of uplifting society. We not only focus on our core business to unleash innovation with groundbreaking thinkers around the world, but also have systematically charted a long-term strategic direction for our ESG. The ESG Steering Committee serves as the center for the highest level of ESG decision-making. With myself serving as Chairperson, the ESG Steering Committee works with senior TSMC executives in a variety of fields to link the United Nations’ Sustainable Development Goals (SDGs) with the Company’s core competitive advantages. Our five focal points are Green Manufacturing, Responsible Supply Chain, Diverse & Inclusive Workplace, Talent Development, and Caring for the Disadvantaged. In 2020, the ESG Steering Committee pursued its goal of sustainable development and explored international ESG trends, evaluation standards, and corporate best practices. At the same time, it set TSMC’s long-term ESG goals, strategies, and public declarations and took a fresh look at how we execute them. We also launched TSMC’s first internal CSR Award to encourage our colleagues to think creatively and participate actively to bring many innovative projects to life.

In addition, under the approval and supervision of the ESG Steering Committee, in 2020 TSMC brought its unique set of professional know-how and resources to support the global fight against the COVID-19 pandemic. In addition to keeping our colleagues healthy and safe and maintaining normal operations, we also provided needed support to society. We budgeted US$20 million to provide for the communities where we operate, including Taiwan, China, Japan, Europe, the United States, and other areas in urgent need of resources, playing our role as a corporate citizen through tangible action.

Based on a foundation of healthy corporate governance, TSMC actively carries out its three missions of Acting with Integrity, Strengthening Environmental Protection, and Caring for the Disadvantaged. Starting from our core business, we set goals for execution, evaluate action plans, and maintain positive interactions with our stakeholders to continue creating value. In addition, I would like to extend my thanks to everyone in the Company. It is only because of everyone’s enthusiastic cooperation and persistence that we can continue to improve, grow stronger, and further meet our commitments to society and the environment to drive beautiful changes in society.

Mark Liu
Chairman and ESG Steering Committee Chairperson
In 2020, the world was ravaged by the COVID-19 pandemic. TSMC took comprehensive disease prevention measures to ensure that operations could continue at wafer fabs around the world and went on to realize 11,617 product innovations for our customers. With innovative technologies, people are able to work and learn remotely. To reduce contact and gatherings, people can use AR/MR technologies to replace business trips, and smart robots to replace manual labor for delivering resources. TSMC stands in solidarity with everyone enduring this challenging time, and we strive to contribute to the health and welfare of the world.

During this time, we also worked with stakeholders to continue realizing our Five Major ESG directions as we resolutely progressed towards the UN’s Sustainable Development Goals. In terms of Green Manufacturing, TSMC is actively using renewable energies, implementing 460 energy-saving measures, and introducing new generations of energy-efficient equipment. External research results have shown that we save 4GWh of energy for every 1 GWh of energy used by TSMC for the production of end products for customers. By increasing our energy efficiency, we are able to mitigate the impact of climate change.

In regards to Building a Responsible Supply Chain, TSMC was able to drive NT$1.7 trillion in output value among related industries in 2020. Each TSMC employee creates, on average, 6.4 job opportunities in Taiwan. We shoulder the responsibility that comes with being an industry leader and have established Supply Online 360, a management platform for a sustainable supply chain, as well as the TSMC Supplier Sustainability Academy. To extend the high standards applied to TSMC Operations and Green Manufacturing, we have also asked suppliers to conduct EP&L assessment and carbon footprint verification, as well as set and strive for energy and water conservation goals.

In order to Create a Diverse & Inclusive Workplace, TSMC expanded our Human Rights Policy’s scope of management to support employee and company growth on the basis of a healthy work-life balance. Investments into Talent Development include the expanded Semiconductor Program and IC Design Program. We are also providing resources through university research centers and industry-academia programs to foster generations of semiconductor professionals. Lastly, when it comes to Caring for the Disadvantaged, TSMC continues to support global prevention and treatment efforts against COVID-19 through the TSMC Education and Culture Foundation and the TSMC Charity Foundation; we have also galvanized efforts from subsidiaries around the world to contribute to the common good.

TSMC has taken tangible action to support the global sustainability movement, and we are the only semiconductor company in the world to be selected into the Dow Jones Sustainability Index (DJSI) for 20 consecutive years. As we look to our future, we will stay true to our unwavering commitment to responsible operations. We hope that every TSMC colleague stands firm at their post and continues to bring positive changes to our world.

Lora Ho
Senior Vice President and ESG Committee Chairperson
As COVID-19 ravages nations and introduces instability and tense geopolitical situations, TSMC is more committed than ever to using innovation for greater social welfare. Based on our trinity of strengths that includes technology leadership, manufacturing excellence, and customer trust, our mission is to be the trusted technology and capacity provider of the global logic IC industry for years to come. In 2020, TSMC’s consolidated revenue reached NT$1,339.3 billion, setting a new record for 11 consecutive years. While we continue to strive for greater business milestones, we also aim to develop strong relationships with stakeholders such as employees, shareholders, customers, and suppliers in order to fulfill our responsibilities as a corporate citizen. We will continue dedicating ourselves to environmental protection, society, and corporate governance to create common value for a sustainable future.
TSMC Value

Make Communication More Efficient and Work, Play, and Learn Anytime and Anywhere

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

Enable 5G, AI, Cloud, and Data Center Applications to Process Vast Amounts of Data and Information Anywhere and Anytime

- Central Processing Units (CPUs)
- Graphics Processing Units (GPUs)
- Field Programmable Gate Arrays (FPGAs)
- AI Machine Learning Processors
- High-speed Networking Chips, etc.

Empower Wearables, Smart Homes, Smart Cities, and Industry 4.0 Applications

- Power Management ICs
- 4K Streaming Set-top Box (STB)
- AI-embedded Smart Camera, etc.

Make Vehicles, Including Hybrid and Electrical Cars, Safer, Smarter and Greener

- Power Management ICs
- Timing Controller (T-CON)
- Other Applications for Smart 8K/4K Digital TV (DTV)

Empower AI-enabled Smart Devices

- Power Management ICs
- Timing Controller (T-CON)
- Other Applications for Smart 8K/4K Digital TV (DTV)

Technology Development Focus

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

Benefits to Product Innovation

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

Innovations for Sustainability

TSMC continues to advance semiconductor manufacturing process technologies and services to enable our customers to unleash 11,617 IC innovations in 2020. These innovations offer products that are more advanced, capable, intelligent, energy-efficient, and safer, and allow us to greatly increase quality of life and move towards a sustainable society for the common good.

- Continue to advance and expand TSMC 3DFabric™
- Power Management ICs
- Timing Controller (T-CON)
- Other Applications for Smart 8K/4K Digital TV (DTV)
- 4K Streaming Set-top Box (STB)
- AI-embedded Smart Camera, etc.
## Sustainability at TSMC

<table>
<thead>
<tr>
<th>Economy</th>
<th>Environment</th>
<th>Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>26% Unleashing innovation by investing US$ 3.72 billion, a 26% increase from 2020, into R&amp;D</td>
<td>14.2 Trillion Market capitalization (NT$)</td>
<td>73,786 Beneficiaries of social engagement</td>
</tr>
<tr>
<td>99% Patent approval rate in the U.S., better than any other top 10 patent holder</td>
<td>6.47% Total shareholder return</td>
<td>1.8 Million Invested into social engagement (NT$)</td>
</tr>
<tr>
<td>27% Increase in volunteers</td>
<td>1 Trillion Over one million participants received employee training and total expense exceeded NT$95 million</td>
<td>100% 100% renewable energy consumption in TSMC offices in Taiwan and overseas locations, achieved net zero emissions for global offices through carbon credits</td>
</tr>
<tr>
<td>46% Reduced air pollutant emissions per unit product by 46% since 2015, reaching the 2030 SDG ahead of schedule</td>
<td>1 1 First semiconductor company in the world to join RE100</td>
<td>95% Reached 95% waste recycling rate for six consecutive years and only &lt;1% of waste has been sent to landfills for 11 consecutive years</td>
</tr>
</tbody>
</table>

### Overview

- **Economy**
  - Unleashing innovation by investing US$ 3.72 billion, a 26% increase from 2020, into R&D
  - Patent approval rate in the U.S., better than any other top 10 patent holder
  - Increase in volunteers
  - Market capitalization (NT$)
  - Total shareholder return

- **Environment**
  - Reduced air pollutant emissions per unit product by 46% since 2015, reaching the 2030 SDG ahead of schedule
  - 1 First semiconductor company in the world to join RE100

- **Society**
  - 73,786 Beneficiaries of social engagement
  - Over one million participants received employee training and total expense exceeded NT$95 million
  - 1 1 First semiconductor company in the world to join RE100
  - 95% Reached 95% waste recycling rate for six consecutive years and only <1% of waste has been sent to landfills for 11 consecutive years
Awards, Recognitions and Ratings

Dow Jones Sustainability World Index for the 20th Consecutive Year
Dow Jones Sustainability Emerging Markets Index

MSCI ACWI ESG Leaders Index Component
MSCI ESG Research – AAA Ratings
MSCI ACWI SRI Index Component
MSCI Emerging Markets ESG Leaders Index
FTSE4Good Emerging Index Component
FTSE4Good All-world Index Component
FTSE4Good TIP Taiwan ESG Index Component

The Sustainability Yearbook 2020 Rankings – S&P Global Gold Class

2020 Climate Change A List – A
2020 Water Security A List – A

The 100 Most Sustainably Managed Companies in the World

"Prime" Rated by ISS ESG Corporate Rating

"Top-Rated" ESG Company within the Semiconductor Industry
“Top-Rated” ESG Company within the Semiconductor Industry

"Platinum" Class Certification – Fab 15A, Fab 15B

2020 Global 100 Most Sustainable Corporations
2020 Carbon Clean 200TM List – 1st Place

2020 Global 100 Most Sustainable Corporations
2020 Global 100 Most Sustainable Corporations

The 100 Most Sustainably Managed Companies in the World

The World’s Best Employers 2020
The World’s Best Employers 2020

Most Honored Company (Technology/Semiconductors) – All-Asia
Best ESG (Technology/Semiconductors) – 1st Place (Buy-side and Sell-side) – All-Asia

Top 5% in Corporate Governance Evaluation of Listed Companies for the 6th Consecutive Year

The Most Prestigious Sustainability Awards – Top Ten Domestic Corporates for the 5th Consecutive Year
Taiwan Top 50 Corporate Responsibility Report Awards – Electronic Information Manufacturing – Platinum Award
English Report – Platinum Award
Sustainable Water Management Award
Climate Leadership Award
Supply Chain Management Award

Corporate Social Responsibility Award – Large Cap – 1st Place

Corporate Knights
Corporate Knights

2020 World’s Most Admired Companies

Forbes
Forbes

Institutional Investor Magazine
Institutional Investor Magazine

Most Honored Company (Technology/Semiconductors) – All-Asia
Best ESG (Technology/Semiconductors) – 1st Place (Buy-side and Sell-side) – All-Asia

Taiwan Stock Exchange
Taiwan Stock Exchange

2021 IEEE Corporate Innovation Award

The 100 Most Sustainably Managed Companies in the World

Wall Street Journal
Wall Street Journal

The World’s Most Admired Companies

FORTUNE
FORTUNE

2020 World’s Most Admired Companies

2020 World’s Most Admired Companies

Institutional Investor Magazine
Institutional Investor Magazine

Top 5% in Corporate Governance Evaluation of Listed Companies for the 6th Consecutive Year

Taiwan Institute of Sustainable Energy
Taiwan Institute of Sustainable Energy

The Most Prestigious Sustainability Awards – Top Ten Domestic Corporates for the 5th Consecutive Year
Taiwan Top 50 Corporate Responsibility Report Awards – Electronic Information Manufacturing – Platinum Award
English Report – Platinum Award
Sustainable Water Management Award
Climate Leadership Award
Supply Chain Management Award

Corporate Social Responsibility Award – Large Cap – 1st Place

CommonWealth Magazine
CommonWealth Magazine

Corporate Social Responsibility Award – Large Cap – 1st Place

Cheers Magazine
Cheers Magazine

Ranked No.1 in Top 10 Most Admired Companies to Young Generations
ESG Feature Stories

Sustainable Products by TSMC Facilitates Global Energy Conservation  11
TSMC Supplier Sustainability Academy Shares Free Learning Resources  12
First Automated Handling System for Wafer Warehouses in the World  13
TSMC Semiconductor Programs Cultivate Next-generation Talent  14
Aiding Global Prevention & Treatment Efforts against COVID-19  15
Sustainable Products by TSMC Facilitates Global Energy Conservation

TSMC believes in thorough green innovation. Internally, we are striving for clean production in all fabs, implementing 460 energy-saving measures and conserving 500 GWh in 2020. Externally, we are leading the world in high-performance, energy-saving semiconductor technologies that enable customers to deliver energy-efficient products. Calculations using the Industry, Science, and Technology International Strategy Center’s (ISTI) model reveal that, in 2020, TSMC helped the world conserve 4 kWh of energy for each 1 kWh spent in production - a testimony to TSMC’s commitment to green manufacturing both internally and externally.

Referring to research results from the American Council for an Energy-Efficient Economy (ACEEE), the ISTI discovered that the link between economic growth and increasing energy consumption can be decoupled with the introduction of electronic products and smart product applications. The adoption of Information and Communication Technology (ICT) can also add value to industry productivity, increasing output for the same amount of resource input (energy, etc.). Upon further analysis, it was discovered that electronic products using semiconductors at its core can help conserve 10.7% of global energy (equivalent to 3.27 million GWh) in 2030. Considering the semiconductor/electronic product ratio and TSMC market share, TSMC products produced for customers will conserve 0.17 million GWh in 2030, which is four times the energy consumed during production. With the help of research development that has introduced ways to make products and processes more energy efficient, TSMC continues to realize increasingly energy-efficient ICT applications and thereby assists other industries and communities with energy conservation.

TSMC is dedicated to maintaining its technology leadership and strives to reduce energy consumption during the production process for the advancement of semiconductor innovation, various smart applications of electronic products, and energy conservation on a global scale.

**Stephen Su**

Vice President and General Director at ITRI Industry, Science and Technology International Strategy Center (ISTI), and Director of AI Applications Office.

Global Energy Consumption Simulation

- **Scenario 1:** No Growth in Electronic Products Application
  - Global Electricity Consumption: 32.45 Million GWh
  - 0.150 Million GWh Saved

- **Scenario 2:** Normal Growth in Electronic Products Application
  - Global Electricity Consumption: 30.95 Million GWh
  - 0.131 Million GWh Saved
  - 29.18

- **Scenario 3:** Accelerated Growth in Electronic Products Application
  - Global Electricity Consumption: 25.8 Million GWh
  - 0.05 Million GWh Saved
TSMC Supplier Sustainability Academy Shares Free Learning Resources

TSMC has a massive supply chain that spans across the world and the Company is always thinking of management directives to strengthen the capability and resilience of its supply chain and extend its influence to upstream suppliers of its own suppliers. In 2020, the Company founded the TSMC Supplier Sustainability Academy and started creating and sharing online courses and management tools for free. By designating compulsory courses and tracking training status, the Company was able to ensure that tier 1 suppliers continued to improve their sustainability management capabilities and help supplier employees understand their labor rights. TSMC hopes that this can effectively raise labor rights awareness across the supply chain and help supplier employees protect themselves. Meanwhile, the Company has made the TSMC Supplier Sustainability Academy available to tier 2 suppliers (suppliers of TSMC’s suppliers) and the general public upon registration.

Scope of Influence of TSMC Supplier Sustainability Academy

As a supplier, we felt that the establishment of the TSMC Supplier Sustainability Academy not only encourages us to make progress but also provides corresponding resources to help the supply chain work together for common good.

Andrew Chang
General Manager of Taiwan Specialty Chemicals Corporation

100% of tier 1 suppliers have completed trainings

TSMC Supplier Sustainability Academy Steering Committee Chairperson and Curriculum Blueprint

The first courses launched for the TSMC Supplier Sustainability Academy revolved around the TSMC Supplier Code of Conduct. There were five interactive, compulsory courses on labor, safety and health, environmental protection, and ethics. Each course was designed to contain an exam upon completion to ensure the quality of learning. All tier 1 suppliers are asked to complete 100% of the training in 2021. As the curriculum required integration of internal resources, the Material Supply Chain Management Section convened a TSMC Supplier Sustainability Academy Steering Committee, organizing 7 major courses across the organization. With the online learning platform, the Company will continue to advance supplier capabilities in operations and quality management to further deepen its sustainability impact.
TSMC is always looking to implement applicable international standards. Since implementing the Electronic Human Factors System, the Company has continued to identify workplace hazards and conduct risk assessment and control for the uncovering, analysis, and elimination of occupational hazards. TSMC strives to create a healthy and safe workplace for our employees. In 2020, to effectively reduce ergonomic hazards from long-term, repetitive operations that warehouse employees must endure, TSMC has developed the world’s first Automated Handling System for Wafer Warehouses. The system has been officially launched at Fab 18A and is being introduced to Fab 14A. It can effectively reduce 95% of the load for warehouse employees per person/per day. By the end of 2022, the system will be gradually introduced into all of the 12-inch GIGAFAB® Facilities in Taiwan.

**TSMC Grows With Employees: Transforming Power to Brainpower with On-the-job Training**

Wafers, a raw material that is required for TSMC production, is delivered to our loading docks every day by suppliers. TSMC warehouse employees will then take out the packaged wafers, place them on a conveyor belt, and transport it to the clean room for production. To build a safer workplace and optimize efficiency of daily operational processes, TSMC has launched a Human Factor Engineering-Wafer Warehouse Automation project where we install an Automated Handling Systems for Wafer Warehouses and reduced the handling load for each warehouse employee by 1.8 metric tons per day. With the introduction of the automated system, the Material Supply Chain Management Section will be adjusting job duties and offering on-the-job trainings to warehouse employees. Employees originally working in loading will now be channeled into supply chain management, process integration, and other more technical duties to help the employee grow with the Company.

**Robotic arm places wafer cassettes onto conveyor belt and into the warehouse.**

<table>
<thead>
<tr>
<th>Roll-out Schedule for the TSMC Automated Handling System for Wafer Warehouses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2018</strong></td>
</tr>
<tr>
<td>Q2: System design</td>
</tr>
<tr>
<td><strong>2019</strong></td>
</tr>
<tr>
<td>Q1: System prototype testing</td>
</tr>
<tr>
<td><strong>2020</strong></td>
</tr>
<tr>
<td>Q3: Fab 14A System implementation</td>
</tr>
<tr>
<td><strong>2021</strong></td>
</tr>
<tr>
<td>Q3: Fab 15B System implementation</td>
</tr>
<tr>
<td>Q4: Fab 13B System implementation</td>
</tr>
<tr>
<td><strong>2022</strong></td>
</tr>
<tr>
<td>Q2: Fab 15B System implementation</td>
</tr>
</tbody>
</table>
TSMC Semiconductor Programs in Partnership with Universities

TSMC launched a series of semiconductor programs in partnership with six universities in Taiwan to raise the competencies of semiconductor talents in Taiwan. The programs bridge students to industry trends and development so that they can effectively apply their academic knowledge to the development of advanced semiconductor process technologies that are increasingly complex. Jointly developed by TSMC experts in various fields and partnering university professors, the courses focus on three aspects: Device/Integration, Process/Module, and Equipment Engineering. Each program covers 20 to 40 courses on specific subjects planned by a curriculum development committee consisting of TSMC executives who also teach classes to bridge the gap between academia and industry and to equip students with core knowledge and competencies required for semiconductor talents in advance. As of 2020, a total of 650 students have enrolled in TSMC’s semiconductor programs as elective courses.

The semiconductor programs also provide students with internship opportunities and job interviews. Differentiated compensation packages are offered to proactive and outstanding students as an incentive to join the semiconductor industry. The program is expected to include 10 universities by 2024, which will bring up the number of student beneficiaries to 1,800. The three primary course themes will also extend to five areas of expertise to cover IC design and intelligent manufacturing. Amid global competition and challenges, the program will be a consistent effort to enhance industry competitiveness in Taiwan in the long run.

**TSMC Semiconductor Programs at Taiwan Local Universities**

<table>
<thead>
<tr>
<th>Schools</th>
<th>Track</th>
<th>Device/Integration</th>
<th>Process/Module</th>
<th>Equipment Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Tsing Hua University</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Taiwan University</td>
<td>NEW</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Yang Ming Chiao Tung University</td>
<td>NEW</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Cheng Kung University</td>
<td>NEW</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Taiwan University of Science and Technology</td>
<td>NEW</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Taipei University of Technology</td>
<td>NEW</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Most of the students are not quite clear about which courses will be helpful for their future career. TSMC’s semiconductor programs provide a comprehensive framework to help students better understand the connection between courses and the practices. The programs also provide students with necessary knowledge and competitiveness in the semiconductor field to accelerate the learning curve after joining the workforce.

**Shi-Chih Yang**  
Student at Department of Material Science and Engineering, National Yang Ming Chiao Tung University

**Chih Chen**  
Department Chair of Material Science and Engineering, National Yang Ming Chiao Tung University

Semiconductor programs are like a precious book. It helps me to start studying related courses as well as to prepare myself with the necessary knowledge and ability earlier, so that I can get ready for either doing research or joining the industry.

**Shi-Chih Yang**  
Student at Department of Material Science and Engineering, National Yang Ming Chiao Tung University
In 2020, TSMC budgeted US$20 million to join global efforts against COVID-19 and also brought its unique set of professional know-how and resources in global procurement and supply chain management to provide support for in-need medical or educational institutes in locations where the Company operates.

**Equipment Donations to Sustain the Health System**

In Taiwan, the TSMC Charity Foundation supplied powered air-purifying respirators (PAPR) to medical centers to reduce risk of infection among frontline medical workers; the TSMC Education and Culture Foundation donated infrared cameras to the Ministry of Education which would be used in national entrance exams, etc. to protect the safety of our students.

Globally, TSMC North America donated sufficient supplies of critical personal protective equipment and ventilators to local public health agencies, and its donation efforts also assisted in supporting the County’s Field Hospital Center established for quarantined COVID-19 patients. It also provided relief to vulnerable communities with immediate food, shelter and medical aid. TSMC Europe donated personal protective equipment, respirators, and other ICU equipment to medical centers across Europe; and also took advantage of its supply chain and logistics management resources to accelerate the delivery of medical supplies and equipment. In Asia, TSMC (Nanjing) donated protective clothing, goggles, gloves, and other necessities to community health centers, and computers to local schools and after-school care centers to ensure that students will be able to have unlimited access to online learning resources despite the pandemic. TSMC Japan collaborated with local governments to donate supplies to support COVID-19 prevention and treatment efforts.

**Support for Research on Vaccines and Medical Equipment to Protect Developing Nations**

Throughout the pandemic, TSMC also supported medical research on COVID-19 diagnosis, vaccine, and treatment by the Foundation for the National Institutes of Health (FNIH) and funded UC Berkeley’s successful research in converting low-cost positive-pressure ventilators into expensive ventilators needed to treat critically ill COVID-19 patients. The research was able to cushion the impact of the global medical equipment shortage.

We appreciate TSMC’s generosity. Its efforts allowed the PreVENT team to design, manufacture, and deliver around 1,000 ventilators to developing nations. This helped physicians save lives during the COVID-19 peak last summer. I believe this is an outstanding example of industry-academia collaboration.

**Tsu-Jae King Liu**
Dean and Roy W. Carlson Professor of Engineering at the UC Berkeley College of Engineering

Top: The Hospital Quintanao’s Toledo in Spain receiving ventilators donated by TSMC.
Middle: Sophie Chang, TSMC Charity Foundation Chairperson, helping medical workers with PAPRs.
Bottom: TSMC employees around the world working together to support COVID-19 relief efforts.
Sustainable Business Practices

- ESG Implementation Framework
- ESG Management Platform
- Materiality Analysis and Stakeholder Communication
- Sustainability Impact
- Carrying Out the UN Sustainable Development Goals
- An Innovation Pioneer
- A Responsible Purchaser
- A Practitioner of Green Power
- An Admired Employer
- Power to Change Society

Pages:
- ESG Implementation Framework: 17
- ESG Management Platform: 18
- Materiality Analysis and Stakeholder Communication: 20
- Sustainability Impact: 32
- Carrying Out the UN Sustainable Development Goals: 36
- An Innovation Pioneer: 39
- A Responsible Purchaser: 71
- A Practitioner of Green Power: 87
- An Admired Employer: 128
- Power to Change Society: 164
ESG Implementation Framework

TSMC’s ESG Policy is the top guiding principle for our sustainable development. The TSMC ESG Matrix set by TSMC’s Founder, Dr. Morris Chang, clearly defines TSMC’s ESG scope. In response to the vision of “Uplifting Society”, TSMC implements sustainability governance effectively in its core business of dedicated IC foundry services through the ESG Implementation Framework. TSMC actively develops positive relationships with all stakeholders, including employees, shareholders/investors, customers, suppliers/contractors, and society to create shared value and pursue a sustainable future.
ESG Management Platform

In compliance with the vision and mission of the TSMC ESG Policy, TSMC is fulfilling its responsibility as a corporate citizen and has established the ESG Steering Committee, the highest level ESG decision-making center. TSMC’s Chairman chairs the ESG Steering Committee and the ESG Committee chair acts as the executive secretary. Senior executives from various functions work alongside the two committee chairs to evaluate the Company’s core operational capacity, establish mid-to-long term ESG goals, and align UN SDGs with the Company’s core advantages for a development blueprint.

**ESG Steering Committee**

- **Chairperson**
  - Chairman
  - Executive Secretary
    - ESG Committee Chairperson

- **Members**

- **Meetings**
  - Quarterly

- **Tasks**
  - Quarterly Meetings
    - Identify pressing sustainability topics and formulate action plans
    - Supervise interdepartmental communication and coordinate resource integration
    - Track achievements across various sustainability issues and formulate plans for further improvement
  - The Committee chair shall report achievements and work plans to the Board of Directors every quarter

**ESG Committee**

- **Chairperson**
  - Senior executive appointed by Chairman

- **Members**
  - Management representatives nominated by functional organizations relating to the economy, environment, society, and governance

- **Meetings**
  - Quarterly

Note: The CSR Executive Committee was renamed as the ESG Executive Committee in March 2021; the CSR Committee was renamed as the ESG Committee at the same time.

Dr. Y. J. Mii  
Senior Vice President, Research & Development

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

Dr. Kevin Zhang  
Senior Vice President, Business Development

TSMC cultivates semiconductor talent and create an innovative workplace. We encourage colleagues to tackle the challenges before them and develop world-leading semiconductor technologies to help customers enable their innovation and usher the world into a better future.

Dr. Jun He  
Vice President, Quality and Reliability

TSMC strives for sustainable management and, in the spirit of shared prosperity, we strike close partnerships with customers and suppliers to pursue excellence, while maintaining the quality of our responsible supply chain through high levels of innovation.

Lora Ho  
Senior Vice President, Europe & Asia Sales

Customer trust is one of the core values at TSMC. We build long-term partnerships with our customers, and through relentless pursuit of technology innovation, manufacturing excellence and close collaboration, we deliver innovative products that drive positive change to society.

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

Suppliers are important partners to TSMC on the road to sustainable management. We hope to build a responsible supply chain through raising ESG standards across the supply chain and drive positive change through the Supply Online 360, an online management platform for a global sustainable supply chain, as well as the TSMC Supplier Sustainability Academy.
The ESG Committee is an interdepartmental communication platform that serves to ensure ESG Steering Committee decisions are upheld. ESG Committee members are senior executives appointed to the Committee by Chairman Mark Liu and are tasked with the goal of aligning with international standards, gaining insight into international trends, and building a top-down operation model across the company. ESG Committee members will also spearhead annual SDG objectives and strategies across different committees, track performance, and balance stakeholder interests to ultimately ensure that ESG Strategies are fully integrated into the company’s daily operations.

Talent is one of the most important assets to the Company and a driving force to move the industry and society forward. We foster a diverse and inclusive workplace and recruit talent with shared values. In the meantime, we also strengthen the collaboration with universities to nurture talent for the future of the semiconductor industry.

Getting ESG right is important not just for TSMC. We want to share what we have so that love and caring will continue to flourish and make Taiwan a better place.

In carrying out sustainable management, TSMC lives out its belief that corporate growth and environmental sustainability can go hand in hand. We aim to establish long-term investment value and deliver outstanding return on investment through strong financial performance, stable dividend policies, and comprehensive corporate governance.

We’ve continued to make efforts towards Green Manufacturing. By developing innovative approaches, we’ve been able to use the most eco-friendly approach to manufacturing chips and create maximum value with minimum resources.

In response to the COVID-19 pandemic, the TSMC Education and Culture Foundation took the initiative to donate hundreds of infrared thermometers to Taiwan’s Ministry of Education to protect the safety and health of students. In addition, we’ve continued to invest more resources in our effort to close education gap and to create a better environment for arts and cultural activities.

Grounded in excellent corporate governance and the core value of “integrity,” TSMC ensures that ethics, regulatory compliance, and risk management measures are incorporated into daily business practices.
In response to climate change, TSMC has increased renewable energy use, raised the recycling rate of Company resources, commenced construction for a zero-waste manufacturing center, implemented circular economy, and launched the "Plant a Tree" Program.

For sustainable supply chain management, TSMC asked suppliers to sign a Supplier Code of Conduct and is now building a global supply chain management platform, "Supply Online 360".

Launched Emotional Security Program for employees to create a diverse, inclusive workplace.

Supported semiconductor talent development and STEM education.

The TSMC Education and Culture Foundation and the TSMC Charity Foundation continued to support our youth, promote fine arts education, assist in remote education, and support the disadvantaged to bring positive change to society.

Continue developing renewable energy sources and waste recycling technologies to expand the scope of circular economy and realize green manufacturing.

Build a high-quality and eco-friendly supply chain.

Continue investing in the semiconductor and STEM talents.

Complied with the 9 UN SDGs selected by Chairman Liu and ESG Steering Committee Members, tracked and managed progress and efforts towards 2030 goals.

Further expanded green manufacturing scope, joined RE100, received additional AWS certifications, built the EP&L module for the Comprehensive Digital ESH Management System, advocated for EP&L among suppliers, built water reclamation facilities, and initiated plans for a zero-waste manufacturing center.

Launched Supply Online 360, launched supplier sustainability academy and on-site contractor care programs, issued Supplier Sustainability Standards, formulated the supplier risk management matrix, required suppliers to propose and implement green manufacturing goals, and continued to push the Company’s supply chain towards sustainability.

Issued Information Security Declaration to ensure better information security and protection of proprietary information in order to maintain the Company's competitive edge and protect partner interests.

The TSMC Charity Foundation formulated a blueprint to support remote education, assisted seniors living alone, advocated for filial piety, and increased volunteer services from TSMC employees; the TSMC Education and Culture Foundation advocated for fine arts, collaborated with external organizations to support education equality in remote areas, and gave our youth a stage for diverse development.
Materiality Analysis and Stakeholder Communication

As we progress towards corporate sustainability, TSMC places great importance on the expectations and demands of internal and external stakeholders. As such, TSMC has established a framework for ESG disclosure in compliance with the latest AA 1000 Accountability Principle issued in 2018. The framework is established on the four major principles of Inclusivity, Materiality, Responsiveness, and Impact. Each year, TSMC regularly evaluates stakeholder feedback and ESG trends through diverse communication channels. We also continue to conduct materiality analysis to identify material ESG topics and establish long-term ESG targets, adopt action plans, and track ESG progress and efficacy accordingly. GRI Standards are also adopted by TSMC as the enduring standard for identifying material issues within TSMC. We have integrated ERM (enterprise risk management) to assess the trends and impact of risks posed by material ESG issues, explain to the public how TSMC is mitigating risks, and build a resilient organization capable of thriving under changing global landscapes.

Phase I: Inclusivity
In compliance with the AA 1000 SES (Stakeholder Engagement Standards, SES), TSMC regards the following six stakeholders as the major stakeholders for engagement: employees, shareholders/investors, customers, suppliers/vendors, and government & society (community, academic institutions, media, NGO/NPO). By evaluating global sustainability trends and engaging with internal/external stakeholders, TSMC identified 21 ESG issues relevant to TSMC in 2020.

Phase II: Materiality
In 2020, materiality analysis was conducted through surveys due to the COVID-19 pandemic. Each organization evaluated influential stakeholders that TSMC frequently engaged with, and issued ESG surveys to said stakeholders. We received 842 replies in 2020, and used the surveys to analyze their level of interest in ESG issues relevant to TSMC. The ESG Steering Committee, led by Chairman Mark Liu, and the ESG Committee Chairperson and Senior Vice President Lora Ho would spearhead efforts to analyze the impacts of each issue on operations (profitability, revenue, customer satisfaction, employee cohesion, risk) and review the sustainability roadmap for long-term development with a total of 150 colleagues that included TSMC’s senior vice presidents, vice presidents, senior fab directors, and fab directors.

6 Categories of Stakeholders
The six major stakeholders that TSMC should engage with are employees, shareholders/investors, customers, suppliers/vendors, government & society (community, academic institutions, media, NGO/NPO).

21 Issues
Identify sustainability issues relevant to TSMC through global sustainability standards (GRI Standards, ISO 26000, RBA, SDGs, SASB, TCFD, and UN Global Compacts), sustainable investing indices (CDP, DJSI, MSCI ESG Index, and SDGs Invest), Company development goals, and stakeholder communication.

842 Surveys
Survey respondents included shareholders/investors (25), employees (511), customers (32), suppliers/vendors (136), government/industry associations (7), and the public (131).

150 Colleagues
A total of 150 colleagues including the Chairman, senior vice presidents, vice presidents, senior fab directors, and fab directors worked together to identify how ESG issues would impact TSMC operations.

14 Material Issues
According to the results from step 3 & 4, we have mapped out the TSMC materiality matrix. The ESG Committee has discussed and agreed on the results, identifying 14 material issues.

(continued on next page)
Phase III: Responsiveness

The ESG Committee was able to identify 14 ESG issues as material based on materiality analysis in 2020. TSMC assessed each issues’ impact on the boundaries of TSMC’s value chain from supply chain and company operations to customers. Pursuant to GRI Standards, we have also identified 23 material topics specific to TSMC in alignment with the ESG issues and collected internal information, data, and management approaches for disclosure in compliance with reporting regulations. Corporate governance, risk management, ethics, regulatory compliance, economic performance, tax policies, and information security are seven issues classified under General Disclosures by the GRI Standards. While they will not be mapped in the materiality matrix, relevant information will be disclosed annually.

Phase IV: Impact

TSMC has established 2030 targets for each material ESG issue. The ESG Committee will regularly review progress towards annual targets and formulate changes to the following year accordingly. Plans, progress, and changes will be disclosed in the annual CSR Report for external parties.

Internal organizations formulated 74 long-term goals for material ESG issues to be achieved in 2030. We have aligned the 14 material issues with the 23 specific topics in the GRI Standards to collect and disclose relevant information based on the reporting requirements and management approach dictated by GRI.

TSMC Materiality Matrix

Note: Corporate governance, risk management, ethics, regulatory compliance, financial performance, tax policy, and information security topics are classified under General Disclosures by GRI and are generally result-oriented. The above issues will, therefore, not be represented in the materiality matrix but relevant information will be regularly disclosed in the Company’s annual report, Company website, CSR Report, ESG website and ESG Newsletter.
## Material Issues and Value Chain

<table>
<thead>
<tr>
<th>Roles</th>
<th>Material Issues</th>
<th>GRI Standards Specific Topics</th>
<th>Upstream Note 1</th>
<th>TSMC Operations Note 2</th>
<th>Downstream Note 3</th>
<th>Operational Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Procurement</td>
<td>Wafer Fabrication</td>
<td>Packaging/Testing</td>
<td>Profitability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stages</td>
<td></td>
<td></td>
<td>Revenue</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Customer Satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Employee Cohesion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Risk</td>
</tr>
<tr>
<td>An Innovation Pioneer</td>
<td>Innovation Management</td>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Product Quality</td>
<td>Customer Safety and Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer Service</td>
<td>Customer Privacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Responsible Purchaser</td>
<td>Supplier Sustainability</td>
<td>Procurement Practices, Supplier Environmental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>Assessment, Supplier Social Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Practitioner of Green</td>
<td>Energy Management</td>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>Climate Change</td>
<td>Emissions, Economic Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Management</td>
<td>Water, Effluents and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air Pollution Control</td>
<td>Emissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste Management</td>
<td>Effluents and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An Admired Employer</td>
<td>Talent Attraction and</td>
<td>Economic Performance, Labor/Management Relations,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Retention</td>
<td>Diversity and Equal Opportunity, Market Presence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Talent Development</td>
<td>Training and Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Rights</td>
<td>Labor/Management Relations, Non-discrimination,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Freedom of Association and Collective Bargaining,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forced or Compulsory Labor, Human Rights Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Occupational Safety and</td>
<td>Occupational Safety and Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power to Change Society</td>
<td>Social Participation</td>
<td>Economic Performance, Indirect Economic Impacts,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local Communities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Note 3: "Customer Use" boundaries are customer products manufactured by TSMC.
Material Issues & Risk Management

**Innovation Management**
- Inability to foresee changes in technologies or develop innovative technologies
- Patent Protection - R&D results unprotected due to lack of patent

**Product Quality**
- Challenges to product quality and yield
- Wafer quality control grows increasingly difficult as products become more complex. Inability to detect defects could incur a loss to our clients and impact Company reputation
- If defects remain undetected in raw materials, it could lead to scrapping the final product, impacting customer and Company operations

**Supplier Sustainability Management**
- Disruptions in the supply chain (for raw materials or equipment) will impact Company operations and our commitment to customers
- Please refer to "Supplier Sustainability Management" in this report for our approach
- Please refer to "6.3 Risk Management" in the 2020 Annual Report and "Supplier Sustainability Management" in this report for our approach

**Climate Change**
- Operational impact from climate change, increasing GHG emissions, and regulations against GHG emissions
- Increasing demands from investors, customers, and environmental groups to increase usage of renewable energy could increase costs and impact Company reputation if demands are not met
- Please refer to "Climate Change and Energy Management" in this report for our approach

**Business/Operation Impact and Our Approach**
- Advanced processes involve increasingly complex technologies, higher production costs, and more complicated supply chains. The Company’s competitive edge and market share could suffer if we are unable to identify technological changes and develop new technologies
- Please refer to "Innovation Management" in this report for our approach

**Risk Type**
- Strategic
- Operational
- Hazardous

**Likelihood and Trend**
- Upwards
- Sideways
- Downwards

**Severity**
- Catastrophic
- Major
- Moderate
- Minor
- Insignificant

(continued on next page)
Unstable water supplies will limit production capacity; TSMC will therefore be unable to satisfy customer demand.

Anomalies in effluents will pollute the environment and negatively impact Company reputation. Please refer to "Water Management" in this report for our approach.

Inability to attract a sufficient number of high-quality talents when needed. Company operations could suffer from an inability to attract a sufficient number of high-quality talents when needed. Please refer to "Talent Attraction and Retention" in this Report for our approach.

Improper use or failure of air pollution control equipment could result in excess emissions, penalties from the authorities, and impact on Company reputation. Please refer to "Air Pollution Control" in this report for our approach.

Unstable power supply will limit production capacity and impact Company reputation. Customer's trust could decline and result in fewer orders. Please refer to "Climate Change and Energy Management" in this report for our approach.

Environmental impact from pollutant emissions.

Water scarcity or disruption and environmental impact from wastewater.

Energy shortage or power outage.

Inability to attract a sufficient number of high-quality talents when needed.

Air Pollution Control

Water Management

Energy Management

Talent Attraction & Retention

Risk Aspects

Business/Operation Impact and Our Approach

Risk Type

Strategic

Operational

Hazardous

Likelihood and Trend

Upwards

Sideways

Downwards

Severity

Almost Certain

Likely

Possible

Unlikely

Rare

Catastrophic

Major

Moderate

Minor

Insignificant

25
Company reputation, employee morale, and talent recruitment could suffer from the lack of proper protection for the human rights of our employees.

Company reputation and customer's interests could suffer from the lack of proper protection for the human rights of supplier's employees.

Please refer to “Human Rights” and “Supplier Sustainability Management” in this report for our approach.

The Company’s competitive edge and growth momentum will suffer when unable to develop talents to meet strategic capabilities.

Please refer to “Talent Development” in this report for our approach.

Employees could suffer from disabling injuries if they do not follow proper safety guidelines.

Please refer to “6.3 Risk Management” in the 2020 Annual Report and “Occupational Safety and Health” in this report for our approach.

Risks and Our Approach

<table>
<thead>
<tr>
<th>Risk Aspects</th>
<th>Business/Operation Impact</th>
<th>Risk Type</th>
<th>Likelihood and Trend</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talent Development</td>
<td>Inability to develop talents to meet strategic capabilities</td>
<td>Strategic</td>
<td>Almost Certain</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>Human Rights</td>
<td>Inability to protect the human rights of TSMC employees and suppliers</td>
<td>Operational</td>
<td>Likely</td>
<td>Major</td>
</tr>
<tr>
<td>Occupational Safety and Health</td>
<td>Earthquakes or fires</td>
<td>Hazardous</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Occupational injuries, occupational diseases, and chemical hazards</td>
<td></td>
<td>Unlikely</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Emerging infectious diseases (e.g., COVID-19)</td>
<td></td>
<td>Rare</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>
**Stakeholder Communication**

**Employees**

- Concerned with job duties and purpose, healthy and safe workplace, competitive compensation and welfare, opportunities for learning and growth, and work-life balance

**Engagement**

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

**Issues**

- Talent Attraction and Retention
- Talent Development
- Company’s Long-term Development in Current Geopolitical Situation
- Ethics and Regulatory Compliance
- Social Participation

**Focus Areas**

- Company’s long-term development under tense geopolitical situations and the global pandemic
- Strengthen industry-academia collaborations around the world to discover and cultivate more young talent
- Expand interaction and cooperation across organizations to broaden employee vision and foster well-rounded talents
- Host a variety of activities for employees to help achieve a better work-life balance
- Leverage big data or AI tools to upgrade office automation to improve productivity and reduce work hours
- Provide the latest regulations for related employees
- Offer more opportunities for employees to engage with society and help the disadvantaged

**Responses from TSMC**

- Helped employees understand how TSMC can grow given the current global landscape and competitive market through internal channels
- Continued to improve the quality and quantity of semiconductor courses and expand industry-academia collaboration to information engineering fields
- Strengthened dual career ladder system for both management and technical expertise to allow employees to develop to their full potential in the right places according to their personal characteristics and skills
- Strengthened employee training and offered more opportunities for internal transfers so that our employees can grow with the Company
- Continued to host various art, family, and sports events as well as clubs to facilitate a better work-life balance among employees
- Introduced the latest Industry 4.0 and Industrial AI technology to build a knowledge base for engineering analysis and make knowledge smarter
- Updated ethics and regulatory compliance training materials. Employee training completion rate was 99.72% with 50,482 employees having received training; management training completion rate was 100% with 5,425 managers having received trainings.
- Continued to invest in society through the TSMC Education and Culture Foundation and the TSMC Charity Foundation, continued to encourage employees to volunteer
Concerned with sustainable value creation, and focused on business development strategies, stable profitability, good shareholder returns, and ESG performance.

Shareholders / Investors

302
Institutional investors

262
Conferences and meetings

In 2020, through quarterly investor conferences and 262 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 12 consecutive years.

TSMC distributed cash dividends on a quarterly basis. Shareholders of TSMC common shares received a total of NT$10 cash dividend per share in 2020.

Disclosed ESG information and data according to semiconductor industry indicators issued by SASB (Sustainability Accounting Standards Board). Held Climate Risk & Opportunities Workshops to identify climate risks and opportunities according to the TCFD framework (Task Force on Climate-related Financial Disclosures); a total of 5 climate risks (inc. zero emission trends) and 1 opportunity (improve company reputation) were added in 2020.

General shareholders’ meeting/annually
Investor conferences/quarterly
Domestic and overseas broker conferences/as needed
Face-to-face meetings, video conference calls and telephone conference calls/as needed
Annual report, CSR report, and annual report on Form 20-F with the US Securities and Exchange Commission/annually

Issues

Focus Areas

Responses from TSMC

- Financial Performance
- Innovation Management
- Risk Management
- Climate Change
- Impact from global politics and economy on the Company’s operations and TSMC’s response
- Changes in the nature of competition
- Future growth potential and profitability
- Dividend policy
- Measures in response to climate change and energy policy
- In 2020, through quarterly investor conferences and 262 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 12 consecutive years.
- TSMC distributed cash dividends on a quarterly basis. Shareholders of TSMC common shares received a total of NT$10 cash dividend per share in 2020.
- Disclosed ESG information and data according to semiconductor industry indicators issued by SASB (Sustainability Accounting Standards Board). Held Climate Risk & Opportunities Workshops to identify climate risks and opportunities according to the TCFD framework (Task Force on Climate-related Financial Disclosures); a total of 5 climate risks (inc. zero emission trends) and 1 opportunity (improve company reputation) were added in 2020.

Stefan Magnusson & Stanley Lu
Orbis Investments
Concerned with TSMC’s technology development and production planning, including product quality that fulfills customer demands, careful protection of customer information, supporting customers in successful production application, and gaining time-to-market advantage.

Customer

115
Quarterly assessment meetings
1,205
Customer meetings

Concerned with TSMC’s technology development and production planning, including product quality that fulfills customer demands, careful protection of customer information, supporting customers in successful production application, and gaining time-to-market advantage.

Issues

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

Focus Areas

- Innovation Management
- Product Quality
- Customer Service
- Information Security

- Technology development schedules and plans
- Capacity planning and production information
- Product quality
- Information protection

Responses from TSMC

- TSMC was able to offer 833 process technologies and 77 packaging technologies in line with its technological roadmap
- New TSMC-Online™ technical file navigation system assisted customer to access up-to-date information easily
- In response to the COVID-19 pandemic, TSMC offered remote auditing services to support customer’s product launching on schedule and win customer trust
- By using a dynamic hotspot failure identification approach at the system level, we were able to increase the success rate of failure analysis, accelerate the development of new processes, and speed up the trouble-shooting stage during customer designs. This helped to reduce process flaws and make products more reliable
- TSMC created information protection protocols, built automated information security management system, and obtained ISO 27001 certification to be compliant with international security standards. Fab 12B/14A/15B have received ISO 15408 certifications, guaranteeing the highest level of safe production and information protection for our customers. All fabs with ISO 15408 certifications are ready to receive high security level orders and ensure optimal safety management in the production process and along the supply chain.

Customers appreciate TSMC’s support, which enables new products to be quickly completed from design to mass production.

With TSMC’s expertise in advanced wafer fabrication technology and support in quality and reliability assurance, MediaTek is able to offer leading innovative designs that fulfill the strict requirements for high-end chipset solutions, recognized by tier-one clients around the world.

HW Kao
Corporate Vice President, MediaTek

TSMC’s customer service teams have a clear understanding of our manufacturing needs and fights hard to support our interests. They always provide prompt responses and are very professional in handling issues. It is a pleasure to work with them. We hold them as the benchmark for service excellence. Please keep up good work and momentum on the support.

Dilip Vijay
VP and GM of APD/CSG/DCSG, Broadcom
Concerned with the development of new process technologies, improving product quality, ESH regulations, ethics and regulatory compliance, and information security, desire to strengthen and deepen partnerships for sustainable supply chain management.

Suppliers/Contractors

- 395 Suppliers participated in the Responsible Supply Chain Forum
- 72 Supplier audit & communication meetings

Suppliers

- Supplier Management Forum, Responsible Supply Chain Forum & Supply Chain ESH Training Forum/annually
- Supply Online 360 Global Responsible Supply Chain Platform/as needed
- On-site support & audit/as needed
- Supplier meetings/as needed
- Supplier Information Security Association meeting/monthly

Issues

- Sustainable Supply Chain Management
- Ethics and Regulatory Compliance
- Product Quality
- Workplace Safety and Health
- Information Security

Focus Areas

- Carry out sustainable actions and continue to improve
- TSMC’s ethics and regulatory compliance and supplier code of conduct
- Raw material quality
- Establish effective ESH management mechanisms
- Information security compliance, assessment results, and sharing experiences

Responses from TSMC

- Built Supply Online 360, a global supply chain management platform; established online TSMC Supplier Sustainability Academy with five lessons on Supplier Code of Conduct now available online
- All tier 1 suppliers signed the Supplier Code of Conduct and complied with business ethics (completion rate: 100%)
- 24 critical suppliers completed third-party supplier audits on sustainability risk by RBA-certified institutions; 12 suppliers received consultation on process advancement and quality improvement
- Hosted Responsible Supply Chain Forum and related training courses for suppliers to share experience; required suppliers to apply learnings to factory operations
- Held nine Supplier Information Security Association meetings, completed supplier information security assessments for nine suppliers, and carried out five supplier information security programs to raise awareness for information security across the supply chain

Engagement

- Responses from TSMC

Sustainability should be the cornerstone of corporate growth. We are happy to be partnering with TSMC towards sustainable operations and a positive cycle.

Chou-Sin Chen
President of Chang Chun Petrochemical Co., Ltd., a Subsidiary Company of Chang Chun Group

We should shoulder the responsibility for environmental protection and strive to develop innovative green technologies by advancing processes, reducing industrial waste, and preventing pollution. We look forward to working with TSMC in the future and fulfilling our social responsibilities.

Alvin Hsieh
Sr. Regional Director of Entegris Asia LLC, Taiwan Branch

Sustainability should be the cornerstone of corporate growth. We are happy to be partnering with TSMC towards sustainable operations and a positive cycle.

Chou-Sin Chen
President of Chang Chun Petrochemical Co., Ltd., a Subsidiary Company of Chang Chun Group

We should shoulder the responsibility for environmental protection and strive to develop innovative green technologies by advancing processes, reducing industrial waste, and preventing pollution. We look forward to working with TSMC in the future and fulfilling our social responsibilities.

Alvin Hsieh
Sr. Regional Director of Entegris Asia LLC, Taiwan Branch
Concerned with the development of advanced process technologies, ESG actions, overseas investments, and environmental regulations (GHG, toxic substances, air pollution/water pollution, etc.) revision trends; sharing of Occupational Safety and Health management experience and discussions on regulations.

Government/Industry Associations

- 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

Government meetings attended 50

Industry association conferences and meetings 48

Issues

- GHG Reduction/Energy Management
- Water Management
- Environmental Regulations
- Occupational Safety and Health
- Innovation Management

Focus Areas

- Build factories that use diverse energy sources and increase use of renewable energies
- Build factories that use diverse water sources and increase use of reclaimed water
- Comply with environmental regulations
- Improve ESH management across the supply chain
- Application for U.S. investments
- Development trends in advanced semiconductor process technologies

Responses from TSMC

- Established 100% renewable energy target for TSMC by 2050 and joined the RE100
- Commenced construction of the TSMC Water Reclamation Plant in Southern Taiwan Science Park and made plans to introduce domestic reclaimed water as a water source; the reclaimed water plant is slated to be in commission in 2021
- Represented the Taiwan Semiconductor Industry Association in discussions with the EPA on reasonable and viable air pollutant emission standards for the semiconductor industry
- Held seven ESH Experience-sharing Workshops and asked suppliers to set long-term sustainability goals for energy conservation, carbon reduction, fire prevention, occupational safety and health, and emergency response
- In December 2020, TSMC incorporated the TSMC Arizona Corporation and has made plans to build a 12-inch wafer fab in Phoenix, Arizona; the fab will employ 5nm processes and is slated to be in commission in 2024 to fulfill strong North American market demands for advanced technology
- Visited the U.S. Patent and Trademark Office, upon invitation, to share development trends in semiconductor technologies and TSMC’s technologies

Engagement

A fire equipment training course at TSMC’s own fire training grounds. The grounds are equipped with a variety of equipment to ensure suppliers can learn how to operate them.

Helen Clarkson
CEO of The Climate Group
Concerned with the resources for education and arts offered by the TSMC Education and Culture Foundation to cultivate well-rounded talents in the new era; concerned with the emergency relief aid, volunteer service, and various charity programs provided by the TSMC Charity Foundation.

- **Cooperating charity groups**: 225
- **Cumulative number of beneficiaries**: 646,975

### Engagement
- Volunteer services/ at least once per week
- **Social Participation**
- **Focus Areas**
  - Seeking additional partners for educating the disadvantaged and offering diverse education to young students
  - Continue to support the arts and expand sponsorships for outstanding local art troupes
  - Measures taken in response to social issues and major events, and impact of those measures
  - Progress in environmental protection projects
- **Responses from TSMC**
  - In 2020, the TSMC Education and Culture Foundation invested NT$ 99.85 million to support diverse education programs with our three cornerstones: Cultivate Young Generation, Educational Collaboration, Promote Arts and Culture. To strengthen ESG and the influence of women, the Foundation hosted the TSMC Youth Dream Building Project to give young Taiwanese people the opportunity to realize a sustainable future through creativity, and also organized five “TSMC Journeys of Female Scientist Lectures” to cultivate outstanding talents for Taiwan.
  - In 2020, the TSMC Charity Foundation devoted funds, material resources, and volunteers to target four charity projects: Caring for Elders Living Alone, Promoting Filial Piety, Taking Care of the Disadvantaged, and Environmental Protection. The Foundation focused on putting resources into Education in Remote Areas and Aid for the Disadvantaged, with 10,451 volunteers serving nearly 64,000 hours. Donations exceeded NT$160 million.

### Issues
- **Volunteer services/ at least once per week**
- **Social Participation**
- **Focus Areas**
  - Measures taken in response to social issues and major events, and impact of those measures
  - Progress in environmental protection projects

### Focus Areas
- **Overview ESG Feature Stories Sustainable Business Practice Operations and Governance Appendix**
- **2020 Corporate Social Responsibility Report**
- **An Innovation Pioneer A Responsible Purchaser An Admired Employer Power to Change Society**

---

During this pandemic, TSMC has been incredibly supportive. I’d like to thank the TSMC Charity Foundation for offering personal protective gear and health supplements but also for appreciating the efforts of medical laboratory scientists.

---

I would like to thank the TSMC Education and Culture Foundation for showing young students what it takes to realize your dream through the TSMC Youth Dream Building Project. It’s challenging, but it gave us a better idea of where we stand.

---

Yu Chun Lin
Student of Dept. of Industrial Design, National United University, Winning teams member from the 3rd & the 4th TSMC Youth Dream Building Project competition

---

Te-Lung Tsai
President of the Taiwan Association of Medical Technologists
TSMC provides advanced processes and technology platforms to help customers realize innovations, drive the success and application of their products, and create value for society and stakeholders. This is a manifestation of the "Better, Together" spirit and a critical reason why TSMC can continue to grow and exert influence. TSMC believes in integrity leadership and has created a sustainability impact management framework based on the Company’s strong governance foundation, six major capitals, four core elements, six sustainable management competencies, and Environmental Profit and Loss (EP&L) valuation model to evaluate and manage the entire value chain’s contribution to society.
In 2020, TSMC completed an economic, environmental, and social impact evaluation and introduced results for Supply Chain Employee Compensation and Corporate Volunteers. We also completed the sustainability impact valuations based on a triple bottom line (TBL). For more information, please refer to sustainability impact valuations in this report.

Note 1: "Supply Chain Output Value Driven by TSMC" in 2020 was calculated with assistance from the Industrial Economics & Knowledge Center using the Input-Output Table in 2016 issued by the Directorate General of Budget, Accounting and Statistics (DGBAS) with corrections using the RAS method. Data from 2018-2019 have also been adjusted.

Note 2: Environmental Profit and Loss (EP&L) presented in this section is the monetary assessment of possible external impacts from TSMC's purchase and production. For the costs and economic benefits arising from the implementation of environmental protection projects, please refer to "Environmental Cost" in TSMC's 2020 annual report. For the EP&L methodology, please refer to the TSMC 2020 Environmental Profit and Loss (EP&L) Report.


Note 4: Environmental Impact of the Supply Chain includes only suppliers who had more than 3 transactions with TSMC in 2020 and with amounts exceeding NT$10 million. A total of 1,041 suppliers meet the criteria. Their environmental impact is then calculated through the Environmentally Extended Input Output (EEIO) analysis. The selection criteria for suppliers was amended in 2020 to include factory and equipment suppliers. Data from 2018-2019 have also been adjusted.

Note 5: Value of Occupational Injury = Cost of Occupational Injury + Medical Expenses + Amount Individuals is Willing to Pay to Avoid Occupational Disasters

Note 6: Supply Chain Employee Compensation = Procurement amount is input into the EXIOBASE 2 database and calculated using relevant compensation coefficients based on the supplier’s industry and location.

Note 7: Corporate Volunteer Value = Volunteer Service Hours * Average TSMC Employee Income

(continued from the previous page)
Sustainability Impact Valuation

TSMC has constructed a Sustainability Impact Strategy Map derived from causal relationships. The map is constructed through the integration of P&L and sustainable management and it evaluates the TSMC value chain’s social impact from an outside-in perspective. Since 2018, TSMC has been collaborating with the Corporate Sustainability Impact Center of Tunghai University to introduce an EP&L valuation model that is capable of converting all environmental footprints produced throughout production & operations into monetary social costs into our Total ESH Management system (TSM).

In 2020, in terms of TSMC operations, TSMC generated NT$1.339 trillion in operating revenue, made a provision of NT$331.7 billion for depreciation and amortization, and issued NT$259.3 billion in cash dividend. TSMC not only helped customers succeed and suppliers become more sustainable, but also offered good returns to its investors. In terms of social value, we paid NT$199.7 billion in taxes and payroll, supporting our government to expand infrastructure and social welfare, and to create more job opportunities; volunteer services from TSMC created NT$80.32 million in social benefit while occupational injuries resulted in NT$12.9 million in social costs. Environmental footprints and resource consumption from the production process resulted in an environmental cost of NT$15.7 billion. In terms of the upstream supply chain, TSMC generated NT$1.802 trillion output value in the supply chain, created 190 thousand job opportunities and NT$157.6 billion in payroll, and resulted in NT$11.5 billion in environmental costs.

In 2020, our investigation showed that TSMC had experienced minor increases in environmental externalities from production and operations over the past three years. The main cause for the rise is an increasing demand for energy, water, and raw materials due to new factories and evolving advanced processes. To reduce social costs from energy consumption, TSMC achieved decreases in externalities from air pollution and waste through low carbon manufacturing, improving energy efficiency, and increasing use of renewable energies; in 2020, the environmental externalities per unit product had reduced by 7% from the previous year. In terms of the supply chain, environmental externalities derived from TSMC procurement are largely concentrated in PM2.5 and GHG emissions from the production of chemical materials and chemical products. TSMC will continue to strive towards a responsible supply chain and ask that our suppliers commit to pollution control and reduced energy resource consumption. We intend to conduct an environmental survey on suppliers in 2021, to further uncover ways to reduce our environmental footprint, increase social welfare, make our supply chain more sustainable, and create more synergy for the value chain. For more details, please refer to the TSMC 2020 Environmental Profit and Loss (EP&L) Report.

Case Study

Operations Management with EP&L at TSMC

TSMC introduced EP&L into production & operations management in 2018 and further applied EP&L analysis to the upstream supply chain in 2019. We conducted hot spot analysis through Environmentally Extended Input Output (EEIO) and started surveying each key supplier using a life cycle approach. As of 2020, we have surveyed and analyzed over 40 suppliers.

In 2020, we conducted an environmental survey on suppliers in 2021, to further uncover ways to reduce our environmental footprint, increase social welfare, make our supply chain more sustainable, and create more synergy for the value chain. For more details, please refer to the TSMC 2020 Environmental Profit and Loss (EP&L) Report.
From purchasing and TSMC operations to customer use, TSMC has outlined a strategy map for the value chain derived from the causal relationship between these interconnected lines to comprehensively evaluate our actions. Monetary value serves as a sustainable management tool to measure the potential external costs (-) and values (+) generated by TSMC on the economy, environment, and society.

TSMC is taking advantage of its position as a leading global semiconductor foundry to improve the technology and capability of local suppliers, as well as drive development and output value for the semiconductor value chain. To address supply chain sustainability issues, we actively work towards a responsible supply chain to reduce environmental and social impact.

TSMC is innovation-oriented and aims to mitigate social costs and impact from energy consumption with the use of renewable energies, reclaimed water, and the circular economy. We hope to foster a humanistic culture and offer equal opportunities, a healthy and safe workplace, and competitive compensation and benefits. We also encourage employees to engage in social participation and work with the Company to create positive change for society.

TSMC is using a new generation of process technologies to help customers realize innovation and improve energy efficiency. We aim to use technology to better human health, safety, and convenience while at the same time working to build a low-carbon society.

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

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

Humanity now faces grave challenges. In the face of such challenges, TSMC is focusing on improving core business competencies through our ten business philosophies and four core values. We are striving to fulfill our five sustainability roles and drive SDGs throughout the semiconductor industry by influencing the three major stages of upstream procurement, TSMC operations, and customer use. With guidance from the ESG Steering Committee, TSMC has set five ESG goals and selected nine primary SDGs. With the ESG Committee, we were able to integrate inter-organizational resources and capabilities to formulate 44 timely and quantifiable long-term goals and implement 24 corresponding actions toward sustainability. We are integrating SDGs into our organizational culture and daily operations, and with Goal 17 of the SDGs – global partnerships – at the core, we are collaborating with internal/external stakeholders through participation, cooperation, and engagement to uncover opportunities for growth in the governance/economic, environmental, and social dimensions. We hope that we can join together in a sustainable future with shared values.

ESG Directions
- **Green Manufacturing**
  - Realize clean production, lead the industry in developing high-efficient semiconductor technologies, employ green innovation in response to climate change, and facilitate global sustainable development
- **Build a Responsible Supply Chain**
  - Through procurements, extend TSMC’s operational and manufacturing standards to related industries in the supply chain and drive growth in the supply chain
- **Create a Diverse & Inclusive Workplace**
  - Recruit partners with shared visions and values, value labor rights, and ensure employees enjoy a workplace that offers learning, development, safety, and health
- **Talent Development**
  - Collaborate with schools to develop TSMC programs and STEM education
- **Care for the Disadvantaged**
  - Integrate Company resources and voluntary employee volunteer services. Build a society of common good and deliver the power of love and societal influence through education and daily life

Process
- **Understand and Prioritize SDGs**
  - TSMC identifies the link between SDGs, the five sustainability roles, and value chain stages through the following three steps: Understand & Prioritize SDGs, Goals & Integration, and Disclosure and Communication. Long-term goals and action plans are then formulated accordingly.
- **Goals & Integration**
  - SDGs
  - Long-term Goals
- **Disclosure and Communication**
  - Sustainable Approaches

TSMC Sustainability Roles
- **An Innovation Pioneer**
  - Innovation is the foundation for growth and the driver for breakthroughs at TSMC. As the leader of the dedicated IC foundry industry, we embrace innovation from each and every TSMC employee. We use the world’s leading technologies to produce high-quality, energy-efficient, and sustainable products and thereby assist in solving the various challenges humanity faces.
- **A Responsible Purchaser**
  - As a world-leading IC foundry, TSMC views responsible procurement as our mission. We hope to exert our influence and create a green semiconductor supply chain by encouraging upstream/downstream suppliers to make progress in technology, quality, delivery, environmental protection, human rights, occupational safety and health, etc.
- **A Practitioner of Green Power**
  - Green manufacturing is the cornerstone of sustainable management at TSMC. We believe that there can be mutual prosperity between business growth and the environment. Therefore, we have deeply entrenched green management into daily operations. By introducing innovative green technologies, we continue to address climate change, energy management, water management, waste management, and air pollution control as we stay committed to becoming the global benchmark for eco-friendly companies.
- **An Admired Employer**
  - Employees are TSMC’s most important asset. We value mutual commitments with our employees. We dedicate ourselves to creating a challenging and enjoyable work environment full of opportunities to acquire new skills, establishing an open-style management system, providing compensation and benefits packages that are above the industry average for employees, and becoming a world-class company that our employees are proud of.
- **Power to Change Society**
  - TSMC is based in Taiwan and has been able to thrive because of support from across society. We believe in giving back to the society that has given us so much, and we do so through the TSMC Education and Culture Foundation and TSMC Charity Foundation. To give back and create common good, the Foundations are dedicated to caring for the disadvantaged, youth education, and culture and arts.
**Linking SDGs and TSMC's Sustainable Development Goals for 2030**

**Good Health and Well-being**
- **Offer Better Medical Care to Seniors Living Alone**
  - Provide 12,000 service visits to seniors living alone through Network of Love

**Quality Education**
- **Promote Filial Piety Among Our Youth**
  - Promote filial piety education in 120 educational institutions
- **Care for the Educationally Disadvantaged**
  - Continuous collaboration with public and private educational organizations and provide no less than NT$15 million in resources annually
- **Volunteer Readers for Children in Remote Areas**
  - Provide more than 10,000 hours of reading services each year

**Clean Water and Sanitation**
- **Reduce Water Risks**
  - Reduce unit water consumption (liter/12-inch equivalent wafer mask layers) by 30% (Base year: 2010)
  - Help suppliers implement water conservation measures and reach 3.5 million metric tons in cumulative amount of water conserved (Base year: 2020)
- **Raise Effluent Standards**
  - Water pollution composite indicator 50% above effluent standards
- **Increase Usage of Reclaimed Water**
  - Increase the replacement rate of reclaimed water by more than 30%

**Affordable and Clean Energy**
- **Produce with Greater Energy Efficiency**
  - Double energy efficiency after five years of mass production for each process technology
  - Save 5,000 GWh cumulatively between 2016 and 2030 through new energy-saving measures
- **Work with Suppliers Toward Energy Conservation**
  - Help suppliers implement energy conservation measures and reduce energy consumption by a cumulative total of 1,500 GWh (Base year: 2018)
- **Use Renewable Energy**
  - Renewable energy to account for 20% of energy consumption in new fabs after adopting 3nm processes. Continue increasing renewable energy purchases annually until 25% of fabs' power consumption is supplied from renewable energy and non-fab power consumption is 100% from renewable energy

Since TSMC's 2020 Sports Day was canceled due to the pandemic, TSMC decided to allocate NT$20 million from the Sports Day budget to kick off the "TSMC Little Baseball Hero Support Program," which is TSMC's first crossover collaboration with the Taiwan Aboriginal Baseball Development Association (TABDA) and the Taiwan Basegarden Baseball Development Association (TBBDA). The program aims to support young baseball players establish an education foundation, build up self-confidence, and unleash their potential.

The TSMC Little Baseball Hero Support Program supports TABDA to offer training to baseball coaches on sports nutrition, injury prevention, sports science, and applications. Through the development of players' second skills, the program provides junior high school baseball team members in Hualien and Taitung with career planning and vocational training. At the same time, the program supports TBBDA in expanding its current service area by establishing "Baseball Reading Classrooms" for baseball teams in junior high schools and elementary schools in areas where the TSMC fabs are located. In addition, a "Baseball Scholarship" will be presented by CPBL stars to encourage young baseball players to read and establish an educational foundation, paving the way for their career development.

TSMC Vice President T.S. Chang, a baseball enthusiast, leads members of TSMC's Fab 12B Softball Team and TSMC's Softball Club to visit schools in Hsinchu. They share their knowledge of baseball and the professional league with kids and help them with schoolwork and life coaching in the pursuit of their dreams.
Support Local Suppliers
Promote Workplace Safety
Facilitate Sustainability Across the Supply Chain
Offer Competitive Compensation

**Decent Work and Economic Growth**

- Maintain position above 75th percentile among industry peers in total compensation
- Tier 1 suppliers required to complete Sustainability Management Self-assessment Questionnaire; completion rate 100%
- Tier 1 suppliers required to sign TSMC Supplier Code of Conduct every three years, completion rate 100%
- Suppliers required to receive third-party (RBA-certified agencies) audits every three years: completion rate 100%
- Conduct due diligence for responsible mineral supply chains on three suppliers each year; 30 cumulative suppliers surveyed

**Promote Workplace Safety**

- Disabling Injuries Frequency Rate (FR) < 0.3
- Disabling Severity Rate (SR) < 3
- Incident Rate per 1,000 Employees < 0.20
- All waste treatment vendors to acquire ISO14001 or other international EHS Management certifications
- Supporting high-risk operation suppliers with health and safety, completion rate: 100%
- Assist high-risk operation contractors with ISO 45001 certification for occupational safety and health management system; completion rate: 100%
- Ensure a cumulative total of 1,500 local suppliers receive support on process enhancement and quality improvement (Base year: 2016)
- Conduct due diligence for responsible mineral supply chains on three suppliers each year; 30 cumulative suppliers surveyed

**Facilitate Sustainability Across the Supply Chain**

- Tier 1 suppliers required to complete Sustainability Management Self-assessment Questionnaire; completion rate 100%
- Tier 1 suppliers required to sign TSMC Supplier Code of Conduct every three years, completion rate 100%
- Suppliers required to receive third-party (RBA-certified agencies) audits every three years: completion rate 100%
- Conduct due diligence for responsible mineral supply chains on three suppliers each year; 30 cumulative suppliers surveyed

**Offer Competitive Compensation**

- Maintain position above 75th percentile among industry peers in total compensation
- Tier 1 suppliers required to complete Sustainability Management Self-assessment Questionnaire; completion rate 100%
- Tier 1 suppliers required to sign TSMC Supplier Code of Conduct every three years, completion rate 100%
- Suppliers required to receive third-party (RBA-certified agencies) audits every three years: completion rate 100%
- Conduct due diligence for responsible mineral supply chains on three suppliers each year; 30 cumulative suppliers surveyed

**Encourage Innovation**

- Maintain TSMC’s technology leadership and invest 8.5% of revenue R&D expenses annually
- Over 50,000 global patents granted
- Offer 1,200 process technologies and 170 packaging technologies in line with TSMC technology roadmap
- Green Product Innovation
  - Decrease the Product Environmental Footprint by 30% for each unit product (Base year: 2010)

**Industry, Innovation and Infrastructure**

**Climate Action**

- Implement Mitigation Strategies to Climate Risks
  - Reduce GHG emissions per unit product (MTCO2e/12-inch equivalent wafer mask layers) by 40%
  - Ensure all high-energy-consumption suppliers receive ISO 14064-1 certification for GHG emissions; completion rate: 100%
  - 0 days of production interruption due to climate disasters

- Strengthen Supply Chain Climate Resilience
  - Invite suppliers to observe our annual emergency response drill; cumulative total of 300 suppliers have observed the drill (Base year: 2016)

**Responsible Consumption and Production**

- Reduce Industrial Waste Output
  - Outsource ≤ 0.5 of unit waste disposal per wafer (kg/12-inch equivalent wafer mask layers)
- Promote a Circular Economy
  - Develop multiple types of electronics-grade chemicals for recycling within TSMC
  - Reduce waste production among major local suppliers by 35% (Base year: 2014)
- Chemicals Management
  - Develop analytical abilities for carcinogenic, mutagenic, and reprotoxic substances for all materials and assist major suppliers in developing such abilities
  - Replace NMP 100% (Base year: 2016)
  - Ensure that all processes are free from PFASs with more than 4 carbon atoms

- Better Recycling
  - Reduce air pollutant emissions per unit product by 50% (Base year: 2015)
  - 98% reduction rate of volatile organic gases

**Facilitate Health Management**

- Ensure zero cases of occupational hazard caused by exposure to chemicals

**Outsource ≦ 0.5 of unit waste disposal per wafer (kg/12-inch equivalent wafer mask layers)**
**Reduce air pollutant emissions per unit product by 50% (Base year: 2015)**
**98% reduction rate of volatile organic gases**

**TSMC Launched Its First ESG AWARD to Enhance Corporate Sustainability Performance and Foster Good ESG Ideas from Employees**

To fulfill its commitment to ESG and sustainable social development, TSMC continues to drive positive changes in the world through tangible actions. In 2020, TSMC launched its first CSR AWARD to acknowledge the fruitful ESG results attained within the Company. This award also encourages all TSMC employees to propose brilliant ideas pertinent to the Company’s Five ESG strategic directions, further inspiring employees to proactively explore opportunities for improvement within their respective duties. In addition, by sharing these ideas, the influence of the common good can be extended outside of TSMC. Within half a month since the award began accepting entries, we received 785 proposals with 25,883 employees contributing to the growing momentum of TSMC’s culture of sustainability.

In a survey, 100% of TSMC employees who participated in the event stated that through the TSMC CSR AWARD, they realized that fulfilling CSR is not just a charity cause. More significantly, it enables them to exert influence through their expertise and contribute to society and the environment. In addition, 98% of the employees who participated in the event shared that through the TSMC CSR AWARD, they found the sustainable value of their jobs and are more inclined to proactively propose sustainable plans in their daily work and put the plans into action.

Check out 2020 TSMC CSR AWARD Highlight Video
An Innovation Pioneer

Innovation is the foundation of growth and driver for breakthroughs at TSMC. As the leader in the dedicated IC foundry industry, TSMC embraces innovation from every employee. We insist on producing sustainable products with high quality and low energy consumption through leading technologies to help resolve the many challenges humanity faces.

- **6,900 > 12,000**: Protected intellectual property rights, with 6,900 patent applications globally and over 12,000 trade secrets register.
- **100%**: CMR substance assessment capability for 100% of materials.
- **92.8%**: Customer satisfaction has exceeded 90% for seven consecutive years.
### Innovation Management

#### Strategies

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Maintain TSMC’s technology leadership and invest <strong>8.5%</strong> of revenue R&amp;D expenses annually</td>
<td>• 3nm process technology in risk production</td>
<td>▼</td>
</tr>
<tr>
<td>• 3nm process technology in risk production</td>
<td>• 5nm process technology in volume production</td>
<td></td>
</tr>
<tr>
<td>• Over <strong>50,000</strong> global patent granted</td>
<td>• Exceed <strong>5,500</strong> global patent applications</td>
<td>▲</td>
</tr>
<tr>
<td>• Over <strong>150,000</strong> trade secret registrations</td>
<td>• Exceed <strong>20,000</strong> trade secret registrations</td>
<td>▼</td>
</tr>
<tr>
<td>• Over <strong>12,000</strong> trade secret registrations</td>
<td>• Over <strong>12,000</strong> trade secret registrations</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** In the wake of adjustments made to the portfolio plan for leading technologies, the annual target for 2020 in global patent applications was exceeded, and the long-term goal for 2030 remains unchanged.

---

**Technology Leadership**

Continuous investment in advanced technology development to maintain TSMC’s technology leadership in the semiconductor industry.

**Intellectual Property Protection**

**Patent protection**

Continue to strengthen patent portfolio by keeping patent applications in sync with the company’s R&D resources to make sure that all research achievements are fully protected.

**Trade secret protection**

Strengthen business operations and intellectual property innovation through trade secret registration and management which documents and consolidates the TSMC competitive trade secret applications.
Innovation Management Framework

In response to the rapidly evolving semiconductor industry, TSMC has been striving to build an innovative workplace that highly encourages innovation since its establishment. In the face of challenges imposed by competitors and advanced process technology in 2020, TSMC continued to enhance the Company’s leading technological competitive advantages through an internal incentive scheme for innovation. Employees are encouraged to bring forth a variety of innovations to enhance organizational innovation vitality. Meanwhile, we also dedicate resources to helping our customers, the industry and academia drive interdisciplinary innovation collaborations, including product innovation with our customers, technical talent innovation with research institutions, and green innovation with our suppliers.

Accumulate Internal Innovation Energy

Idea Forums
- Operations
- R&D
- Quality and Reliability
- Corporate Planning Organization
- Finance

Total Quality Excellence and Innovation Conference (TQE)

Innovate Through Interdisciplinary Collaboration

Open Innovation Platform®
Collaboration with World-class R&D Institutes
- University Research Center
- Industry-Academia Joint Development Project
- Semiconductor Programs
- Ph.D. Scholarship
- Advanced IC Design Program
- University Shuttle Program

Realize Innovation

Technology Leadership
Intellectual Property Protection
Intelligent Precision Manufacturing
Innovation Cases
- Virtual Design Environment (VDE)
- High-Efficiency Hazardous Substance Testing Mechanism
- Smart Technical File Navigation System
- Increasing EUV Energy Efficiency
- Biological Treatment System
- Waste Management with Full Traceability
- Management Mechanism for Stack Emission Baseline

Innovative Values

Accumulate Internal Innovation Energy
Idea Forums
- Operations
- R&D
- Quality and Reliability
- Corporate Planning Organization
- Finance

Total Quality Excellence and Innovation Conference (TQE)

CSR AWARD

Innovate Through Interdisciplinary Collaboration
Open Innovation Platform®
Collaboration with World-class R&D Institutes
- University Research Center
- Industry-Academia Joint Development Project
- Semiconductor Programs
- Ph.D. Scholarship
- Advanced IC Design Program
- University Shuttle Program

Realize Innovation
Technology Leadership
Intellectual Property Protection
Intelligent Precision Manufacturing
Innovation Cases
- Virtual Design Environment (VDE)
- High-Efficiency Hazardous Substance Testing Mechanism
- Smart Technical File Navigation System
- Increasing EUV Energy Efficiency
- Biological Treatment System
- Waste Management with Full Traceability
- Management Mechanism for Stack Emission Baseline

Innovative Values
Technology Leadership

In 2020, TSMC continued to expand its scale of research and development. The total R&D expenditure for the year was US$ 3.72 billion, a 26% increase from the previous year and 8.2% of the Company’s total revenue\(^\text{Note 1}\). The R&D team has grown to a team of 7,404 people, a 13% increase from the previous year. The scale of R&D investments is on par with top tech companies worldwide and even surpasses the scale of some companies.

Faced with the increasingly difficult challenge to continue extending Moore’s Law, which calls for the doubling of semiconductor computing power every two years, TSMC has focused its R&D efforts on offering customers first-to-market, leading-edge technologies and design solutions that contribute to their product success. In 2020, following the application of 5nm technology to mass production, the Company’s R&D organization continued to fuel the pipeline of technological innovation needed to maintain industry leadership. For TSMC’s 3nm technology, the sixth generation platform to make use of 3D transistors, TSMC continues full development with major customers and has completed IP design and started silicon validation, the Company’s research and pathfinding pushed forward with exploratory studies for nodes beyond 2nm, which is the leading-edge technology in the semiconductor industry today.

In addition to complementary-metal-oxide-semiconductor (CMOS) logic, TSMC conducts R&D on a wide range of other semiconductor technologies that provide the functionalities required by customers for mobile System-on-Chip (SoC) and other applications, such as smartphones, high-performance computing, IoT, and automotive electronics, etc.

In 2020, TSMC maintained its strong partnership with the world’s top research institutions, including the Semiconductor Research Corporation (SRC) in the United States and the Interuniversity Microelectronics Centre (IMEC) in Belgium. The Company also continues research collaboration with world-class universities, driving advancement in semiconductor technology and nurturing future talents.

Note 1: As reflected upon the revenue growth in 2020, R&D expenditure is slightly under 8.5% of total revenue.
Technology Leadership and Innovation

CMOS Logic Technologies

- N7+ technology entered risk production, the industry's first commercially available EUV (extreme ultraviolet) process technology
- 5nm FinFET technology led the foundry to successfully enter risk production
- 7nm FinFET plus technology entered volume production and led the world to deliver customer products to market in high volume

Specialty Technologies/Interconnect & Packaging Technologies

- Foundry's first underpanel 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
- Volume production launch of new generation CMOS image sensors of sub-micron pixel for mobile applications and development of Ge-on-Si sensor for three dimensional range sensing applications with superior performance
- High-volume production of InFO-PoP Gen-3 for mobile application processor packaging

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

- Volume production of industry-leading 5nm process technology

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

<table>
<thead>
<tr>
<th>Technology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5nm FinFET (N5) technology</strong></td>
<td>TSMC’s most advanced technology that leads in both technology and production capacity, enabling revolutionary products in 2020.</td>
</tr>
<tr>
<td><strong>7nm FinFET (N7) family technologies</strong></td>
<td>NT technology began volume production in April of 2018. By the end of 2020, TSMC has used N7 family technologies to produce more than one billion fully functional and defect-free chips for products to over 100 customers.</td>
</tr>
<tr>
<td><strong>N12e™ technology</strong></td>
<td>Based on 12FFC+ technology and its IP ecosystem, TSMC introduced N12e™ technology in 2020, bringing TSMC’s world-class FinFET transistor technology to AI-enabled Internet of Things (IoT) and other high-efficiency, high-performance edge devices. This technology offers industry-leading low operating power (Vdd), and excellent low leakage performance of ultra-low-leakage (ULL) SRAM (static random access memory), and new ultra-low leakage devices.</td>
</tr>
<tr>
<td><strong>22nm Ultra-low Leakage (ULL) (22ULL) analog technology</strong></td>
<td>22ULL analog technology platform, which is fully compatible with logical process, was established in 2020. This platform offers low-noise 2.5-Volt input/output (IO) transistors and low temperature-coefficient-of-resistance (TCR) TaN (Tantalum nitride) thin film resistors to support customers’ differentiated analog designs.</td>
</tr>
<tr>
<td><strong>22ULL Radio Frequency (RF) (22ULL RF) technology</strong></td>
<td>22ULL RF technology received product tape-outs from over 20 customers in 2020.</td>
</tr>
<tr>
<td><strong>22ULL Embedded Magnetic Random Access Memory (MRAM) technology</strong></td>
<td>22ULL Embedded MRAM technology IPs completed reliability qualifications in 2020, with &gt;100K cycle endurance and reflow capability. This technology demonstrated automotive Grade-1 capability and was applied to volume production for customer wearable products in 2020.</td>
</tr>
<tr>
<td><strong>CMOS Image Sensor (CIS) technology</strong></td>
<td>In 2020, TSMC helped customers lead the market in rolling out 0.8µm pixel products. Pixel size was further reduced to 0.7µm within nine months with timely volume production. The smaller pixel size enables 30% higher resolution for CIS with the same chip size.</td>
</tr>
<tr>
<td><strong>CMOS MEMS (micro electro-mechanical systems) technology</strong></td>
<td>TSMC successfully helped customers bring monolithic ultrasonic scanners into volume production.</td>
</tr>
<tr>
<td><strong>3DFabric™ technologies</strong></td>
<td>In 2020, TSMC introduced 3DFabric™, a comprehensive family of 3D silicon stacking and advanced packaging technologies, which are comprised of frontend TSMC-SocMix™ 3D silicon stacking and backend 3D interconnect technologies which include CoWoS® (chip on wafer on substrate) and InFO (integrated fan-out), providing customers flexible solutions for integration of chiplets.</td>
</tr>
<tr>
<td><strong>InFO-PoP (Integrated Fan-Out Package-on-Package) technology</strong></td>
<td>Successfully developed InFO-PoP technology, which integrates 5nm SoC (System-on-Chip) and DRAM (dynamic random access memory) for advanced mobile device applications. This technology helped deliver several customer products to market in high volume in 2020.</td>
</tr>
</tbody>
</table>
Semiconductors are transforming many key industries, including information and communication, transportation, education, health care, entertainment, agriculture, etc. because of their greater capabilities and better energy efficiency through innovations and breakthroughs. These advancements are critical to the future of electronics that will bring more positive impacts on our lives. As the most trusted dedicated foundry service provider in the world, TSMC continues to deliver industry-leading, next-generation, leading-edge semiconductor technologies, as well as offer comprehensive specialty technologies and leading edge semiconductor technologies, as well as offer comprehensive specialty technologies and leading 3D chip stacking and packaging services to help customers unleash their innovations and deliver more advanced, more capable, more energy-efficient, and more affordable products, including smartphones, high performance computing (HPC), Internet of Things (IoT), automotive, digital consumer electronics, health care devices, etc.

Collaborate with Customer to Deliver World’s First Handheld, Single-probe, Whole-body Ultrasound System that Helps Improve Overall Healthcare System Efficiency

One remarkable example was our collaboration with Butterfly Network, which delivered its next-generation Butterfly iQ+, the world’s only handheld, single-probe, whole-body ultrasound system in 2020, following the debut of its initial model, Butterfly iQ in 2018. By delivering groundbreaking performance and unparalleled efficiency with faster, sharper, and more detailed imaging, the Butterfly iQ+ helps healthcare providers around the world save time during diagnosis and treatment of patients to improve overall patient outcomes. Leveraging Butterfly Network’s most advanced Ultrasound-on-Chip™ technology and TSMC’s world-leading CMOS MEMS manufacturing technology, the ultrasound transducers can be seamlessly integrated on a single chip. The Butterfly iQ+ features 15% faster frame rates and 60% faster pulse repetition frequency, to give healthcare practitioners the clarity they need to help get important insights quickly.

In addition, the Butterfly iQ+ extends battery life by 20% and scanning time by 100% to enhance operation efficiency. The high-performance imaging capabilities and excellent operation efficiency make this innovative product a powerful tool to help healthcare providers around the world to make timely diagnosis and decisions for treatment, even if they are in underserved communities or in remote areas. Additionally, the innovative Butterfly iQ+ technology has been shown to be a particularly useful tool during the global COVID-19 pandemic due to its lung imaging capabilities, portability and ease of cleaning, as infection control has become increasingly important. The Butterfly iQ+ marks a big step forward for point-of-care ultrasound with its innovations and breakthroughs, and will continue to bring significant clinical, economic and societal impact going forward.

In total, TSMC deployed 281 distinct process technologies, and manufactured 11,617 products for 510 customers in 2020 to continue to bring significant outcomes and efficiency across global healthcare systems.

TSMC Continues to Advance Technologies to Unleash Customer Innovation

Butterfly Network Collaborates with TSMC to Unleash Innovation to Help Improve Patient Outcomes and Efficiency across Global Healthcare Systems
Intellectual Property Protection

TSMC constructs a global strategic patent portfolio to secure freedom in business operations, strengthen leadership in the industry, and protect R&D results in leading-edge technologies. Based on the Company's technology leadership in professional semiconductor manufacturing, the global intellectual property portfolio strategies combined with innovative analysis methods of patent map navigation, the battle-tested patents created through invention mining from R&D technology blueprints to seize the commanding heights in key technologies, TSMC generates more patents with higher R&D investment output rate in the industry. Meanwhile, under an innovative patent management mechanism, patent prosecution processes are closely monitored to ensure quality and efficiency. The Company reviews patent portfolio regularly, as well as acquiring patents strategically and/or collaborating with patent alliance(s), to build a comprehensive patent protection network.

Build Global Strategic Patent Portfolio

TSMC’s number of patent published applications in the U.S. ranked third in 2020, setting a new record in history. The number of patents issued in the U.S. ranked sixth on the list, same as the ranking of patent grants in 2018, the historical record. TSMC also ranks first among the top ten patent holders in the U.S. in terms of patent approval rate. The number of global patent grants accumulated has reached 45,000, and 27,000 of which were the contributions of 73 recognized TSMC Prolific Inventors. Meanwhile, TSMC encourages employees to file their inventions for patent applications. In 2020, 459 employees contributed for the first time to a total of 387 U.S. patents.

Four Initiatives of Patent Management Mechanism

TSMC implements four IP management initiatives under an all-around patent management mechanism to protect the Company's R&D results and technology leadership. The initiatives include strategic patent profiling, competitive mining and generating, portfolio construction, and portfolio parading.

TSMC's all-around patent management mechanism involves a review mechanism, reward system, promotion education, and talent training programs. The Company has established a grading mechanism for patent prosecutions that reviews invention disclosures, manages entire patent application process, and expands patent families. It maximizes existing resources to generate a highly strategic patent portfolio that has significant global influence. Meanwhile, TSMC employees are encouraged to continuously file their inventions through diversifying innovation-driven mechanisms.
In 2020, the annual TSMC Patent Campaign successfully attracted nearly 1,400 entries of inventions, and about 3,000 employees joined the Online Quiz on patent knowledge. Meanwhile, the cross-function Leading Technology Invention Forum held eight forums to discuss six emerging technologies and received more than 700 inventions.

TSMC also proactively maintains close ties with both domestic and international patent offices through technical exchanges, assisting patent examiners in better understanding the technical content of TSMC, and consequently accelerating the patent examination process in order to obtain high-quality patent protection. In 2020, TSMC was invited to share the Company’s experiences in IP management in four industry-government-academia IP seminars, contributing to the widespread of IP education and talent cultivation, and facilitating an upgrade in IP protection. Meanwhile, TSMC also shares practical experiences and insightful advice on patent mechanisms and reviews efficiency to help build a comprehensive IP protection mechanism.

Trade Secret Protection
TSMC’s stable core business is the foundation in fulfilling its corporate social responsibility. As TSMC’s most important intellectual property, trade secrets are not only vital to TSMC’s competitiveness, but also the driving force behind its sustainable innovation. Therefore, TSMC built up the Trade Secret Registration and Management System to record and track trade secrets that contribute to the Company’s technology leadership, manufacturing excellence, and customer trust. As of December 2020, over 100,000 trade secrets have been registered and recorded by more than 30,000 employees in the system.

TSMC proactively and systematically manages its key trade secrets as formatted records. Adhering to its culture of innovation and attitude of pursuing excellence, TSMC constantly improves its Trade Secret Registration and Management System by actively applying artificial intelligence technology to keep up with the updates in technology trends and clusters. The Company also established a talent pool to maximize the operational efficiency and benefits of this Trade Secret Registration and Management System for sustainable technology innovation and strengthened overall competitiveness.

TSMC is fully committed to continuously enhance trade secret management to maintain an innovative culture. To recognize employees for their outstanding contributions to the Company, TSMC presents the “Golden Trade Secret Award” every year to registered trade secrets that have the most significant impact on company competitiveness. As of 2020, TSMC has presented 1,616 Golden Trade Secret Awards to more than 4,000 inventors. In 2020, TSMC Chairman Dr. Mark Liu conferred special awards in appreciation of the talented inventors who have earned numerous awards and honors throughout the past six years.

### Number of Trade Secrets Registered Each Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Trade Secrets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>&gt; 8,000</td>
</tr>
<tr>
<td>2018</td>
<td>&gt; 8,800</td>
</tr>
<tr>
<td>2019</td>
<td>&gt; 10,000</td>
</tr>
<tr>
<td>2020</td>
<td>&gt; 12,000</td>
</tr>
</tbody>
</table>

### Benefits of the Trade Secret Registration and Management System

- **Enhance Competitiveness**
  - When there is a breach of rights, it can quickly collect data on the case.
- **Inventions, technology innovation or improvements in TSMC operations are comprehensively documented in the online system.**
- **It monitors and prevents trade secret leakage.**
- **It is integrated with other corporate internal systems to maximize synergy.**

Strategic Management of IP Portfolio
Intelligent Trade Secret Management System Powered by Intelligent Automation and AI

**Integrated with Human Resources System Integration**
TSMC’s trade secret registration system integrates with the human resources system and automatically updates employees’ registration information in its human resources file. This serves to highlight employees’ contributions to TSMC’s technological innovations and serve as an important indicator for supervisors to consider for performance evaluation and promotion.

**Intelligent Reminder Function**
The trade secret system automatically compares employees’ trade secret registration records, and reminds them to complete the registration process in a timely manner.

**Real-time Data Visualization Analysis**
TSMC systems uses advanced information analysis software to visualize trade secret registration data and provide employees with real-time updates and precise data on the quantity of registrations, allowing them to more effectively understand their registration status and adjust their registration strategies more efficiently.

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

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

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

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

**Talent Pool**
Analyze Golden Trade Secret award winners’ backgrounds to generate an “elite innovation talent pool” for TSMC’s talent development planning and strategic management.

**Intelligent Precision Manufacturing**
As the world’s leading semiconductor foundry service provider, TSMC is the first to realize automated manufacturing. The Company has applied AI to the big data and machine learning platform for wafer fabrication to create an intelligent manufacturing environment featuring self-diagnosis and self-feedback capabilities. In response to the increasingly diversified and growing need for high-quality chips, TSMC initiated a comprehensive digital transformation. Digitized fabs are launched to transform the manufacturing process. With automated data collection, system assistance and AI judgment, process efficiency per batch is increased by 30% to 40%. In accelerating intelligent manufacturing, TSMC has also built an AI quality control system for wafer fabs to ensure production quality, facilitate benchmarking among different fabs, and strengthen technology transfer capacity.

In intelligent manufacturing, TSMC introduced augmented reality (AR) and mixed reality (MR) technologies to enable cross-fab collaboration remotely. In 2020, iWorker, a remote work system was further adopted to enhance remote access management and internet traffic control. The system allows for over 2,000 employees to work from home simultaneously during peak hours in one day, which is a timely solution to limited access to regular workplaces as a result of the COVID-19 pandemic.

Since TSMC first introduced automated transport and overhead hoist transfer (OHT) systems to 8-inch fabs in 2019 along with the demand forecasting and dispatch system, automated transport per day has exceeded 150,000 times as of December 2020. By providing a safe and friendly work environment, the systems help more than 3,000 employees increase work efficiency by 10 to 15%. The adoption effectively increases productivity and reduces risks of ergonomic injuries resulting from the handling of heavy objects.

Armed with intelligent precision manufacturing technology, TSMC is expected to move towards intelligent assistive manufacturing and switch to fully automated intelligent manufacturing. TSMC will continue to inject innovation vitality into the global IC industry and be a trusted, long-term partner with our customers.
Cross-fab Remote Collaboration

1. First automated 12-inch GIGAFAB® facilities in the industry built
2. 100% automated wafer fabrication achieved
3. Computer Integrated Manufacturing system established to integrate highly repetitive and inefficient work
4. Productivity of employees at mature manufacturing process facilities increased by 10% to 15% annually

- Wafer Big Data Infrastructure constructed
- Analysis results produced by artificial intelligence introduced to the manufacturing system
- Big Data Analytics for Semiconductor Manufacturing Contest held for three consecutive years in collaboration with MoST and NTHU, with 300 teams from 50 universities
- Big data courses collaborated and improved together with NTU, NTHU, and NCTU, providing both theoretical and practical teaching in class

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

- Research pool consisting of 1,000 IT experts and 300 machine learning experts recruited
- Efforts to develop advanced technologies and potential applications through the intelligent system continued
- Engaged experts and professionals in the development of an AI model that integrates human knowledge and computer AI
- Conducted interdisciplinary exchanges with Harvard University, University of Cincinnati, and Ohio State University on the latest AI applications and development in semiconductor manufacturing

- In response to the COVID-19 pandemic, TSMC ramps up digital transformation, using AR and MR technology to enable cross-fab remote collaboration and strengthen inter-fab technology transfer capacity.
- Initiated digitized fabs to transform the manufacturing process, effectively increasing process efficiency by 40%
TSMC's Open Innovation Platform® 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. Throughout the collaboration with OIP partners, spanning among five alliances of Electronic Design Automation (EDA), Intellectual Property (IP), Cloud, Design Center Alliance (DCA) and Value Chain Aggregator (VCA), TSMC actively synerizes and realizes innovative thinking, under the common goal of shortening design cycle time, time-to-volume, time-to-market, and ultimately time-to-revenue.

As OIP moves into its 13th anniversary, TSMC has been facilitating the collaboration & communication annually with OIP alliance partners on the latest process requirements, to infuse the most advanced semiconductor technology know-hows into their EDA, IP, Cloud products, and design services. Thus, TSMC continues to expand its ecosystem solutions to be timely available to customers so they can enhance Power, Performance and Area (PPA) in their products. This helps achieve co-optimization among TSMC process technologies, OIP enablement solutions, and customer product designs. By 2020, TSMC had provided customers with more than 12,000 different technology files and 450 Process Design Kits (PDKs) via TSMC-Online™ from 0.5um to 3nm, as well as a portfolio of more than 35,000 IP titles from 0.35um to 3nm. Those deliverables support customers for quick & reliable design and delivery of innovative products to fuel the incessant growth of global technology development.

In August 2020, TSMC held its online Technology Symposium and OIP Ecosystem Forum for the first time to maintain an important and close connection with worldwide customers and ecosystem partners during the COVID-19 pandemic.

### TSMC's Five OIP Alliances

#### EDA Alliance
The foundry segment’s earliest certification program, covering Electronic Design Automation (EDA) tools that are required for all IC design stages, timely delivering design tool enhancements required by new process technologies.

#### IP Alliance
The silicon-proven Intellectual Property (IP) portfolios are available to meet foundry segment’s design application needs.

#### Value Chain Aggregator Alliance
Integrate design enablement building blocks and provide specific services at each link in the IC value chain, such as IP development, front-end & back-end designs, wafer manufacturing, assembly, and testing.

#### Cloud Alliance
The industry’s first in offering OIP Virtual Design Environment (OIP VDE), lowering entry barriers for customer’s adoption of Cloud solutions, to speed up product design by fully utilizing the high-performance compute available in the Cloud.

#### Design Center Alliance
Offering services ranging from system-level front-end design to back-end physical/test implementation.
During the annual events, a complete set of design solutions were unveiled jointly with OIP alliance partners, as a result of tight partnership, to address the market demands for application-specific platforms of Mobile, High Performance Computing (HPC), Automotive, and IoT in the aspects as shown in the graph on the right.

TSMC was recognized by IEEE, the world’s largest professional association dedicated to advancing technology, with the 2021 Corporate Innovation Award in December 2020 to highlight its leadership in foundry technologies along with its Open Innovation Platform®, which have enabled many revolutionary products in 5G mobile and energy-efficient, high-performance computing that have brought fundamental changes to the way we live and work.

“The IEEE extends its congratulations to TSMC for receiving the 2021 Corporate Innovation Award. TSMC’s achievements in both developing 7nm technology, and enabling the innovations of IC designers everywhere, have placed it among a select group of organizations that have made lasting contributions to the field of engineering, and to the world.”

— Dr. Toshio Fukuda, IEEE President and CEO

For the recognition of the contributions & outcomes that were delivered by OIP alliance partners from the collaborative activities, TSMC announced the 2020 OIP Partner of the Year Awards for Excellence in Accelerating Silicon Innovation.
### University Programs

Talent cultivation is among the five primary sustainable development goals of TSMC. Through collaboration with universities, TSMC is dedicated to enhancing domestic talent quality and industry competitiveness through STEM education. In addition to offering consistent resources, TSMC initiates university programs under three main themes: research collaboration, talent cultivation, and career exploration for students. In 2020, TSMC founded the TSMC Scholarship for Ph.D. Students and expanded the scope of semiconductor and IC layout design courses in the curriculum. The Company also hosted events like the TSMC X Microsoft Careerhack to continuously invigorate the innovative momentum in the industry.

#### University Research Center

TSMC has established research centers in collaboration with top-ranked universities in Taiwan and dedicated research funds to encourage university professors to conduct groundbreaking semiconductor research projects. As the research centers strive to develop leading-edge technologies in semiconductor devices, material science, manufacturing processes, and IC design, they are also training talents in semiconductor research. In 2020, more than 215 professors and 2,800 outstanding students in electronic engineering, physics, material science, chemistry, chemical engineering, and mechanical engineering joined TSMC’s university research centers.

#### Industry-Academia Joint Development Project

TSMC works with universities in Taiwan and overseas to promote joint development projects. A variety of innovative research topics cover technologies in transistors, conductors, materials, simulation, and design technology. In 2020, TSMC collaborated with 89 professors in 25 universities on 86 industry-academia joint development projects. The annual research funds exceed NT$338 million, and over 157 U.S. patent applications were filed.

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

<table>
<thead>
<tr>
<th>Collaboration Project</th>
<th>University</th>
<th>Beneficiary/Collaboration Details</th>
<th>Dedicated Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>National Yang Ming Chiao Tung University</td>
<td>NT$17.88 million</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Taiwan University</td>
<td>Nearly NT$17.88 million awarded in 2020 to 186 students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Cheng Kung University</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Tsing Hua University</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 universities in Taiwan, and 15 universities overseas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beneficiary/Students and professors</td>
<td>Offer research assistantship to encourage outstanding students to focus on the study of semiconductor devices, materials, manufacturing processes, and IC design without financial burdens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beneficiary/Professors</td>
<td>Offer research funds to encourage university professors to propose new semiconductor research programs and cultivate semiconductor talents</td>
</tr>
</tbody>
</table>

---

**Note:** The maximum grant amount given to an undergraduate department is 100 thousand, 120 thousand to a graduate program, and 360 thousand to a Ph.D. program. Grants were given to 86 undergraduate students, 55 graduate students, and 46 Ph.D. students in 2020.
TSMC Ph.D. Scholarship

To facilitate the quality and R&D capabilities of key talents in Taiwan’s semiconductor industry, TSMC launched a new Ph.D. scholarship in 2020, offering Ph.D. students NT$500,000 in grants per year to a maximum of five years, NT$2.5 million in total. The scholarship program also invites senior TSMC managers to be mentors in collaboration with university professors. By offering industry-academia research resources, outstanding students are encouraged to pursue Ph.D. degrees in studies pertinent to the semiconductor industry. A total of 22 students received the scholarship in 2020.

Advanced IC Design Program

The complexity of IC design rises with the rapid advancement of design applications in 5G, AI, and high-performance computing. In keeping up with Moore’s Law that drives the development of 5nm and more advanced technologies, it is becoming increasingly challenging for wafer manufacturing technologies to seamlessly cater to customer’s IC designs. To ensure the competitiveness in power, performance, and area (PPA) of end products, TSMC is leading the industry in the cultivation of top IC design and layout talents well-versed in design & technology co-optimization (DTCO).

“TSMC’s Advanced IC Design Program is very helpful in eliminating the industry-academia gap. Especially with TSMC instructors offering first-hand industrial knowledge, students get a more concrete sense of the industry’s demand and the most up-to-date advanced process technologies. The program also helps students better identify their future goals and career plans.”

—David Hung-I Su, Adjunct Professor at the Department of Engineering and System Science, National Tsing Hua University

Before the course, 58% of the students did not know that TSMC offers jobs in IC design

After the course, 87% of the students understand the key role TSMC plays in the IC design industry and look forward to joining TSMC in IC design jobs

<table>
<thead>
<tr>
<th>TSMC’s Involvement</th>
<th>Course Detail</th>
<th>Frequency/Beneficiaries</th>
<th>Partnering University</th>
</tr>
</thead>
<tbody>
<tr>
<td>University instructors</td>
<td>Introduction to IC design and 3D IC in advanced technologies</td>
<td>6 hours</td>
<td>National Tsing Hua University</td>
</tr>
<tr>
<td>TSMC instructors</td>
<td>Standard cell design in advanced technologies</td>
<td>Six hours per school</td>
<td>National Yang Ming Chiao Tung University</td>
</tr>
<tr>
<td>Conduct circuit design case studies</td>
<td>Introduce key IC manufacturing process, layout techniques and IP resources</td>
<td>800 students</td>
<td>National Taiwan University of Science and Technology</td>
</tr>
<tr>
<td>Demonstrate IC design flow in advanced technologies</td>
<td>Offer onsite tutorials and Q&amp;A</td>
<td>A total of 150 students will join the program.</td>
<td>National Taipei University of Technology</td>
</tr>
<tr>
<td>Introduce key IC manufacturing process, layout techniques and IP resources</td>
<td>Offer summer internship opportunities</td>
<td>A total of 150 students in 2020</td>
<td>NEW</td>
</tr>
<tr>
<td>TSMC-NTUT IC Layout and Design Courses</td>
<td>IC layout</td>
<td>18 lessons</td>
<td>NEW</td>
</tr>
<tr>
<td></td>
<td>IC layout in advanced nodes and apply AI in assisting IC layout</td>
<td>18 lessons/semester</td>
<td>NEW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 students</td>
<td>NEW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A total of 150 students since 2016</td>
<td>NEW</td>
</tr>
</tbody>
</table>

"I am honored to have received the recognition of TSMC’s Ph.D. Scholarship and benefited from meeting the experienced mentors. Every lesson learned from the mentor gives me an in-depth understanding of the industry. I really appreciate TSMC for the resources and opportunity."

—Sheng-Tsung Lai, Ph.D. Student, Department of Electrical Engineering, Yuan Ze University

"Receiving TSMC’s Ph.D. Scholarship is a huge encouragement for me. It’s more than just a financial relief to me. The mentoring program enables me to more vividly envision my future research direction and life goals."

—Han-Fang Hsueh, Ph.D. Student, Division of Electronic Materials, Department of Materials Science and Engineering, National Taiwan University
In 2020, the pre-courses of TSMC Advanced IC Design Program was first launched in National Tsing Hua University as an extended program based on the TSMC-NTUT IC Layout and Design Course that has been running for six years. A team of TSMC professionals carefully design course materials with a goal to expand the original IC layout courses into a comprehensive IC design program. In the courses, students learn about how TSMC maintains its technology leadership while shorting customers’ time-to-market with DTCO design solutions, including electronic design automation (EDA) tool certification and design flow enablement for each new process technology. In December 2020, the pre-courses was launched at National Tsing Hua University, National Yang Ming Chiao Tung University, and National Taiwan University of Science of Technology. The official launch of the TSMC Advanced IC Design Program will take place in the first semester of 2021. TSMC has also planned differentiated compensation for students who finish the program to join the industry upon graduation. TSMC endeavors to continuously incubate semiconductor talents on campus and contribute to the growth of a domestic talent pool for semiconductor and IC design.

**University Shuttle Program**

Committed to the cultivation of semiconductor talents, TSMC helped professors and students of 16 universities around the world in turning IC design into actual chips and verifying their designs in application through the TSMC University Shuttle Program in 2020. The free-of-charge support also gives students a chance to access TSMC’s industry-leading manufacturing process.

While over 70% of the schools involved in TSMC University Shuttle Program switched to teaching remotely in the wake of the COVID-19 pandemic in 2020, the program has not been jeopardized by the pandemic and distance. The number of publications made through the TSMC Shuttle Program of the year reached 93 in the year. In addition, the program has proven that student research is more than just innovative ideas but highly feasible designs that can become high-yield chips with the help of TSMC. Moreover, ten papers of the total publications were elected into the International Solid-State Circuits Conference (ISSCC), a prestigious conference known as the “Olympics of IC design.”

**"We have been working with the TSMC University Shuttle Program for the past years in the rapidly changing, wide range of memory applications. In addition to having cultivated numerous students of excellence dedicated to memory research, we regularly share our research findings at globally renowned conferences and journals which are met with acclaim across the industry, academia, and research institutions."**

— Dr. Marvin M.F. Chang, Distinguished Professor at the Department of Electrical Engineering, National Tsing Hua University

In addition to 5G, wireless communications, memory application, Artificial Intelligence, wearable devices, security applications, and biotechnology, the research fields for the program in 2020 also covered global sustainability trends like low-energy-consumption technologies. Researches on energy efficiency, including UCLA’s radio frequency research, Stanford University’s biomedical research, UC Berkeley’s wireless communications research, University of Michigan’s pulse-injection crystal oscillator design, National Tsing Hua University’s research on memory, and many applied research of National University of Singapore, are a strong indication that contemporary research is no longer focused on technological feasibility only. Power-saving features and durability which are the key factors in sustainable commercialization were also covered by the research.

**"Thanks to the TSMC University Shuttle Program, the innovations we’ve worked tirelessly on were finally realized. Also, the early exposure to TSMC’s industry-leading technologies gave me a competitive edge over my peers during job hunting."**

— Dr. Win-San Khwa, Department of Electrical Engineering, National Tsing Hua University

**Manufacturing Technologies Provided to Students**

- Non-volatile memory (NVM)
- Mixed signal circuits
- Analog signal circuits
- Digital signal circuits
- Ultra-low power (ULP)
- 5G and wireless communications
- Memory applications
- Artificial Intelligence
- Wearable devices
- Security applications
- Biotechnology
- Automotive and drone related radar applications
- Data center internet backbone

"The six-hour pre-course of TSMC’s Advanced IC Design Program is invigorating. It not only deepens my understanding of TSMC but also gives me a clear view of practical IC design flow in advanced technologies. It has intrigued me to further join the semiconductor industry and thrive."

— Hung-Teng Wu, participant of the pre-course of TSMC Advanced IC Design Program and student of the Department of Power Mechanical Engineering, National Tsing Hua University
## Key Academic Collaborators and Research Direction in 2020

<table>
<thead>
<tr>
<th>University</th>
<th>Professor</th>
<th>Research Project Title</th>
<th>Innovative Results</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Taiwan University</td>
<td>Chen-Iuan Liu</td>
<td>Phase-locked Loop Based on Oscillator and Filter Integration</td>
<td>Improve the sensitivity of voltage and temperature; fast phase lock with different input signal</td>
<td></td>
</tr>
<tr>
<td>National Taiwan University</td>
<td>Tai-Cheng Lee</td>
<td>Phase-locked Loop Based on Voltage Controlled Oscillator Using Sub-sampling Technique</td>
<td>Sub-sampling techniques applied to a voltage-controlled oscillator to effectively reduce noise under 5G high-frequency environment</td>
<td></td>
</tr>
<tr>
<td>National Tsing Hua University</td>
<td>Chrong-Jung Lin</td>
<td>Stackable 3D Resistive Random Access Memory (RRAM)</td>
<td>Identical chip size to allow for more usable memories under three-dimensional structures</td>
<td></td>
</tr>
<tr>
<td>National Tsing Hua University</td>
<td>Ya-Chin King</td>
<td>Color image recognition and high energy-efficient computation using Resistive Random-Access Memory (RRAM) and Static Random Access Memory (SRAM)</td>
<td>High-speed parallel computational memory featuring both storage and computation functionalities to drastically reduce the latency and space overheads of data movement in traditional edge processors, thereby speed up computation and reduce energy consumption</td>
<td></td>
</tr>
<tr>
<td>National University of Singapore</td>
<td>Massimo Alioto</td>
<td>Error-correcting and Physically Unclonable Function (PUF) Based Key Generation Architecture</td>
<td>Equipped with error correcting function integrated with machine learning to significantly reduce voltage and temperature sweeps compared with traditional unclonable key generation structure</td>
<td></td>
</tr>
<tr>
<td>National Yang Ming Chiao Tung University</td>
<td>Shyh-Jye Jou</td>
<td>A Communication Millimeter-wave Baseband System with Self-healing and Testing functions</td>
<td>Using Smart Sensing Technique and calibration method to reduce the complexity of analog circuit design and increase communication throughput</td>
<td></td>
</tr>
<tr>
<td>National Yang Ming Chiao Tung University</td>
<td>Wei-Zen Chen</td>
<td>112-Gb/s PAM4 Cable Transmitter and Receiver</td>
<td>A novel optimized algorithm for data/clock recovery on circuit, integrated with ultra-low-noise frequency synthesis technique to enhance modulation capacity</td>
<td></td>
</tr>
<tr>
<td>National Yang Ming Chiao Tung University</td>
<td>Yen-Cheng Kuan</td>
<td>W-band Multi-user Interference-tolerant Radar System</td>
<td>High-precision frequency hopping radar system supporting simultaneous operations of multiple users without interfering with one another</td>
<td></td>
</tr>
<tr>
<td>University College Dublin</td>
<td>Robert Bogdan</td>
<td>Low-power Phase-locked loop Based on Charge-Sharing Locking Quadrature</td>
<td>Suppress oscillator phase noise and achieve ultra-low jitter through enhancing phase noise endurance and injecting energy into oscillator</td>
<td></td>
</tr>
<tr>
<td>University of Michigan</td>
<td>David Blaauw, Dennis Sylvester</td>
<td>Ultra-low-power Crystal Oscillator with High-energy Pulse Injection</td>
<td>Injected with frequency-divided, high-energy, low-frequency pulse to significantly reduce power consumption and disturbing of the crystal oscillator</td>
<td></td>
</tr>
</tbody>
</table>

### Note: Cooperative partners are sequenced in alphabetical order.
Virtual Design Environment (VDE) in the Cloud Created a New Model for Industry-academia Collaboration, Contributing to the Tape-out Success of TSMC’s First Academia-Developed 16nm FinFET Chip through University Shuttle Program

TSMC continues to expand R&D activities to secure its leadership in semiconductor technologies. As the development of TSMC’s advanced manufacturing technology is moving forward at full speed while also maintaining the protection of TSMC proprietary information, TSMC launches the University Shuttle Program to share its process technologies with university professors and students for research. The program actively bridges the gap between academia and the industry.

In 2020, TSMC expanded the architecture of Virtual Design Environment (VDE) in the cloud that was originally intended only for customers. After eliminating the concerns in information security, universities now can access TSMC advanced technology process database via VDE remotely to support research and teaching on IC design. This innovative cloud-based solution has greatly helped universities to take a stride directly into N16 FinFET technology for the first time, by two to three generations ahead of previously applicable process technologies in 40nm and 28nm.

To amplify the impact of TSMC’s University Shuttle Program, TSMC offered N16 FinFET technology to universities in 2020, starting from the long-term industry-academia collaboration with Stanford University in the United States. A research team led by Dr. Mark Horowitz of Stanford’s Electrical Engineering Department was the first to adopt the Virtual Design Environment (VDE) for the research on AI accelerator chips for deep neural network (DNN) in N16 FinFET technology. In December of the same year, the research team transmitted the IC layout design through VDE to TSMC and completed tapeout. Through TSMC’s University Shuttle Program, the IC design was realized in actual silicon. This is the first N16 FinFET chip created by academia through TSMC University Shuttle Program and it advanced AI research in a big way.

Meanwhile, another long-time partner, the UCLA research team has also started research on RF circuits based on N16 FinFET process technology via TSMC VDE that will be under the guidance of distinguished professor Dr. Mau-Chung Frank Chang.

"Through VDE, the first N16 FinFET University Shuttle Program chip tapeout was achieved. Stanford University and TSMC have created an innovative model for industry-academia collaboration that amplifies top research results by integrating advanced industrial process technology. It inspires more innovation to become a reality in the semiconductor industry."
—Dr. Philip Wong, Chief Scientist at TSMC

"TSMC University Shuttle Program in conjunction with the Virtual Design Environment in the cloud is simply an unprecedented combination. Students get to realize their innovative ideas using industry-leading advanced process technology. It is an incentive to attract more talents to join the semiconductor industry."
—Dr. Mau-Chung Frank Chang, Distinguished Professor at UCLA

TSMC University Shuttle Program Facilitates Foresight IC Design

- Provides students to access leading node technology for the first time through VDE for researches
- Allows students to access leading node technology for the first time through VDE for researches
- Plan to extend collaboration with National Yang Ming Chiao Tung University and National Taiwan University
### Product Quality

#### Strategies

**Enhance Quality Culture**
- Promote continuous improvement programs to enhance the internal quality culture.
- Encourage local suppliers to participate in the Taiwan Continuous Improvement Award to strengthen a culture of quality and competitiveness within TSMC’s local supply chain.

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

### 2030 Goals

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Generate up to NTS 20 billion in value from improvement projects and involve outstanding projects in the Taiwan Continuous Improvement Award</td>
<td>▪ Generate NTS 12 billion in value from improvement projects and involve at least five outstanding projects in the Taiwan Continuous Improvement Award</td>
<td>▪ Generated more than NTS 15 billion in value from improvement projects and involve 6 outstanding projects in the Taiwan Continuous Improvement Award</td>
</tr>
<tr>
<td>▪ Encourage 100% of major local raw materials suppliers and 75% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award to advance to the finals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ 100% of major local raw materials suppliers and 50% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award to advance to the finals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ 79% of major local raw materials suppliers to participate in the Taiwan Continuous Improvement Award to advance to the finals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ 46% of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award to advance to the finals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2021 Targets

| ▪ Increase the productivity of each visual inspection worker that is responsible for outgoing 12-inch wafers to 7,000 pieces | ▪ Increase the productivity of each 12-inch wafer outgoing visual inspector to 5,570 pieces per month | ▪ Increased the productivity of each 12-inch wafer outgoing visual inspector to 5,423 pieces per month |
| ▪ Increase the productivity of each visual inspection worker that is responsible for outgoing packages by 5% per month and 50% accumulatively (Base year: 2019) | ▪ Increase the productivity of each visual inspection worker that is responsible for back-end packages by 10% | ▪ Increased the productivity of each visual inspection worker that is responsible for back-end packages by 5.5% |

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

**New**: Due to the COVID-19 pandemic, fewer suppliers were involved with the award. The suppliers not engaged with the award shared experiences remotely.

### 2020 Achievements

**Achieved**

**Exceeded**

**Missed Target**
Note 3: Reduction of NMP usage is limited to sites in Taiwan. Since the substitute chemicals affect the product yield in several sites, formula testing and adjustments were necessary. TSMC subsidiaries will proceed with chemical substitution in 2021.

### Strategies

#### Improve Quality Capability
- Develop hazardous substance analysis capabilities in chemical laboratories to ensure occupational safety and health (OHS)
- Strengthen management for hazardous substances to improve green manufacturing

#### Realize Quality Application
- Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company’s technology roadmap

### 2030 Goals

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve Quality Capability</td>
<td>Develop the ability to analyze 100% of CMR (Carcinogenic, Mutagenic, and Reprotoxic) substances and help major suppliers develop the same capabilities</td>
<td>Develop the ability to analyze 100% of CMR substances and help 20% of the major suppliers to develop the same capabilities</td>
<td>Developed the ability to analyze 100% of CMR substances Target: 100%</td>
</tr>
<tr>
<td></td>
<td>N-methylpyrrolidone (NMP) 100% replacement (Base year: 2016)</td>
<td>Reduce the use of NMP by 95%</td>
<td>Reduced the use of NMP by 95% Target: 95%</td>
</tr>
<tr>
<td></td>
<td>No process involves Perfluoroalkyl Substances (PFASs) that have more than four carbons</td>
<td>VisEra requires photoresist suppliers to complete the assessment and selection of substitutes for Perfluorohexanoic acid (PFHxA) related substances and launch production line testing</td>
<td>Did not use PFASs with more than four carbons for the development of advanced processes of 3nm and below Target: 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Realize Quality Application</td>
<td>Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company’s technology roadmap</td>
<td>Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process per the R&amp;D targets</td>
<td>Completed reliability qualification for 5nm process technology volume production, 22nm Ultra-Low Leakage embedded MRAM IP, and the fifth-generation integrated Fan-Out packaging (InFO)</td>
</tr>
<tr>
<td></td>
<td>Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company’s technology roadmap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Strategies

- Develop hazardous substance analysis capabilities in chemical laboratories to ensure occupational safety and health (OHS)
- Strengthen management for hazardous substances to improve green manufacturing

### 2030 Goals

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve Quality Capability</td>
<td>Develop the ability to analyze 100% of CMR (Carcinogenic, Mutagenic, and Reprotoxic) substances and help major suppliers develop the same capabilities</td>
<td>Develop the ability to analyze 100% of CMR substances and help 20% of the major suppliers to develop the same capabilities</td>
<td>Developed the ability to analyze 100% of CMR substances Target: 100%</td>
</tr>
<tr>
<td></td>
<td>N-methylpyrrolidone (NMP) 100% replacement (Base year: 2016)</td>
<td>Reduce the use of NMP by 95%</td>
<td>Reduced the use of NMP by 95% Target: 95%</td>
</tr>
<tr>
<td></td>
<td>No process involves Perfluoroalkyl Substances (PFASs) that have more than four carbons</td>
<td>VisEra requires photoresist suppliers to complete the assessment and selection of substitutes for Perfluorohexanoic acid (PFHxA) related substances and launch production line testing</td>
<td>Did not use PFASs with more than four carbons for the development of advanced processes of 3nm and below Target: 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Realize Quality Application</td>
<td>Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company’s technology roadmap</td>
<td>Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process per the R&amp;D targets</td>
<td>Completed reliability qualification for 5nm process technology volume production, 22nm Ultra-Low Leakage embedded MRAM IP, and the fifth-generation integrated Fan-Out packaging (InFO)</td>
</tr>
</tbody>
</table>
TSMC strives to provide global customers with outstanding semiconductor foundry services. To continuously reduce product defect, while improving process control and the timely detection of abnormalities to avoid quality incidents that may affect our clients, the Quality and Reliability Organization works alongside other divisions to refine the quality management system. In 2020, TSMC precisely defined each process’s identification for various packaging technologies to ensure quality control is implemented correctly at each stage. TSMC also synchronized the technology identification system with the customer-facing business units to enhance the coherence and accuracy of the flow from ordering to the production lines. In terms of system management, TSMC set up quality control procedures with clients (system providers) to ensure product quality.

Besides expanding its quality improvement efforts to VisEra, TSMC established Quality and Reliability laboratories across the globe to cultivate more advanced, efficient quality analysis capabilities, which are the basis for continuously optimizing processes. Quality is the sound support for TSMC’s technological advancement. In 2020, TSMC set up the highly automated Advanced Materials Analytic Center (AMAC), which adopts machine learning in analyzing the relevance between raw materials and process parameters to strengthen quality control of incoming materials.

Devoted to cultivating the next generation of quality management talents, TSMC continues to invest in the Industry-Academia Joint Development Project. As of 2020, the Quality and Reliability Organization has completed 16 research projects with five universities, covering subjects of materials, process, and chip designs. A portion of the research results has been introduced to the development of TSMC advanced processes. Meanwhile, TSMC has also donated premium analytics and measurement equipment to universities to elevate the quality analysis capabilities of academic institutions and strengthen the synergy of industry-academia collaborations.

Besides expanding its quality improvement efforts to VisEra, TSMC established Quality and Reliability laboratories across the globe to cultivate more advanced, efficient quality analysis capabilities, which are the basis for continuously optimizing processes. Quality is the sound support for TSMC’s technological advancement. In 2020, TSMC set up the highly automated Advanced Materials Analytic Center (AMAC), which adopts machine learning in analyzing the relevance between raw materials and process parameters to strengthen quality control of incoming materials.

Devoted to cultivating the next generation of quality management talents, TSMC continues to invest in the Industry-Academia Joint Development Project. As of 2020, the Quality and Reliability Organization has completed 16 research projects with five universities, covering subjects of materials, process, and chip designs. A portion of the research results has been introduced to the development of TSMC advanced processes. Meanwhile, TSMC has also donated premium analytics and measurement equipment to universities to elevate the quality analysis capabilities of academic institutions and strengthen the synergy of industry-academia collaborations.

**Note 1:** Leverage machine learning to analyze the correlation between raw materials and TSMC process control parameters; build the highly automated Advanced Materials Analytic Center (AMAC) to enhance the raw material detectability.

**Note 2:** Optimize the naming rules for different packaging technologies to enhance the raw material detectability.

**Note 3:** Build related quality control procedures to have better cooperation with the system-level customers to ensure product quality.
Enhance Quality Culture

Quality is the cornerstone of sustainable development for TSMC. To ensure product quality and customer satisfaction, TSMC strives to improve the quality system and methodology. In 2020, the Quality and Reliability Organization held company-wide conferences such as the Total Quality Excellence and Innovation Conference (TQE), training programs, and quality improvement projects on experiment design, statistical process control, measurement technologies, machine learning, and quality auditing. These programs aim to deepen TSMC employees’ problem-solving capabilities.

TSMC has held TQE for 28 years, which is a rewarding mechanism of public recognition. In 2020, a knowledge sharing platform for outstanding projects had been created as a new approach of TQE. Organizations and divisions were encouraged to learn from one another, sparking innovation in quality improvement. In 2020, TSMC employees submitted more than 10,000 improvement projects, generating more than NT$15 billion in value. Notably, more than 240 projects recognized by the TQE are now published on the platform. As of December 2020, the posts have earned more than 300,000 clicks.

Moreover, TSMC puts up posters to promote quality in all sites, strengthening the commitment to quality among TSMC employees. In 2020, more than 99% of our employees stated that the posters and sharing of the outstanding projects are beneficial to raising awareness towards quality.

TSMC established a new theme - STOP & FIX - in 2019 to encourage our employees to take the initiative to prevent potential quality abnormality or outdated operation standards. In 2019, the category received 5,500 cases. By 2020, a total of over 6,500 cases were submitted, generating more than NT$4.4 billion in value due to the improvement projects.
Timeline of Total Quality Excellence and Innovation Conference (TQE)

**Group** | **Improvement Strategy** | **Improvement Benefit**
--- | --- | ---
Production Capacity Improvement | Established the three major automated systems  • Optimized scheduler system for photomask robotic arms  • Inspection system for photomask control wafers  • Integrated platform for photomask pattern inspection | 5% Daily output increased  30% Operation time reduced  140 million per year (NT$)
Quality Improvement | Increased the concentration of ion implantation to increase color saturation  • Introduced 3D gates to reduce the after-image effect | >50% Yield increased  20% Increased rate of color saturation
Cost and Production Support | A first-ever automated monitoring processing structure that calculates the optimized process and automatically selects programs and tools  • Increased monitoring flexibility, reduce the preparation time for monitoring and reduce the waste of production capacity | >20% Increased rate of productivity of the monitoring staff  >25% Reduced rate of monitoring loss  120 million per year (NT$)
ESH and Green Corporation | Vent renovation for tools that produce high concentrations of ammonia  • Increased the efficiency of ammonia removal by washing towers | 28 tons Ammonia emission reduced by 28 tons/year, at a reduction rate of > 60%  >70% Reduced rate of Ammonia emission per product unit  45 million per year (NT$)
STOP & FIX | Designed innovative AI models that allow the computer to generate standardized photomask images | >50% Intercepted photomasks that have quality concerns  >50% Reduced inspection time for photomask tools  38.4 million per year (NT$)
Assistant Engineers | Optimized equipment maintenance  • Modularized jigs to reduce the hours required for tool maintenance | 74% Reduced alarm frequency  30 million per year (NT$)
Outstanding Proposals from Direct Labor | Developed recycling and reuse technologies for the motors  • Established a standardized calibration procedure for humidity sensor drift | Reduced motor scraps and calibration of humidity sensors, and reduced maintenance costs
Process and Efficiency Improvement | Introduced IT vulnerability scanning tools  • Established a review mechanism for new systems; all new systems must pass the IT security review before going online  • Replaced 100% of software with no security updates | Reduced information security vulnerabilities significantly  99 points scored for Corporate IT security, higher than the average score for semiconductor companies (90 points)

**2020 TQE-Winning Cases**

<table>
<thead>
<tr>
<th>Year</th>
<th>Progress</th>
<th>Key Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 - 2008</td>
<td>Preparation stage</td>
<td>• Digitize the project submission system (including project registration, review, and calculation of benefit value)</td>
</tr>
<tr>
<td>2009 - 2014</td>
<td>Expand the recognition of outstanding projects</td>
<td>• Set outstanding project standard</td>
</tr>
<tr>
<td>2015 - 2019</td>
<td>Optimize application process and recognition themes</td>
<td>• Optimize the inquiry function of the submission system  • Add report analytics to the submission system</td>
</tr>
<tr>
<td>2020 and beyond</td>
<td>Strengthen organizational learning</td>
<td>• Build the knowledge-sharing platform for outstanding projects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Accumulated Proposals (Unit: 10,000)</th>
<th>Accumulated Effectiveness (Unit: NT$ 100 million)</th>
<th>Accumulated Bonus (Unit: NT$ 10 thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 - 2008</td>
<td>300</td>
<td>880</td>
<td>62</td>
</tr>
<tr>
<td>2009 - 2014</td>
<td>500</td>
<td>1,480</td>
<td>98</td>
</tr>
<tr>
<td>2015 - 2019</td>
<td>900</td>
<td>1,430</td>
<td>99</td>
</tr>
<tr>
<td>2020 and beyond</td>
<td>1,090</td>
<td>62</td>
<td>57</td>
</tr>
</tbody>
</table>
TSMC is entirely devoted to improving quality. By participating in the Taiwan Continuous Improvement Award Competition, TSMC exchanges practical knowledge on quality improvement with peers from other industries and facilitates the advancement of all local industries. TSMC also encourages employees to observe and learn from the experiences of other sectors, which sparks innovation and problem-solving among the employees. In 2020, TSMC received five Golden Awards, one Silver Award, and one Best Innovation Award in the Taiwan Continuous Improvement Award Competition.

To facilitate the supply chain’s sustainability, TSMC also encourages suppliers to participate in the Taiwan Continuous Improvement Award Competition. In 2019, 100% of the local major raw materials suppliers participated; in 2020, TSMC first expanded the scope to back-end packaging materials suppliers, 46% of whom participated. In 2021, TSMC will continue to improve participation and quality, aiming to achieve 50% of participation and 20% of advancement to the finals. In 2020, TSMC suppliers received four Golden Awards, five Silver Awards, and five Bronze Awards. To highlight such achievements in quality improvement, TSMC published the supplier award list on the official website.

In 2020, while complying with COVID-19 regulations, TSMC’s Quality and Reliability Organization promptly adjusted strategies and invited suppliers that did not participate in the competition to observe as a form of benchmark learning. TSMC’s quality experts also offered consultation remotely, helping the suppliers pinpoint where to improve and select appropriate improvement measures for their companies.
Improve Quality Capability

In order to improve quality and efficiency, TSMC started to utilize machine learning technology and method in 2014, and successfully applied advanced spectrum analysis to automated classification of wafer defects so that differences among processes and equipment were detected, immediately triggering improvements. TSMC established a defect inspection and classification system for 12-inch wafers to refine the consistency of outgoing inspection and strengthen TSMC’s overall competitive advantage. In 2020, the productivity of each 12-inch wafer outgoing visual inspector increased to 5,423 pieces per month. Furthermore, machine learning automation was expanded to back-end packaging visual inspectors, whose productivity was increased by 5.5%.

To fulfill the goals of raw materials and supplier management, the Quality and Reliability Organization first applied machine learning to the raw materials results of the Risk Management and Materials Management Organization, failures regarding hazardous substance management included insufficient labeling and categorized storage, insufficient personal protective gear, and failure to conduct regular product testing for hazardous substances. Relevant suppliers implemented corrective measures according to TSMC’s recommendations by December 2020. Meanwhile, in terms of recycling and reusing acidic solutions, the Quality and Reliability Organization offers a reliable quality verification and control method that aids the Operations Organization to keep reducing the percentage of impurities in acidic solutions. In 2021, TSMC plans to share the recycling and reuse technologies with the chemicals suppliers, expanding the effort to achieve its sustainable goals of balancing between product quality and environmental protection.

In 2020, TSMC once again worked with the SEMI to hold the second SEMICON in Taiwan to facilitate technological exchanges and deepen the local supply chain’s sustainability and competitiveness.

productivity of each 12-inch wafer outgoing visual inspector

<table>
<thead>
<tr>
<th>Year</th>
<th>Goal</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>5,258</td>
<td>5,441</td>
</tr>
<tr>
<td>2017</td>
<td>5,250</td>
<td>4,747</td>
</tr>
<tr>
<td>2018</td>
<td>4,928</td>
<td>4,900</td>
</tr>
<tr>
<td>2019</td>
<td>5,258</td>
<td>4,569</td>
</tr>
<tr>
<td>2020</td>
<td>5,423</td>
<td>5,259</td>
</tr>
</tbody>
</table>

In 2020, Chairperson of the TCIA Northern Taiwan Steering Committee and Vice President of TSMC, Dr. Jun He (Fourth from the right), served as the award presenter and encouraged the establishment of a responsible supply chain and inter-industry exchange.
TSMC Develops the High-Efficiency Hazardous Substance Testing Mechanism of 100% Detection

To fully track materials with potential risks, TSMC built the highly automated Advanced Materials Analytic Center (AMAC), creating an exclusive database for Carcinogenic, Mutagenic, and Reprotoxic (CMR) substances. Using three major spectrometry technologies - inductively coupled plasma optical emission spectrometry (ICP-MS), chromatography/time-of-flight/mass- TSMC scans for carcinogenic substances listed in Group 1 (carcinogenic to humans) by International Agency for Research on Cancer. In 2020, TSMC completed the assessment and selection of technologies and materials for 3nm process, conducted analysis on 100% of the materials with potential risks, and identified 178 CMR substances in the semiconductor materials. TSMC significantly streamlined the analytic process and reduced the time required from seven days to twelve hours, elevating testing efficiency by 93%.

TSMC adheres to its commitment to hazardous substance management. Following its chemicals management procedure, TSMC actively sets up a defense against CMR and hazardous substances. Regarding the materials already in use on site, TSMC requires suppliers to list CMR substances as mandatory items in the Certificate. TSMC would require the business units that use such materials to assess alternative chemicals, aiming to substitute the material completely. If 100% substitute is not immediately possible, TSMC will continue to invest in developing alternatives while providing adequate protective gear for employees on-site and conducts regular sampling tests on the operation environment complying with Regulations of Monitoring Labor Operational Environment to prevent risks of exposure for the workers. Regarding new materials, the control and monitoring are conducted through the TSMC Green Procurement Survey. TSMC requires that suppliers provide a certificate of analysis to prove that the materials comply with regulations to safeguard TSMC employees and the industry supply chain.

TSMC Develops the High-Efficiency Hazardous Substance Testing Mechanism

![Diagram of TSMC Hazardous Substance Testing Mechanism]

Case Study

TSMC CMR Testing Capabilities

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>15%</td>
<td>16%</td>
<td>16%</td>
<td>17%</td>
<td>100%</td>
</tr>
<tr>
<td>Goal</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>17%</td>
<td>100%</td>
</tr>
</tbody>
</table>

TSMC Hazardous Substance Testing Mechanism

- Three major testing equipment (ICP-MS/GCMS/LCMS)
- TSMC exclusive spectrum database for CMR substances
- Scanning for 178 CMR substances and guarantees 100% detection
- Increasing testing speed by 93% with high-efficiency technology

Comprehensive Control Measures

- Can be replaced
  - Business unit assessment on substitute chemicals
  - Require testing for hazardous substances while assessing new materials

- Cannot be replaced
  - Enhance protection with protective gear
  - Ensure regular sampling tests on the operation environment

Deliver materials with potential risks to third-party testing institutes for testing

Potentially Carcinogenic Matters

- Business units can replace CMR substances as hazardous substances
- Disclose hazardous substances on the Green Procurement Survey
- Continue to assess substitute chemicals for hazardous substances

Complex Origin Management

- Require suppliers to list CMR substances as mandatory items in the Certificate
- Require main raw materials suppliers to provide analysis certification
- Require testing for hazardous substances while assessing new materials

100% Testing Capabilities

93% Improved Testing Efficiency
Management of Hazardous Substances from Fabrication

TSMC’s hazardous substance management is based on the QC 080000D Hazardous Substance Management System Requirement, aiming to avoid entirely or minimize the use of hazardous substances that may affect human health or pollute the environment. TSMC is committed to fully comply with international standards and the customers’ requirements on hazardous substances for all customer products.

Hazardous Substance Management Throughout the Product Life Cycle

In 2020, TSMC continued substituting all PFOA-related (Perfluorooctanoic acid, PFOA) substances and succeeded after multiple improvements and tests. In recent years, the international community have noticed concerns for Perfluoralkyl substances, PFASs, including the 6-carbon Perfluorohexanoic acid, PFHxS. The European Union is planning to regulate the substance in the future. Within TSMC, only a part of the photoresists used by VisEra contains such substance. Anticipating the regulatory tightening worldwide, TSMC has taken the initiative to assess substitute chemicals with suppliers in 2020.

Furthermore, TSMC uses N-Methyl-2-Pyrrolidone (NMP) in several photoresist wet-stripping processes. To reduce risks of exposure and pollution, TSMC started the replacement project in 2016, avoiding using 100% of the NMP in 7nm and more advanced processes in introducing and designing stage of photoresist wet stripping process, and existing fabs continued to conduct replacement. Since replacement requires changing equipment hardware and process parameters, partial sites’ product yield was affected and had to undergo multiple formula adjustments and testings. In 2020, TSMC continued to work closely with several customers, assessing substitute materials for more than 50 processes. Although TSMC missed the target to replace 100% of NMP compared to the base year of 2016, the Company is still working towards goals of company-wide 95% reduction of NMP in 2021 and 100% NMP replacement and avoid using PFASs of more than four carbons in all processes by 2030.

Realize Quality Application

The Quality and Reliability Organization helps customers introduce product reliability needs to product design during the stage of technological development. In 2020, TSMC’s Quality and Reliability Organization collaborated with its R&D team to focus on the advanced logic manufacturing process, specialty process, advanced packing technologies development, and quality qualification to ensure that component features, product yield, and reliability meet the requirements.

For the advanced logic process, the Quality and Reliability Organization completed product quality and reliability qualifications of EUV lithography 5nm Fin Field Effect Transistor (FinFET), helping the world’s first 5nm product into mass production in 2020. For the specialty process, TSMC completed reliability qualification for 22nm Ultra-low Leakage (ULL) embedded MRAM IP. Furthermore, for high-performance mobile computing and high-performance ULL process platforms, TSMC successfully passed the consumer-grade qualification and automotive grade-1 qualification for 28nm Embedded Flash. For advanced packaging, TSMC integrated the front-end wafer process and back-end chip packaging to provide advanced packaging solutions. This is the system integration for wafer-grade processes. Also, TSMC completed qualifications for the fifth-generation integrated Fan-Out packaging (InFO), whose linewidth is more sophisticated, and heterogeneously integrated larger-size CoWoS® packaging technology and went into mass production to meet the demands for mobile devices and high-performance computing products.
## Customer Service

### Strategies

**Precise Response**

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

**Virtual Fab**

- Provide comprehensive information in a timely manner to ensure the success of customer’s products; strengthen processes and systems to protect customer product information to the highest standard.

### 2030 Goals

- Maintain customer satisfaction rating of over 90%
- Reduce cases of problematic engineering quality or poor reliability to 60% of the level in 2019 for every million 12-inch wafers shipped
- In line with TSMC’s technology roadmap, TSMC provides customers with over 1,200 types of available wafer manufacturing and process technology, and over 170 types of advanced packaging technology
- Pass customer product information audit with no major flaws

### 2021 Targets

- Maintain customer satisfaction rating of over 90%
- Reduce cases of problematic engineering quality or poor reliability to 70% of the level in 2019 for every million 12-inch wafers shipped
- In line with TSMC’s technology roadmap, TSMC provides customers with over 860 types of available wafer manufacturing and process technology, and over 85 types of advanced packaging technology
- Pass customer product information audit with no major flaws

### 2020 Achievements

- Customer satisfaction rating of 92.8%, seven consecutive years with > 90% satisfaction
  - Target: > 90%
- Reduce cases of problematic engineering quality or poor reliability to 70% of the level in 2019 for every million 12-inch wafers shipped
  - Target: 95% of the level in 2019
- In line with TSMC’s technology roadmap, TSMC provides customers with over 833 types of available wafer manufacturing and process technology, and over 77 types of advanced packaging technology
  - Target: 800 types of technology and 60 types of advanced packaging technology
- Pass customer product information audit with no major flaws
  - Target: No major flaws
Customer trust is TSMC’s core value. We believe that TSMC’s competitiveness hinges on how competitive our customers are and that our customers’ success is also our success. In order to provide customers with the highest level of service, TSMC has established a devoted customer service team, which is a dedicated coordination window to provide timely assistance and creates the best customer experience, from design support, mask making, and wafer manufacturing to backend services. TSMC also commits to protecting proprietary customer information to the highest standard to develop a long-term partnership and become a long-term and trusted partner that is critical to their success.

Precise Response

Customer feedback and opinions are important foundations for advancing customer relationships. TSMC learns about customer needs through irregular meetings, quarterly reviews, and annual satisfaction surveys. The channels are a way for customers to provide feedback on the performance of business behavior, relationship, technology, quality, yield, design support, manufacturing, customer service, and further expectations for the future. TSMC regularly reviews and analyzes customer feedback to propose optimal solutions. By having a comprehensive response process to customer needs, TSMC continues to advance customer relations. In 2020, under the COVID-19 pandemic, TSMC held a total of 1,205 online meetings with 163 customers, 115 quarterly reviews with 31 customers, and annual satisfaction surveys with nearly 200 customers. Responding to customer expectations for convenient access to technical files and higher response efficiency to business needs, TSMC established a smart technical file navigation system and further reviewed and simplified project review, quotation, and contract signing processes to increase response speed to customer’s business needs. The annual customer satisfaction rating in 2020 was 92.8%, maintaining high ratings of above 90% for seven consecutive years. Customers responded positively to the new, streamlined business process in the customer satisfaction survey. Satisfaction ratings from customer service items evaluated quarterly also reached over 80%. In response to a rapidly changing market, TSMC is working closely with customers to continuously satisfy their needs with advanced technology, manufacturing excellence, and high-quality services.
Virtual Fab

Real-time interaction and information exchange as well as comprehensive protection for proprietary customer information are critical for TSMC to build customer trust. For real-time interaction and information, customers have a 24/7 access to important information on design, engineering, and logistics through TSMC-Online™. It also allows customers to create customized reports according to their management requirements to increase wafer management efficiency.

For design integration, TSMC-Online™ offers customers with comprehensive, accurate, and up-to-date information during the design stage to help customers quickly complete their product design; for engineering integration, TSMC offers information on wafers, yields, electrical analysis, quality, and reliability to help customers improve product performance; and for logistics, TSMC proactively delivers related information from order placement to delivery to ensure that customers can have real-time access to necessary data.
knowledge of order status. To serve as a customer’s “virtual fab”, through TSMC-Online™, customers can manage comprehensive product manufacturing information on a real-time basis. TSMC offers transparent and comprehensive services for wafer fabrication to ensure that our customers achieve product success.

With the continuous increase in the types of advanced technologies, the design complexity is also constantly increasing. In 2020, TSMC collaborated with OIP alliance partners and cloud service providers to offer unlimited and comprehensive information security protection to customers. We also used cloud services to create a highly accessible design environment to help customers accelerate design to market and win business opportunities.

In 2020, in line with the technology roadmap, we provided customers with more than 830 types of wafer technologies and more than 70 types of advanced packaging technologies. For protecting proprietary customer information, TSMC commits to ensuring the interest of all customers and to designing protection mechanisms that can satisfy customer needs. To help customers accelerate product certification, TSMC obtained ISO 15408 IT security certification for Fab 12B, Fab 15B, and Fab 14A in 2020, achieving the highest security standard for product safety and proprietary customer information protection, and is now ready to receive and fulfill orders for high-security products.

Under the pandemic, customers are not able to take international business trips. As a result, TSMC is complying with security standards for proprietary information to build remote sharing platforms for different information security levels. TSMC has successfully completed 15 remote audits to support customer’s product launching on schedule and win customer trust.

TSMC strongly believes that continuous innovation, highest-quality products and services are the key factors to maintain customer satisfaction. As a trusted technology and capacity provider in the global logic IC industry, TSMC will continue to be service-oriented and bring maximum benefits to our customers so that we become a long-term important partner that customers can trust and rely on for success.

### Case Study

**Smart Technical File Navigation System**

With an increasing number of technology types, TSMC-Online™ offers more than 12,000 technical files as of 2020. In the existing complex binary indexed tree, customers often get lost or make mistakes along the pathway. As the technology grows more complex and file sizes increase, it takes a longer time to download documents.

In 2020, TSMC’s Customer Service Organization, Business Development Organization, and Corporate IT Organization worked together to revamp TSMC-Online™ data structure and launch a smart file navigation system to help customers access required technical files for new product designs faster. To ensure the system is robust at the time of launching, the Customer Service Organization and Business Development Organization have referred to user feedbacks and access how technical files are used and categorized from the customer’s perspective. We use a 2D matrix table to replace the existing binary indexed tree and strengthen filter and search functions. With support from the Corporate IT Organization, TSMC-Online™ is also open for cloud download services under the premise of information security.

With the new TSMC-Online™ data structure and smart file navigation system, customers will be shown a file map that helps them find any files easily; at the same time, cloud services will also significantly increase technical files download speed. The smart file navigation system is launched in stages beginning in March 2021. We predict that the system will effectively reduce the time that customers search for technical files by 70% and increase the download speed by three to ten times.

---

### Technology Types for Customers

<table>
<thead>
<tr>
<th>Years</th>
<th>Types of Wafer Manufacturing Technology</th>
<th>Types of Advanced Packaging Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>585</td>
<td>22</td>
</tr>
<tr>
<td>2017</td>
<td>693</td>
<td>31</td>
</tr>
<tr>
<td>2018</td>
<td>716</td>
<td>46</td>
</tr>
<tr>
<td>2019</td>
<td>765</td>
<td>60</td>
</tr>
<tr>
<td>2020</td>
<td>833</td>
<td>77</td>
</tr>
</tbody>
</table>

Note: 2020 index includes Taiwan Facilities and Subsidiaries.
TSMC Delivers Unrivalled Manufacturing Flexibility

> 12.4M 2020 total managed capacity reached over 12.4M 12-inch wafer equivalents
A Responsible Purchaser

As the world’s largest dedicated IC foundry, we have made it our mission to purchase responsibly. We have the power to make a difference and we are doing so by asking our suppliers to make advancements in the following aspects: technology, quality, delivery, environmental protection, human rights, safety, and health. Our goal is to build a green and sustainable semiconductor supply chain.

- All tier 1 suppliers have signed the TSMC Supplier Code of Conduct
- All minerals are conflict-free
- Cumulative energy conserved by suppliers through TSMC support
### Supplier Sustainability Management

#### Safeguard Labor Rights

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tier 1 suppliers’ completion rate for signing the TSMC Supplier Code of Conduct every three years:</strong> 100%</td>
<td>Tier 1 suppliers completed the Sustainability Management Self-Assessment Questionnaire at a completion rate of 100%</td>
<td>All Tier 1 suppliers signed the TSMC Supplier Code of Conduct for a completion rate of 100% Target: 100%</td>
</tr>
<tr>
<td><strong>Tier 1 suppliers’ completion rate of the Sustainability Management Self-Assessment Questionnaire:</strong> 100%</td>
<td></td>
<td>All Tier 1 suppliers completed the Sustainability Management Self-Assessment Questionnaire for a completion rate of 100% Target: 100%</td>
</tr>
<tr>
<td><strong>Critical suppliers’ completion rate for receiving third-party audits (by RBA-certified auditing institutions) every three years:</strong> 100%</td>
<td>Continue to require critical suppliers to receive third-party audits by RBA-certified auditing institutions. The target is for 60 critical suppliers to complete third-party audits</td>
<td>A total of 24 critical suppliers completed third-party supplier audits by RBA-certified institutions Target: 60 critical suppliers</td>
</tr>
<tr>
<td><strong>TSMC continues to monitor supplier employees working at TSMC factory sites</strong></td>
<td>TSMC continues to monitor supplier employees working at TSMC factory sites</td>
<td>Monthly alert automatically generated on the attendance of supplier employees working at TSMC factory sites</td>
</tr>
<tr>
<td><strong>Supplier due diligence on sourcing conflict-free minerals:</strong> 100% of the minerals used are sourced responsibly</td>
<td>Supplier due diligence on sourcing conflict-free minerals: 100% of minerals used are conflict free</td>
<td>100% sourcing conflict-free minerals Target: 100%</td>
</tr>
<tr>
<td><strong>TSMC audits a cumulative total over 30 suppliers (at least three suppliers per year) for due diligence on sourcing conflict-free minerals</strong></td>
<td>Complete audits on at least three suppliers for due diligence on sourcing conflict-free minerals</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Tier 1 suppliers: Suppliers trading directly with TSMC with more than three orders per year, with order amount exceeding NT$5 million. In 2020, 1,144 suppliers met the criteria. Since the suppliers signing every year were relatively consistent, the frequency was adjusted from every year to every three years.

**Note 2:** Critical suppliers: Suppliers accounting for the top 85% of purchasing expenses or of a single-source purchase, with indicators such as procurement amount, product supply criticality, and business relationship with TSMC.

**Note 3:** Due to the COVID-19 pandemic, TSMC lowered the target number of suppliers for on-site audits in 2020 to minimize contagion risk.
Manage Sustainability Risk

All suppliers are required to adhere to the TSMC Supplier Code of Conduct, taking actions to improve labor rights, safety and health, environmental protection, business ethics, and the efficiency of their management systems, and reduce disruption risk for business operations.

Optimize Local Procurement

To continuously increase local sourcing, TSMC actively provides consultation on improving core capabilities, and sets reduction targets for energy consumption, water consumption, waste, and carbon emissions to support the sustainable development of the local supply chain.

Strategies

2030 Goals

Strengthen Supply Chain Resilience

- Continue to diversify facilities and assess new suppliers; develop 145 multi-source supply solutions (Base year: 2018)\(^\text{Note 4}\)
- Develop 105 multi-source supply solutions for raw materials
- A cumulative total of 300 local raw materials suppliers participate in the observation of TSMC annual emergency response drill (Base year: 2016)

2020 Achievements

- Developed 70 multi-source supply solutions Target: 64
- 21 local raw materials suppliers participated in the observation of TSMC annual emergency response drill, with a cumulative total of 111 suppliers Target: 20 suppliers this year, 110 in total

Improve the Sustainability of the Supply Chain

- A cumulative total of 1,500 local suppliers participate in the Environment, Safety, and Health (ESH) training program (Base year: 2016)
- A cumulative total of 680 suppliers participated in the ESH training program
- Ten local raw materials suppliers receive consultation on process advancement and quality improvement, with a cumulative total of 55 suppliers
- Completion rate of Safety and Health consultation for critical high-risk suppliers: 100%\(^\text{Note 5}\)
- Critical high-risk suppliers complete Safety and Health consultation at a rate of 100%

2021 Targets

- Develop 145 multi-source supply solutions
- A cumulative total of 130 suppliers participate in the observation of TSMC annual emergency response drill
- Critical high-risk suppliers complete Safety and Health consultation at a rate of 100%

Target:

- Critical high-risk suppliers completed Safety and Health consultation at a rate of 100%

Note 4: TSMC raised the 2020 target from 125 to 145 as the multiple-source supply solution program achieved the 2030 Goal of 125 ahead of schedule.

Note 5: A total of 32 critical high-risk suppliers (formerly known as vendors with high-risk-operations) were audited in 2019, of which 3 suppliers with safety and health audit scores below 70 received consultation in 2020 and passed improvement requirements after evaluation.
Reduce Environmental Impact

Optimize Local Procurement
To continuously increase local sourcing, TSMC actively provides consultation on improving core capabilities, and sets reduction targets for energy consumption, water consumption, waste, and carbon emissions to support the sustainable development of the local supply chain.

2020 Goals
2021 Targets
2020 Achievements

Reduce Environmental Impact

- Increase Local Sourcing
  - 64% local sourcing for indirect raw materials
  - 60% local sourcing for spare parts
  - 35% local sourcing for backend equipment
- Provide consultation on power reduction for suppliers and reduce electricity consumption by a cumulative total of 1.5 billion kWh (Base year: 2018)
- Reduce waste production among major local suppliers by 35% (Base year: 2014)
- High electricity consumption suppliers receive ISO 14064-1 Greenhouse Gas Emission verification at a completion rate of 100%
- Provide consultation on water reduction for suppliers and reduce water consumption by a cumulative total of 38 million tons (Base year: 2020)

- 60% local sourcing for indirect raw materials
- 50% local sourcing for spare parts
- 36% local sourcing for backend equipment
- Reduce supplier electricity consumption by a cumulative total of 320 million kWh
- Reduce waste production among major local suppliers by 30.4%
- High energy consumption suppliers receive ISO 14064-1 Greenhouse Gas Emission verification at a completion rate of 50%
- Reduce supplier water consumption by a cumulative total of 4.5 million tons

- 60.5% local sourcing for indirect raw materials
- 50% local sourcing for spare parts
- Reduce supplier electricity consumption by a cumulative total of 210 million kWh
- Reduce waste production among major local suppliers reduced by 29.4%
- Waste production among major local suppliers reduced by 29.1%
- High energy consumption suppliers receive ISO 14064-1 Greenhouse Gas Emission verification at a completion rate of 100%
- Reduce supplier water consumption by a cumulative total of 4.5 million tons

Achieved  Exceeded  Missed Target

Note 6: Referring to TSMC’s main operation region of Taiwan.
Note 7: Definition for high electricity consumption suppliers: Energy consumption at a single site exceeding 5 million kWh per year.
Note 8: Referring to raw materials suppliers in the top 80% of local waste production. Calculation formula: A/(A+B)(%); A: waste reduced by the factory in the underlying month (tons); B: total waste produced by the factory in the underlying month (tons).
Note 9: For spare parts, the annual local sourcing target was missed because the proportion of advanced packaging increased and quality requirements have become stricter, and because TSMC had to increase inventory levels due to COVID-19.
Note 10: For backend equipment, since the proportion of advanced packaging has increased and both quality requirements and technical specifications have become stricter, TSMC has also increased the procurement volume of domestic and foreign suppliers, and the demand for foreign suppliers is still strong; requirements, therefore, TSMC removed the target beginning in 2021.
As a global semiconductor industry leader, TSMC aims to lead the improvement of the supply chain and is committed to an environmentally and socially responsible business model. TSMC focuses on two policies, Sustainability Risk Management and Local Procurement Optimization, as the core of our sustainable supply chain development, driving the supply chain towards a safe work environment, dignity of labor, ethical business conduct, and environmental protection.

In 2020, TSMC worked closely with supplier partners through four guiding principles: Code Compliance, Risk Assessment, Audit Participation, and Continuous Improvement. TSMC encourages supplier partners to continue improving, commit to essential values, and take the initiative to promote sustainable practices to their upstream suppliers.

### Implementing the Four Guiding Principles of Responsible Supply Chain Management

To foster growth for supplier partners worldwide, TSMC continues to expand the scope of our supply chain management. TSMC upgraded the supply chain business portal, Supply Online, to a global responsible supply chain management platform, Supply Online 360, which integrates supplier communication and increases information accuracy and immediacy. The platform went online on December 22, 2020. On the practical level, the platform is built upon the structure of the four guiding principles and based on the TSMC Supplier Code of Conduct. Through its new feature, the Sustainability Management Module, the Supply Online 360 platform enables digital follow-up for signature compliance with the Code of Conduct, completion of the Sustainability Management Self-Assessment Questionnaire, and progress in audit improvement. Using online data, these new features can improve the efficiency of efforts in the physical world. At the same time, TSMC established the TSMC Supplier Sustainability Academy and the Supply Chain Worker Grievance Channel on the Supply Online 360 platform, taking tangible actions to build a responsible supply chain and working closely with suppliers to ensure the sustainability of the semiconductor supply chain.

### Code Compliance

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

#### Management Measures

- Tier 1 suppliers are required to sign the Supplier Code of Conduct.
- Critical Suppliers are required to ask their upstream suppliers, contractors, and service providers to commit and adhere to the TSMC Supplier Code of Conduct.
- Added Supplier Sustainability Standards

### Risk Assessment

- Suppliers evaluate their compliance via Sustainability Self-Assessment Questionnaire (SAQ) or are evaluated by the TSMC Team.

#### Management Measures

- Determining the level of Code compliance of Tier 1 suppliers via Sustainability Self-Assessment Questionnaire (SAQ) or are evaluated by the TSMC Team.
- The TSMC Supplier Healthiness Assessment Rectification Program (S.H.A.R.P.) team identifies risks with indicators such as procurement amount, product supply criticality, and business relation with TSMC.
- Monitor suppliers with serious violations, tracking their continuous improvement to reduce risks.
- Suppliers are required to assess and mitigate climate change risks.

### Audit Participation

- Critical suppliers receive third-party audits by RBA-certified institutions or on-site audits by the TSMC S.H.A.R.P. Team.

#### Management Measures

- Critical suppliers are required to receive third-party audits; TSMC monitors audit results and requires improvement.
- Establish Supply Chain Sustainability Program, which conducts on-site audits with the S.H.A.R.P. methodology.
- Critical suppliers receive third-party audits by RBA-certified institutions or on-site audits by the TSMC S.H.A.R.P. Team.
- Suppliers implement improvement measures according to the audit results and receive relevant consultation.

### Continuous Improvement

- Suppliers implement improvement measures according to the audit results and receive relevant consultation.

#### Management Measures

- TSMC provides consultation or assistance and arranges for follow-up inspections for improvement.
- TSMC may reduce the trade volume or terminate trade with suppliers that fail to meet the requirements.
- Provide business operations and sustainability training programs free of charge, and require suppliers to complete the programs.
- Establish TSMC Supplier Sustainability Academy.
- Establish Supply Chain Worker Grievance Channel.
Code Compliance

As a member of the Responsible Business Alliance, RBA, TSMC sets its Supplier Code of Conduct according to RBA’s Code of Conduct. It requires suppliers to comply with the Code of Conduct while encouraging them to ask their upstream suppliers, contractors, and service providers to approve and adopt the same code in practices and management. New suppliers must sign the TSMC Supplier Code of Conduct to be eligible for partnership. The new suppliers must undergo regular risk assessments and audits in future partnerships and continue to improve according to audit results.

In 2020, TSMC further established the TSMC Supplier Sustainability Standard, which specifies five major categories for implementation, focuses on sustainable conduct, and helps suppliers to take tangible actions for sustainability.

Risk Assessment and Audit Participation

To deepen its understanding of the supply chain’s development and identify potential risks, TSMC adopted a three-phase risk assessment process in 2020. By classifying, categorizing, and identifying areas for improvement for suppliers, TSMC provides training resources on the Supply Online 360 platform and conducts on-site audits and consultations for critical high-risk suppliers, ensuring effective risk control.

After the preliminary assessment for all suppliers, TSMC requires Tier 1 Suppliers to conduct the SAQ to identify sustainability risks. In 2020, Tier 1 Suppliers in Taiwan, where TSMC is headquartered, completed 1,144 SAQs, in which the five major categories of the TSMC Supplier Code of Conduct were covered. The assessment results show that, for the Labor category, suppliers often have no specified protocols to monitor the work environment of their supply chain. For Safety and Health, suppliers lack identification and risk planning for environmental protection laws, operations in confined space, and operations involving hazardous materials. For the Code of Business Ethics, SAQ results show that 21% of the suppliers do not have a business ethics management system. In addition, TSMC requires critical suppliers to follow up the sustainability management of their upstream supply chains. Through Supply Online 360, it’s expected to conduct integrated management from Tier 1 suppliers in 2021.

For the preliminary assessment, examine the category and source of origin of all supply products based on suppliers’ business relations with TSMC to analyze potential risks.

Based on SAQ results and trading amount, TSMC categorizes Tier 1 suppliers into critical/non-critical and different risk levels. TSMC then implements supplier management according to the Supplier Risk Matrix and supplier classification.

For critical high-risk suppliers in the Supplier Risk Matrix, whose management is more urgent, TSMC conducts on-site audits to identify the actual risk status and provides consultation to reduce risks for the suppliers.
At the same time, TSMC categorizes critical suppliers according to indicators such as procurement amount, supplier product criticality, and business relation with TSMC and determines risk levels referring to SAQ results and priority violation records. Using the two dimensions of criticality and risk levels, TSMC establishes a Supplier Risk Matrix that classifies suppliers annually. This classification is then used in determining specific sustainability management actions to continuously enhance supplier understanding of the five major categories defined by the RBA. TSMC aims to improve supplier capabilities and effectively track sustainability risks in the supply chain.

After identifying risks using the Supplier Risk Matrix, TSMC implements management measures according to supplier classifications. In 2020, the TSMC S.H.A.R.P. Team collaborated with third-party institutions certified by the RBA and completed 24 on-site audits for critical high-risk suppliers, assessed actual risks, and improve supplier performance on sustainability.

TSMC aims to work closely with suppliers in maintaining consistent material supply and services, and ensure mutual benefit by guiding suppliers to establish a safe work environment that safeguards workers’ health and limits environmental impact. TSMC launched the TSMC Supplier Sustainability Academy education platform on Supply Online 360, and by compiling training courses from TSMC operational and manufacturing practices, TSMC provides

**Critical High-risk Suppliers Assessment Process**

- **Tier 1 Suppliers**
  - **Critical Suppliers**
  - **High-risk Suppliers**
  - **Critical High-risk Supplier On-site Audit**

**Supplier Risk Matrix, Classification and Management Measures**

- **Critical High-risk Suppliers**
  - Risk Level: High
  - Signing the TSMC Supplier Code of Conduct
    - Critical High-risk Suppliers: ✔
    - Critical Low-risk Suppliers: ✔
    - Non-critical High-risk Supplier: ✔
    - Non-critical Low-risk Suppliers: ✔
  - Risk Assessment via SAQ
    - Critical High-risk Suppliers: ✔
    - Critical Low-risk Suppliers: ✔
    - Non-critical High-risk Supplier: ✔
    - Non-critical Low-risk Suppliers: ✔
  - Completion of the TSMC Supplier Code of Conduct Program of the Supplier Sustainability Academy
    - Critical High-risk Suppliers: ✔
    - Critical Low-risk Suppliers: ✔
    - Non-critical High-risk Supplier: ✔
    - Non-critical Low-risk Suppliers: ✔
  - On-site Audit
    - Critical High-risk Suppliers: ✔
    - Critical Low-risk Suppliers: ✔
    - Non-critical High-risk Supplier: ✔
    - Non-critical Low-risk Suppliers: ✔

**Number of Suppliers Completing Third-party Audits**

- **High risk**
  - High-risk Suppliers: 24
  - Critical Suppliers: 79
  - Non-critical Suppliers: 103
  - 2018: 32
  - 2019: 46
  - 2020: 24
  - 2021: 60

- **Low risk**
  - Low-risk Suppliers: 163
  - Critical Suppliers: 163
  - Non-critical Suppliers: 163
  - 2018: 163
  - 2019: 163
  - 2020: 163
  - 2021: 163

**Number of Suppliers Attending Each Year**

- **Cumulative Total of Suppliers Audited**
  - Year 2018: 32
  - Year 2019: 46
  - Year 2020: 24
  - Year 2021: 60

- **Number of Suppliers Completing Third-party Audits**
  - Year 2018: 32
  - Year 2019: 46
  - Year 2020: 24
  - Year 2021: 60
2020 Critical High-risk Suppliers Audits

**Auditor**
TSMC S.H.A.R.P. Team and RBA-certified Third Party Institutions

**Suppliers Audited**
Factories of 24 Critical High-risk Suppliers

**Audit Methods**
24 On-site Audits

**Distribution of Audit Violations**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Major Violations Audited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>1. Not fully adhering to work hour regulations</td>
</tr>
<tr>
<td>Ethics</td>
<td>1. Require suppliers to establish business ethics rules; expected to complete in 2021</td>
</tr>
<tr>
<td>Supply Chain Risks</td>
<td>1. Not establishing multiple sources or safety stock for raw materials or finished goods</td>
</tr>
<tr>
<td></td>
<td>2. Lacking comprehensive water and electricity backup plans in response to climate change</td>
</tr>
<tr>
<td></td>
<td>3. Lacking comprehensive human resources plans in response to unexpected developments</td>
</tr>
<tr>
<td>Reliability of Quality</td>
<td>1. Lacking control over the quality of raw materials</td>
</tr>
<tr>
<td></td>
<td>2. Not implementing upstream supply chain risk assessment or business continuity plans;</td>
</tr>
<tr>
<td></td>
<td>not conducting regular on-site and document audits for upstream suppliers</td>
</tr>
<tr>
<td></td>
<td>3. Not planning or notifying TSMC in time when making changes to the production process</td>
</tr>
<tr>
<td>Fire Safety System</td>
<td>1. Not establishing an effective fire safety management system</td>
</tr>
<tr>
<td></td>
<td>2. Fire safety equipment not compliant with relevant regulations</td>
</tr>
<tr>
<td></td>
<td>3. Fire safety equipment lacking maintenance</td>
</tr>
<tr>
<td>Safety and Health</td>
<td>1. Required suppliers to assign personnel specifically for fire safety management</td>
</tr>
<tr>
<td></td>
<td>2. Required suppliers to fully implement management of hot work, flammable chemicals,</td>
</tr>
<tr>
<td></td>
<td>and fire safety equipment, and provide TSMC's relevant procedures for suppliers' reference</td>
</tr>
<tr>
<td></td>
<td>3. Required suppliers to implement and prepare emergency response management</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>Not establishing an effective rainwater management system</td>
</tr>
</tbody>
</table>

**Key Achievements**

1. Establish and verify multiple sources for raw materials and finished goods, and have safety stock in place
2. Establish and verify supplies and have safety stock in place
3. Establish comprehensive business continuity plans in response to COVID-19
4. Control and manage the quality of raw materials to ensure that materials comply with specifications and quality is consistent
5. Assess risks of the upstream supply chain, conduct on-site audits, and encourage compliance with TSMC standards
6. Enhance internal training on protocols relevant to production process changes
7. Establish management measures for separating rainwater and wastewater

---

Note 1: Priority violations may present risks of production halt, loss of life, legal violations, or systematic failure. For example: lacking response mechanism for unexpected disruptions in production lines, environmental pollution, hiring child labor, or forced labor.

Note 2: Major violations refer to significant differences between implementation and proper ESH procedures, such as daily operations not adhering to ESH procedures.

Note 3: Minor violations refer to risks other than priority or major violations, such as incomplete training records or incomplete ESH procedures.
Continue to Advance Supply Chain Sustainability

As the global semiconductor industry continues to grow, TSMC considers effective supply chain management to be an important mission. TSMC cares about the sustainability of the environment, society, and the economy, aspiring to improve supply chain management, and effect behavioral change. TSMC makes use of two policies to do so: 1: "Sustainability Risk Management" which requires all suppliers to adhere to the TSMC Supplier Code of Conduct, take actions to improve labor rights, safety and health, environmental protection, business ethics, and the efficiency of their management systems, and reduce disruption risk for business operations. 2: "Local Procurement Optimization" to continuously increase local sourcing, actively provide consultation on improving core capabilities, and set reduction targets for energy consumption, water consumption, waste, and carbon emissions to support the sustainable development of the local supply chain. As a leading semiconductor company, TSMC aims to use its influence in the industry with these two policies as well as the four Action Plans to promote progress towards sustainability.

"Thanks to the auditing and coaching from TSMC’s team of experts, TPPC’s concept of disaster prevention has been extended to risk management, system maintenance, and loss prevention designs that enabled our disaster prevention standards to reach the international level for semiconductor fabs in a short period of time and strengthened the company’s overall disaster prevention capability and the safety awareness of employees."

— Chih Hung Feng, Assistant Vice President of Xinying Plant, TAIWAN PULP & PAPER CORPORATION

learning resources on labor rights, environmental protection, workplace safety and health free of charge. Such knowledge on corporate management improves supplier capabilities and even extends to upstream suppliers, enhancing the sustainability of the overall supply chain.

TSMC values people above all else, and has further established a public reporting channel for supplier employees on Supply Online 360. This offers protection for supplier employees, extends and deepens TSMC’s management, and builds a more inclusive workplace for the supply chain.

Four Action Plans

- **Supplier Employees**
  - Supply Chain Worker Grievance Channel

- **TSMC Grievance Handling Committee**
  - Investigation and supervision
  - Penalty
  - Report to the top supervisor of supply chain management for penalty

- **Suppliers**
  - Examine problems
  - Make improvements

---

**Society**
- Safeguard Labor Rights
- Strengthen Supply Chain Resilience

**Environment**
- Improve the Sustainability of the Supply Chain
- Reduce Environmental Impact

**Economy**
- Local Procurement Optimization

**Sustainability Risk Management**
- Two Policies
**Sustainability Risk Management**

TSMC implements two of the action plans, Safeguard Labor Rights and Strengthen Supply Chain Resilience, through audits and consultations that urge suppliers to continuously improve, building a work environment that ensures the dignity of workers and business ethics. In 2020, TSMC initiated the S.H.A.R.P. program, in which TSMC and suppliers work closely and effectively. Such comprehensive, collaborative efforts continue to reduce supply chain risks.

**Supplier Problems and Challenges**

- Insufficient transparency of supplier compliance with the TSMC Supplier Code of Conduct
- Records of supplier employees working at TSMC sites for seven consecutive days
- Whether suppliers comply with regulations on sourcing responsible minerals and raw materials
- Insufficient workplace safety rules for contractors and subcontractors at TSMC factory sites
- The current supply chain lacks emergency response capabilities, which may lead to disruption risk in supply

**TSMC Consultation Measures**

- Require Tier 1 suppliers to sign the TSMC Supplier Code of Conduct
- Require suppliers to complete third-party audits by RBA-certified auditing institutions
- Set up Supply Chain Worker Grievance Channel on Supply Online 360
- Quarterly review on whether supplier employees work at TSMC sites for seven consecutive days
- Continue due diligence to ensure sourcing of 100% conflict-free minerals
- Strengthen workplace safety management for contractors, especially on-site operational subcontractors and downstream subcontractors, and specify penalties and fines for workplace safety violations
- Strengthen workplace safety management for contractors, including workplace safety management in the comprehensive supplier evaluation
- Continue to develop multi-source supply solutions
- Invite suppliers to observe TSMC annual emergency response drills
- Initiate the S.H.A.R.P. program

**Number of Suppliers**

- 1,144
- 24
- 36
- 1
- 2
- 21
- 24

**2020 Performance**

- Tier 1 suppliers signed the statement at the completion rate of 100%.
- 24 Critical high-risk suppliers completed audits by third-party RBA-certified institutions.
- No complaints reported during the underlying year.
- Upgrade management tools, enabling automatic monthly reports that alert changes in supply and ask suppliers to improve.
- Completed 100% of due diligence on conflict-free minerals sourcing for the supply chain.
- Include violation penalty terms in orders. Suppliers taking the orders implicitly agree to violation penalties. In 2020, 1 supplier received a penalty for violations.
- United Integrated Services and Taiwan Puritic Corp received TSMC Outstanding Supplier Awards.
- Develop 70 multi-source supply solutions.
- 21 suppliers participated this year, with a cumulative total of 111 suppliers.

---

**Note 1:** In 2020, supplier employees at TSMC factory sites occasionally still worked for seven consecutive days. TSMC has emphasized the importance of work hour management to suppliers.

**Note 2:** Added violation penalties to the order form in 2018, and the practice continued in 2020.
Sourcing Responsible Minerals

TSMC supports sourcing conflict-free raw materials as a practice of humanitarianism and compliance with social ethics. Therefore, TSMC has adopted a series of compliance measures based on industry best practices, including the due diligence framework by the Organization for Economic Cooperation and Development (OECD), the Model Supply Chain Policy for a Responsible Global Supply Chain of Minerals from Conflict-affected and High-risk Areas. TSMC is also a firm supporter of the Responsible Business Alliance (RBA) and Global e-Sustainability Initiative (GeSi), requiring suppliers to source conflict-free raw materials according to the Responsible Minerals Assurance Process (RMAP). TSMC requires suppliers to comply with our responsible minerals sourcing policy and sign a statement of conflict-free minerals for products containing tantalum, tin, gold, and tungsten. Since 2018, TSMC has also disclosed to customers the source smelters for cobalt used in TSMC products. By 2021, TSMC plans to audit at least three suppliers that use tantalum, tin, gold, and tungsten to strengthen disclosure from suppliers. Since 2018, TSMC has also disclosed to customers the source smelters for cobalt used in TSMC products. By 2021, TSMC plans to audit at least three suppliers that use tantalum, tin, gold, and tungsten to strengthen disclosure from suppliers.

For the latest TSMC disclosure documents, please visit the TSMC website or the website of the US Securities and Exchange Commission.

Supplier Healthiness Assessment Rectification Program (S.H.A.R.P.)

To enhance supply chain resilience and ensure business continuity, TSMC started the Supply Chain Sustainability Program in 2020, assembling an auditing team with in-house experts and third-party RBA-certified institutions, named the Supplier Healthiness Assessment Rectification Program (S.H.A.R.P.).

The program audits five major categories, including Supply Chain Risk, Quality and Reliability, Environmental Protection, Safety and Health, Fire Protection System, and Labor Ethics. Through on-site audits, face-to-face communication, and other methods, TSMC continues to develop benchmark behaviors in the five major categories and improve the supply chain.

### Conflict-free Minerals Management Process

1. **TSMC Statement on Responsible Sourcing of Minerals**
2. **Reasonable Country of Origin Inquiry**
3. **Due Diligence**
4. **Public Disclosure**

### Conflict-free Minerals Due Diligence

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Conflict-free Smelters</th>
<th>Percentage Using Conflict-free Minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>173</td>
<td>100%</td>
</tr>
<tr>
<td>2017</td>
<td>235</td>
<td>100%</td>
</tr>
<tr>
<td>2018</td>
<td>259</td>
<td>100%</td>
</tr>
<tr>
<td>2019</td>
<td>256</td>
<td>100%</td>
</tr>
<tr>
<td>2020</td>
<td>234</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: Data stated herein include Tier 1 Suppliers of TSMC facilities in Taiwan, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.

### S.H.A.R.P.

- **Supply Chain Risks**
  - Simulate multiple-incident scenarios and solutions to minimize damage in advance

- **Quality and Reliability**
  - Rigorous requirements on Quality and Reliability to avoid deviations

- **Fire Protection System**
  - Establish a comprehensive Fire Protection System to minimize the risks of damaging production lines and neighboring communities

- **Environmental Protection Safety and Health**
  - Implement Occupational Safety and Health to protect operating personnel
  - Require the supply chain to reduce energy consumption and carbon emission

- **Labor Ethics**
  - Require the supply chain to safeguard labor rights and ethics rules to create a positive work environment that retains talent

- **TSMC S.H.A.R.P. Team**
- **External Third-Party Institutions**
Optimize Local Procurement

Two of the action plans, "Improve the Sustainability of the Supply Chain" and "Continue to Reduce Environmental Impact", are tangible actions TSMC has taken to optimize local procurement. TSMC offers consultation for suppliers to expand production capacity, advance production processes, and improve quality. At the same time, TSMC requires suppliers to guarantee environmental safety and health in the workplace, reduce environmental impact and its external cost, and mitigate the effects of climate change and resource depletion. TSMC conducts Supplier Environmental Profit and Loss (EP&L) assessments to quantify environmental impact, guiding suppliers to set up targets of environmental protection to improve the local supply chain.

<table>
<thead>
<tr>
<th>Action Plans</th>
<th>Supplier Problems and Challenges</th>
<th>TSMC Consultation Measures</th>
<th>Number of Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve the Sustainability of the Supply Chain</td>
<td>Production capacity, production process, and quality management require improvement</td>
<td>Provide consultation for suppliers to expand production capacity, improve advanced measurement technology, and enhance manufacturing quality</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Insufficient implementation of Environmental Protection, Safety and Health</td>
<td>Hold the annual Responsible Supply Chain Forum</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Address environmental impact and resource depletion caused by localized manufacturing</td>
<td>Hold forums to share experiences of real practices on Environment, Safety and Health</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fortify management of supplier Environmental Safety and Health, and include the performance as one of the indicators in the comprehensive supplier evaluation</td>
<td>1</td>
</tr>
<tr>
<td>Continue to Reduce Environmental Impact</td>
<td></td>
<td>Promote local sourcing to reduce transportation cost, set sourcing targets for indirect raw materials, spare parts, and backend equipment</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require local suppliers with high power consumption to reduce electricity usage</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require top ten waste-producing suppliers to reduce waste and report on the progress made each year</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conduct annual Supplier Environmental Profit and Loss (EP&amp;L) assessment</td>
<td></td>
</tr>
</tbody>
</table>

2020 Performance:
- Completed 89 items of quality improvement in materials for advanced processes; 32 suppliers completed capacity expansion according to the mass production needs for 3 nm and 3 nm processes.
- TSMC ESG Committee Chairperson and Senior Vice President, Lora Ho, shared TSMC's commitment to sustainability, while 92% of the suppliers attended expressed interest in sustainable development strategies and 89% expressed interest in risk control.
- Explain TSMC Supplier Sustainability Standard, require suppliers to establish management systems for Environment, Safety and Health and fire protection, and urge senior management of the suppliers to enhance supervision.
- Present Excellent Supplier Award to Chang Chun Petrochemical Company, setting an example for other suppliers.
- 60% for indirect raw materials, 44.8% for spare parts, 31% for backend equipment.
- Provide consultation on power reduction for suppliers and reduce energy consumption by a total of 210 million kWh.
- Reduce waste production of supplier business units by 29.4%.
- Encourage raw materials suppliers to participate in the assessment, expected to complete in 2021.
Enhance Supply Chain Environment, Safety and Health and Loss Prevention Capabilities

To enhance environment, safety and health and loss prevention capabilities, TSMC divides its supply chain environment, safety and health training into two aspects: experience-sharing and on-site audits. In 2020, for experience sharing, TSMC illustrated the content and implementation guidelines for the Supplier Sustainability Standard and shared case studies on common violations in sustainability audits, such as failure to wear personal protective equipment properly, deficiency of the management procedures of fire protection system impairment/hot work operation, and failure to turn on the valves of fire protection systems. TSMC recommended measures for improvement and shared tangible, actionable solutions to reduce energy and water consumption in the experience sharing forum. The forum elevated the soft power of suppliers, and a total of 347 people from 147 suppliers attended. For on-site audits and consultation, in 2020 the TSMC S.H.A.R.P. team visited supplier companies to examine production lines, evaluate supplier fire protection software and hardware, and offered suggestions for improvement.

In 2020, TSMC continued to strengthen experience sharing by inviting suppliers to the Facility services Academy at Fab 15, offering effective training by detailing the operation, maintenance, and testing procedures of fire protection equipment on-site. In 2020, TSMC held observations of emergency response drills in factories for local raw materials suppliers for the fifth consecutive year. A total of 21 suppliers observed the drills on-site, with a cumulative total of 111 people attending.

Key Points in Supply Chain ESH and Loss Prevention

- Occupational injuries
- Occupational illnesses
- Chemicals management
- Pollution prevention
- Reduction of energy and water consumption
- Hazardous substance management and control
- Personal protective equipment
- Contractor management
- Machinery protection and maintenance
- Emergency response
- Fire prevention
- Fire protection equipment maintenance
- Earthquake protection
- Natural disaster risks

Key Points in Promoting Supply Chain ESH and Loss Prevention

- Supplier Consultation (ESH training/Observation of emergency response drills)
- Supplier Consultation and Power Reduction
  - Description of the Fire Safety System
  - Case Sharing—Common Failures among Suppliers
  - Consultation on reducing energy and water consumption
  - Continue to hold observation of emergency response drill
- Supplier Consultation and Power Reduction
  - New topic for consultation: RBA7.0
  - Practices—Fire protection system operation training
  - On-site checking suppliers’ improvement status
  - Emergency response—Table-top simulations
  - Introduce energy saving designs into new supplier factories
  - Set targets for suppliers to reduce water consumption
  - Request high-electricity consumption suppliers to acquire ISO14064-1 certification

ESH Experience-Sharing Training Program—Number of Suppliers Attended

- Number of Suppliers Attending Each Year
- Cumulative Total
**Improve the Local Supply Chain**

TSMC’s production is primarily located in Taiwan. Our procurement can be divided into six categories: equipment, spare parts, raw materials, facility services, IT, and goods. To build a more effective and competitive supply chain, TSMC actively seeks to elevate local suppliers’ advanced manufacturing process capabilities and establish a comprehensive local semiconductor supply chain.

Besides promoting local sourcing in Taiwan, TSMC has also set up independent procurement organizations for TSMC subsidiaries, including TSMC (China), TSMC (Nanjing), and WaferTech. Such organizations are the extension of the TSMC global supply chain, which helps local suppliers to improve technological levels, quality consistency, and reduce costs as well as carbon emissions.

---

### 2020 Supply Chain Management Activities for Taiwan Facilities

**Set Procurement Targets**
- Increase or maintain local sourcing percentage to meet the long-term goals

**Improve Technology Levels**
- Proactively improve the technology levels and quality of critical equipment, spare parts, and raw materials suppliers to increase local sourcing

**Invite International Companies**
- Invite foreign suppliers to set up manufacturing, R&D, and training sites in Taiwan
### Consultation Achievements for Enhancing Advanced Process Capabilities of Local Suppliers

#### Development of Spare Parts for Advanced Processes

| 2 | Spare parts maintenance |
| 2 | Spare parts coating |
| 4 | Spare parts machining |

#### Supplier Problems and Challenges

- The percentage of imported high-level spare parts for several advanced processes is still too high, as local suppliers lack critical process technology.
- Some advanced tools must be sent overseas for repair and maintenance, which is time-consuming and affects production schedules.

#### TSMC Consultation Measures

- Assemble a team of experts to provide consultation for local suppliers, offer technological training, and assist in certification.
- Regular exchange with suppliers on industry developments and cutting-edge technologies to ensure supplier R&D directions are consistent with industry demands.

#### 2020 Achievements

1. Provide consultation to develop 110 spare parts for advanced processes.

#### Build Capacity

| 4 | Chemicals |
| 1 | Abrasives |
| 2 | Photoresists |
| 2 | Gases |

#### Supplier Problems and Challenges

- Capacity insufficient to meet advanced process requirements.

#### TSMC Consultation Measures

- Production line expansion.

#### 2020 Achievements

2. Capacity increase.
3. Establish the Best-Known Method (BKM) for improving deficient quality.

#### Improve Advanced Measurement Technology

| 5 | Chemicals |
| 1 | Abrasives |
| 1 | Photoresists |
| 4 | Gases |

#### Supplier Problems and Challenges

- Measurement technology insufficient to meet advanced process requirements.

#### TSMC Consultation Measures

- Add analytical instruments.
- Introduce advanced instruments.

#### 2020 Achievements

5. Increase detection threshold.
6. Capability for IC material analysis.
Continue to Reduce Environmental Impact

Drawing on experience, TSMC requires and assists suppliers to continuously improve performance on sustainability. In 2020, suppliers reduced energy consumption by 210 million kWh. In 2021, TSMC will increase its efforts, requiring suppliers to set power reduction targets in each factory’s annual environmental protection targets to push towards the sustainability goal of reducing a cumulative total of 320 million kWh. For local suppliers that produce the most waste, in 2020, waste production per unit decreased by 29.4%, surpassing the annual target of 29.1%.

In addition to energy consumption and waste reduction, TSMC will expand its management scope to water and carbon emission reduction in 2021, requiring suppliers to implement measures to reduce water consumption, set specific reduction targets, and regularly follow up on the results. TSMC aims to reduce water consumption by a cumulative total of 35 million tons by 2030. At the same time, TSMC also requires High Energy Consumption Suppliers to undergo greenhouse gas emission certification and receive ISO 14064-1 Organization Quantification and Reporting of Green House Gases certification. The goal is to achieve a 100% completion rate by 2030. By working closely with suppliers, TSMC aims to mitigate climate change risks.

Targets and Achievements of Suppliers’ Efforts to Reduce Electricity and Water Consumption, Waste, and Carbon Emission

### Electricity Consumption Reduction

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1 Suppliers</th>
<th>Supplier with high electricity consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>210</td>
<td>20.5</td>
</tr>
<tr>
<td>2021</td>
<td>320</td>
<td>26.2</td>
</tr>
<tr>
<td>2022</td>
<td>430</td>
<td>28.5</td>
</tr>
<tr>
<td>2023</td>
<td>1,500</td>
<td>29.4</td>
</tr>
</tbody>
</table>

### Water Consumption Reduction

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1 Suppliers</th>
<th>Supplier with high waste production per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>213</td>
<td>0</td>
</tr>
<tr>
<td>2021</td>
<td>450</td>
<td>50</td>
</tr>
<tr>
<td>2022</td>
<td>711</td>
<td>56</td>
</tr>
<tr>
<td>2023</td>
<td>3,500</td>
<td>100</td>
</tr>
</tbody>
</table>

### Waste Reduction

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1 Suppliers</th>
<th>Supplier with high waste production per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>20.5</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>26.2</td>
<td>50</td>
</tr>
<tr>
<td>2019</td>
<td>28.5</td>
<td>56</td>
</tr>
<tr>
<td>2020</td>
<td>29.4</td>
<td>100</td>
</tr>
<tr>
<td>2021</td>
<td>30.4</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>35.0</td>
<td></td>
</tr>
</tbody>
</table>

### Carbon Management

<table>
<thead>
<tr>
<th>Year</th>
<th>Tier 1 Suppliers</th>
<th>Supplier with high electricity consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2021</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2022</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>2023</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
A Practitioner of Green Power

Green manufacturing is the cornerstone of sustainable management at TSMC. We believe that corporate growth and environment protection should not be mutually exclusive; our goal is to become the global standard of eco-friendly corporations. To such ends, we integrate green management into daily operations and strive to carry out climate change and energy management, water management, waste management, and air pollution control through introducing innovative green technologies.
# Climate Change and Energy Management

## Strategies

### Strengthen Climate Resilience
Establish climate change countermeasures and preemptive precautions to lower risk of climate disasters

### Drive Low-carbon Manufacturing
Continue to use best available technology to reduce emissions of greenhouse gases (GHG) and become an industry leader in low-carbon manufacturing

### Use Renewable Energy
Continue to purchase renewable energy and install solar-energy power systems to achieve target of 100% renewable energy use

### Increase Energy Efficiency
Plan and implement new energy-saving measures each year to increase energy efficiency

## 2030 Goals

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 day of production interruption due to climate disasters</td>
<td>0 day of production interruption due to climate disasters</td>
<td>Achieved</td>
</tr>
<tr>
<td>Reduce GHG emissions per unit product (metric ton of carbon dioxide equivalent (MTCO2e)/12-inch equivalent wafer/mask layer) by 40% (Base year: 2010)</td>
<td>Reduce GHG per unit of production (metric ton of carbon dioxide equivalent (MTCO2e)/12-inch equivalent wafer mask layer) by 20%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>Reduce unit product environmental externalities by 30% (Base year: 2010)</td>
<td>Reduce unit product environmental externalities by 8% (NT$12-inch equivalent wafer mask layer)</td>
<td>Missed Target</td>
</tr>
<tr>
<td>Starting from 3nm new fabs, renewable energy accounts for more than 20% of energy consumption and the purchasing of renewable energy to increase annually to achieve 25% renewable energy for fabs and 100% renewable energy for non-fab facilities</td>
<td>Continue to purchase renewable energy and achieve 9% of renewable energy in TSMC and overseas sites used 100% renewable energy</td>
<td>Missed Target</td>
</tr>
<tr>
<td>Save 5,000 GWh cumulatively between 2016 and 2030 through new energy-saving measures</td>
<td>Save 500 GWh and 2,200 GWh cumulatively</td>
<td>Achieved</td>
</tr>
<tr>
<td>Double energy efficiency after five years of mass production for each process technology</td>
<td>Increase 5nm process technology energy efficiency by 0.2 times in the second year of mass production</td>
<td>Missed Target</td>
</tr>
<tr>
<td>500 GWh energy saved, and cumulatively saved 1,700 GWh</td>
<td>500 GWh energy saved, and cumulatively saved 1,700 GWh</td>
<td>Achieved</td>
</tr>
<tr>
<td>Energy efficiency of 10nm and 7nm process technologies increased by 1.4 times in the fourth year of mass production</td>
<td>Energy efficiency of 10nm and 7nm process technologies increased by 1.4 times in the fourth year of mass production</td>
<td>Exceeded</td>
</tr>
</tbody>
</table>

## 2020 Achievements

<table>
<thead>
<tr>
<th>2020 Achievements</th>
<th>2021 Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 0 day of production interruption due to climate disasters</td>
<td>• 0 day of production interruption due to climate disasters</td>
</tr>
<tr>
<td>• Reduced GHG emissions per unit product (metric ton of carbon dioxide equivalent (MTCO2e)/12-inch equivalent wafer mask layer) by 23%</td>
<td>• Reduced GHG emissions per unit product (metric ton of carbon dioxide equivalent (MTCO2e)/12-inch equivalent wafer mask layer) by 23%</td>
</tr>
<tr>
<td>• Reduced unit product environmental externalities by 7.5% (NT$12-inch equivalent wafer mask layer)</td>
<td>• Reduced unit product environmental externalities by 7.5% (NT$12-inch equivalent wafer mask layer)</td>
</tr>
<tr>
<td>• Purchased 1,230 GWh of renewable energy, Renewable Energy Certificates (REC), and carbon credits, achieving 7.6% of TSMC’s power consumption, TSMC overseas sites used 100% renewable energy</td>
<td>• Purchased 1,230 GWh of renewable energy, Renewable Energy Certificates (REC), and carbon credits, achieving 7.6% of TSMC’s power consumption, TSMC overseas sites used 100% renewable energy</td>
</tr>
<tr>
<td>• Double energy efficiency after five years of mass production for each process technology</td>
<td>• Increase 5nm process technology energy efficiency by 0.2 times in the second year of mass production</td>
</tr>
<tr>
<td>• 500 GWh energy saved, and cumulatively saved 1,700 GWh</td>
<td>• 500 GWh energy saved, and cumulatively saved 1,700 GWh</td>
</tr>
<tr>
<td>• Energy efficiency of 10nm and 7nm process technologies increased by 1.4 times in the fourth year of mass production</td>
<td>• Energy efficiency of 10nm and 7nm process technologies increased by 1.4 times in the fourth year of mass production</td>
</tr>
</tbody>
</table>

Note 1: As of 2020, GHG emissions include fluorinated GHG emissions; the indicator will be used to evaluate various practices in the future. Note 2: As of 2020, the unit for product indicators will be in “12-inch equivalent wafer”. Note 3: Environmental externalities refers to the potential impact of the environmental footprint derived from business activities on human well-being, and takes the environmental profit and loss as a comprehensive index. The internal EP&L module was completed for the Total ESH Management digital system in 2020 and 19 key suppliers were included into EP&L evaluations to continue identifying ways to improve. Overseas fabs were unable to complete product life cycle assessment because of the COVID-19 pandemic and the assessment will be completed in 2021. Note 4: Definition of Renewable Energy Use: Purchase renewable energy, Renewable Energy Certificates, and carbon credits produced by renewable energy. Note 5: Energy efficiency is the product equivalent per kWh of power (12-inch equivalent wafer mask layer/kWh). Note 6: Some 10nm production lines have been converted to 7nm production lines.
The year 2020 was an important milestone in TSMC’s fight against climate change. TSMC closely follows and carries out a variety of climate action goals following theParis Agreement. The ESG Steering Committee, led by Chairperson Dr. Mark Liu, evaluates TSMC climate change guiding principles twice a year and ESG Committee Chairperson Senior Vice President Lora Ho annually reports to the Board of Directors on climate actions and results of the year. In May 2020, TSMC signed the world’s largest corporate renewable power purchase agreement (PPA); in July 2020, TSMC was officially approved by RE100 as the first semiconductor company to be a member of this global initiative for renewable energy, and TSMC declared a sustainability goal of using 100% renewable energy by 2050, driving the development of green energy industry, and realizing a future for sustainable environments.

As advanced processes continue to evolve, IC processes have become increasingly complex and now require higher electricity consumption. In 2020, TSMC purchased renewable energy, invested in the development of green tools, and worked diligently to carry out all 460 energy-saving measures and introduce new energy-saving tool models to strive towards better energy efficiency in all technology nodes of processes. Facing the potential risks brought by extreme climates and global warming, TSMC focuses on regulatory compliance, energy and carbon emissions reduction, and carbon asset management. TSMC is also using the Task Force on Climate-related Financial Disclosures (TCFD) framework proposed by the Financial Stability Board (FSB) to identify climate risks and opportunities. Based on the results, measures and goal management were established to effectively track response progress and outcomes, thereby lowering the financial impact of climate risks on business operations.
**Strengthen Climate Resilience**

Resilience to climate disasters is an integral part of corporate operations in an environment with increasingly volatile climates. TSMC uses the RCP8.5 global warming scenario issued by the UN to identify disaster factors introduced by extreme climates and established Climate Risk Adaptive Standards. In 2020, TSMC was able to successfully defend against potential impact from disasters and potential operating losses from climate change to achieve the target of zero production interruption.

**Identify Climate Risk**

To uncover potential risks and opportunities, TSMC follows the TCFD framework to evaluate climate change risks and opportunities cross-functionally. In 2020, TSMC hosted a Climate Change Risk and Opportunity Workshop and invited related internal organizations to engage in group discussions on "policies and regulations", "market, technologies, and reputation", and "physical risks". Net zero emissions trend, EIA requirements, uncertainty in new energy saving/carbon emission reduction technologies, flood and drought impact to supply chain, and insurance premium increasing for natural disaster, and other risk factors were new introduced into the financial impact analysis of climate change in 2020 as climate risks to account for internal and external environmental changes; enhancing corporate reputation was introduced as a new climate opportunity. In 2020, to cope with climate change, TSMC also carried out actions such as purchasing local renewable energy, building the TSMC Water Reclamation Plant in Tainan Science Industrial Park, planning and building green buildings, implementing programs for energy saving and carbon emissions reduction, and water conservation, investing into energy-efficient products, elevating building foundation, and more. For more details, please see "Financial Impact Analysis of Climate Change".

---

### Climate Change Risk and Opportunity Matrix

<table>
<thead>
<tr>
<th>Impact</th>
<th>Short-term</th>
<th>Medium-term</th>
<th>Long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

**Opportunities**

1. Participation in carbon trading/renewable energy market
2. Rewards from public sector & collaborations of carbon emission offset
3. Construct green buildings
4. Use of reclaimed water
5. Develop services to deliver low-carbon products and increase energy efficiency for our customer’s products
6. Drive low-carbon green manufacturing
7. Increase resilience against natural disasters
8. Improve Company reputation/image

**Transition Risks**

1. GHG restrictions and carbon taxes/carbon levy
2. Net zero emission trends
3. EIA commitment
4. Uncertainty in new energy saving/carbon reduction technologies
5. Impact on Company reputation/image

**Physical Risks**

1. Floods (TSMC)
2. Floods Supply Chain
3. Droughts (TSMC)
4. Droughts Supply Chain
5. Higher natural disaster insurance premium
6. Rising temperature
### Financial Impact Analysis of Climate Change

<table>
<thead>
<tr>
<th>Climate Risk</th>
<th>Potential Financial Impact</th>
<th>Climate Opportunities</th>
<th>Potential Financial Impact</th>
<th>2020 Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Emissions Restriction and Carbon Taxes/Carbon Fee</td>
<td>• Restriction on manufacturing capacity expansion; increase in operation costs</td>
<td>Participation in Renewable Energy Plans Participation in Carbon Trading Market</td>
<td>• Early purchases of renewable energy, successfully increasing manufacturing capacity</td>
<td>• Signed renewable energy contracts of up to 1.3 GW in Taiwan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Purchased 1,230 GWh of renewable energy to offset 100% of carbon emissions of global offices and all overseas operation sites</td>
</tr>
<tr>
<td>Net Zero Emission Trends</td>
<td>• Increased cost of installation and operation for carbon reduction facilities</td>
<td>Obtain Rewards from Public Sectors and Collaborations of Carbon Emission Offset</td>
<td>• Stock up on required carbon credit for future emissions</td>
<td>• Received rewards from public sector for offsetting F-GHGs and nitrous oxide</td>
</tr>
<tr>
<td></td>
<td>• Increased cost for purchasing carbon offset products</td>
<td></td>
<td></td>
<td>• Used carbon credit to offset carbon emissions and achieve net zero for global offices</td>
</tr>
<tr>
<td>EIA Commitment</td>
<td></td>
<td>Use of Reclaimed Water</td>
<td>• Satisfy customer demands for energy-efficient products and increase revenue</td>
<td>• Invested in the development of 5-nm energy-efficient products</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertainties in the Development of New Energy</td>
<td>• Increase energy consumption in production lines using new process technologies result in higher operating costs</td>
<td>Construct Green Buildings</td>
<td>• Successfully build advanced production line</td>
<td></td>
</tr>
<tr>
<td>Saving/Carbon Reduction Technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on Company reputation</td>
<td>• Damage to company image when unable to meet stakeholder expectations</td>
<td>Enhance Corporate Reputation</td>
<td>• Reduce utilities costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood/Drought</td>
<td>• Production affected, resulting in financial losses and a decrease in revenue</td>
<td>Increase Resilience against Natural Disasters</td>
<td>• Strengthen climate resilience and lower the risk of operation interruption and potential losses</td>
<td>• Only semiconductor company to have been in the Dow Jones Sustainability Index (DJSI) for 20 consecutive years; Listed in Leadership of CDP climate change and water security</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Elevated building foundation of Fab 18 Phase 3 by 2 meters</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Fab 18 Phase 3 committed to using and developing reclaimed water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Established a comprehensive water monitoring system</td>
</tr>
<tr>
<td>Higher Natural Disaster Insurance Premium</td>
<td>• Increase in operating costs</td>
<td>Drive Low-carbon Green Manufacturing</td>
<td>• Save energy and reduce costs</td>
<td>• Conserved 500 GWh of electricity through energy conservation programs</td>
</tr>
<tr>
<td>Rising Temperature</td>
<td>• Increase in energy consumption, costs, and carbon emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Carbon offset products are renewable energy certificates, carbon credits or other carbon neutral products.
TSMC has long been committed to green manufacturing and aspires to be a world leader in low-carbon manufacturing. The Company performs yearly reviews of the overall effectiveness of carbon reduction based on third-party-verified GHG inventory results. Because F-GHG emissions and the indirect emission of GHGs due to power consumption are the two main sources of GHG emissions, TSMC has for many years, continued to establish industry best practices for GHG reduction. In 2020, TSMC replaced and installed roughly 1,684 local abatement facilities for fluorinated GHGs and nitrous oxide; acquired two new green building certificates; and implemented energy-saving projects for process tools machines while taking progressive steps to increase the use of renewable energy to reduce the GHG emissions per unit product.

**GHG Reduction Best Practices**

<table>
<thead>
<tr>
<th>Scope 1</th>
<th>Direct GHG Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISO 14064-1 emissions inventory and third-party verification</strong></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>All facilities and subsidiaries completed emissions inventory and third-party verification</td>
<td></td>
</tr>
<tr>
<td><strong>Optimize gas quantity used in production</strong></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Introduced optimized process parameters in accordance with the manufacturing specifications of the Intelligent Engineering Center</td>
<td></td>
</tr>
<tr>
<td><strong>Substitute high global warming potential (GWP) fabrication gases</strong></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>All 12-inch fabs are now using optimized carbon reduction technology - remote plasma dissociation of Nitrogen Trifluoride (NF3), 6-inch and 8-inch fabs are using Nitrogen Trifluoride (NF3) / Octafluorobutane (C8F8)</td>
<td></td>
</tr>
<tr>
<td><strong>Install Point-of-Use Abatement equipment for fluorinated GHGs</strong></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Achieved full installation on new process tools using F-GHG in new and existing fabs and installed a new 1,684 POU abatement equipment in 2020, replaced 84 existing POU abatement equipment to achieve 92% installation rate</td>
<td></td>
</tr>
<tr>
<td><strong>Introduce POU Nitrous Oxide reduction technologies</strong></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td></td>
</tr>
<tr>
<td>Developed Nitrous Oxide reduction technologies and made it a standard for new tools, became first in Taiwan to install the technology in 100% of new process tools using N2O in Fab 18A and Fab 18B</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scope 2</th>
<th>Indirect GHG Emissions (From Purchased Energy)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISO 50001 energy management and third-party audits</strong></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>ISO 50001 inventory and third-party certification were conducted for all TSMC fabs in Taiwan, TSMC (China), and TSMC (Nanjing)</td>
<td></td>
</tr>
<tr>
<td><strong>Construct green buildings</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>The Company leads the global semiconductor industry with the largest LEED-certified building area and constructed two more fabs, which received green building certification. In total to date, 34 buildings have received LEED certifications and 23 buildings received EEWH certifications</td>
<td></td>
</tr>
<tr>
<td><strong>Energy efficiency standards</strong></td>
<td></td>
</tr>
<tr>
<td>460 Measures</td>
<td></td>
</tr>
<tr>
<td>Energy efficiency of advanced technologies leads industry peers, with 460 energy-saving measures over 8 categories implemented and 501 GWh saved</td>
<td></td>
</tr>
<tr>
<td><strong>Next-generation fab tools use energy-saving, carbon-reducing designs</strong></td>
<td></td>
</tr>
<tr>
<td>Exclusive</td>
<td></td>
</tr>
<tr>
<td>The only company in the world to launch energy-saving programs on next-generation semiconductor fab tools; completed energy-saving programs on 68 models and saved 200 GWh electricity</td>
<td></td>
</tr>
<tr>
<td><strong>Introduce renewable energy to reduce carbon emissions</strong></td>
<td></td>
</tr>
<tr>
<td>12.3 GWh</td>
<td></td>
</tr>
<tr>
<td>Leading semiconductor manufacturer in Taiwan with 1,230 GWh in renewable energy purchased and 100% use of renewable energy in global offices</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scope 3</th>
<th>Indirect GHG Emissions (Value Chain)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISO 14064-1 emissions inventory and third-party audit</strong></td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>High Energy Consumption Suppliers are required to complete GHG emissions inventory and third-party audits; 40% completion rate in 2020</td>
<td></td>
</tr>
<tr>
<td><strong>Reduce carbon footprint from raw materials</strong></td>
<td></td>
</tr>
<tr>
<td>59,000 Metric Tons</td>
<td></td>
</tr>
<tr>
<td>Require High Energy Consumption Suppliers to set annual targets and begin to save electricity; in 2020, TSMC suppliers conserved 113 GWh in energy and reduced carbon emissions by 59,000 metric tons</td>
<td></td>
</tr>
<tr>
<td><strong>Optimize delivery schedules</strong></td>
<td></td>
</tr>
<tr>
<td>9,500 Metric Tons</td>
<td></td>
</tr>
<tr>
<td>Improved process tools delivery schedules and replaced air freight with ocean shipping, reducing 9,531 metric tons in GHG emissions</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Figures from Joint Steering Committee (JSTC) report of the World Semiconductor Council.
Note 2: High Energy Consumption Suppliers are the suppliers that use >50 million kWh/year in a single facility.
GHG Emissions Inventory

In 2020, TSMC continued to implement the benchmark practices of optimizing the use of process greenhouse gases, minimizing global warming potential (GWP), maximizing the removal rate in exhaust, and comprehensively adopted the best available technology. By taking tangible actions, the Company has effectively reduced 4.2 million metric tons of direct CO2e emissions (Scope 1), of which fluorinated GHG emissions per unit product were reduced considerably by 68% in 2020, more than two times the target set by the World Semiconductor Council. Indirect emissions (Scope 2), caused by energy consumption, were also curbed as a result of increased use of renewable energy; indirect emissions (Scope 3) of upstream and downstream value chains mainly involve raw material production and energy-related activities. As such, TSMC has set energy conservation and carbon reduction goals with its suppliers to work together toward creating a sustainable supply chain.

As the world’s largest provider of semiconductor technologies and capacity, TSMC is deeply aware of our responsibilities towards local and global environments. We pay close attention to Science Based Targets (SBTs) in line with the 2°C scenario and various climate actions such as the RE100 initiative. Using renewable energy is the primary way that companies are able to reduce carbon emissions, so TSMC has to collaborate with external partners to develop carbon reduction/carbon negative technologies and obtain carbon credits for carbon offset to ensure TSMC is moving towards the SBT targets and net zero emissions. In 2020, TSMC was able to achieve 100% use of renewable energy in global offices and also used carbon credits to offset carbon emissions from natural gas used in the kitchen to achieve net zero emissions, setting a milestone for TSMC.

**Scope 1 GHG Emissions**

In 2020, TSMC continued to implement the benchmark practices of optimizing the use of process greenhouse gases, minimizing global warming potential (GWP), maximizing the removal rate in exhaust, and comprehensively adopted the best available technology. By taking tangible actions, the Company has effectively reduced 4.2 million metric tons of direct CO2e emissions (Scope 1), of which fluorinated GHG emissions per unit product were reduced considerably by 68% in 2020, more than two times the target set by the World Semiconductor Council. Indirect emissions (Scope 2), caused by energy consumption, were also curbed as a result of increased use of renewable energy; indirect emissions (Scope 3) of upstream and downstream value chains mainly involve raw material production and energy-related activities. As such, TSMC has set energy conservation and carbon reduction goals with its suppliers to work together toward creating a sustainable supply chain.

As the world’s largest provider of semiconductor technologies and capacity, TSMC is deeply aware of our responsibilities towards local and global environments. We pay close attention to Science Based Targets (SBTs) in line with the 2°C scenario and various climate actions such as the RE100 initiative. Using renewable energy is the primary way that companies are able to reduce carbon emissions, so TSMC has to collaborate with external partners to develop carbon reduction/carbon negative technologies and obtain carbon credits for carbon offset to ensure TSMC is moving towards the SBT targets and net zero emissions. In 2020, TSMC was able to achieve 100% use of renewable energy in global offices and also used carbon credits to offset carbon emissions from natural gas used in the kitchen to achieve net zero emissions, setting a milestone for TSMC.
TSMC’s manufacturing is primarily based in Taiwan. In 2020, TSMC achieved major progress in the renewable energy market: the Company became part of the first group to engage in renewable energy wheeling transactions. Unfortunately, our efforts have yet to guarantee sufficient supply in European and U.S. facilities. With our growing capacity, TSMC is unable to suppress the growth of overall carbon emissions despite implementing industry-leading standards for energy conservation/carbon reduction and achieving targets for unit product carbon reduction. TSMC will continue striving towards SBTs and net zero emissions by strengthening green innovation, purchasing renewable energy, driving the development of regional green energy industries, using carbon neutral raw materials, and expanding external collaborations to develop carbon credit projects.

Value EP&L and Strive to Reduce Carbon Externalities

Every three years, TSMC updates or establishes product life cycle assessments, water footprint assessments, and carbon footprint assessments in Taiwan fabs and obtains ISO 14040, ISO 14066, and ISO 14047 certifications. Product life cycle assessment for overseas fabs was expected to be completed in 2020 but third-party certification organizations were unable to conduct site audits due to COVID-19; product life cycle assessment for overseas fabs will be delayed to 2021.

In terms of reducing unit product environmental footprint, TSMC uses an Environmental Profit and Loss (EP&L) tool to convert environmental impact from TSMC operations into external costs (also known as environmental externalities). In 2020, TSMC completed the EP&L module for the Total ESH Management digital system, allowing us to systematically compile operation data from various facilities in a timely manner as a continuous improvement management tool. Analysis in 2020 revealed that Scope 1 and Scope 2 GHG emissions are the primary source of TSMC’s environmental externalities, accounting for 96.6%. To mitigate external costs brought on by TSMC operations, TSMC continues to drive low-carbon manufacturing, improve energy efficiency, increase the use of renewable energy, and more. In 2020, unit product environmental externalities was reduced by 7.5% from the previous year. TSMC also applied EP&L to upstream raw material suppliers, and we discovered that chemical raw materials manufacturing suppliers accounted for 51% of the supply chain’s environmental externalities, which was primarily particulate matters and GHG emissions. EP&L is now the cornerstone for TSMC when formulating carbon reduction strategies. In 2021, TSMC will be expanding partnerships with suppliers to work together and reduce external costs on society from GHG emissions and reach the 2030 goal of reducing unit product environmental externalities by 30%.

Use Renewable Energy

In 2020, with full support from the Board and management team, TSMC was able to purchase more renewable energy and move towards carbon neutrality. In July 2020, TSMC officially joined the RE100, becoming the first semiconductor company in the world to do so. We committed to 100% renewable energy in global operations and zero direct CO₂ emissions from electricity consumption by 2050. TSMC hopes to drive the trend of renewable energy use in the global semiconductor industry through its own efforts. In terms of purchasing renewable energy, TSMC’s efforts are evident. As of 2020, TSMC has provided 100% renewable energy to its manufacturing sites in Taiwan and had purchased approximately 12% of the renewable energy in Taiwan. To further reduce its carbon footprint, TSMC has committed to purchasing 100% renewable energy in its global operations by 2050 and has made significant progress towards this goal. TSMC has also implemented a series of initiatives to reduce its carbon footprint and promote green innovation, including the expansion of partnerships with suppliers, the use of carbon neutral raw materials, and the development of carbon credit projects. These efforts have contributed to a reduction in carbon emissions and a decrease in external costs brought on by TSMC operations.

**EP&L Trend Chart**

Unit: EP&L (NT$ billion)  
Unit: Product environmental externalities (NT$/12” wafer-e-mask layer)
sustainable actions. In 2020, TSMC received the first RE100 Leadership Awards - Most Impactful Pioneer from The Climate Group.

**Purchasing Renewable Energy**

TSMC vision is for corporate growth and the environment to prosper together. Our sustainability goals for 2030 are 25% renewable energy consumption for all fabs and 100% renewable energy consumption for non-fab facilities. After all overseas sites transition to using 100% renewable energy, we will also expand the ratio of renewable energy consumption in local sites.

The renewable energy development in Taiwan is in the early stage and TSMC is working with the MOEA, Bureau of Energy, Bureau of Standards, Metrology, and Inspection, Taipower, and the Allied Association for Science Park Industries to discuss and eliminate the gap between regulation and real practice as well as scheme out details for future wheeling transaction. By communicating closely with the government and with support from renewable energy businesses, Taiwan was able to reach its first renewable energy wheeling milestone in May 2020. The Solar Plant in Chiayi County generated and transmitted renewable energy to TSMC, and a number of onshore wind farms transmitted to TSMC fabs in Taiwan in the fourth quarter of 2020, an sign that Taiwan’s renewable energy sector is growing stronger. As of the end of 2020, TSMC has signed power purchase agreements to purchase 1.3 GW of renewable energy, which will reduce 2.2 million metric tons of carbon emissions each year, helping achieve 100% renewable energy used in global offices, and making contribution to climate change mitigation.

TSMC hopes to drive the renewable energy sector and related industries by purchasing renewable energy and supporting related government policies. Starting in 2018, TSMC began to purchase renewable energy, RECs, and carbon credits in countries with comprehensive regulations and ample supply, aiming to completely offset carbon dioxide emissions from the power used in locations around the world including the United States,

**Use of Renewable Energy and Ratio**

<table>
<thead>
<tr>
<th>Year</th>
<th>Renewable Energy Purchased in Taiwan (100GWh)</th>
<th>Renewable Energy Purchased Overseas (100GWh)</th>
<th>Percentage of Renewable Energy Used (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>2</td>
<td>7.1</td>
<td>2.1%</td>
</tr>
<tr>
<td>2017</td>
<td>1</td>
<td>7.5</td>
<td>0.8%</td>
</tr>
<tr>
<td>2018</td>
<td>8.8</td>
<td>9.2</td>
<td>7.0%</td>
</tr>
<tr>
<td>2019</td>
<td>6.8</td>
<td>9.8</td>
<td>6.8%</td>
</tr>
<tr>
<td>2020</td>
<td>2.5</td>
<td>7.8</td>
<td>25%</td>
</tr>
<tr>
<td>2030</td>
<td></td>
<td></td>
<td>25%</td>
</tr>
</tbody>
</table>

**Renewable Energy Development Timeline**

- In response to the Amendment to Electricity Act opening up the electricity market, a renewable energy team was established to evaluate renewable energy purchases
- Joined the Taiwan Renewable Energy Certification Platform and became one of the first semiconductor fabs to receive renewable energy certificates
- One of the first in Taiwan to complete renewable energy wheeling contracts by purchasing 1,230 GWh of renewable energy
- First semiconductor company to join the RE100
- Signed the world’s largest PPA (920 MW)
- One of the first in Taiwan to become Taiwan’s biggest buyer of green energy upon first purchase
- Three consecutive years as Taiwan’s biggest buyer
- Taiwan’s largest green energy buyer for two consecutive years
- Overseas sites started using 100% renewable energy
- Committed to using renewable energy in Taiwan fabs
Canada, Europe, China, and Japan; 2020 marks the third consecutive year that TSMC has achieved zero carbon emission from power consumption in overseas sites.

Renewable Energy Systems
In addition to purchasing renewable energy, TSMC has also installed solar panels in TSMC facilities to produce carbon-free renewable energy for our own fabs. In 2020, 416 kWp of solar panel capacity was installed, and has already provided 4.63 GWh, reducing carbon emissions by 2,356 metric tons (the equivalent of annual carbon absorbed by 200,000 trees); in 2021, an additional 227 kWp in capacity of solar panels will be added, and this is expected to generate up to 5.76 GWh of electricity.

Increase Energy Efficiency
In 2020, TSMC continued to implement energy efficiency programs for manufacturing processes and with the goal of increasing energy efficiency by 100% after a process technology has entered mass production for five years. By expanding innovative energy-saving measures, installing smart energy-saving equipment, and adding components for energy conservation, TSMC was able to increase energy efficiency of 10nm and 7nm process technologies in the fourth year of mass production by 1.4 times, reaching our long-term 2030 goal ahead of schedule; energy efficiency for the 16nm and above process technologies has also improved by 1.8 times. TSMC has an unwavering commitment to continue improving energy efficiency in the face of more complex, advanced process technologies in the future.

In 2020, TSMC consumed a total of 16,900 GWh in energy; with electricity making up 95%, natural gas coming second at 5%, 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 treatment facilities to reduce the direct emission of fluorinated greenhouse gases and volatile organic compounds. Diesel is not used directly in production, but to run emergency power generators and fire pumps during emergencies, power outages, or during annual maintenance.

TSMC Renewable Energy Capacity & Generated

<table>
<thead>
<tr>
<th>Year</th>
<th>Southern Taiwan Science Park (kWp)</th>
<th>Central Taiwan Science Park (kWp)</th>
<th>Hsinchu Science Park (kWp)</th>
<th>Overseas (kWp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1,130,124</td>
<td>1,383,208</td>
<td>2,923,716</td>
<td>3,704,733</td>
</tr>
<tr>
<td>2017</td>
<td>1,383,208</td>
<td>2,923,716</td>
<td>3,704,733</td>
<td>4,628,288</td>
</tr>
<tr>
<td>2018</td>
<td>16.5</td>
<td>372</td>
<td>954</td>
<td>1,392</td>
</tr>
<tr>
<td>2019</td>
<td>372</td>
<td>954</td>
<td>1,392</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>16.5</td>
<td>372</td>
<td>954</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Power Generation (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>18.7</td>
</tr>
<tr>
<td>2017</td>
<td>32</td>
</tr>
<tr>
<td>2018</td>
<td>572</td>
</tr>
<tr>
<td>2019</td>
<td>3,129</td>
</tr>
<tr>
<td>2020</td>
<td>3,129</td>
</tr>
</tbody>
</table>

Energy Efficiency of 10nm & 7nm Process Technologies

<table>
<thead>
<tr>
<th>Year</th>
<th>1916</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1</td>
<td>1.3</td>
<td>1.7</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>1</td>
<td>1.3</td>
<td>1.7</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>1</td>
<td>1.3</td>
<td>1.7</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>1.3</td>
<td>1.7</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

Unit Product Energy Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>21.8</td>
<td>21.4</td>
<td>22.3</td>
<td>28.1</td>
<td>26.7</td>
</tr>
<tr>
<td>Year 2</td>
<td>21.8</td>
<td>21.4</td>
<td>22.3</td>
<td>28.1</td>
<td>26.7</td>
</tr>
<tr>
<td>Year 3</td>
<td>21.8</td>
<td>21.4</td>
<td>22.3</td>
<td>28.1</td>
<td>26.7</td>
</tr>
<tr>
<td>Year 4</td>
<td>21.8</td>
<td>21.4</td>
<td>22.3</td>
<td>28.1</td>
<td>26.7</td>
</tr>
</tbody>
</table>

Note 1: Standardized baseline for energy efficiency is the values taken from the first year of mass production of 10nm and 7nm process technologies.
Note 2: The data covers Taiwan Facilities, TSMC (China), WaferTech, and TSMC (Nanjing).
Note 3: Diesel and natural gas are not used in manufacturing and is therefore not counted in unit product energy consumption.
Note 3: The unit product indicator is calculated based on 12-inch wafer equivalent starting from 2020.
Expand Energy-saving Measures

In 2020, TSMC's Energy-saving and Carbon Reduction Committee worked to conserve more energy through company-wide roll-outs of energy-saving measures. The committee defined five major energy conservation teams for different process technologies as part of their efforts to conserve more energy from manufacturing equipment and fab facilities. The five teams are the advanced processes R&D team, 12-inch wafer fab team, advanced backend and 8-inch wafer fab team, EUV (extreme ultraviolet lithography) team, and facility team.

In response to the growing number of tools used at TSMC, the Intelligent Engineering Center launched the Green Manufacturing Engineering Program in 2020 to reduce equipment repair risks and increase energy efficiency. With the program, the Intelligent Engineering Center integrates energy conservation planning and operations for all fabrication equipment across all fabs. Each month, the five energy conservation teams meet and discuss new innovative measures for rapid roll-out into other fabs and set standards for new fabs as soon as possible. The New Generation Equipment Energy Conservation Program, launched in 2018, reached new heights in 2020 with 139 energy-saving measures tested and applied to 68 different types of 5 nm and 3 nm manufacturing tools, helping TSMC save 200 GWh in energy consumption.

In 2020, TSMC carried out 460 energy-saving measures across 8 different categories and was able to conserve 500 GWh in energy consumption, the equivalent of 250,000 metric tons of carbon emissions. The energy savings translated into NT$1.25 billion of actual financial savings and external carbon costs reduced from lower carbon emissions were around NT$380 million.

15-year Energy-saving Targets

<table>
<thead>
<tr>
<th>Year</th>
<th>Accumulated Energy Saved (as of 2019)</th>
<th>Additional Energy Saved</th>
<th>Total Energy Saved (as of 2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1 GWh</td>
<td>6 GWh</td>
<td>1.0 GWh</td>
</tr>
<tr>
<td>2017</td>
<td>6 GWh</td>
<td>9 GWh</td>
<td>1.5 GWh</td>
</tr>
<tr>
<td>2018</td>
<td>9 GWh</td>
<td>12 GWh</td>
<td>2.1 GWh</td>
</tr>
<tr>
<td>2019</td>
<td>12 GWh</td>
<td>17 GWh</td>
<td>2.9 GWh</td>
</tr>
<tr>
<td>2020</td>
<td>17 GWh</td>
<td>28 GWh</td>
<td>3.5 GWh</td>
</tr>
<tr>
<td>2025</td>
<td>28 GWh</td>
<td>28 GWh</td>
<td>5.6 GWh</td>
</tr>
<tr>
<td>2030</td>
<td>50 GWh</td>
<td>50 GWh</td>
<td>5.0 GWh</td>
</tr>
</tbody>
</table>

Results of the New Generation Equipment Energy Conservation Programs

- **Accumulated Energy Saved in 2016-2019**: 1,200 GWh
- **Additional Energy Saved in 2020**: 500 GWh
- **Accumulated Energy Saved in 2020**: 1,700 GWh

**Total Energy Consumption**

- **2016**: 4.8 GWh
- **2017**: 2.0 GWh
- **2018**: 1.0 GWh
- **2019**: 8.8 GWh
- **2020**: 9.2 GWh

**GHG Emissions**

- **CO₂ from Energy Use**: 8.6%
- **CO₂+CH₄**: 7.2%
- **N₂O**: 0.1%
- **F-GHG**: 2%
- **Renewable energy**: 88%
- **Non-renewable energy**: 15%
- **Natural gas**: 8%

Notes:
1. 1 cubic meter of natural gas=10.5 kWh of electricity, 1 Wh=3.600 kJ joules.
2. Data included Taiwan Facilities, WaferTech, TSMC (China), TSMC (Nanjing), and VisEra.

---

**15-year Energy-saving Targets**

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit: 100 GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1.0</td>
</tr>
<tr>
<td>2017</td>
<td>1.5</td>
</tr>
<tr>
<td>2018</td>
<td>2.1</td>
</tr>
<tr>
<td>2019</td>
<td>2.9</td>
</tr>
<tr>
<td>2020</td>
<td>3.5</td>
</tr>
<tr>
<td>2025</td>
<td>5.6</td>
</tr>
<tr>
<td>2030</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Average energy conservation efficiency (model)**

- **2016**: 10%
- **2017**: 12%
- **2018**: 14%
- **2019**: 16%
- **2020**: 18%

**Energy conservation measures tested (items)**

- **2016**: 159 items
- **2017**: 250 items
- **2018**: 272 items

**Energy conservation action plans (items)**

- **2016**: 15 items
- **2017**: 54 items
- **2018**: 68 items
- **2019**: 119 items
- **2020**: 129 items

**Equipment (types) Increase**

- **2016**: 20 equipment types
- **2017**: 37 equipment types
- **2018**: 54 equipment types
- **2019**: 68 equipment types
- **2020**: 129 equipment types

---

**Total Energy Consumption**

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit: 100 GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4.8</td>
</tr>
<tr>
<td>2017</td>
<td>5.5</td>
</tr>
<tr>
<td>2018</td>
<td>11.0</td>
</tr>
<tr>
<td>2019</td>
<td>12.7</td>
</tr>
<tr>
<td>2020</td>
<td>16.8</td>
</tr>
</tbody>
</table>

**GHG Emissions**

- **CO₂ from Energy Use**: 8.6%
- **CO₂+CH₄**: 7.2%
- **N₂O**: 0.1%
- **F-GHG**: 2%
- **Renewable energy**: 88%
- **Non-renewable energy**: 15%
- **Natural gas**: 8%
### Energy Conservation Teams for Green Innovation

<table>
<thead>
<tr>
<th>Categories/Competent authority</th>
<th>Five Energy Conservation Teams</th>
<th>Machines</th>
<th>Energy Conservation Goals</th>
<th>2020 Achievements</th>
</tr>
</thead>
</table>
| **Manufacturing Equipment**   | Advanced processes R&D team   | New generation 3nm/5nm machines | • Develop and test energy-saving components  
• Find optimal tool settings for energy conservation  
• Determine specifications for new tools | Fab 12B reduced 25 GWh by introducing green components, green pumps, and optimal exhaust settings |
|                               | 12-inch wafer fab team        | Existing 12-inch wafer machines | • Optimize recipe settings for existing tools  
• Seek new ways to conserve energy  
• Determine best known method for energy conservation | Fab 15A and 15B reduced 25% in energy consumption by introducing low-energy consumption system for pipeline heating that effectively reduced pipeline surface temperature |
|                               | Advanced backend and 8-inch wafer fab team | Existing backend & 8-inch fab machines | • Replace low energy efficiency auxiliary equipment  
• Determine specifications for new packaging and testing equipment | All 8-inch wafer fabs began using green pumps and green chillers, saving 12 GWh each year |
|                               | ELV team                      | ELV machines | • Increase energy efficiency  
• Determine specification for new tools | Fab 12B, Fab 15B, and Fab 18A increased energy efficiency by 5% with big data analysis |
| **Facility Equipment**        | Facility team                 | General facilities not for manufacturing | • Replace low energy efficiency equipment  
• Install smart energy conservation system for facility equipment  
• Determine specifications for new equipment | Fab 12A/B, Fab 14B, Fab 15A, Fab 15B, and Fab 18A saves 17.1 GWh each year by using lithium-ion batteries for the uninterrupted power supply system |

The Energy Saving and Carbon Reduction Committee awarded Energy Conservation Model Awards and Energy Conservation Innovation Awards according to employees' success with energy conservation targets and innovative ideas.

Trophies were made from recycled TSMC copper to add a special eco-friendly touch while encouraging energy innovation.
Energy Conservation Measures

**Lighting Energy Savings**
- Smart lighting in non-cleanroom areas
- Replace bulbs with LED lighting
  
  Fabs: All fabs

10 Measures; 16 GWh Energy Saved; 8,100 Metric Tons CO₂ Reduced

**A.C. Energy Savings**
- Smart, energy-saving cooling unit
- A.C. adjustments for energy conservation
  
  Fabs: All fabs

10 Measures; 94 GWh Energy Saved; 47,800 Metric Tons CO₂ Reduced

**Increased Performance**
- Modified wet film for A.C. humidifier
  
  Fabs: 12-inch fabs

7 Measures; 32 GWh Energy Saved; 16,300 Metric Tons CO₂ Reduced

**Energy Usage Management**
- Reduced cooling water for manufacturing processes
- Reduced exhaust emissions from equipment
  
  Fabs: All fabs

92 Measures; 42 GWh Energy Saved; 21,400 Metric Tons CO₂ Reduced

**Standby Energy Savings**
- Energy-saving mode for uninterrupted power supply system
- Cooling fan for battery cabinet to conserve energy
  
  Fabs: All fabs

9 Measures; 98 GWh Energy Saved; 49,900 Metric Tons CO₂ Reduced

**Unit Replacement**
- Replace with new high-efficiency, energy-saving pumps
  
  Fabs: Fab 3, Fab 2/5, Fab 6, and Fab 8

25 Measures; 10 GWh Energy Saved; 5,100 Metric Tons CO₂ Reduced

**New Unit Specs**
- New equipment uses high efficiency, energy-saving auxiliary equipment
  
  Fabs: 12-inch fabs/Advanced backend

125 Measures; 96 GWh Energy Saved; 48,900 Metric Tons CO₂ Reduced

**Equipment Adjustments**
- Optimized power consumption
  
  Fabs: All fabs

182 Measures; 112 GWh Energy Saved; 57,000 Metric Tons CO₂ Reduced

Note: Carbon dioxide emission is 0.509 kg CO₂e/kWh; 1 kWh = 3,600 kilojoules.
In addition to expanding energy-saving facilities and equipment, TSMC is also reducing material consumption, increasing climate resiliency, and including eco-friendly designs by building certified green buildings. As of 2020, 34 fabs have received LEED gold international certifications and 23 fabs received EEWH certifications. TSMC also leads the global semiconductor industry with the largest LEED-certified architectural area, and is number one in Taiwan for the largest green building-certified areas and certified green fabs. In addition, TSMC launched the “Plant a Tree Program” in 2020, collaborating with government agencies to obtain land for creating forests and offering the public a healthier, better urban environment.

### Leading the Industry by Example

In 2020, although COVID-19 caused production and business activities around the world to decelerate, TSMC continued to actively save energy and reduce carbon emissions, hoping to serve as a benchmark for the industry. In 2020, TSMC was once again recognized as an Outstanding Manufacturer for Voluntary Greenhouse Gases Emissions Reduction by the Bureau of Industrial Development, and was rated as a leading enterprise by the Carbon Disclosure Project (CDP) for carrying out green manufacturing commitments.

TSMC has long worked to develop climate mitigation and adaption measures, and we are happy to share our insight and experiences with outside parties. The TSMC-led Taiwan Semiconductor Industry Association (TSIA) Energy Committee regularly engages with 13 association members to share energy-saving experiences and management practices. In 2020, TSMC conserved 500 GWh in energy and helped association members save a total of 300 GWh in energy as well. TSMC also helped members obtain ISO 50001 certifications and was successful with a 71% completion rate. GHG reductions reached 82% in 2020, exceeding the association’s goal.

#### TSMC Built Certified Green Buildings

- **1** Number 1 in the global semiconductor industry with the largest LEED-certified building area; number 1 most LEED-certified company in Taiwan
- **23** Largest EEWH-certified building area in Taiwan
- **13** Most green factory certifications in Taiwan
- **5** Largest exceptional smart building-certified building area in Taiwan

Note: Declared commitment to energy conservation and carbon reduction at the High-Tech Energy Saving and Carbon Emission Reduction Symposium, 30% ISO 50001 completion rate and 80% GHG reduction rate in 2030, target for 2025 is 80% ISO 50001 completion rate and 85% GHG reduction rate.

Note: In 2020, Fab 15B Phase 7 and Fab 18A Phase 1 became newly certified.
Semiconductor technologies are constantly evolving and Extreme Ultraviolet (EUV) technology is key to the successful evolution to process technologies below 5nm. Unfortunately, energy consumption from EUV machines is more than ten times that of deep ultraviolet (DUV) machines. In order to ensure both process technology advancement and environmental sustainability, TSMC is searching for ways to conserve EUV power consumption and was able to successfully increase energy efficiency by 5% in 2020 through big data analysis and improving mechanisms.

EUV machines are the most advanced machines in semiconductor lithography processes, and there is incredibly high risk associated with product quality when changing any processes. However, TSMC decided to collaborate with suppliers for the New Generation Equipment Energy Conservation Program. Research into EUV machines gave us further insight into the mechanism: EUV is reflected, on average, more than 10 times through a special transmission lens within the EUV machine. Each reflection results in 30% energy loss and so the machine preserves less than 2% of the light source power. In order to increase energy efficiency of EUV machines, TSMC turned to big data to learn about how EUV light is produced, how energy is consumed, and how it operates. We discovered that the pulse created from EUV light and transmissions lens is the main factor in energy consumption, and immediately worked to develop mitigation measures.

In 2020, TSMC first amended equipment programming to achieve optimal EUV light pulse power and redesigned the structure of the transmission lens to increase reflective rate by 3%. TSMC also analyzed data from our carbon dioxide laser system magnifier and realized that by replacing holding frequency with fluctuation frequency, we would be able to increase the magnifier’s energy efficiency by 10%. Our three-pronged approach successfully increased the energy efficiency of EUV machines by 5% and the innovative approach has now been applied to new 3nm EUV machines so that we may do our part in conserving energy and reducing carbon emissions.

TSMC successfully increased energy efficiency by 5% in 2020 through big data analysis and improving mechanisms.
Water Management

**Strategies**

- **Manage Water Resource Risk**
  - Enforce climate change mitigation policies, implement water conservation and water shortage adaptation measures.

- **Develop Diverse Water Sources**
  - Develop water reclamation technologies; continue to practice water conservation and use reclaimed water during fabrication.

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

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce unit water consumption (liter/12-inch equivalent wafer mask layer) by 30% (Base year: 2010)</td>
<td>• Reduce unit water consumption (liter/12-inch equivalent wafer mask layer) by 9% (Base year: 2010)</td>
<td>• Reduced unit water consumption by 8.9% (Base year: 2010) Target: 10%</td>
</tr>
<tr>
<td>• Increase the replacement rate of reclaimed water by more than 30%</td>
<td>• Complete the TSMC Tainan Science Park Reclaimed Water Plant and begin water supply</td>
<td>• TSMC Tainan Science Park Reclaimed Water Plant tender project completed and construction commenced</td>
</tr>
<tr>
<td>• Water pollution composite indicator reduction rate of 50% above effluent standards</td>
<td>• Water pollution composite indicator reduction rate of 44%</td>
<td>• Water pollution composite indicator reduction rate of 42.4% Target: 20%</td>
</tr>
<tr>
<td>• Discharged less than 6.3 ppm of tetramethylammonium hydroxide (TMAH)</td>
<td></td>
<td>• Discharged less than 6.3 ppm of TMAH Target: Less than 6 ppm</td>
</tr>
</tbody>
</table>

Note 1: Replace city water with reclaimed domestic or industrial wastewater.
Note 2: The scope of water pollution projects and figures include Taiwan facilities and VioEra.
Note 3: 2030 Goals raised from 30% to 50%.
Note 4: Due to test production in new fabs, unit water consumption did not meet our target. TSMC continues to commit to the development of water reclamation technologies. The TSMC Tainan Science Park Reclaimed Water Plant is expected to be operational by 2021.
Note 5: Due to increased fab production, TMAH concentration levels in discharge failed to meet the target. TSMC is evaluating expansion of the treatment system.
In 2020, TSMC adopted the Water Risk Atlas from the World Resources Institute (WRI) to evaluate water risk levels in areas with TSMC facilities by using key indicators of water supply, effluent water quality, and regulatory/reputation risks. TSMC facilities in Taiwan and our affiliate VisEra were both rated medium-to-low risk while Wafertech was rated low risk. TSMC (China) and TSMC (Nanjing) were rated high and medium-to-high risk as they face differences in water quality in their regions and require refined water, thereby increasing wafer unit water consumption.

In 2020, TSMC became the first to bring 5 nanometer (5nm) process technologies to mass production. TSMC increased clean water consumption as 5nm process technology includes advanced wafer stacking and reduced wire width, meaning that the smallest dust particle could have an impact on yield. This further demonstrates the importance of effectively using water resources and flexibility in water resource management.

TSMC strives for comprehensive water cycle management through the following three major strategies: managing water resource risk, developing diverse water sources, and developing preventive measures.

**TSMC Water Consumption Rate at Three Science Parks**

- **Hsinchu Science Park**
  - Baoshan Reservoir
  - Second Baoshan Reservoir
  - Reservoirs
  - TSMC Water Consumption Rate: 5.7 ten thousand metric tons/day (appx. 10.3%)

- **Central Taiwan Science Park**
  - Liyutan Reservoir
  - Deji Reservoir
  - Reservoirs
  - TSMC Water Consumption Rate: 5.4 ten thousand metric tons/day (appx. 3.7%)

- **Southern Taiwan Science Park**
  - Nanhua Reservoir
  - Zengwen Reservoir
  - Reservoirs
  - TSMC Water Consumption Rate: 8.2 ten thousand metric tons/day (appx. 8.5%)
Effective Water Management with AWS

The Alliance for Water Stewardship (AWS) sets the global standard for sustainable water management. TSMC became the first semiconductor company in the world to receive Platinum Certification when Fab 6 and Fab 14B were certified. Other TSMC fabs are using the "smart copy" technique to earn AWS certifications as well. In 2020, Fab 15A and Fab 15B broke records again by obtaining Platinum Certifications from AWS. In 2021, TSMC will be focusing on certifications for Hsinchu facilities including Fab 12A, Fab 12B, Fab 5, and Advanced Backend Fab 3.

Water Balance and Supply Chain Environmental Relationship Chart

---

**AWS Five Achievements**

<table>
<thead>
<tr>
<th>Excellent Management System</th>
<th>Sustainable Water Balance</th>
<th>Good Water Quality</th>
<th>Healthy Water Environment</th>
<th>Safe Drinking Water and Sanitation Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Source</td>
<td>Facility Water Balance</td>
<td>Water Discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Stress Management Blueprint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Water Source**
- Diverse water resource supply
  - TSMT Water Reclamation Plant in Southern Taiwan Science Park
  - Water Reclamation Plants in Yongkang and Anping, Taiwan

**Facility Water Balance**
- Irrigation
- Recycled Rainwater System
- Domestic Water Consumption
- Air Scrubbing in Cleanrooms
- Domestic Wastewater
- Reclaiming air-scrubbing water from cleanrooms

**Water Discharge**
- Biological Treatment System
  - COD Decomposition
  - Onsite Wastewater Treatment Plant

**Water Recycling System**
- Ultrapure Water System
  - Tool Production
- Backwash Wastewater Recycling
- Liquid waste distribution

**Smart Water Management**
- Reclaimed AC Water
- Reclaiming AC condensation water
- Water allocation
- Water Recycling System
- Water Plant

**Water Plant**
- Rainfall
- Rivers
- Monitor reservoir water levels

---

**Water Balance and Supply Chain Environmental Relationship Chart**

---

**Effective Water Management with AWS**

The Alliance for Water Stewardship (AWS) sets the global standard for sustainable water management. TSMC became the first semiconductor company in the world to receive Platinum Certification when Fab 6 and Fab 14B were certified. Other TSMC fabs are using the "smart copy" technique to earn AWS certifications as well. In 2020, Fab 15A and Fab 15B broke records again by obtaining Platinum Certifications from AWS. In 2021, TSMC will be focusing on certifications for Hsinchu facilities including Fab 12A, Fab 12B, Fab 5, and Advanced Backend Fab 3.
As a result of climate change, 2020 was the first year without typhoons since 1964. Without typhoons, the reservoir watershed experienced a sharp decline in rainfall collection. TSMC deployed a blueprint for water stress management to monitor water levels in various reservoirs and adopted a water balance chart to take stock of water conservation measures. In May 2020, when the drought monitoring signal changed from blue to green (indicating fairly severe drought conditions), TSMC immediately established a Drought Emergency Response Team to monitor water sources and water truck capacities and reduce water consumption by 5%. Water levels remained low until November 2020, during which TSMC decided to further reduce water consumption by 7%. Smart water recycling management mechanisms were activated to allocate reclaimed water to TSMC facilities and increase water efficiency.

**Drought Contingency Measures**

<table>
<thead>
<tr>
<th>Drought Monitoring Signal from the Water Resources Agency</th>
<th>Government Response Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue (Normal water levels)</td>
<td>Stabilize supply and demand</td>
</tr>
<tr>
<td>Green (Fairly severe)</td>
<td>Encourage farmers to suspend farming</td>
</tr>
<tr>
<td>Yellow (First stage)</td>
<td>Suspend water supply for irrigation in certain areas for specific times</td>
</tr>
<tr>
<td>Orange (Second stage)</td>
<td>Reduce water supply to industrial users by 5-20%</td>
</tr>
<tr>
<td>Red (Third stage)</td>
<td>Ration water by district</td>
</tr>
</tbody>
</table>

**Water Conservation Measures & Achievements in 2020**

**TSMC**

<table>
<thead>
<tr>
<th>Response Measures</th>
<th>TSMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor WRA reservoirs supplying water to TSMC facilities and regularly host drills</td>
<td>24,000 metric tons</td>
</tr>
<tr>
<td>Drought Emergency Response Team begins to monitor water sources/water truck capacities and reduce water consumption by 5%</td>
<td>270,000 metric tons</td>
</tr>
<tr>
<td>Perform Water truck drills Reduce water consumption by 7%</td>
<td>6,000 metric tons</td>
</tr>
<tr>
<td>Activate water trucks Reduce water supply by 5-20% Reduce water consumption by 7-20% (Not initiated in 2020)</td>
<td>71,000 metric tons</td>
</tr>
</tbody>
</table>

**Government**

<table>
<thead>
<tr>
<th>Response Measures</th>
<th>Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilize supply and demand</td>
<td></td>
</tr>
<tr>
<td>Encourage farmers to suspend farming</td>
<td></td>
</tr>
<tr>
<td>Suspend water supply for irrigation in certain areas for specific times</td>
<td></td>
</tr>
<tr>
<td>Reduce water supply to industrial users by 5-20%</td>
<td></td>
</tr>
<tr>
<td>Ration water by district</td>
<td></td>
</tr>
</tbody>
</table>

**New 2020 Additional Water Conservation Levels**

- Increased the water production rate of RO recycling systems (1.3%)
- Improved usage efficiency by allocating reclaimed water (14%)
- Reduced cooling tower and sand filter backwash water (0.3%)
- Extend regeneration and backwash cycle for clean water & recycling system (3.7%)
- Rationed the water production rate of RO recycling systems (1.3%)
- Improved usage efficiency by allocating reclaimed water (14%)
- Reduced cooling tower and sand filter backwash water (0.3%)
- Extend regeneration and backwash cycle for clean water & recycling system (3.7%)

**Strengthen Water Management & Increase Water Recycling**

The four major water conservation measures at TSMC are to "Reduce Facility System Water Consumption, Increase Wastewater Recycling of Facilities, Improve Water Production Rate of the System, and Decrease Water Discharge Loss from the System". These four measures are integrated with the three water management processes of "Water Supply Diversity, Water Efficiency Management, and Wastewater Resource Recycling". TSMC strives to uncover more opportunities to conserve water and has developed 38 distribution systems based on the composition and concentration of wastewater from fabrication for wastewater classification and resource management. Equipment is then used to decompose pollutants and increase water recycling. With 9 recycling systems and 13 wastewater facilities, TSMC has been able to develop 10 renewable materials as of 2020.
Wafer unit water consumption continues to increase due to stricter requirements for clean water from advanced processes and optimized operations. TSMC is implementing our four water conservation measures to increase water sources and reduce water consumption, but we continue to seek other opportunities to conserve water. In 2020, TSMC launched a backwash wastewater recycling system and was able to conserve 297,000 metric tons of water, further increasing water conservation levels in 2020 to 1.927 million metric tons, and reducing wafer unit water consumption to 128.4 (L/12-inch equivalent wafer mask layer). TSMC was able to achieve an 8.9% reduction from the base year but was unable to meet our annual target. In 2021, the TSMC Tainan Science Park Reclaimed Water Plant will become operational and it is expected to reduce TSMC’s demand for city water. In 2020, the wafer unit wastewater discharge was 86.0 (L/12-inch equivalent wafers mask layer), which was a 3.9% reduction from last year. This indicates that our four water conservation measures are effective in reducing pollutant concentration and increasing water recycling.
### Milestones in Water Reuse

#### Procurement, Tenders and Project Collaboration
- Collaborate with partner firms for the establishment of water reclamation plant
- Participate in the promotion of reclaimed water in Taiwan with the Construction and Planning Agency of the Ministry of Interior, the Water Resources Agency of the Ministry of Economic Affairs, and the Water Resources Bureau of the Tainan City Government

#### Construct Water Reclamation Plant and Supply Water
- Construct domestic water reclamation plant and supply water
- Construct industrial water reclamation plant and supply water

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>• Construction contract signed for TSMC Tainan Science Park Reclaimed Water Plant&lt;br&gt;• Wastewater supply network and construction of the Tainan Science Park Reclaimed Water Plant&lt;br&gt;• Commenced construction of water reclamation plant in Yongkang, Tainan</td>
</tr>
<tr>
<td>2020</td>
<td>• Supply 5,000 tons/day of water from the water reclamation plant in TSMC Tainan Science Park Reclaimed Water Plant&lt;br&gt;• Increase water supply from the TSMC Tainan Science Park Reclaimed Water Plant to 10,000 tons/day&lt;br&gt;• Supply TSMC with 5,000 tons/day of water from the water reclamation plant in Yongkang, Tainan&lt;br&gt;• Supply TSMC with 10,000 tons/day of water from the water reclamation plant in Anping, Tainan</td>
</tr>
<tr>
<td>2021</td>
<td>• Supply 5,000 tons/day of water from the water reclamation plant in Yongkang, Tainan&lt;br&gt;• Increase water supply from the TSMC Tainan Science Park Reclaimed Water Plant to 20,000 tons/day&lt;br&gt;• Supply TSMC with 9,500 tons/day of water from the water reclamation plant in Yongkang, Tainan&lt;br&gt;• Increase water supply for TSMC from the water reclamation plant in Anping, Tainan to 37,500 tons/day</td>
</tr>
<tr>
<td>2022</td>
<td>• Supply 20,000 tons/day of water from the water reclamation plant in TSMC Tainan Science Park Reclaimed Water Plant&lt;br&gt;• Supply TSMC with 9,500 tons/day of water from the water reclamation plant in Yongkang, Tainan&lt;br&gt;• Increase water supply for TSMC from the water reclamation plant in Anping, Tainan to 37,500 tons/day</td>
</tr>
</tbody>
</table>

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

Reduce Pollutant Concentration in Effluents

As a leader in the global semiconductor industry, TSMC is working on developing a variety of measures for water pollution prevention to mitigate impact on the environment caused by TSMC operations. Suspended solids, ammonia nitrogen, and copper ion are key pollutants that were reduced to legally required effluent standards ahead of schedule in 2018 and 2019. In 2020, Tetramethylammonium hydroxide (TMAH) concentration was reduced to 6.3ppm but failed to achieve the 2020 target despite a 20% reduction from the previous year. TSMC is working to reduce TMAH concentration by developing low-concentration TMAH recycling and anion adsorption technologies. COD reduction is more difficult to achieve because evolving fabrication processes have increased demand for organic compounds. TSMC hopes to develop biological treatment systems that can help achieve 100ppm by 2025.

Water Pollution Composite Indicator

For a comprehensive insight into the environmental impact of effluent pollutants, TSMC has developed a water pollution composite indicator based on eight major pollutants. The indicator is capped by legal effluent standards and serves as a key indicator in reducing and preventing pollutant concentration in effluents. In response to evolving fabrication processes and increased demand for chemicals, TSMC will continue to develop its own membrane bioreactor system and has increased reduction goals in 2030 from 30% to 50%. In 2020, the Water Pollution Composite Indicator was reduced by 42.4%, exceeding the 20% target of the year.

Preventive Techniques on Key Pollutants of Wastewater Quality

<table>
<thead>
<tr>
<th>Key Pollutant Index</th>
<th>Overall Water Pollution Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieved 2025 goals ahead of schedule</td>
<td>Water Pollution Composite Indicator Reduction Rate 44%</td>
</tr>
<tr>
<td>• Suspended Solids 29.4 ppm</td>
<td>2021 Ongoing</td>
</tr>
<tr>
<td>• Copper Ion 0.09 ppm</td>
<td></td>
</tr>
<tr>
<td>• Ammonia Nitrogen 17.31 ppm</td>
<td></td>
</tr>
<tr>
<td>• TMAH 6.3 ppm</td>
<td></td>
</tr>
<tr>
<td>• COD 194 ppm</td>
<td></td>
</tr>
<tr>
<td>Achieved 2025 goals ahead of schedule</td>
<td></td>
</tr>
<tr>
<td>• Coagulation and precipitation from backwashing wastewater</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>• Update ammonia nitrogen treatment system</td>
<td>• Recycle low-concentration liquid waste</td>
</tr>
<tr>
<td>• Separation copper-containing liquid waste and electroplating</td>
<td>• Set up biological treatment system</td>
</tr>
<tr>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Note: Data includes Taiwan Facilities.</td>
<td></td>
</tr>
</tbody>
</table>

Develop Preventive Measures

Reduce Pollutant Concentration in Effluents

As a leader in the global semiconductor industry, TSMC is working on developing a variety of measures for water pollution prevention to mitigate impact on the environment caused by TSMC operations. Suspended solids, ammonia nitrogen, and copper ion are key pollutants that were reduced to legally required effluent standards ahead of schedule in 2018 and 2019. In 2020, Tetramethylammonium hydroxide (TMAH) concentration was reduced to 6.3ppm but failed to achieve the 2020 target despite a 20% reduction from the previous year. TSMC is working to reduce TMAH concentration by developing low-concentration TMAH recycling and anion adsorption technologies. COD reduction is more difficult to achieve because evolving fabrication processes have increased demand for organic compounds. TSMC hopes to develop biological treatment systems that can help achieve 100ppm by 2025.

Water Pollution Composite Indicator

For a comprehensive insight into the environmental impact of effluent pollutants, TSMC has developed a water pollution composite indicator based on eight major pollutants. The indicator is capped by legal effluent standards and serves as a key indicator in reducing and preventing pollutant concentration in effluents. In response to evolving fabrication processes and increased demand for chemicals, TSMC will continue to develop its own membrane bioreactor system and has increased reduction goals in 2030 from 30% to 50%. In 2020, the Water Pollution Composite Indicator was reduced by 42.4%, exceeding the 20% target of the year.

Preventive Techniques on Key Pollutants of Wastewater Quality

<table>
<thead>
<tr>
<th>Key Pollutant Index</th>
<th>Overall Water Pollution Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieved 2025 goals ahead of schedule</td>
<td>Water Pollution Composite Indicator Reduction Rate 44%</td>
</tr>
<tr>
<td>• Suspended Solids 29.4 ppm</td>
<td>2021 Ongoing</td>
</tr>
<tr>
<td>• Copper Ion 0.09 ppm</td>
<td></td>
</tr>
<tr>
<td>• Ammonia Nitrogen 17.31 ppm</td>
<td></td>
</tr>
<tr>
<td>• TMAH 6.3 ppm</td>
<td></td>
</tr>
<tr>
<td>• COD 194 ppm</td>
<td></td>
</tr>
<tr>
<td>Achieved 2025 goals ahead of schedule</td>
<td></td>
</tr>
<tr>
<td>• Coagulation and precipitation from backwashing wastewater</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>• Update ammonia nitrogen treatment system</td>
<td>• Recycle low-concentration liquid waste</td>
</tr>
<tr>
<td>• Separation copper-containing liquid waste and electroplating</td>
<td>• Set up biological treatment system</td>
</tr>
<tr>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Note: Data includes Taiwan Facilities.</td>
<td></td>
</tr>
</tbody>
</table>
## Wastewater Classification and Resource System

### Hydrofluoric (HF) Acid Wastewater
- HF acid wastewater (2 types)
- Ozone-containing HF acid wastewater
- Manufacturing process scrubbing water
- Hydrofluoric (HF) acid wastewater
- Local scrubber wastewater recycling

### Acidic, Caustic, and Organic Wastewater
- Deionized water
- Ozone-containing deionized water
- Acidic wastewater (2 types)
- Ozone-containing acidic wastewater
- Caustic wastewater
- Ozone-containing Caustic wastewater
- TMAH wastewater
- Organic wastewater (2 types)
- Acidic wastewater recycling
- Ozone-containing acidic wastewater recycling
- Caustic wastewater recycling
- Caustic wastewater upcycling
- Organic wastewater recycling

### CMP Wastewater
- Electroplating wastewater
- CMP wastewater (2 types)
- Copper-containing CMP wastewater
- Cobalt-containing CMP wastewater
- Chemical coagulation recycling of CMP wastewater
- Copper-containing CMP wastewater upcycling

### High-concentration Liquid Waste
- Waste sulfuric acid
- Waste copper sulfate
- Cobalt-containing liquid
- Other wastewater (16 types)
- Waste-H2SO4 reclamation
- Copper-containing electroplating wastewater recycling
- Cobalt-containing electroplating wastewater recycling

### Recycling Systems
- Degraded water recycling
- Ozone-containing degraded water recycling
- Acidic wastewater recycling
- Ozone-containing acidic wastewater recycling
- Caustic wastewater recycling
- Ozone-containing Caustic wastewater recycling
- TMAH wastewater recycling
- Biological treatment system for organic wastewater

### Wastewater Treatment
- Chemical coagulation treatment of HF acid wastewater
- HF (including ammonia) treatment
- Biological treatment of HF acid wastewater
- Acidic and Caustic wastewater treatment
- NH4-N wastewater treatment and recycling
- TMAH liquid waste recycling
- Biological treatment system for organic wastewater

### Products Recycled
- Silicon slurry
- Calcium fluoride
- Fluorite
- Ammonium sulfate
- Ammonia water
- Gypsum
- TMAH
- Sulfuric acid
- Copper bar
- Cobalt bar

---

**Note 1:** TMAH stands for Tetramethylammonium hydroxide
**Note 2:** Among these recycled products, sulfuric acid and electronic grade coating copper are reused on TSMC sites, while the rest are reused externally by other industries.
**Note 3:** Introduced silicon slurry recycling in 2020.
Track Distribution in High-concentration Organic Matter Processes to Reduce COD Emissions > 90%

Semiconductor manufacturing technology continues to advance, increasing the demand for organic compounds as well as increasing COD levels in effluents. To improve water quality, TSMC has designed a distribution system to collect advanced organic wastewater (AOR) and monitor equipment that emit high-concentration organic compounds. TSMC has been able to reduce COD concentration by more than 90% through adjusting organic compound emission parameters on equipment. Organic wastewater from semiconductors requires a more complex biological treatment than regular organic wastewater. TSMC invested labor and resources to sustain our environment, successfully developing a membrane bioreactor system applicable to semiconductor manufacturing to further reduce COD levels.

Developing Hydrofluoric Acid Wastewater Membrane Bioreactor System to Reduce COD

The membrane bioreactor system is a key technology that resolves previous problems with organic wastewater. However, the system requires a large area and the process faces problems with clogging from biological thin films as the organic wastewater from semiconductor fabrication contains hydrofluoric acid. As such, TSMC is working to develop a membrane bioreactor system applicable to semiconductor manufacturing. High-concentration organic wastewater sources are first identified and channeled into the membrane bioreactor system to reduce the size of the system and ensure the system can be placed within fabs. Organic wastewater containing hydrofluoric acid will undergo reverse osmosis to increase fluoride ion levels, increase efficiency gain with calcium fluoride, and contain calcium carbonate levels (water hardness) below 300 ppm. An automatic thin film pickling device is also designed so that bacteria can adhere to the permeable membrane for better performance, reduced clogging, and water recycling.

In 2020, Fab 18A successfully used a distribution tracking to improve machinery emission parameters and reduce COD emission concentration to 150 ppm with the help of TSMC’s unique membrane bioreactor system. Fab 18A accomplished a major milestone for new fabs and its processes will become the design standard for future fabs. We are also advancing our biological treatment of organic wastewater to drive green manufacturing, and expect to achieve <100 ppm in COD emissions by 2025.

COD Treatment Process

[Diagram of COD Treatment Process]

- Biological thin film treatment process
  - Machine using organic compounds
  - Use RO system to recycle water produced from the biological treatment system
  - Recyclable water
  - Low-concentration COD Wastewater discharge

- Regular wastewater treatment
  - Low-concentration organic wastewater
  - Wastewater tanks
  - Reverse osmosis (RO) system
  - Science park wastewater plant
## Waste Management

### Strategies

#### Source Reduction
Promote waste reduction by source separation and require vendors to provide low chemical consumption equipment.

- **2030 Goals**
  - Outsourced unit waste disposal per wafer $\leq 0.50$ kg (12-inch equivalent wafer mask layer)

- **2020 Achievements**
  - Achieved

#### Circular Economy
Collaborate with vendors to develop new waste recycling technology to increase the amount of waste recycled and reused.

- **2030 Goals**
  - Outsourced unit waste disposal per wafer $\leq 1.01$ kg (12-inch equivalent wafer mask layer)

- **2021 Targets**
  - In-house resource recycling rate $\geq 22\%$
  - Target: $\geq 23\%$

#### Audit and Guidance
Conduct audits, joint evaluation and guidance based on regulations governing waste treatment vendors in high-tech industry.

- **2030 Goals**
  - All waste treatment vendors shall acquire ISO 14001 or other international EHS Management certifications

- **2021 Targets**
  - 82% of waste treatment vendors shall acquire ISO 14001 or other international EHS Management certifications

- **2020 Achievements**
  - 80% of waste treatment vendors have acquired ISO 14001 or other international EHS Management certifications
  - Target: 75%

---

**Note1**: The unit product indicator for outsourced unit waste treatment per wafer is calculated based on 12-inch wafer equivalent starting in 2020. Accordingly, the goal was adjusted from 0.22 (kg/8-inch equivalent wafer mask layer) to 0.50 (kg/12-inch equivalent wafer mask layer).

**Note2**: See section on “Source Reduction” for reasons why targets were not achieved.

**Note3**: TSMC will be building advanced manufacturing facilities in 2021. Considering the initial demand for equipment cleaning and wafer testing in new facilities, the target set for outsourced unit waste treatment per wafer in 2021 is higher than that of 2020. To achieve the $\leq 0.50$ target for 2030, TSMC will launch programs including raw material reduction, expanding in-house resource recycling equipment, building a zero waste manufacturing center and electronic-grade material recycling trials.

**Note4**: TSMC requires waste treatment vendors to at least acquire ISO14001 or ISO45001 certifications as the basis for standardized management. Waste treatment vendors include waste treatment and recycling vendors. Vendors exempted from online reporting, government-owned enterprises, or public-to-private enterprises are excluded from the aforementioned vendors.
As a practitioner of green manufacturing, TSMC’s waste management strategies abide by the principle of waste minimization, resource recycling, and reuse maximization. In 2020, the waste recycling rate reached 95% for the sixth consecutive year. TSMC achieves source optimization and minimization by adjusting raw materials usage parameters at the source and technical solutions for process technology. After raw materials are used in manufacturing processes, onsite recycling is prioritized so that resources are sufficiently reused instead of being disposed of as waste right away. TSMC also promotes source reduction throughout the supply chain to facilitate waste reduction upstream, and the reuse of wafer cassettes at downstream packaging and testing facilities.

TSMC’s waste resource management makes use of in-house resource recycling equipment and turns waste into products. Furthermore, TSMC approved construction plans for our first Zero-Waste Manufacturing Center in 2020. When waste treatment needs to be outsourced, recycling and recovery are prioritized over incineration and landfill to ensure optimal resource utilization. The percentage of waste sent to landfills has been less than 1% for the past 11 years as of 2020.

In addition to implementing a circular economy, TSMC also takes full responsibility for the management of waste clean-up, treatment, and recycled product flow. Under the Waste Treatment Vendor Sustainability Enhancement Project, 80% of waste treatment vendors have acquired ISO14001 certification. At the same time, the existing waste life cycle management procedure is continuously being upgraded towards the more systematic, automated, and smart Intelligent Waste Management Procedure with Full Traceability. In 2020, TSMC collaborated with the Environmental Protection Administration (EPA) to establish the first Automated Waste Disposal Declaration Platform in the industry. It provides a mechanism for real-time waste declaration and clean-up monitoring launched along with TSMC’s GPS Satellite Fleet System. In addition, the Intelligent Management Plan for Proper Waste Treatment was started to launch to fully replace manual inspection. Systematic cloud-based tracking is used to trace recycled product transport and flow to prevent illegal waste disposal. Waste treatment vendors are encouraged to keep pace with TSMC in achieving environmental sustainability.
### 2020 Total Waste Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>6,777</td>
<td>291,984</td>
<td>705,850 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>7,977</td>
<td>361,968</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>16,017</td>
<td>377,767</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>21,235</td>
<td>395,480</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>25,466</td>
<td>550,275</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note1:** Data includes Taiwan facilities.

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.

### Outourced Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4,685</td>
<td>158,899</td>
<td>226,962 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>5,037</td>
<td>196,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>5,501</td>
<td>208,340</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7,119</td>
<td>212,465</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7,700</td>
<td>269,640</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.

### Percentage of Recycled Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4,685</td>
<td>158,899</td>
<td>226,962 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>5,037</td>
<td>196,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>5,501</td>
<td>208,340</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7,119</td>
<td>212,465</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7,700</td>
<td>269,640</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.

### Outsourced General Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4,685</td>
<td>158,899</td>
<td>226,962 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>5,037</td>
<td>196,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>5,501</td>
<td>208,340</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7,119</td>
<td>212,465</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7,700</td>
<td>269,640</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.

### Outsourced Hazardous Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4,685</td>
<td>158,899</td>
<td>226,962 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>5,037</td>
<td>196,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>5,501</td>
<td>208,340</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7,119</td>
<td>212,465</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7,700</td>
<td>269,640</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.

### Percentage of Waste Sent to Landfill

<table>
<thead>
<tr>
<th>Year</th>
<th>Taiwan facilities</th>
<th>Subsidiaries</th>
<th>Total Waste Production</th>
<th>Percentage of Recycled Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4,685</td>
<td>158,899</td>
<td>226,962 metric tons</td>
<td>95%</td>
</tr>
<tr>
<td>2017</td>
<td>5,037</td>
<td>196,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>5,501</td>
<td>208,340</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>7,119</td>
<td>212,465</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7,700</td>
<td>269,640</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note2:** The data is compiled based on waste disposal declaration data and the processing capacity of in-house resource recycling facilities.

**Note3:** Subsidiaries will start recycle evaluation plan to reduce landfill rate in 2021.
Source Reduction

As complexity and production capacity increase in advanced processes, TSMC’s raw material consumption increases along with waste generation. To reduce environmental impact, TSMC established a Waste Management Task Force and the Unit Waste Production Management System in a cross-organizational effort. The self-imposed management mechanism is enhanced with the Plan-Do-Check-Act (PDCA) management cycle to commit to source reduction. In 2020, TSMC implemented 226 waste management improvement measures, including process simplification, extending the life cycle of chemicals and maintenance schedule, exploring new chemical alternatives, and introducing high-temperature manufacturing processes. A total of 37,858 metric tons of waste were reduced as TSMC strives to lower material use and waste production from all dimensions. New TSMC facilities began operations in 2020. Due to the complexity of new process development, higher demand for wafer cleanliness, and the need to continue adjusting and optimizing operations system, the outsourced unit waste treatment per wafer was 1.01 (kg 12-inch equivalent wafer mask layer). The in-house resource recycling rate was 22%, which also missed the original goal for the year. In the future, TSMC will continue to implement measures such as reducing chemicals at the source, expanding in-house resource recycling facilities, building and launching the Zero-Waste Manufacturing Centers, and reusing electronic-grade materials to meet the 2030 goal of achieving 0.5 kg outsourced waste treatment per wafer.

Waste Reduction Management Mechanism

**Waste Reduction Measures and Results in 2020**

<table>
<thead>
<tr>
<th>Case</th>
<th>Waste Management Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 cases</td>
<td>Chemical use time/flow reduction</td>
</tr>
<tr>
<td>43 cases</td>
<td>Process simplification solution</td>
</tr>
<tr>
<td>34 cases</td>
<td>Chemical alternatives</td>
</tr>
<tr>
<td>28 cases</td>
<td>Life cycle extension of chemicals</td>
</tr>
<tr>
<td>9 cases</td>
<td>Maintenance schedule extension</td>
</tr>
<tr>
<td>7 cases</td>
<td>Introduction of high-temperature process</td>
</tr>
<tr>
<td>2 cases</td>
<td>Copper-containing/cobalt-containing liquid waste electrolysis</td>
</tr>
<tr>
<td>1 cases</td>
<td>Ammonium sulfate waste crystallization</td>
</tr>
<tr>
<td>1 cases</td>
<td>Silicon-containing liquid waste filter press dehydration</td>
</tr>
<tr>
<td>1 cases</td>
<td>Sulfuric acid liquid waste reclamation</td>
</tr>
</tbody>
</table>

> 30,000 metric tons Manufacturing Equipment Waste Reduction

> 150,000 metric tons In-house Recycling Equipment
Circular Economy

Dedicated to the implementation of a circular economy, TSMC is no longer just a waste resources producer. To strengthen control over product flow and reduce risks derived from mishandling by outsourced vendors, TSMC continues to implement the ‘Action Plan to Turn Waste into High-Value Products’, which includes the development and introduction of resource recycling technologies and equipment. Waste resources produced in manufacturing processes are revitalized and remade into products to be used within TSMC facilities or sold to other industries.

Timeline for the Waste-to-Value Action Plan

Since 2015, TSMC has been actively implementing on-site reuse of waste sulfuric acid, and has set up equipment to recycle cobalt-containing and copper-containing liquid wastes to reduce sulfuric acid consumption and outsourced treatment of cobalt-containing and copper-containing liquid wastes. To increase the value of materials recycled from copper-containing liquid waste, TSMC worked with raw material suppliers on developing purification procedures that remake pure recycled copper tubes into electronic-grade copper anodes. A cumulative total of over 10 metric tons of electronic-grade copper anodes have been reused in TSMC manufacturing processes as of 2020. In addition, TSMC has built the Ammonium Sulfate Waste Crystallization System to optimize operational procedures and efficiency. In expanding in-house resource recycling equipment, TSMC introduced the “Physical Regeneration Technique for Backgrinding Wastewater”, that turns silicon-containing liquid waste into industrial silicon cake, TSMC’s fifth recycled product. In 2020, TSMC recycled over 150,000 metric tons of waste and produced 120,000 metric tons of products, creating more than NT$500 million of value in resources circulation.

In 2020, TSMC approved construction plans for the Zero-Waste Manufacturing Center in the Central Taiwan Science Park. Construction is scheduled to complete in 2023. At the same time, TSMC participated in technology development and launched the electronic-grade chemicals recycling pilot line including IPA and cyclopentanone and ammonia. The goal is to purify IPA, cyclopentanone and ammonium sulfate waste into reusable materials for TSMC processes and subsequently reduce environmental impact through material reclamation.

TSMC Aspires to be a Practitioner of Circular Economy

Approved construction plans for the first Zero-waste Manufacturing Center
- Started selling cobalt tubes
- Activated silicon-containing liquid waste resource recycling equipment
- Began sales of industriel silicon products

2020
- Activated copper-containing liquid waste resource reuse equipment
- Activated waste sulfuric acid resource reuse equipment
- Achieved zero waste or zero purchasing goals
- Established our first electronic-grade chemical recycling test line

2025
- Expanded in-house resource recycling equipment
- Consolidated waste resources circulation
- Achieved zero purchase of industrial-grade sulfuric acid
- Established our first electronic-grade sulfuric acid recycling test line
- Achieved zero cobalt-containing liquid waste resource reuse equipment
- Achieved zero cobalt-containing liquid waste

Waste
- Semiconductor Process
- Raw Material
- Zero-Waste Manufacturing Center
- Waste Treatment Vendor Disposal
- Waste Treatment Vendor Recycling, Reuse and Disposal
- Reuse for Other Industries

Cost saved from waste reduction
620,900 Thousand (NT$)

Income generated from waste recycling
524,100 Thousand (NT$)

Note: Income value statistics cover Taiwan facilities.
Ammonium Sulfate Waste Crystallization System 2.0 Significantly Increases Treatment Capacity by 400%

In response to the advancement of manufacturing processes and capacity, TSMC continues to strengthen efforts towards achieving a circular economy and effectively reducing the environmental impact of increased waste. TSMC collaborated with vendors throughout the supply chain to assess and improve the Ammonium Sulfate Waste Crystallization System. In 2020, TSMC completed the development of Ammonium Sulfate Waste Crystallization System 2.0. Heating equipment is introduced to accelerate the heating cycle and reduce production loss after regular maintenance. Digital dashboards monitor ionic concentration of the system to stabilize evaporation capacity. Also, the automated rinsing mechanism prevents blockage of process route to maintain solid-liquid separation performance. The upgraded system can increase treatment capacity by 400% from 400 metric tons to 2,000 metric tons a month. Accordingly, the system will become standardized in new facilities built in the future.

Since 2018, TSMC has reduced over 15,800 metric tons of ammonium sulfate liquid waste outsourced for treatment and produced 4,200 metric tons of industrial ammonium sulfate crystals. The value created from waste recycling and reduction has exceeded NT$35 million. TSMC will adopt the "smart copy" technique to introduce the Ammonium Sulfate Waste Crystallization System to existing facilities. In 2022, the system can reduce ammonium sulfate outsourced for treatment by an estimated 60,000 metric tons per year and yield more than 15,000 metric tons of industrial ammonium sulfate crystals, which will create NT$130 million in value.

TSMC In-House Ammonium Sulfate Waste Recycling Timeline

- 2018: Fab 15A adopted the Ammonium Sulfate Waste Crystallization System 1.0.
- 2019: Introduced digital monitoring, automated rinsing mechanism and other treatment capacity improvement measures and assessments.
- 2020: Introduced the Ammonium Sulfate Waste Crystallization System 2.0 to existing facilities.
- 2021: Completed the development of Ammonium Sulfate Waste Crystallization System 2.0 to be standardized in new facilities.
- 2022: Ammonium sulfate liquid waste resource recycling rate exceeds 90%.

Ammonium Sulfate Waste Crystallization System

<table>
<thead>
<tr>
<th>Feature</th>
<th>1.0</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Unit</td>
<td>Slower temperature rise</td>
<td>Accelerate temperature rise</td>
</tr>
<tr>
<td>Crystallization Unit</td>
<td>Manual inspection on ionic concentration</td>
<td>Digital monitoring dashboard</td>
</tr>
<tr>
<td>Solid-Liquid Separation</td>
<td>Dehydration</td>
<td>Auto-monitoring and control over ionic concentration</td>
</tr>
<tr>
<td>Dehydration</td>
<td>Screening/Packaging</td>
<td>Automated rinsing mechanism</td>
</tr>
<tr>
<td>Industrial Ammonium Sulfate Crystal</td>
<td></td>
<td>Manual removal of blockage</td>
</tr>
</tbody>
</table>
Committed to source reduction and achieving a circular economy, TSMC also takes full responsibility for the management of outsourced waste treatment through the Waste Treatment Vendor Sustainability Enhancement Project. For new vendor selection, TSMC has a cross-division team of experts and a comprehensive selection procedure to carefully choose outstanding vendors to work with. A document review and onsite operational inspection will be conducted in six dimensions. Qualified vendors are subjected to weekly and monthly document reviews and quarterly and annual onsite inspections. Eight dimensions covering 166 inspection items are listed in accordance with the Waste Treatment Vendor Annual Audit Plan. Lastly, vendor replacement is carried out based on the three dimensions stipulated in the Annual Evaluation for Waste Treatment Vendors.

In 2020, TSMC audited over 55 waste treatment vendors on site, reaching a 100% inspection rate, and 79 deficiencies were improved. The percentage of vendors evaluated as “excellent” and “good” has improved from 36% in 2015 to 75%. The number of vendors certified for ISO14001 increased to 44, accounting for 80% of all vendors. In striving for excellence, TSMC initiated the Intelligent Waste Management Procedure with Full Traceability. Through the introduction of smart automation, manual inspections can be replaced with systematic management of suspicious activities through auto-detection and reporting. The procedure will enhance vendor sustainability as TSMC is committed to achieving green manufacturing.

Zero-waste Manufacturing Center Facilitates Circular Economy

In addition to proactively developing waste recycling technologies to recycle and reuse waste materials, TSMC initiated a project to build our first Zero-waste Manufacturing Center. Proposing a novel circular economy model, the project aims to purify waste resources into semiconductor-grade chemicals that will return to TSMC manufacturing processes. The recycled material will substitute for at least 30% of raw material demand. The project also plans to recover residual heat from waste resources as assisting energy, which will reduce energy demand in recycling processes, enabling TSMC to truly meet its sustainability goal of developing green manufacturing using green technologies. TSMC’s first Zero-waste Manufacturing Center, which will be located in Central Taiwan Science Park, was approved by the Board of Directors in 2020. The construction work begins in 2021. Guided by the three principles of maximum waste reduction, optimal environmental benefits, and minimized management risk, the center is expected to reduce outsourced waste treatment by 140,000 metric tons each year and create NT$1.2 billion of value in waste recycling and reduction. It will be our first facility based on circular economy model. The Zero-waste centers will gradually expand to be built in Hsinchu and Tainan as TSMC continues to pursue its sustainability goals.

Timeline for TSMC Zero-waste Manufacturing Center

- 2018: TSMC acquired the support of Central Taiwan Science Park to initiate plans for the Zero-waste Manufacturing Center
- 2020: TSMC Board of Directors approved construction of the Zero-waste Manufacturing Center in Central Taiwan Science Park
- 2021: Zero-waste Manufacturing Center in Central Taiwan Science Park begins to build
- 2023: Zero-waste Manufacturing Center in Central Taiwan Science Park to officially begin operations
- 2027: Zero-waste Manufacturing Centers to be established in other science parks

In 2020, TSMC audited over 55 waste treatment vendors on site, reaching a 100% inspection rate, and 79 deficiencies were improved. The percentage of vendors evaluated as “excellent” and “good” has improved from 36% in 2015 to 75%. The number of vendors certified for ISO14001 increased to 44, accounting for 80% of all vendors. In striving for excellence, TSMC initiated the Intelligent Waste Management Procedure with Full Traceability. Through the introduction of smart automation, manual inspections can be replaced with systematic management of suspicious activities through auto-detection and reporting. The procedure will enhance vendor sustainability as TSMC is committed to achieving green manufacturing.
Waste Cleanup and Disposal Vendor Management Process

Timeline for Waste Treatment Vendor Management

- Established and activated a new waste treatment vendor selection procedure
- Executed Waste Treatment Vendor Management Audit Plan
- Founded TSMC GPS Satellite Fleet System
- Announced standards for waste treatment vendor annual evaluation

2015

2016

- Initiated vendor ISO 14001 certification plan
- Quarterly vendor onsite audit plan
- Recycled product flow monthly tracking

2017

2018

- Strengthen Waste Treatment Vendor Management Audit Plan
- Expanded coverage of onsite monitoring equipment

2019

- Established the batch declaration cloud platform for disposal receipts
- Collaborated with vendors to host waste management practice forum

2020

- Completed the Automated Waste Disposal Declaration Platform
- Enhanced TSMC GPS Satellite Fleet System
- Activated the Intelligent Management Plan for Proper Waste Treatment
- Established the Recycled Product Cloud Reporting Platform

2030

- Achieve the goal of 100% vendors ISO 14001 certified
### Waste Treatment Vendor Audit and Guidance Results in 2020

<table>
<thead>
<tr>
<th>Deficiency Type</th>
<th>Number of Deficiencies</th>
<th>Legal Compliance Correction</th>
<th>Onsite Environment/Operational Improvement</th>
<th>Setting regulations and procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Management</td>
<td>35</td>
<td>▪ Amend waste disposal contracts to comply with laws and regulations</td>
<td>▪ Improve waste storage environment</td>
<td>▪ Set regulations for waste treatment vendor audits</td>
</tr>
<tr>
<td>Safety and Health Management</td>
<td>23</td>
<td>▪ Designate supervisors to specific chemical operations</td>
<td>▪ Improve Globally Harmonized System of Classification and Labelling of Chemicals and safety data sheet (SDS) conformity onsite</td>
<td></td>
</tr>
<tr>
<td>Wastewater Management</td>
<td>12</td>
<td>▪ Amend onsite operational records and comply with the water pollution prevention measures plan and permit</td>
<td>▪ Improve onsite effluent discharge labelling and wastewater pipe labelling</td>
<td></td>
</tr>
<tr>
<td>Air Pollution Management</td>
<td>9</td>
<td>▪ Improve onsite operational records and comply with the stationary pollution source installation, operating and fuel use permit</td>
<td>▪ Increase inspection frequency at sampling checkpoints onsite</td>
<td></td>
</tr>
</tbody>
</table>

### Evaluation Results

- **Waste Management**
  - 2016: 3 (42%)
  - 2017: 17 (37%)
  - 2018: 18 (36%)
  - 2019: 30 (74%)
  - 2020: 33 (75%)
- **Safety and Health Management**
  - 2016: 4 (58%)
  - 2017: 23 (63%)
  - 2018: 29 (64%)
  - 2019: 30 (74%)
  - 2020: 33 (75%)
- **Wastewater Management**
  - 2016: 2 (10%)
  - 2017: 1 (5%)
  - 2018: 1 (5%)
  - 2019: 1 (5%)
  - 2020: 0 (0%)
- **Air Pollution Management**
  - 2016: 4 (42%)
  - 2017: 17 (37%)
  - 2018: 18 (36%)
  - 2019: 30 (74%)
  - 2020: 33 (75%)

**Note:** Total score 100: ≧ 90 Excellent; ≧80 Good; ≧70 Average; ≧60 Passed; <60 Disqualified vendor

### ISO-certified Waste Treatment Vendors

- **2016**: 23 (50%)
- **2017**: 32 (60%)
- **2018**: 36 (60%)
- **2019**: 28 (70%)
- **2020**: 44 (80%)

**Note:** Total score 100: ≧ 90 Excellent; ≧80 Good; ≧70 Average; ≧60 Passed; <60 Disqualified vendor
TSMC Leads the Industry to Embrace an Era of Intelligent Waste Management with Full Traceability

In 2020, TSMC built an industry-leading intelligent waste management procedure with full traceability. Through the Multiple Automated and Intelligent Projects, TSMC strengthens management of the three outsourced areas of waste clean-up, treatment, and recycled product transport and flow to continue improving waste product life cycle management.

Waste Clean-up: Enhanced Traceability with Automated Declaration Platform

In 2020, TSMC collaborated with the Environmental Protection Administration (EPA) to establish the Automated Waste Disposal Declaration Platform. TSMC was invited by EPA to share its experiences developing the platform and shared a video on the Industrial Waste Management & Control System website to encourage others in the industry to follow suit.

Waste Treatment: Replace Manual Inspection with Advanced Technology & Smart Management

Once waste enters a treatment facility, proper handling is of utmost importance. TSMC started to upgrade the onsite remote monitoring system at 6 key waste treatment vendors to replace conventional manual inspections. First, TSMC worked with waste treatment vendors on stipulating checkpoints in treatment processes and set up onsite equipment. The system automatically tracks and integrates data, images, and declaration information. In addition, it supervises treatment processes and sends out abnormal alerts through license plate and image recognition technology. After that, TSMC carries out onsite anomaly investigations and manages suspicious activities in treatment processes based on the auto-detection and report system mode.

Recycled Product Transport and Flow Tracking: Build Systematic Cloud Platform and Convert from Monthly Declaration to Itemized Reporting

After waste is properly treated into products, transport and flow are vital to the results of TSMC’s model of a circular economy. TSMC launched a Recycled Product Flow Cloud Reporting Platform in 2020 and will require vendors to report on recycling product transport and flow item by item instead of declaring on a monthly basis in 2021. As the transport footprint is more real-time and transparent, the life cycle of waste is more comprehensively managed based on full traceability.

In 2020, TSMC hosted the first Waste Management Practice Forum, providing a summary of regulatory changes to serve as a basis for legal compliance. TSMC also shared its management tips and experiences with common deficiencies and deficiencies subjected to penalties. Through face-to-face communication with vendors on enhancing the management procedure, vendors are also encouraged to advocate it to their clients as a joint effort to achieve environmental sustainability.
### Air Pollution Control

#### 2030 Goals

- **Reduce unit air pollutant emissions** by 50% *(Base year: 2015)*
- **Reduction rate of volatile organic gases** > 98%

#### 2021 Targets

- **Reduce unit air pollutant emissions** by 45%
- **Reduction rate of volatile organic gases** > 96%

#### 2020 Achievements

- **Reported** 0 cases of abnormal occurrences to supervising authorities

---

**Strategies**

- **Best Available Technology**
  - Adopt Best Available Technology to control pollutants emitted through operations and lower impact on the environment

- **Strengthen Monitoring of Air Pollution Prevention Equipment**
  - Leverage backup systems and dual-track management, along with pollutant monitors, to ensure that equipment functions as intended and to prevent abnormal occurrences

---

**Notes**

- **Note 1**: As of 2020, the unit for unit air pollutant emissions is changed from 'L/8-inch equivalent wafer mask layer' to 'L/12-inch equivalent wafer mask layer'.
- **Note 2**: Increased the 2030 Sustainable Development Goal from 45% to a 50% reduction from the base year.
- **Note 3**: Abnormal occurrences are defined as equipment failure that cannot be repaired within 24 hours or abnormal emissions due to suspended use.
TSMC is committed to air pollution control. In 2020, we were able to enhance volatile organic gases reduction rate to 98.3% and achieve our 2030 Goals ahead of schedule because of the Low-efficiency Single Zeolite Rotor Concentrators Upgrade Initiative and the introduction of dual zeolite rotor concentrators to new facilities. This 98.3% significantly exceeds legal requirements of 90% from the Air Pollution Control and Emissions Standards for the Semiconductor Industry and the suggested reduction rate of 92% from the Environmental Protection Administration (EPA) in the BACT for Volatile Organic Gases. Through effective separation of emissions from sources and highly effective local scrubbers, TSMC is now managing air pollutants through multi-phase BAT to reduce unit air pollutant emission and build a sustainable future.

**Best Available Technology**

Air pollutant emissions from the semiconductor industry are primarily comprised of acid/alkaline gases and volatile organic gases. TSMC has adopted Separation and Emission from Sources and Multi-Phase BAT for pollution prevention. We continue to work with experts in the industry to advance prevention systems by introducing additional local scrubbers and improving terminal prevention facilities to ensure that air pollutant emissions meet or exceed government standards.

In the first phase of source separation, newly-installed high-efficiency local scrubbers will be treating specific toxic gases, corrosive gases, flammable gases, perfluorocarbon greenhouse gases, and other acid/alkaline gases. In the second phase, waste gases containing low concentrations of inorganic acid/alkaline gases will be sent to the central scrubber, which is the terminal prevention facility, for second-phase water rinsing and neutralization treatment. For volatile organic gases, facilities determine whether condensing local treatment facilities are required based on boiling points. The exhaust will then be channeled into zeolite rotor concentrators. By classifying and separating exhaust gases from the source and utilizing second-phase treatment, we can effectively increase air emission treatment efficiency.

---

**Air Pollution Prevention Treatment Procedures**

**First Stage—Local Scubbers**

- Adsorption
- Plasma + Wet
- Burn + Wet
- Thermal + Wet
- Condensation
- Wet (Facility site)
- Wet (Process site)
- Electrostatic Precipitation
- Acid and Alkaline Gases
- Exhaust Duct

**Second Stage—Central Treatment Facility**

- Dual-Stage Wet Scrubber
- Central Scrubber with High-efficiency Washing Equipment
- Dual Zeolite Rotor Concentrators
- Acid and Alkaline Gases
- Volatile Organic Gases
- Exhaust

**Dual-Track Independent Monitoring System**

- Monitor Operating Conditions
- Monitor Emission Reduction
- Stack Exhaust
- Online Fluorine Gas Monitoring
- Online IPA Monitoring
- Stack Exhaust

**Facility Parameter Change Management System**

NEW
Effective Source Separation—Local Scrubbers

TSMC continues to expand on existing production capacity and accelerate R&D progress. To prevent further air pollution from new processes and chemicals, TSMC established the New Tool and New Chemical Review Committee, comprised of personnel from the Corporate Environment Safety and Health Division, Industrial Safety and Environmental Protection Division, and Facility Division. The committee is responsible for reviewing the safety and environmental impact of new tools and chemicals. New chemicals must go through two stages of review. The first review verifies risks related to the new chemicals and establishes control measures, and determines the environmental impact of the new process or chemical based on its properties. During this stage, the review committee also assesses how to classify exhaust gases and which local treatment facilities to use. The second review is to assess environmental impact from production verification tests and establish the exhaust gas classification to serve as the standard when using the new chemical.

Review Process for New Chemicals

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Operations &amp; Monitoring Center</td>
<td>Assess human and environmental impact from production verification test and establish effective pollutant classifications/BAT</td>
<td>Facility Operations &amp; Monitoring Center</td>
<td>Review and confirmation from the Facility Division and Industrial Safety and Environmental Protection Division in all fabs</td>
<td>Facility Operations &amp; Monitoring Center</td>
<td>Facility Operations &amp; Monitoring Center</td>
</tr>
</tbody>
</table>

Fabs must apply for a Management of Change before they become eligible for new chemicals that have already passed the second review. The Industrial Safety and Environmental Protection Division and Facility Division must first confirm the effectiveness of air pollution prevention equipment towards the new chemical before its deployment into mass production. In 2020, TSMC remained proactive in air pollution prevention and conducted 422 reviews for 239 new chemicals and 183 new tools. In 2020, TSMC collaborated with suppliers to test new local treatment facilities with different mechanisms such as adsorption, burning, and wet electrostatic precipitation (Wet-EP). Local treatment equipment were evaluated for safety and performance by TSMC and for efficiency by a third-party. Intensive testing was conducted to ensure that local treatment equipment are able to deliver on-target pollutant reduction before they are introduced into pollutant treatment for specific semiconductor processes.

Local Scrubbers Categories

<table>
<thead>
<tr>
<th>Process</th>
<th>Semiconductor Fabrication</th>
<th>Target Pollutant</th>
<th>Control Technologies</th>
<th>Equipment</th>
<th>Reduction Rate</th>
<th>Real-time Parameter Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Pressure Condensation</td>
<td>Wet Etching</td>
<td>Corrosive Gases</td>
<td>Plasma</td>
<td>&gt; 95%</td>
<td>Reactor temperature, pH value, Circulation water flow, Inlet pressure</td>
<td></td>
</tr>
<tr>
<td>Organic Process</td>
<td>PR Stripping</td>
<td>High Boiling Point Organics</td>
<td>Wet</td>
<td>&gt; 95%</td>
<td>Pressure difference of local scrubber, Condensation temperature</td>
<td></td>
</tr>
<tr>
<td>Storage Tanks</td>
<td>Chemical Storage Tank</td>
<td>Corrosive Gases</td>
<td>Wet</td>
<td>&gt; 95%</td>
<td>Pressure difference of local scrubber, Condensation temperature</td>
<td></td>
</tr>
<tr>
<td>Wastewater Tanks</td>
<td>Acid and Alkaline Gases</td>
<td>Wet</td>
<td>&gt; 95%</td>
<td>Pressure difference of local scrubber, Condensation temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Local Scrubbers

Experiments from New Chemicals

Identifying Risks

Process for
First Review
Experimental Test
Second Review
Production Verification Test
Management of Change
Mass Production

- Natural gas flow
- Oxygen flow
- Circulating water flow
- Inlet pressure
- Current amperage
- Circulating water flow
- Inlet pressure
- Reactor temperature
- pH value
- Circulation water flow
- Inlet pressure
- Pressure difference of local scrubber
- Inlet pressure
- Pressure difference of local scrubber
- pH value
- Circulation water flow
- Inlet pressure
- Corrosion voltage
- Corona current
- Inlet pressure
- Pressure difference of local scrubber
- Condensation temperature
- Specific High Boiling Point Organics = 95%
Enhance Local Scrubber Performance
TSMC adopts eight different types of local scrubbers to pre-treat high-concentration exhaust based on pollutant properties. The eight different local scrubbers include thermal-wet, burn-wet, plasma-wet, wet type in facility, wet type in process, adsorption, condensation, and high-temperature thermal scrubber. As TSMC continues to develop its manufacturing, the company also continues to collaborate with suppliers for new local scrubbers. In 2020, TSMC started using Wet-EP local treatment for wet etching. Wet-EP local scrubbers use a corona technology that is highly effective against acid/alkaline gases and can deliver >95% sulfuric acid (H₂SO₄) reduction. In 2020, our that is highly effective against acid/alkaline gases and can etching. Wet-EP local scrubbers use a corona technology that is highly effective against acid/alkaline gases and can deliver >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

delivered >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

delivered >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

delivered >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

delivered >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

delivered >95% sulfuric acid (H₂SO₄) reduction. In 2020, our

Evolving Terminal Prevention Facilities
As air pollutant emissions evolve and increase with process technology, TSMC has been working to improve the performance of terminal prevention facility. In 2019, volatile organic gases accounted for 34% of TSMC air pollutant emissions, and we consider volatile organic gas reduction to be a top priority. In 2020, TSMC collaborated with prevention equipment suppliers to raise the reduction standard for single zeolite rotor concentrators from 95% to 97%. To further improve adsorption, the concentrators will also adopt a new and highly effective fiberglass substrate. Between 2019 to 2020, a total of eight single zeolite rotor concentrators were replaced as part of the Low-efficiency Single Zeolite Rotor Concentrators Upgrade Initiative. We intend to replace eight more low-efficiency single zeolite rotor concentrators in 2021 to ensure the reduction rate of volatile organic gases can exceed 97% steadily. In 2020, a full roll-out was achieved for the clean-gas-desorbing zeolite rotor concentrators developed in 2017 in all 12-inch wafer fabs before 7nm process. All 12-inch wafer fabs are now equipped with optimized parameters for single zeolite rotor concentrators to ensure the average reduction rate for volatile organic gases in all 12-inch wafer fabs exceeds 98%.

The Facility Division collaborated with prevention equipment suppliers and adopted dual zeolite rotor concentrators, which is an upgraded technology that adds a new rotor concentration process after the exhaust is adsorbed and burned by the first rotor concentrator. After the second rotor concentration process, exhaust will be channeled back into the first rotor concentrator for processing. The repeated process achieves a 99.5% reduction rate. As of 2020, Fab 15B and Fab 18A have adopted dual zeolite rotor concentrators. In 2021, dual zeolite rotor concentrators are expected to roll out to Fab 188, Fab 12P8, Advanced Backend Fab 6, and other fabs.

In 2020, the average reduction rate of volatile organic gases in TSMC reached 98.3%, enabling us to meet our 2030 Sustainable Development Goals ahead of schedule. The reduction is a testimony to our commitment to air pollution reduction.

Zeolite Rotor Concentrators Milestones

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Clean-gas-desorbing zeolite rotor concentrators in existing fabs</td>
</tr>
<tr>
<td>2018</td>
<td>Introduced dual zeolite rotor concentrators in new fabs</td>
</tr>
<tr>
<td>2019</td>
<td>Introduced parameter optimization for single zeolite rotor concentrators to existing fabs</td>
</tr>
<tr>
<td>2020</td>
<td>Introduced Low-efficiency Single Zeolite Rotor Concentrators Upgrade Initiative to existing fabs</td>
</tr>
<tr>
<td>2020</td>
<td>Introduced the Improvement Program for Inefficient Thermal Oxidizer of Zeolite Rotor Concentrators</td>
</tr>
<tr>
<td>2021</td>
<td>Introduced AI parameter optimization for single zeolite rotor concentrators to existing fabs</td>
</tr>
</tbody>
</table>

Increasing Reduction Rate for Zeolite Rotor Concentrators

- **Reduction Rate Improvement**
  - **95%**
    - Low-Efficiency Single Zeolite Rotor Concentrators
    - Inefficient Thermal Oxidizer of Zeolite Rotor Concentrators
  - **96%**
    - Single Zeolite Rotor Concentrators
  - **97%**
    - Clean-Gas-Desorbing Zeolite Rotor Concentrator
    - Parameter Optimization for Single Zeolite Rotor
    - AI Parameter Optimization for Single Zeolite Rotor Concentrator
  - **98%**
    - Dual Zeolite Rotor Concentrators
  - **99%**
    - Dual Zeolite Rotor Concentrators
TSMC uses scrubbing towers and regular demister layer treatment approaches against acid/alkaline gases. To improve the overall efficiency of terminal prevention facilities, in 2020, the Facility Division and the Industrial Technology Research Institute collaborated to design a High-efficiency Acid and Alkaline Scrubber. This new scrubber is equipped with a high-efficiency demister, airflow distributor, and filter. Regulations for packed layers, sprinklers, and Raschig rings were also updated. Fab 188 is set to be the first to acquire the new scrubber in 2021.

In 2020, the Facility Division also collaborated with the Corporate Environment Safety and Health Division to establish a Stack Emission Baseline. TSMC implemented mitigation measures for stack emissions and monitor results regularly. As a result of the aforementioned reduction efforts, unit air pollutant emission (L/12-inch equivalent wafer mask layer) in 2020 was reduced by 46% against the base year of 2015, meaning that we achieved the 2030 Goal of 45% reduction ahead of schedule, and have therefore increased the 2030 Sustainable Development Goals to a 50% reduction from the base year.

### Improve Air Pollution Prevention Technologies

TSMC continues to explore ways to achieve air pollution reduction and improve the performance of air pollution prevention equipment. Before introducing new prevention technologies, we assess viability in terms of space, safety, and economics. In 2020, TSMC introduced three new technologies: High-efficiency Acid and Alkaline Scrubber, Improvement Program for Inefficient Thermal Oxidizer of Zeolite Rotor Concentrators, and AI Parameter Optimization for Single Zeolite Rotor Concentrators. To achieve our goal of smart manufacturing, we began applying smart parameter tuning to air pollution prevention facilities for single zeolite rotor concentrators. Concentration level at entry, temperature, air flow, and other external parameters are imported into the tool so that it can automatically set the optimal burning temperature, desorption temperature, rotor revolution, and other operating parameters. By stimulating functions and the artificial neural network, we can enable equipment to recommend optimal settings for maximum reduction of volatile organic gases. TSMC completed preliminary testing and found that optimal desorption flow and rotor revolution will be able to increase the reduction rate of volatile organic gases of single zeolite rotor concentrators to 98% or more.

### Total Emission and Air Pollutants Emissions per Unit of Production

<table>
<thead>
<tr>
<th>Metric tons</th>
<th>g/12-inch equivalent wafer mask layers</th>
<th>Unit: %</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0.87</td>
<td>100.0</td>
</tr>
<tr>
<td>480</td>
<td>0.72</td>
<td>97.8</td>
</tr>
<tr>
<td>360</td>
<td>0.69</td>
<td>96.9</td>
</tr>
<tr>
<td>240</td>
<td>0.62</td>
<td>96.4</td>
</tr>
<tr>
<td>120</td>
<td>0.50</td>
<td>95.4</td>
</tr>
</tbody>
</table>

#### Total Hydrocarbons
- 2016: 300.2
- 2017: 295.2
- 2018: 298.4
- 2019: 299.6
- 2020: 299.6

#### Ammonia
- 2016: 0.87
- 2017: 0.72
- 2018: 0.69
- 2019: 0.62
- 2020: 0.50

#### Chlorine
- 2016: 0.00
- 2017: 0.00
- 2018: 0.00
- 2019: 0.00
- 2020: 0.00

#### Sulphuric Acid
- 2016: 96.0
- 2017: 94.0
- 2018: 96.4
- 2019: 96.9
- 2020: 97.8

#### Nitric Acid
- 2016: 99.0
- 2017: 98.3
- 2018: 98.3
- 2019: 98.3
- 2020: 98.3

### Annual Reduction Rate of Volatile Organic Gases

- **Average Reduction Rates of TSIC (including subsidiaries)**
  - 2016: 95.4%
  - 2017: 96.4%
  - 2018: 96.9%
  - 2019: 97.8%
  - 2020: 98.3%

- **Average Reduction Rates of Subsidiaries**
  - 2016: 95.4%
  - 2017: 96.4%
  - 2018: 96.9%
  - 2019: 97.8%
  - 2020: 98.3%

Note: Figures from TSMC Fabs in Taiwan, TSMC (China), TSMC (Nanjing), and Viseria. Data excludes WaferTech as there is no total hydrocarbon monitor to provide any record of reduction rates.
Strengthen Monitoring of Air Pollution Prevention Equipment

TSMC works to actively improve equipment efficiency, and is strengthening stability and monitoring of air pollution control equipment to ensure compliance with local rules and regulations. All air pollution prevention equipment are equipped with "N+1" (at least one) backup system(s) and an uninterruptable power supply system to guarantee continuous operation. In order to maintain continuous emissions monitoring, prevention equipment is also equipped with comprehensive alert systems, including a dual-track independent monitoring system that is immediately activated upon system failure. The system will alert the Facility Monitoring and Control Center and Industrial Safety Emergency Response Center to repair equipment or switch backup systems.

Due to rapid advances in process technology, 12-inch wafer fabs use different fabrication processes, emit different pollutants, and require different local scrubbers. To ensure effective management over the parameters on local scrubbers, TSMC debuted the Facility Parameter Change Management System in 12-inch wafer fabs in 2020. The system can effectively manage operating parameters on local scrubbers and terminal prevention facility. The parameters will then automatically be compared to standard parameters at a fixed time every day to ensure prevention equipment are operating on optimal parameters. Inconsistent parameters will be automatically reported to the person in charge for system confirmation and to confirm stack emission in normal condition. With the addition of an early warning system, the Air Pollution Prevention Equipment Operation Status Platform, TSMC reported 0 abnormal occurrences in air pollution prevention equipment to supervising authorities in 2020.

Facility Parameter Change Management System

Operating parameters sent daily to local data center to be compared with standard parameters

Monitoring system compares operating parameters and standard value daily
TSMC believes in “Zero Emissions” and is committed to reducing air pollutant emissions. In order to maintain high efficiency in air pollution prevention equipment, TSMC introduced the Facility Parameter Change Management System to monitor optimal operating parameters and also consistently monitor and control concentration levels at the stack emissions. We are deploying a two-method approach – emissions separation at the source and improving performance of terminal prevention facilities – to reduce concentration levels in our emissions.

In 2020, the Facility Division and Corporate Environment Safety and Health Division collaborated to introduce the Management Mechanism for Stack Emission Baseline. The air pollutant baseline was developed by gathering data on emission concentration levels at stack emissions in TSMC Fabs in Taiwan. We discovered that the concentration level of volatile organic gases exceeded regulatory standards from cross-contamination in exhaust duct. Stacks generally employ a regenerative thermal oxidizer that uses shared exhaust duct, which can result in cross-contamination. As such, we were only able to achieve a 95% reduction in volatile organic gases for regenerative thermal oxidizers, which still has room for improvement when compared to the 98% for direct-fired thermal oxidizers.

In order to target exhaust ducts with high concentration levels, TSMC launched the Improvement Program for Inefficient Thermal Oxidizer of Zeolite Rotor Concentrators in 2020 to replace regenerative thermal oxidizers with direct-fired thermal oxidizers, a single pathway oxidizer. Condensation type scrubbers were also installed at the pollution source to capture organic matter with high boiling points and drastically reduce concentration levels in stack emission from terminal prevention facilities. In 2020, upgraded regenerative thermal oxidizers achieved an average of over 98% reduction in volatile organic gases. In addition to deploying the Renovation Program for Air Pollution Prevention Equipment to replace expired terminal prevention facility for stacks with exceeding acid/alkaline gases emission baseline, TSMC is also investigating pollutants from the source, implementing the Roll-out Program for High-Efficiency Local Scrubbers, and regularly monitoring progress.

In 2020, TSMC carried out three programs to target 79 stacks that exceeded concentration baselines. A total of 36 exhaust ducts were renovated and inspected. A budget will be allocated to continue renovating the remaining stacks.

By implementing the Management Mechanism for Stack Emission Baseline and renovating stacks that exceed the concentration baseline, TSMC achieved 46% (L/12-inch equivalent wafer mask layer) reduction in unit air pollutant emission from the base year of 2015 and was able to achieve our 2030 Sustainable Development Goals ahead of schedule.
An Admired Employer

Employees are TSMC’s most important asset. We value mutual commitments with our employees. We dedicate ourselves to creating a challenging and enjoyable work environment full of opportunities to acquire new skills, establishing an open-style management system, providing compensation and benefits packages that are above the industry average for employees, and becoming a world-class company that our employees are proud of.

8,193

New Employees

Recruited 8,193 new employees around the world with competitive job opportunities

140.8

Billion (NT$)

In payroll and employee benefits globally

0

Reinforced occupational safety and health to ensure zero cases of occupational hazards from chemical exposure
### Talent Attraction and Retention

#### Strategies

**Bolster Employee Commitment**
- Fulfill core values and business philosophy
- Provide competitive compensation packages

**Fulfill Internal Transfer Policy**
- Underscore on-the-job training with systematic job rotations

**Maintain Healthy Turnover Rate**

**Strengthen Industry-Academia Cooperation with Semiconductor Program**

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct Employee Opinion Survey on Core Values every two years and reinforce core values</td>
<td>Reinforce core values based on the 2020 Employee Opinion Survey on Core Values results, conduct the 2021 Employee Engagement Survey to increase employee engagement, and strive towards our commitment to sustainability</td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
<tr>
<td><strong>▪ Maintain position above 75th percentile among industry peers in total compensation</strong></td>
<td><strong>▪ Continue to maintain a position in the 75th percentile among industry peers in total compensation</strong></td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
<tr>
<td>▪ Ensure that over 95% of employees are fully committed to their work</td>
<td>▪ Ensure that over 95% of employees are willing to continue to work for TSMC in the next five years</td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
<tr>
<td>▪ Maintain total turnover rate between 5%–10%</td>
<td>▪ Maintain total turnover rate between 5%–10%</td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
<tr>
<td>▪ Less than 10% new hire (&lt;1 year) turnover rate</td>
<td>▪ Strengthen onboarding training and culture integration to ensure ≤15% new hire (&lt;1 year) turnover rate</td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
<tr>
<td>▪ Promote diverse industry-academia cooperation with internships, competitions, and the comprehensive Semiconductor Program on device/integration, process/module, and equipment engineering, Welcome 5,000 students from global universities and graduate programs to enroll in aforementioned events</td>
<td>▪ Promote diverse industry-academia cooperation with internships, competitions, and the comprehensive Semiconductor Program on device/integration, process/module, and equipment engineering, Welcome 3,500 students from global universities and graduate programs to enroll in aforementioned events</td>
<td>□ Achieved ▲ Exceeded ▫ Missed Target □ Achieved ▲ Exceeded ▫ Missed Target</td>
</tr>
</tbody>
</table>

Note 1: For more details, please refer to 4. Employee Commitment.

Note 2: In 2020, TSMC expanded external recruitment due to growing labor demands and therefore only 45.2% of vacancies were filled through internal transfers, missing the 2020 target of 50%. TSMC will continue to facilitate internal transfers and strive towards the goal of “Over 75% of manager positions shall be filled through internal promotions.”

Note 3: For more details, please refer to 2.1 Employee Turnover.

Note 4: Related explanation on Fulfill Internal Transfer Policy has been moved from Talent Attraction and Retention to Talent Development in consideration of the scope and definition of the subject.
In TSMC's strategy of talent attraction and retention, industry-academia cooperation is mainly structured through the Semiconductor Program on device/ integration, process/module, and equipment engineering. Beginning in 2021, the Semiconductor Program will be expanded to include information engineering so that students from different departments may also enroll and potentially become semiconductor professionals for the local semiconductor industry. TSMC also intends to attract and retain talents, bolster employee commitment, and support long-term company growth by maintaining our status as a leading employer.

Shared Visions and Values

Recruitment Criteria

"Putting the right people with shared visions and values in the right positions" has always been TSMC’s guideline for recruiting talents, designing compensation packages, managing employee performance, and developing training programs. We are committed to our declaration of Diversity and Inclusion at TSMC and all employees at TSMC are treated equally regardless of gender, religion, race, nationality or political affiliation. With shared vision, we work toward a common goal under a common commitment. With shared values, we abide by a common set of values and a unified code of conduct. By putting the right person into the right position, TSMC enables its employees to contribute to the Company where they are most needed and allows employees to develop with the company, thereby generating success for both employees and the Company.

To hire people with shared visions and values, TSMC prioritizes character and capability over professional skills when assessing candidates. Due to the Company’s expansion and business needs in recent years, mobility has become an important criterion as well. To this end, TSMC has developed a number of selection criteria on integrity, resilience, innovation, decision-making, and other qualities. Candidates shall be evaluated by selection criteria assessment and interviews.

Responding to technological changes and the rise of a new generation of talent, TSMC recognizes that only through proactive measures in talent incubation, recruitment, and retention, can the Company tap into employees’ capabilities in R&D, manufacturing, and service to thereby sustain TSMC’s long-term competitive advantages in the face of global competition and challenges. Furthermore, considering that TSMC operations are largely based in Taiwan, TSMC is aiming to develop high-quality talents for Taiwan’s semiconductor industry. To such ends, TSMC has cooperated with prestigious universities in Taiwan to design the comprehensive Semiconductor Program that will contain theoretical and practical courses. The Program was first launched in National Tsing Hua University and has since spread to National Taiwan University, National Cheng Kung University, National Yang Ming Chiao Tung University, National Taiwan University of Science and Technology, and National Taiwan University of Science and Technology in 2020. In 2021, TSMC will be collaborating with worldwide leading IT companies to expand the Program to include credited information engineering courses that integrate theory and practicum. The goal for 2030 is to have 5,000 students from different departments in Taiwan work for TSMC.

Workforce Structure

As of the end of 2020, TSMC has 56,831 employees globally. Among them, 38,456 employees are managers, professionals, and assistants while the remaining 18,375 are technicians. As the semiconductor industry is both knowledge and technology-intensive, over 80% of our managers and professionals hold a Master's degree or higher. Around 90% of TSMC’s employees are based in the principal place of business, Taiwan, with the remaining 10% in subsidiaries in Asia (including China, Japan, South Korea, etc.), North America, Europe, etc.

Female Workers

Due to the nature of the semiconductor industry and local social/cultural background, male employees account for more than 60% of employees and 80% of managers, professionals, and assistants at TSMC. Female workers are the pillars of production line technicians, with around 80% of the technicians being women. As TSMC’s fabs become increasingly automated, there is a declining need for production line technicians, a group consisting mainly of female employees, which is leading to a gradual drop in the total percentage of female employees at TSMC.

Despite the decline in the percentage of female employees in recent years, under fair selection mechanism, TSMC’s female employees enjoyed a similar promotion ratio in 2020 with their male counterparts, at 0.901. female section managers or above, are generally promoted more than their male counterparts at a ratio of 1.111.

TSMC cares about diversity and inclusion. We are striving towards gender equality and we continue to spotlight issues relating to female workers. Every employee’s desire for personal pursuits is respected and we also seek for different solutions. We welcome women to join the TSMC family and we will ensure that female workers are retained for the long-term so they can live up to their full potential and make valuable contributions to TSMC and society.
### Workforce Structure

<table>
<thead>
<tr>
<th>Category</th>
<th>Group</th>
<th>Male Employees</th>
<th>Group Percentage (%)</th>
<th>Female Employees</th>
<th>Group Percentage (%)</th>
<th>Subtotal and Percentage by Group</th>
<th>Percentage of Total Employees (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Managers</td>
<td>5,123</td>
<td>87.5</td>
<td>734</td>
<td>12.5</td>
<td>5,857</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Professionals</td>
<td>22,449</td>
<td>80.8</td>
<td>5,318</td>
<td>19.2</td>
<td>27,767</td>
<td>48.9</td>
</tr>
<tr>
<td></td>
<td>Assistants</td>
<td>3,870</td>
<td>80.1</td>
<td>962</td>
<td>19.9</td>
<td>4,832</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>4,294</td>
<td>23.4</td>
<td>14,081</td>
<td>76.6</td>
<td>18,375</td>
<td>32.3</td>
</tr>
<tr>
<td>Location</td>
<td>Taiwan</td>
<td>32,269</td>
<td>63.0</td>
<td>18,950</td>
<td>37.0</td>
<td>51,219</td>
<td>90.1</td>
</tr>
<tr>
<td></td>
<td>Asia</td>
<td>2,308</td>
<td>58.6</td>
<td>1,632</td>
<td>41.4</td>
<td>3,940</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>North America</td>
<td>1,127</td>
<td>69.6</td>
<td>493</td>
<td>30.4</td>
<td>1,620</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>Europe</td>
<td>32</td>
<td>61.5</td>
<td>20</td>
<td>38.5</td>
<td>52</td>
<td>0.1</td>
</tr>
<tr>
<td>Age</td>
<td>18-20</td>
<td>24</td>
<td>57.1</td>
<td>18</td>
<td>42.9</td>
<td>42</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>21-30</td>
<td>10,096</td>
<td>67.1</td>
<td>4,760</td>
<td>32.9</td>
<td>15,056</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>16,315</td>
<td>64.1</td>
<td>9,138</td>
<td>35.9</td>
<td>25,453</td>
<td>44.8</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>7,276</td>
<td>55.3</td>
<td>5,876</td>
<td>44.7</td>
<td>13,152</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>1,854</td>
<td>64.0</td>
<td>1,043</td>
<td>36.0</td>
<td>2,897</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>60+</td>
<td>171</td>
<td>74.0</td>
<td>60</td>
<td>26.0</td>
<td>231</td>
<td>0.4</td>
</tr>
<tr>
<td>Education</td>
<td>Ph.D.</td>
<td>2,257</td>
<td>90.1</td>
<td>247</td>
<td>9.9</td>
<td>2,504</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>Master’s</td>
<td>21,368</td>
<td>80.4</td>
<td>5,195</td>
<td>19.6</td>
<td>26,563</td>
<td>46.7</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s</td>
<td>8,904</td>
<td>60.9</td>
<td>5,718</td>
<td>39.1</td>
<td>14,622</td>
<td>25.7</td>
</tr>
<tr>
<td></td>
<td>Other Higher Education</td>
<td>1,685</td>
<td>30.2</td>
<td>3,901</td>
<td>69.8</td>
<td>5,586</td>
<td>9.8</td>
</tr>
<tr>
<td></td>
<td>High School</td>
<td>1,522</td>
<td>20.1</td>
<td>6,034</td>
<td>79.9</td>
<td>7,556</td>
<td>13.3</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Regular</td>
<td>35,733</td>
<td>62.9</td>
<td>21,092</td>
<td>37.1</td>
<td>56,825</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Contractor</td>
<td>3</td>
<td>50.0</td>
<td>3</td>
<td>50.0</td>
<td>6</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>56,831</td>
<td></td>
</tr>
</tbody>
</table>

Note: The total of 56,831 employees only includes regular employees and contractors expected to become regular employees. In addition to the two groups mentioned, TSMC employs 284 contractors, who are not included in the figures listed in the Global Workforce Structure. Contractors include employees with disabilities (269 individuals) and employees for special projects or short term support (15 individuals).

### Compensation Ratio by Gender

<table>
<thead>
<tr>
<th>Region/ Subsidiary</th>
<th>Position</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>Managers</td>
<td>1</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>Professionals</td>
<td>1</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>Assistants</td>
<td>1</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>1</td>
<td>1.13</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>0.88</td>
</tr>
<tr>
<td></td>
<td>Assistants</td>
<td>1</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>1</td>
<td>1.11</td>
</tr>
<tr>
<td>North America, Europe, Japan, and South Korea</td>
<td>Managers</td>
<td>1</td>
<td>0.94</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>0.71</td>
</tr>
<tr>
<td></td>
<td>Professionals</td>
<td>1</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Assistants</td>
<td>1</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>1</td>
<td>1.03</td>
</tr>
<tr>
<td>WaferTech</td>
<td>Managers</td>
<td>1</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Professionals</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Assistants</td>
<td>1</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>Technicians</td>
<td>1</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Talent Recruitment

Recruitments at global branches are mainly through local hiring. However, in the principal place of business, Taiwan, we must consider technological development and diversity. Therefore, we target recent graduates and overseas professionals for more professional positions. This contributes to a diverse and inclusive talent pool and also fulfills the Company’s long-term development needs.

Campus Recruitment

TSMC’s core values, corporate culture, and world-leading business performance has again warranted our placement on top of the 2021 Top 10 Most Admired Companies to Young Generations list by the Cheers magazine. In 2020, to align with the Company’s growth, TSMC expanded recruitment and introduced 7,322 new hires in Taiwan and 8,193 new hires around the world. Among them, 79.5% of all new hires are below the age of 30.

Recruitment in Taiwan was through official website, campus recruitment, intern programs, JDP (Joint Development Program), RDSS (Research Development Substitute Services), social media, and more. Our Internship Program is a major annual program in Taiwan and recruit talent in special fields, TSMC has continued to host the Summer Internship Program for Taiwan fabs and recruited 347 interns, of which 30% (105 interns) were female students. After the internship, 114 interns received advance offers after evaluation, contributing to success for both students and the Company. In 2020, Taiwan remained relatively unaffected and so, with disease prevention measures on hand, TSMC continued to host the Summer Internship Program for Taiwan fabs and recruited 347 interns, of which 30% (105 interns) were female students. After the internship, 114 interns received advance offers after evaluation, accounting for 33% of total participants. Among them, 25% were female. The percentage of female students participating in the internship program, receiving advance offers, or joining TSMC are higher than the current percentage of female professionals at TSMC (19.2%). This shows that TSMC continues to strive towards gender equality in the workplace. Unfortunately, due to the pandemic, Intern Programs at TSMC North America, TSMC (China), and TSMC (Nanjing) had to be scaled back. A total of 42 interns were recruited, of which 14.2% (6 interns) were female students.

TSMC’s internship program allows students to familiarize themselves with the industry and identify a domain of interest for further progression. Students can then register for semiconductor-related courses when they return to school, better adapt to the industry in the future, and reduce the transitional phase required for adapting to the workplace. As of 2020, an average of 40% of the interns from 2018 to 2019 have joined TSMC either through advance offers or regular recruitment, indicating that internship recruitment program is effective in attracting talent for TSMC at an early stage.

Overseas Recruitment

To sustain the Company’s diversified talent pool and recruit talent in special fields, TSMC has continued with the Overseas Talent Recruitment Program in regions with a high density of semiconductor talents. In terms of industry-academia cooperation, TSMC has maintained close contact with MIT, Stanford University, UC Berkeley, and other prestigious universities around the world in recent years to incubate top research talents and ensure early engagement with global talents for future recruitment. TSMC is also consistently recruiting experienced semiconductor professionals in key technological hubs in the U.S., India, Canada, Japan, and other European nations.
Hire Disabled Workers in Taiwan

According to Article 38 of the People with Disabilities Rights Protection Act in Taiwan, the number of disabled people with the capability to work shall be no less than 1% of a company’s total employees, and when a company employs a person with severe disabilities, that person shall be calculated as two. In addition, companies that do not employ a sufficient amount of people with disabilities shall periodically pay subsidies to the Disabled Employment Funds held by competent authorities for labor affairs at local municipalities and counties (cities) based on the deficient amount. The amount of the subsidies is based on the deficient amount of employed disabled workers multiplied by monthly basic wage.

In line with the government’s policies and regulations, TSMC endeavored to provide job opportunities to those with disabilities. In 2020, we also maintained partnership programs with various universities in Taiwan to provide high-quality positions, such as Campus Recruitment Representatives, for disabled university students or graduates.

In 2020 TSMC’s fabs in Taiwan complied with regulations and employed a total of 367 new employees with mild or moderate disabilities, and 87 with severe disabilities, with the weighted ratio reaching 1% of total employees. In 2020, VisEra also provided vacancies for disabled candidates. However, due to the nature of available job vacancies, VisEra received a dearth of suitable applicants, leading to its failure to meet the 1% requirement, and has paid subsidies according to legal requirements.

In 2020, COVID-19 impacted global industries. In response to the demand for increased output capacity and technological development, TSMC continued to recruit more employees for our fabs, especially in Taiwan. TSMC started adopting online recruitment and remote interviews beginning in March to offer a more flexible interview approach for candidates. This ensures that we can fulfill the rising demand for talents while also guaranteeing the safety and health of all those involved. TSMC held 4 campus recruitment webinars for senior students in college preparing to graduate in 2020. With the pandemic contained during the second half of 2020, TSMC relaunched some of the campus recruitment events, holding 18 interview sessions at 6 universities throughout September and October. We also introduced a mobile recruitment bus for the first time to offer students with diverse interview experiences. In 2020, we hired 7,322 new employees at our fabs in Taiwan, which was 1.65 times the number of new hires in 2019.

During the recruitment, TSMC continues to follow principles of “putting right people with shared visions and values in the right positions”. We continued to adhere to internal interview standard scales and evaluations to ensure that all new hires maintain a shared vision. At the same time, TSMC provides orientation, training programs, buddy program and more to help newcomers to adapt to work environment and role faster. These practices encourage employees to stay with TSMC to push the envelope of technology together.

In 2020, VisEra also provided vacancies for disabled candidates. However, due to the nature of available job vacancies, VisEra received a dearth of suitable applicants, leading to its failure to meet the 1% requirement, and has paid subsidies according to legal requirements.

TSMC continues to expand & offer high-quality jobs with comprehensive disease prevention measures.

In response to the demand for increased output capacity and technological development, TSMC continued to recruit more employees for our fabs, especially in Taiwan. TSMC started adopting online recruitment and remote interviews beginning in March to offer a more flexible interview approach for candidates. This ensures that we can fulfill the rising demand for talents while also guaranteeing the safety and health of all those involved. TSMC held 4 campus recruitment webinars for senior students in college preparing to graduate in 2020.

With the pandemic contained during the second half of 2020, TSMC relaunched some of the campus recruitment events, holding 18 interview sessions at 6 universities throughout September and October. We also introduced a mobile recruitment bus for the first time to offer students with diverse interview experiences. In 2020, we hired 7,322 new employees at our fabs in Taiwan, which was 1.65 times the number of new hires in 2019.

During the recruitment, TSMC continues to follow principles of “putting right people with shared visions and values in the right positions”. We continued to adhere to internal interview standard scales and evaluations to ensure that all new hires maintain a shared vision. At the same time, TSMC provides orientation, training programs, buddy program and more to help newcomers to adapt to work environment and role faster. These practices encourage employees to stay with TSMC to push the envelope of technology together.

When we saw TSMC’s recruitment bus on campus, I thought it was pretty cool. I had to take this opportunity and see if I could become a part of TSMC.”

— Jia-Pu Li, Graduate Student at the Department of Engineering Science, National Cheng Kung University
Fulfill Internal Transfer Policy

To help employees plan their career paths, TSMC is dedicated to enhancing the transparency of internal job opportunities, thereby encouraging internal transfers, allowing the right people to gravitate toward the right positions, and reducing turnover rates. In 2020, TSMC achieved 100% internal transfer completion rate. However, TSMC expanded external recruitment due to growing labor demands and therefore only 45.2% of vacancies were filled through internal transfers, missing the 50% target for 2020. TSMC does remain committed to talent development and will promote employees with potential when necessary for organizational growth. 79.3% of manager positions were filled through internal promotions, reaching the annual target. TSMC will continue to strive to fulfill internal transfers and promotions to meet rising demands from organizational growth but also a need for personal career development.

Employee Turnover Rate

To ensure talent mobility and long-term growth, TSMC firmly believes that a healthy employee turnover rate should be between 5% and 10%, which has thus become the Company’s long-term goal. In 2020, TSMC’s employee turnover rate was 5.3%, which is in line with what we believe to be a healthy turnover rate.

Compensation and Benefits

Competitive Compensation Package

TSMC provides competitive compensation packages to attract and retain the best talents, and to reward employee performance and encourage long-term contribution. Our packages include a base salary, allowance, employee cash bonuses, and profit-sharing schemes. The total compensation of an employee is determined based on individual expertise, job responsibility, performance, commitment to long-term contribution, and the Company’s operations and profit.

As TSMC continues to grow in revenue and profit, we have increased total compensation and benefits for employees from around NT$99.7 billion to NT$140.8 billion between 2016 and 2020, and average compensation and benefits for employees from around NT$2.12 million to NT$ 2.48 million during the same period.

Historical Vacancies Filled by Employees

Unit: %

<table>
<thead>
<tr>
<th>Year</th>
<th>New Hires (ppl)</th>
<th>New Hires Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3,686</td>
<td>7.9</td>
</tr>
<tr>
<td>2017</td>
<td>3,643</td>
<td>7.5</td>
</tr>
<tr>
<td>2018</td>
<td>2,233</td>
<td>4.8</td>
</tr>
<tr>
<td>2019</td>
<td>5,087</td>
<td>9.9</td>
</tr>
<tr>
<td>2020</td>
<td>8,193</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Note: The figures for 2016–2017 cover TSMC’s Taiwan fabs, while those for 2018–2020 cover both TSMC’s Taiwan fabs and its subsidiaries.

Note 2: Due to a large number of new vacancies and external recruitment expansion projects between 2019 and 2020, the percentage of vacancies filled through internal transfers was significantly lower in 2019 and 2020 than it was between 2016 and 2018.

Historical Vacancies Filled by Employees Ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>New Hires Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>50.8</td>
</tr>
<tr>
<td>2020</td>
<td>45.2</td>
</tr>
</tbody>
</table>

Historical Turnover Rates

Unit: %

<table>
<thead>
<tr>
<th>Year</th>
<th>Turnover Rate</th>
<th>Voluntary Turnover Rate</th>
<th>New Hire Turnover Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>4.3</td>
<td>4.2</td>
<td>5.1</td>
</tr>
<tr>
<td>2017</td>
<td>4.2</td>
<td>4.1</td>
<td>5.3</td>
</tr>
<tr>
<td>2018</td>
<td>4.5</td>
<td>4.3</td>
<td>5.1</td>
</tr>
<tr>
<td>2019</td>
<td>4.9</td>
<td>4.8</td>
<td>5.1</td>
</tr>
<tr>
<td>2020</td>
<td>15.7</td>
<td>13.4</td>
<td>11.9</td>
</tr>
</tbody>
</table>

Note: In 2020, TSMC witnessed a large increase in new hires and therefore the new hire turnover rate exceeded the originally anticipated 13.5%.
In 2020, TSMC’s revenue and profits reached new record highs. The cash bonus and profit-sharing scheme allocated for Taiwan facilities was valued at NT$69.5 billion. In 2020, the average total compensation for a new TSMC engineer with a master’s degree was higher than NT$1.8 million including 12 months in base salary, 2 months in year-end bonus, cash bonuses and profit-sharing scheme. The average total compensation for direct labor was higher than NT$1.0 million, meaning the average monthly income is four times the minimum wage in Taiwan.

In addition, the Taiwan Stock Exchange requires all listed companies in Taiwan to disclose the number, the average and median compensation of full-time employees in non-executive positions and their respective differences against the previous year (as shown in the table below). The numbers are calculated in accordance with the regulations of the Taiwan Stock Exchange, which excludes executive officers (managers) and employees eligible for exemption. For those not employed with the Company for a full year, the data is prorated. And the profit-sharing amount is at profit-year basis therefore part of the compensation data is projected.

We hope the Company can continue to grow in the future and so TSMC adjusted the salary structure for all formal employees in Taiwan facilities in January of 2021. Some variable pay items were recategorized into the base salary and each employee experienced a 20% increase in base salary, increasing monthly disposable income for entry-level employees. In addition to the salary structure changes, the annual salary adjustment for 2021 commence as planned. TSMC believes that a competitive compensation can help the Company generate operational success and maintain a leadership position above industry peers in TSMC profits and overall compensation packages.

Corporate Officer Shareholding Guidelines
TSMC believes that long-term shareholding by corporate officers can strengthen the link between corporate officers and shareholders. In 2020, TSMC established the Corporate Officer Shareholding Guidelines, requesting the Chairman, CEO, and other corporate officers to hold shares valued at a certain percentage of their annual base salary. Throughout their time at TSMC, corporate officers must maintain a certain value of shares as required by the Company.

### Average and Median Compensation

<table>
<thead>
<tr>
<th>Year</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Compensation (NT$)</td>
<td>1,596,000</td>
<td>1,819,000</td>
</tr>
<tr>
<td>Average Compensation (NT$)</td>
<td>1,981,000</td>
<td>2,377,000</td>
</tr>
<tr>
<td>Full-time Employees ( ppl)</td>
<td>47,314</td>
<td>43,430</td>
</tr>
</tbody>
</table>

- 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 Taiwan and other overseas locations.
- In April 2020, TSMC gave salary raises to all TSMC employees in Taiwan and abroad. The salary increase rate was 3%-5% for employees in Taiwan, 7% - 8% for employees in China, and 3% - 5% for employees in other regions.

The employee incentive programs take into consideration TSMC’s financial and operational performance, future development, and the operational performance of each subsidiary, with linkage to employee’s job responsibilities and performance. The programs are implemented with short-term and long-term incentive schemes according to local industry practices.

- The incentive program of TSMC fabs in Taiwan is implemented over a period of two years. Cash bonuses are paid quarterly to provide timely incentive and profit sharing is paid annually, in the following year, 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 2020, for TSMC employees, total compensation and benefits which includes salary, allowances, cash bonus, profit sharing, pensions, and other benefits, totaled NT$ 140.8 billion.
- In 2020, the median of global employees’ annual compensation (excluding pensions and benefits) was about NT$1.81 million, and the ratio between the total annual compensation of the CEO and the median employee compensation was about 233:1. Considering the differences in compensation structure across countries, the data of median annual compensation is based on the actual amount paid to fulltime employees with full-year seniority.
Parental Benefits
To provide sufficient support in their personal and work lives, TSMC offers employees parental leaves in accordance with local laws and regulations, sets up four kindergartens for fabs in Taiwan, and provides a comprehensive leave management system. Employees have flexibility in making use of their vacation days to take care of their children. Employees who need to take long leaves of absence for military service or severe injuries can also apply for unpaid leaves, and then apply for reinstatement after the expiration of the period, to fulfill both personal and family needs.

In 2020, a total of 557 employees in TSMC’s Taiwan facilities and VisEra applied for unpaid parental leaves, and a total of 497 employees were scheduled to return from unpaid parental leaves, of which 392 employees returned either as scheduled or ahead of schedule, leading to a return rate of 78.9%. The retention rate, on the other hand, was 77.7%, since 306 out of 384 employees who resumed duty in 2019 were still in service by the end of 2020.

In addition, in 2020, the number of TSMC employees aged between 20 and 64 in Taiwan accounted for 0.33% of Taiwan’s population of the same age group. Meanwhile, the number of employees’ newborns was 2,469, which was 1.5% of the total number of newborns in Taiwan, an example of our outstanding benefits having positive contributions to society.

Unpaid Parental Leave in TSMC’s Taiwan Facilities and VisEra - Applicants, Return Rate, and Retention Rate

To provide sufficient support in their life and work, TSMC sets up four kindergartens for Taiwan facilities.
Benefits Better Than Statutory Regulations

To encourage employees to strive towards long-term Company development, TSMC offers employees benefits that are better than the statutory requirements and regulations for benefits such as holidays, insurance, pensions, financial assistance for emergencies, subsidies for marriage/childbirth/funerals, and discounts in designated shops. Furthermore, all TSMC facilities are equipped with 24-hour health centers, where healthcare management professionals and appointed on-site physicians provide quality services beyond those required by legal statutes. The health centers work with hospitals and Employee Assistance Program services providers to offer comprehensive support for the emotional and physical well-being of our employees.\(^{\text{Note 1}}\).

TSMC values the well-being of its employees. The company encourages employees to exercise regularly by subsidizing 63 sports clubs, improving exercise facilities, and holding regular sports events to help employees find peers with similar sports interests for balance between work and life. In 2020, TSMC was granted the Exercise Enterprise Certification Award by Sports Administration of the Ministry of Education.

TSMC clubs are highly active\(^{\text{Note 2}}\). The clubs not only participate in games hosted by Hsinchu Science Park, Central Taiwan Science Park, and Southern Taiwan Science Park Note 3 but also engage with other clubs in the community. For example, the Ballroom Dancing Club of Hsinchu Science Park was invited to participate in the end-of-year dance performance by Industrial Technology Research Institute while the Softball Club at Southern Taiwan Science Park hosts tee ball games during the weekends to teach local children about softball and fulfill their social responsibility.

Solid Pension System

TSMC’s employee pension system includes the Defined Benefit Plan under the Taiwan Labor Standards Act, the Defined Contribution Plan under the Taiwan Labor Pension Act, as well as the regulations of labor laws in overseas regions. In addition to statutory contributions, we commission professional accountants and consultants annually to conduct precise calculations of our Company’s pension fund, so as to assure sufficient funding for employee pension payments in the future.

Pension Allocation and Preparation

TSMC Practices

- TSMC provides a defined benefits plan based on an employee’s length of service and average monthly salary for the six-month period prior to retirement under the Labor Standards Act
- The money was administered by the Labor Pension Fund Supervisory Committee and deposited in the Committee’s name into a designated account with the Bank of Taiwan

Pension Status in 2020

- TSMC and VisEra contributed an amount equal to 2% of salaries paid each month
- The fair value of TSMC’s planned assets in Taiwan was NT$5,066,203,000 at the end of 2020. In accordance with the above provisions, the amount of recognized expenses of TSMC in 2020 was NT$204,915,000. The amount of accrued pension liabilities to be contributed in accordance with the law was NT$11,914,074,000 at the end of 2020
- VisEra’s pension reserve amount, at the end of 2020, was NT$2,160,799
- TSMC in Taiwan made monthly contributions equal to 6% of each employee’s monthly salary to employees’ pension accounts. The total amount of pension in 2020, including contributions from overseas subsidiaries, was NT$2,905,684,000

Note 1: For more details, please refer to the Occupational Safety and Health section of this report.

Note 2: WaferTech is based in the state of Washington in the U.S. To comply with local Covid-19 regulations, WaferTech did not convene any sport-related club activities in 2020.

Note 3: Including the Hsinchu Science Park Competition, Central Taiwan Science Park Games, and Southern Taiwan Science Park Friendlies.
Employee Commitment

TSMC’s four core values of integrity, commitment, innovation, and customer trust were defined since Founder Dr. Morris Chang established the company. Today, incumbent chairman Mark Liu and chief executive officer C.C. Wei carry on the legacy by requiring all employees to serve with the four core values of TSMC in mind. Through interactive websites, microfilms, employee-made films, conferences, lectures, and internal journalism, TSMC’s leadership continuously engages with managers and employees to communicate the Company’s vision, core values, and business philosophy as part of efforts to consolidate corporate culture, and deepen mutual commitment between the Company and its employees.

To monitor employees’ commitment to TSMC’s core values and to the Company, TSMC conducts biennial surveys on how employees perceive the company’s core values. The survey scope in 2020 included TSMC’s Taiwan facilities, TSMC (China), TSMC (Nanjing), WaferTech, TSMC North America, TSMC Canada, TSMC Europe B.V, TSMC Japan, and TSMC Korea. The survey covered 97.9% of employees from TSMC & subsidiaries. For the 2020 survey, the valid response rate was 86% with a total of 52,464 surveys issued and 44,904 valid responses.

The 2020 Employee Opinion Survey on Company Core Values contained the same four sections on integrity, commitment, innovation, and customer trust as the 2018 survey did. Each section contained five questions. In 2020, the Employee Opinion Survey on Company Core Values scores were tallied through positive responses in which the total ratio of "strongly agrees" and "agrees" from a five-point scale will be tallied and presented as survey results.

In two of the questions in the "Commitment" section, the 2020 survey results showed that 96% of employees were fully committed to their work and making the Company better while 95% of employees were willing to continue to work for TSMC and grow with the Company in the next five years. The aforementioned questions are "8. I am willing to commit fully in my work to make TSMC an even more successful company." and "10. For the next 5 years, I am willing to contribute my talents to TSMC and grow together with the Company." Survey results for the "Commitment" section reached the 95% target previously set.

Note: In 2020, WaferTech was included in the survey scope for the first time. VisEra was not included in the survey due to its different industrial background.

Case Study

Excellent Instructor Award

Talent is a critical component to TSMC’s success and internal instructors are important drivers for fostering talents within the Company. The Excellent Instructor Award has been awarded to internal instructors for teaching excellence for 15 years now. We also hope that the award can encourage other outstanding colleagues to join the ranks of our instructors and share their experiences for more efficient teachings. A total of 63 instructors received awards from Dr. C.C. Wei, CEO of TSMC, at the 2020 awards ceremony. We also invited external presentation coaches to share some tips on teaching and the key to becoming a better instructor.

2020 TSMC Excellent Instructor Award
### Talent Development

**Strategies**

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

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Non-required courses on the e-Learning Platform offered by the Self-Directed Learning Program shall register a usage rate of at least 60%</td>
<td>- Self-learning shall account for no less than 50% of learning programs designed for the specific needs of organizations</td>
<td>✓ Achieved</td>
</tr>
<tr>
<td></td>
<td>- The number of usage for self-learning resources is no less than 50,000</td>
<td>✓ Achieved</td>
</tr>
<tr>
<td></td>
<td>- Self-learning accounted for 64.4% of learning programs designed for the specific needs of organizations</td>
<td>✓ Achieved</td>
</tr>
<tr>
<td></td>
<td>- Continued to support new fab personnel in achieving a 100% completion rate for courses such as &quot;Advanced Training on Wafer Processes&quot;, &quot;Physics of Semiconductor Devices&quot;, &quot;Professional Development for Process Engineers&quot;, and &quot;Four Lessons on Quality&quot;</td>
<td>✓ Achieved</td>
</tr>
</tbody>
</table>

**Target:**

- 50% for self-learning programs designed for the specific needs of organizations.
- 100% for courses such as "Advanced Training on Wafer Processes", "Physics of Semiconductor Devices", "Professional Development for Process Engineers", and "Four Lessons on Quality".

**NEW**

- The number of usage for self-learning resources over 50,000
The 2030 sustainable development goal of Talent Development at TSMC is aimed at ensuring that employee skillsets remain relevant, supporting long-term TSMC growth, and promoting lifelong learning among employees. In the next decade, TSMC will enhance on-the-job training, offer diversified learning resources, and build comprehensive self-learning programs to promote self-learning among employees, enhance the learning agility of organizations, and help employees grow. To these ends, TSMC has formulated the strategy to promote self-learning. Furthermore, since self-learning has accounted for more than 64.4% of learning programs, the Company is setting new goals aimed at encouraging employees to take advantage of online elective courses. In addition, TSMC has also established a talent development framework and encourages employees to rotate within the organization to develop comprehensive capabilities.

Fulfill Talent Development
Promoting self-directed learning is the important strategy for talent development at TSMC. To facilitate self-learning, TSMC is dedicated to raising employee awareness on self-learning and encouraging them to use diverse learning resources and tools. Employees are encouraged to engage in learning activities that align with the Company’s growth, organizational needs, and personal performance at any time or place and of any form. Employees should continue to progress their self-efficacy at work and galvanize energy for Company growth and social progress. In addition, TSMC has proactively implemented on-the-job training and certification systems, allowing employees to learn and improve their work performance in the workplace. The Company not only systematically designs job rotation programs to cultivate future talent, but also encourages its employees to complement their career plans with the Company’s organization development, so as to allow them to utilize their talents and grow.

Transparent System for Employee Development and Job Rotation
TSMC offers a comprehensive framework for employee development, whereby a dual career ladder system covering both management and technical positions allows employees to explore their full potential in either of the two types of positions according to personal characteristics and skills. For example, the selection process for TSMC Academy Fellows and Academicians identifies employees dedicated to scientific research and ensure that they are unencumbered by managerial tasks so that they can devote more time to breakthrough research and their fortes.

Furthermore, the promotion system in the employee development framework is based on two major principles: transparency on internal vacancies and respect for employees’ transfer decisions. It considers development potential as an important indicator for evaluating candidates for promotion. A handbook on promotion procedures and numerous relevant tools are offered to managers to help them assess candidate potential.

In 2020, 34.3% of managers and 26.9% of professionals were transferred or rotated for individual development or due to organizational development. The Company’s expansion led to an increasing number of new recruits in 2020 and a reduced percentage of only 45.2% vacancies filled through internal transfers than the previous year.
While there is a decrease, TSMC remains dedicated to internal talent mobility and developing well-rounded leaders. Therefore, we will continue reinforcing the dual career ladder system, uncovering employee potential based on competencies and personal preference, and ensure internal job rotations by maintaining that 50% of vacancies shall be filled through internal transfers. Our commitment to internal job rotations is driven by our hope to meet rising demands from organizational growth but also a need for personal career development.

### Employee Development Framework-Dual Career Ladder System

- **Management Positions**: Responsible for organization and personnel management
- **Technical Positions**: Dedicated to technology or other professional fields

### Key Development Objectives

- **Dual Career Ladder System**
  - Develop a comprehensive employee development framework, strengthen HR-related systems and supplementary measures, and build an environment where each employee is put in the position that best suits their abilities.

- **Talent Mobility**
  - Facilitate talent mobility by ensuring transparency on internal vacancies, respecting employees’ transfer decisions, and allowing employees to plan for their own careers.

- **Promotion Indicator-Employee Potential**
  - Potential has been listed as one of the indicators as the reference for evaluating candidates for promotion.

- **Strengthen Technical Capabilities**
  - Restructured the Technical Board to enhance matrix management capabilities and tracked progress for the five major tasks.

### 2020 Enforcement Report

- Clarified the differences between management jobs and technical jobs, and introduced performance appraisal and development procedures.
- Provided different training courses for managers and technical/professional managers.
- Regularly selected Fellow and Academician of TSMC Academy to support the career development of technical staffs.
- 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.
- 34.3% of managers and 26.9% of professionals were transferred or rotated due to either individual or organizational development.
- 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 tools to help managers conduct potential evaluation for employee promotion.
- Talent Exchanges: 141 employees exchanged at different fabs and conducted a learning journey that lasted six months to one year.
- Recruiting Experts: Recruited a total of 15 technical supervisors for special programs.
- Assemble Expert Team: Selected 415 experts to form an expert team that aims to resolve long-term engineering issues across different fabs.
- Resolve Long-term Engineering Issues: Resolved over 247 long-term engineering issues.
- Host Technical Trainings: Held 3,058 technical trainings to 83,774 participants.
Diverse and Equal Opportunities for Learning and Development

The Company’s growth is inextricably connected to our employees’ personal growth. Self-learning can not only enhance work performance but also give employees the opportunity to contribute to social progress in daily life. TSMC designs employee learning and development programs based on three key elements: goal, plan, and discipline. The Company is committed to building a diverse and equal learning environment that encourages continuous learning and offers rich content. It has also formulated the TSMC Employee Training and Education Procedures to integrate internal and external resources, enhance employee capabilities, and help employees and Company grow with society.

TSMC’s employees set individual development plans according to personal requirements, mid-year and year-end performance review, and career development goals. The individual development plans form one of the bases on which the Company’s annual training program is designed.

In 2020, employee performance assessment registered a completion rate of 100%. In the same year, TSMC provided over 920,000 hours of training programs and activities for learning and development to over 1 million participants. Each employee received, on average, over 16 hours of training and training expenses exceeded NT$95 million.

To ensure the effectiveness of training programs, TSMC measures the outcome with four levels of evaluation—reaction, learning, behavior, and results—based on the theory proposed by American scholar Donald L. Kirkpatrick.

In 2020, all open courses were evaluated on the reaction level, including contents, instructor, administration, and satisfaction scores. The courses received an overall satisfaction score of 94 (the total score is 100). A total of 850,000 participants completed 3,500 online courses and learning evaluations. 8% of the training courses were further evaluated on the behavioral level. Most on-the-job training offered by internal organizations were further evaluated at the learning and behavioral level, and evaluations at the results level have been built into the employee performance management and development system.

### Historical Training Index

<table>
<thead>
<tr>
<th>Year</th>
<th>Certified Internal Instructors</th>
<th>Total Training Hours</th>
<th>Trainees Who Completed Training</th>
<th>Average Evaluation Score of Course Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>623,711</td>
<td>1,257</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>2017</td>
<td>639,852</td>
<td>1,629</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>2018</td>
<td>551,752</td>
<td>1,694</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>2019</td>
<td>540,408</td>
<td>1,862</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>2020</td>
<td>741,178</td>
<td>2,003</td>
<td>94</td>
<td>94</td>
</tr>
</tbody>
</table>

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

### Average Hours of Training per Employee

<table>
<thead>
<tr>
<th>Year</th>
<th>Manager</th>
<th>Indirect Labor</th>
<th>Direct Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>15.3</td>
<td>10.9</td>
<td>5.9</td>
</tr>
<tr>
<td>2017</td>
<td>16.9</td>
<td>7.4</td>
<td>5.7</td>
</tr>
<tr>
<td>2018</td>
<td>15.1</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>2019</td>
<td>19.0</td>
<td>8.4</td>
<td>8.9</td>
</tr>
<tr>
<td>2020</td>
<td>21.0</td>
<td>6.9</td>
<td>6.9</td>
</tr>
</tbody>
</table>
## 2020 Key Objectives for Learning and Development Programs

To continue targeting the strategy of promoting self-learning, TSMC is assisting employees in advancing their studies in their professional domain while extending their reach to other domains. To reach this goal, TSMC is offering self-learning resources for employees to learn at any time and place.

### Professional Training for Engineers/ Junior-level Managers
- Deepen engineers/junior-level managers’ domain knowledge in front-end/back-end processes and instill quality awareness through actual classes, self-learning, co-learning, and hands-on operations.

### Self-learning
- Develop mobile learning applications and e-Learning systems that enable employees to learn at any time and place.

### English Skills
- Strengthen TSMC employees’ English skills to support our goals of a globalized operation model and talent development.

#### 2020 Enforcement Report

<table>
<thead>
<tr>
<th>Objective</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Training on Wafer Processes</td>
<td>100%</td>
</tr>
<tr>
<td>Professional Development for Process Engineers</td>
<td>100%</td>
</tr>
<tr>
<td>Four Lessons on Quality</td>
<td>100%</td>
</tr>
<tr>
<td>Physics of Semiconductor Devices</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launched mobile learning applications so that employees can use mobile phones to engage Self-learning at all times</td>
<td>100%</td>
</tr>
<tr>
<td>Strengthen functions on e-Learning platform to allow employees to share and recommend courses among each other and foster a culture of Self-learning</td>
<td>100%</td>
</tr>
<tr>
<td>Launch a Self-learning Bar that offers specific subjects and themed online learning resources</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>English program includes</td>
<td>100%</td>
</tr>
<tr>
<td>- Online English Webinar</td>
<td></td>
</tr>
<tr>
<td>- English Workshops</td>
<td></td>
</tr>
<tr>
<td>- One-on-one English Consultation</td>
<td></td>
</tr>
<tr>
<td>- English Learning Website</td>
<td></td>
</tr>
<tr>
<td>- English Book Fair</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign-ins to Online English Webinar</td>
<td>&gt; 14,000</td>
</tr>
<tr>
<td>Participants at English Workshops</td>
<td>&gt; 400</td>
</tr>
<tr>
<td>Usage Rate of One-on-one English Consultation</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>Average Visit/Day to the English Learning Website</td>
<td>300–500</td>
</tr>
<tr>
<td>Increase in Language Books Sold</td>
<td>76%</td>
</tr>
</tbody>
</table>
## Human Rights

### Strategies

- Enforce TSMC Human Rights Policy, Responsible Business Alliance Code of Conduct, and United Nations Guiding Principles on Business and Human Rights

### 2030 Goals

- Establish communication and reporting channels for all employees globally and establish a comprehensive system for management and analysis

### 2021 Targets

- Maintain 100% e-voting at labor-management meetings in all Taiwan facilities

### 2020 Achievements

- All of TSMC’s Taiwan facilities adopted an e-voting system for the election of new labor representatives and list e-voting systems as the only voting method for all future elections of the same kind

  **Target:** All of TSMC’s Taiwan facilities shall adopt an e-voting system for the election of new labor representatives and list e-voting systems as the only voting method for all future elections of the same kind

- No material regulatory violations (penalty: > NT$1 million)

  **Target:** No material regulatory violations

- Strengthen employee understanding of TSMC Human Rights Policies and ensure it is applied into the workplace through full employee engagement in online courses

  1. > 95% employees complete trainings
  2. 100% passing rate in post-class

---

**2030 Goals** | **2020 Achievements**
--- | ---

- Establish communication and reporting channels for all employees globally and establish a comprehensive system for management and analysis

- Maintain 100% e-voting at labor-management meetings in all Taiwan facilities

- All of TSMC’s Taiwan facilities adopted an e-voting system for the election of new labor representatives and list e-voting systems as the only voting method for all future elections of the same kind

  **Target:** All of TSMC’s Taiwan facilities shall adopt an e-voting system for the election of new labor representatives and list e-voting systems as the only voting method for all future elections of the same kind

- No material regulatory violations (penalty: > NT$1 million)

  **Target:** No material regulatory violations

- Strengthen employee understanding of TSMC Human Rights Policies and ensure it is applied into the workplace through full employee engagement in online courses

  1. > 95% employees complete trainings
  2. 100% passing rate in post-class
Human Rights Policy
TSMC believes that respecting human rights and creating a respectful workplace is critical to TSMC and our suppliers. To ensure comprehensive human rights actions, TSMC formulated the Human Rights Policy in 2020.

Human Rights Governance
Human Rights Policy is the highest guiding principle for planning, execution, review, and action for all human rights governance in TSMC. Across all global sites and facilities, operational supervisors shall work with senior executives in HR, Information Technology and Materials Management & Risk Management, and Legal organization and take charge of human rights topics.

- The highest HR executive will be responsible for managing/ coordinating and reporting major human rights topics in TSMC to management.
- The Human Rights Operation Center of HR organizations will be responsible for human rights topics that have daily relevance to employees. Regulations should be formulated and implemented in accordance with Measures for Human Resources Management System and the Internal Control Procedures for Human Resource Management System to ensure that the Company meets Responsible Business Alliance (RBA) or higher standards.
- The IT Supply Chain Management Section of the Information Technology and Materials Management & Risk Management organization will be responsible for all human rights topics related to suppliers. All regulations shall be formulated and implemented in compliance with the TSMC’s Supplier Code of Conduct to ensure proper supplier management.

Human Rights Protection Training
In 2020, TSMC provided employees with a total of 93,822 hours of human rights protection training. In total, 55,031 employees (107,057 training attendances) completed the training program, accounting for 96.8% of TSMC’s total employees. Going forward, TSMC will continue to focus on human rights protection and offer training programs to raise human rights awareness among employees to minimize risks.

Human Rights Risk Management
As a full member of the Responsible Business Alliance (RBA), TSMC will conduct due diligence in compliance with the RBA Code of Conduct to ensure that TSMC either meets or exceeds the standard. Using RBA’s self-assessment questionnaire (SAQ), TSMC conducts annual assessments to identify internal operations bearing the highest social, environmental, and moral hazards.

Between 2016 and 2018, TSMC commissioned a third-party institute trained in social and environmental audit to conduct RBA’s Validated Assessment Program (VAP) on all fabs in addition to TSMC’s annual SAQ assessment. Of the 16 fabs assessed, 14 fabs received full marks. Responding to customer demand, TSMC conducted VAP audits on Fab 12b in 2020. The complete audit report will be made available to customers on RBA-Online in 2021.

<table>
<thead>
<tr>
<th>Human Rights Protection Training</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendees (ppl)</td>
<td>116,907</td>
</tr>
<tr>
<td>Training Hours (hours)</td>
<td>93,822</td>
</tr>
</tbody>
</table>

| Risk Management |
|----------------------------------|--|
| Taiwan Facilities | Subsidiaries |
| Corporate Headquarters | VisaFRA 90.3 | TSMC (China) 93.2 | TSMC (Nanjing) 91.3 | WaferTech 89.3 |
| Fab 2 | 95.6 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 3 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 5 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 6 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 8 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 12A | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 12B | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 14A | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 14B | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 15A | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Fab 15B | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Advanced Backend Fab 1 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Advanced Backend Fab 2 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Advanced Backend Fab 3 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Advanced Backend Fab 4 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |
| Advanced Backend Fab 5 | 92.2 | 92.2 | 92.2 | 91.8 | 92.6 | 92.6 | 91.9 | 92.6 | 93.5 | 92.9 | 93.9 | 93.2 | 95.2 | 90.9 |

SAQ Assessment Scores (2021)
- Low risk (≥ 85)
- Medium risk (≥ 65 & < 85)
- High risk (< 65)

VAP Assessment Scores (2020)
- Low risk (≥ 85)
- Medium risk (≥ 65 & < 85)
- High risk (< 65)

VAP Assessment Scores (2019)
- Low risk (≥ 85)
- Medium risk (≥ 65 & < 85)
- High risk (< 65)

VAP Assessment Scores (2016-2018)
- Low risk (≥ 85)
- Medium risk (≥ 65 & < 85)
- High risk (< 65)
### Human Rights Policy Concerns and Practices in 2020

<table>
<thead>
<tr>
<th>Targets and Actions</th>
<th>Safe, Healthy, and Harassment-free Workplace</th>
<th>Non-discrimination &amp; Equal Employment Opportunity</th>
<th>Prohibit Forced Labor and Child Labor</th>
<th>Working Time</th>
<th>Responsible Mineral Sourcing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Assessment</strong></td>
<td>Investigate whether there are any occupational diseases from chemical exposure</td>
<td>Establish TSMC Recruitment Interview, Internal Control Procedures, and define principles of non-discrimination and offer the Recruitment &amp; Selection training courses and suggestions/remininders to the hiring supervisors</td>
<td>Comply with the regulations on freely chosen employment in the RBA Code of Conduct</td>
<td>TSMC requires suppliers to comply with its conflict-free minerals sourcing policy and sign a statement on conflict-free minerals for products containing tantalum, tin, gold, and tungsten</td>
<td>Provide a variety of activities and clubs to enrich the concept of work-life balance</td>
</tr>
<tr>
<td><strong>High-risk Employees</strong></td>
<td>1,739 employees under special health management (For more details, please refer to the Occupational Safety and Health section of this report)</td>
<td>Eliminate discrimination in the workplace in compliance with Internal Control Procedures starting from recruitment</td>
<td>Inquire candidate regarding willingness-to-work during interviews</td>
<td>Understand employee work hours through reporting channels, facility-level communication meetings, and management systems</td>
<td>Establish a due diligence framework in compliance with the Model Supply Chain Policy for a Responsible Global Supply Chain of Minerals from Conflict-Affected and High-Risk Areas by the OECD</td>
</tr>
<tr>
<td><strong>Mitigation Measures</strong></td>
<td>Quarterly meetings on occupational health management held by senior executives to manage and control the five major safety hazards of occupational diseases across departments</td>
<td>A total of 720 managers completed the Recruitment &amp; Selection training course in 2020</td>
<td>Complied with legal regulations for recruitment and hiring, prohibited child labor and forced labor</td>
<td>Managed and generated employee timesheets and provided early warnings to facility supervisors on point four management</td>
<td>Suppliers of products containing tantalum, tin, gold, and tungsten must collaborate with more than one compliant smelter</td>
</tr>
<tr>
<td><strong>Remedies</strong></td>
<td>Immediate transfer from original post for workplace support</td>
<td>Violations to the non-discrimination principle by management shall be punished according to internal policies on rewards and punishment</td>
<td>Risk prevention through regular VAP and SAQ mechanisms from the RBA Code of Conduct</td>
<td>Suppliers will be asked to terminate sourcing if there is evidence of sourcing from non-compliant mines</td>
<td>Collaborate with members of the TSMC Employee Welfare Committee and activity organizers to promote activities and encourage participation</td>
</tr>
<tr>
<td><strong>Reporting Channels</strong></td>
<td>Occupational Disease Investigation Committee &amp; Employee Voice Channels</td>
<td>Irregular Business Conduct Reporting</td>
<td>Irregular Business Conduct Reporting</td>
<td>Employee Voice Channels</td>
<td>Reporting Channels for Supply Chain Employees</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Assessment</th>
<th>Action 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigate whether there are any occupational diseases from chemical exposure</td>
<td>- Make necessary position or work station changes depending on the situation. For severe cases, the offender will be punished according to the TSMC Employee Reward and Punishment Measures</td>
</tr>
<tr>
<td>Increase voluntary participation rate for non-statutory employee health plans</td>
<td>- Collaborate with members of the TSMC Employee Welfare Committee and activity organizers to promote activities and encourage participation</td>
</tr>
<tr>
<td>Case inquiry by the Sexual Harassment Investigation Committee and Ombudsman</td>
<td>- Conduct questionnaires to make improvements in the future</td>
</tr>
<tr>
<td></td>
<td>- Move up the date to draw lots for the use of child care facilities. This will allow those who did not draw a lot to have adequate time to find other child care facilities</td>
</tr>
<tr>
<td></td>
<td>- Offer competitive compensation and benefits to kindergarden teachers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High-risk Employees</th>
<th>Action 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,739 employees under special health management (For more details, please refer to the Occupational Safety and Health section of this report)</td>
<td>- Conduct questionnaires to make improvements in the future</td>
</tr>
<tr>
<td>2 incidents verified by the Sexual Harassment Investigation Committee</td>
<td>- Move up the date to draw lots for the use of child care facilities. This will allow those who did not draw a lot to have adequate time to find other child care facilities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mitigation Measures</th>
<th>Action 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly meetings on occupational health management held by senior executives to manage and control the five major safety hazards of occupational diseases across departments</td>
<td>- Conduct questionnaires to make improvements in the future</td>
</tr>
<tr>
<td>Launched Psychological Safety Program</td>
<td>- Move up the date to draw lots for the use of child care facilities. This will allow those who did not draw a lot to have adequate time to find other child care facilities</td>
</tr>
<tr>
<td>Offered classes on anti-harassment and anti-bullying</td>
<td>- Offer competitive compensation and benefits to kindergarden teachers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reporting Channels</th>
<th>Action 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Disease Investigation Committee &amp; Employee Voice Channels</td>
<td>- Conduct questionnaires to make improvements in the future</td>
</tr>
<tr>
<td>Irregular Business Conduct Reporting</td>
<td>- Move up the date to draw lots for the use of child care facilities. This will allow those who did not draw a lot to have adequate time to find other child care facilities</td>
</tr>
<tr>
<td>Employee Voice Channels</td>
<td>- Offer competitive compensation and benefits to kindergarden teachers</td>
</tr>
</tbody>
</table>
**Employee Engagement**

TSMC values employee opinions/interests and therefore offers several communication channels. The highest-level executives of the HR organization are responsible for many of the channels, ensuring that matters are handled in an efficient and confidential manner as we continue to strive towards an open and transparent environment for employees/managers and colleagues to communicate. Furthermore, TSMC respects employees’ right to take part in collective bargaining and peaceful rallies. In accordance with legal requirements in Taiwan, the Company regularly holds labor-management meetings to brief employees on Company operations and invite employees to engage in discussions on labor conditions and benefits. To facilitate labor-management communication, after the labor representative’s four-year term was up in 2018, fabs in the Central Taiwan Science Park adopted an e-voting system for the election of new labor representatives. The e-voting system was expanded in 2019 to Longtan facilities and in 2020 to Hsinchu and Tainan facilities to encourage more employee voting. As of December 31st, 2020, all labor representative elections in Taiwan facilities have been conducted through e-voting.

In 2020, TSMC’s internal communication channels handled a total of 4,343 cases of employee opinions and complaints, including 4 through the Sexual Harassment Investigation Committee, 171 through the Ombudsman System, 3,192 through the Fab Caring Circle, and 70 cases through the Irregular Business Conduct Reporting System. All reported cases have been processed and addressed by competent organizations.

Cases reported through the Sexual Harassment Investigation Committee, the Ombudsman System and Irregular Business Conduct Reporting System were investigated and reviewed by designated committee members. Cases reported through the Employee Opinion Box were handled by responsible persons, who would then communicate with employees about the solutions and outcome. Employees can access all internal communication channels via the internal employee portal.

In 2020, there were 2 verified cases of sexual harassment as confirmed by the Sexual Harassment Investigation Committee. The perpetrating employees received severe punishments and one was dismissed from the Company. As both cases involved social software abuse, TSMC has reinforced the social software section in the 2020 sexual harassment prevention courses to raise awareness among employees.

There were 6 violations to business ethics and all involved employees have been punished in compliance with Company regulations. The importance of business ethics continues to be advocated in related courses. In 2020, the annual business ethics and regulatory compliance training completion rate was 99.72%, with 50,482 employees having received trainings. Management training completion rate was 100%, with 5,425 managers having received trainings.

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.

---

**Cases Reported Through Internal Communication Channels**

<table>
<thead>
<tr>
<th>Year</th>
<th>Sexual Harassment Investigation Committee (Cases Reported)</th>
<th>Sexual Harassment Investigation Committee (Cases Established)</th>
<th>Irregular Business Conduct Reporting System (Cases Reported)</th>
<th>Irregular Business Conduct Reporting System (Cases Established)</th>
<th>Discrimination Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2019</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2020</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The figures for Ombudsman System, Sexual Harassment Investigation Committee, Irregular Business Conduct Reporting System, and Employee Opinion Box cover all TSMC facilities, while the figure for Fab Caring Circle covers only TSMC’s Taiwan facilities.
### Internal Communications Structure

**Employees**
- Employee Portal
- Employee Survey
- HR Area Service Team
- eSilicon Garden

**Employee Voice Channels**
- Ombudsman System
- Employee Opinion Box
- Whistleblower Procedures
- Fab Caring Circle
- Sexual Harassment Investigation Committee
- SMS
- 113 Caring-dedicated Line

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

**Managers of All Levels**

**Board of Directors and Management Team**

**Human Resources**

**System/Committee Chair**

### Employee Voice Channels

#### Fab Caring Circle
Various Issues in Fabs (Equipment/weworkplace/work assignments/process updates/internal management)
Person in Charge: Fab Directors

#### Employee Opinion Box
Various Company Issues (livelihood/JOS internal transfers/performance development/leave, attendance & overtime/pay & welfare/resignation & unpaid leave/personal rights & interest/other suggestions)
Person in Charge: Vice President, Human Resources

#### 113 Caring-dedicated Line
Personal and Work-related Issues (area code +113)
Person in Charge: Vice President, Human Resources

#### SMS
Personal and Work-related Issues
0987-571785 (help hotline)
Person in Charge: Vice President, Human Resources

#### Ombudsman System
Major management missteps, workplace violence, and financial audit issues
Person in Charge: Vice President

#### Whistleblower Procedures
Accounting & Legal Issues
Person in Charge: Chairman of TSMC Audit Committee Chairperson

#### Sexual Harassment Investigation
Sexual Harassment
Person in Charge: Deputy Director, Legal

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

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2030 Goals</th>
<th>2021 Targets</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Promote Safety Culture</strong></td>
<td>• Incident Rate per 1,000 Employees $&lt; 0.20$</td>
<td>• Incident Rate per 1,000 Employees $&lt; 0.20$</td>
<td>• Incident Rate per 1,000 Employees: $0.311$</td>
</tr>
<tr>
<td></td>
<td>• Disabling Injury Frequency Rate (FR) $&lt; 0.3^{\text{Note 1}}$</td>
<td>• Disabling Injury Frequency Rate (FR) $&lt; 0.4$</td>
<td>• Disabling Injury Frequency Rate (FR): $0.42$</td>
</tr>
<tr>
<td></td>
<td>• Disabling Severity Rate (SR) $&lt; 3^{\text{Note 1}}$</td>
<td>• Disabling Severity Rate (SR) $&lt; 4$</td>
<td>• Disabling Severity Rate (SR): $4$</td>
</tr>
<tr>
<td><strong>Comprehensive Health Management</strong></td>
<td>• 0 Cases of Occupational Disorders Caused by Exposure to Chemicals</td>
<td>• 0 Cases of Occupational Disorders Caused by Exposure to Chemicals</td>
<td>• 0 Cases of Occupational Disorders Caused by Exposure to Chemicals</td>
</tr>
<tr>
<td></td>
<td>• Health Program Participation Rate: $55%$</td>
<td>• Health Promotion Program Participation Rate: $\geq 53%$</td>
<td>• Health Promotion Program Participation Rate: $53.5%$</td>
</tr>
<tr>
<td><strong>Internal-External Alliance</strong></td>
<td>• Assist all contractors with high risk operations $^2$ in obtaining ISO 45001 certification for occupational safety and health management system</td>
<td>• Assist $65%$ of our contractors engaged in high risk operations obtain ISO 45001 certification for occupational safety and health management system</td>
<td>• Assisted $60%$ of our contractors engaged in high risk operations obtain ISO 45001 certification for occupational safety and health management system</td>
</tr>
</tbody>
</table>

Note 1: According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate (FR)/Disabling Severity Rate (SR) are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. Target has been amended according to new definition. See Statistical Analysis of Disabling Injuries for detailed information.

Note 2: TSMC continues to have new vendors that are considered as contractors engaged in high risk operations each year and will therefore continue to offer assistance in this area.

Note 3: Missed target for incident rate per 1,000 employees. For mitigation measures, please see Safety Performance Index.

---

**Achieved**

**Exceeded**

**Missed Target**
In 2020, all TSMC’s fabs in Taiwan received ISO 45001 certifications and, in response to ISO 45001 system updates, TSMC assisted TSMC (China), TSMC (Nanjing), WaferTech, and VisEra obtain ISO 45001 certifications to comply with the latest international standards on occupational safety and health, and to ensure the safety and health of all TSMC employees. TSMC also established a Disease Control Committee in response to the COVID-19 pandemic. The committee’s purpose is to design prevention measures based on changing situations, designate isolated working groups of employees and vendors, and maintain day-to-day operations.

With higher production capacity, the number of contractors visiting TSMC subsequently set a new record in 2020, climbing from 32,168 people/day in 2019 to 39,470 people/day. TSMC is now the most visited semiconductor company in Taiwan. TSMC is committed to providing a safe workplace for contractors and hopes that contractors can participate in creating a friendly and healthy workplace. To such ends, TSMC founded the Editorial Committee comprised of 108 engineers from the Industrial Safety and Environmental Protection Division. The Committee categorized and restructured complicated regulations on environment protection, safety, and health. The regulations were compiled and classified based on the fabrication stage it would impact and the Contractor ESH Bluebook was issued in March 2020. The bluebook is an intuitive illustrated reference guide that can help contractors and inspire our peers to create a safe and healthy workplace across the supply chain. The Contractor ESH Bluebook has also been updated to comply with new regulations. TSMC immediately established Thermal Hazard Prevention Procedures to comply with the latest Thermal Hazard Prevention Guide for Outdoor Labor in High Temperatures. The Procedures are intended to warn and provide measures to contractors about potential heat strokes, heat exhaustion, or seizures induced by heat.

Internal Control for Safety and Health

- All Departments
  - Work with other departments to implement all safety- and health-related activities

- Wellness Center
  - Responsible for health advocacy
    - Health Care
    - Assistance for employees
    - Early warnings for occupational diseases

- Fab-level Industrial Safety and Environmental Protection Division
  - Promote safety- and health-related activities
    - Workplace risk inspection
    - Chemical exposure assessment
    - Noise and non-ionizing radiation protection
    - Ergonomic engineering management
    - Foundry-level Occupational Safety and Health Committees
      - Contractor management
      - Fab-level occupational disease prevention
      - Assist subsidiaries in developing regulations for occupational safety and health
      - Assist leased or borrowed fabs or offices during emergency responses

Corporate ESH Division

- Construct corresponding blueprints, management protocols, and SOPs
- Establish policies, targets, and plans
- Find and introduce new technologies, information on new hazards or occupational safety and health risks, and new management procedures to audit safety and health performances
- Convene the company-level Occupational Safety and Health Committee
- Hold safety and health discussions with external stakeholders
- Demand contractor compliance with TSMC ESH standards and build a sustainable supply chain
- Spearhead the Occupational Disease Investigation Committee to carry out occupational disease prevention throughout TSMC
- Define responsibilities for leased facilities and ensure ESH regulations of the are complies with risk identification

Collaborate with External Stakeholders to Reduce Occupational Safety and Health Risks

- Government, TSIA & SEMI Organizations
  - Collaborate to build a healthy and safe workplace

- Suppliers and Contractors
  - Improve safety and health across supply chain through guidance and collaboration
Promote Safety Culture

TSMC believes that people come first and we strive to build a humanistic workplace. Each management level has the responsibility to build a safe and healthy workplace and we ask employees to comply through various management systems and regulations. We continue to improve by observing people, the environment, and behaviors. Educational training is also provided to ensure that employees work toward this goal and thereby propel TSMC into sustainable development.

Safety and Health Measures

Following the TSMC Safety and Health Policy, TSMC implemented the following measures and used the Safety Performance Index (SPI) to track performances for safety and health measures. The Occupational Safety and Health Committee at the fab level and at the corporate level will regularly report safety and health efforts to employees. We continue to improve by observing people, the workplace and we ask employees to comply through educational training. We encourage employees to suggest ways to improve workplace safety. Their suggestions will then be classified and tracked to control, prevent or reduce hazard and risks.

Safety and Health Measures

- Kept up to date with latest regulations, tracked compliance in all fabs, and issued 10 amendments to safety and health regulations.
- In response to rapid expansion, TSMC detailed ESH management responsibilities for leased properties including leased offices, labs, testing centers, parking lots, or fabs.
- 29 of 58 documents on standardizing ESH management processes were reviewed and amended in 2020.
- In response to the COVID-19 pandemic, TSMC established the Disease Prevention Guidelines to define responsible divisions for disease prevention, investigation approaches, health declarations, communication with external parties, inspecting disease prevention measures, disinfection, and other processes.
- TSMC obtained the ISO 45001 certification for occupational safety and health management system.
- 83 employees passed the ISO 45001/ISO 45001 internal auditing training as part of our efforts to train internal auditors.
- 29 of 58 documents on standardizing ESH management processes were reviewed and amended in 2020.
- In response to the COVID-19 pandemic, TSMC established the Disease Prevention Guidelines to define responsible divisions for disease prevention, investigation approaches, health declarations, communication with external parties, inspecting disease prevention measures, disinfection, and other processes.
- TSMC obtained the ISO 45001 certification for occupational safety and health management system.
- 83 employees passed the ISO 45001/ISO 45001 internal auditing training as part of our efforts to train internal auditors.
- For employees and contractors, TSMC conducted workplace hazard identification, safety and health management plans, job site analysis, job site observation and operational safety analysis, and job site analysis. All identified risks were classified into different risk levels for future management, tracking, and monitoring to control, prevent or reduce hazards and risks. Carried out 28,000 cases of hazard assessment.
- A total of 5,626 cases of change management were completed with zero related incident.
- All chemicals were put through safety assessing processes before use. A total of 259 chemicals were introduced with zero related incidents.
- Evaluated and introduced 194 new tools with zero related incidents.
- Contractors engaged in a total of 28,758 high-risk operations. Two new regulations have been added: "Notification of Hazard in Contractor’s Work Site Inspection" and "Thermal Hazard Prevention Guide for Outdoor Labor in High Temperatures." For more details, please refer to the Contractor ESH Bluebook.
- A total of 1,628 cases of failed compliance were raised with internal audits. All cases of failed compliance were corrected within the designated time.
- Became first in the industry to deploy all-hazard management in disaster drills. Carried out 195 drills and 75 tabletop exercises in 2020. Upgraded evacuation roll call mechanism from manual to automatic (employees will swipe their ID) to ensure all employees are accounted for.
Safety Performance Index

The TSMC Safety Performance Index (SPI) was classified into four levels and two subtypes—active index and passive index. The active index encourages employees to participate in health & safety programs and raise suggestions for safety improvements while the passive index shows the number of safety-related failures and false alarms. In 2020, blue-light indicators were reduced to 70.4% from 88.8% in the previous year while red-light indicators rose by 3% as the number of incidents grew from 21 in 2019 to 30 in 2020. Upon investigation with the 3L5W (Three-legged Five Whys) tool, we discovered that the incidents included 11 gas false alarm, 10 personnel injuries, four early warnings for fire false alarm incidents, four chemical leakages, and one power outage. The SPI has been declining each year since 2019.

As such, TSMC will issue safety culture questionnaires to a number of fabs in 2021 to identify matters that can be improved. The questionnaire results are expected to be analyzed in 2022 and we will be able to gain insight into the efficacy of previous mitigation measures.
In 11 cases of early warnings, the special gases were turned off immediately after the warning signals. The gases were then channeled to treatment facilities through wind ducts and therefore there were no actual gas leaks, personnel injuries, or pollution to the environment. Causes of the early warnings were analyzed and TSMC will work towards standardization, automation, and employee training.

- Define replacement procedures for special gas cylinders and introduce standard processes for pressurizing special gases and checking for helium leaks into the management procedures.
- Install safety device that automatically determines gas cylinder pressure. Any gas cylinders that fail to meet standards will not be issued to the production line. This helps reduce the risk of human error.
- When replacing gases, workers should wear video transmission equipment that sends on-site videos to the Emergency Response Center and the FMCS to ensure workplace safety during high-risk operations.

Reduce Gas False Alarm

In the seven personnel injury cases, six were extremity fractures from falling while walking and were confirmed to be non-work-related; one was from ladder misuse during machine maintenance and TSMC has responded by establishing a Safety Management Procedures for All Workplace Machines.

- All ladders must be inspected during entry. After inspections, the ladder will be labeled with "Notice (CH/EN)" and "Ladder Sign".
- Set specific requirements on the width, depth, and rung spacing of all ladders. Employees shall not stand on their tiptoe or on one foot when on ladders; the ladders must be placed on a smooth surface, employees shall not place other surfaces on top of ladders to use as a platform, and employees shall not engage in any work that requires large, drastic movements on ladders.

Employees

Contractors

Reduce Personnel Injuries

In 2020, TSMC contractors were engaged in 28,758 high-risk tasks each day. There were three contractor injuries in 2020 from noncompliance to on-site procedures, top-heavy tools that were not corrected, and lack of safety training before operations.

- Issued On-site Health, Safety and Hazard Notices to remind contractors to be aware of safety and health items. TSMC project leads must now accompany contractors entering high-risk areas. Anyone entering the 3.5 floor/ceiling must apply for a Ceiling Work Permit.
- Added Procedures for the Identification of Hard-to-Move Machines to list top-heavy machines that have a high risk of toppling over and mitigation measures during construction meetings.
- Integrated Contractor Management with Access Control Systems; vendors that have not completed TSMC safety and health training will not be allowed onto the premise.

- Define replacement procedures for special gas cylinders and introduce standard processes for pressurizing special gases and checking for helium leaks into the management procedures.
- Install safety device that automatically determines gas cylinder pressure. Any gas cylinders that fail to meet standards will not be issued to the production line. This helps reduce the risk of human error.
- When replacing gases, workers should wear video transmission equipment that sends on-site videos to the Emergency Response Center and the FMCS to ensure workplace safety during high-risk operations.

Reduce Fire False Alarm

The early warning fire alarm system was triggered four times in 2020, of which one was caused by cast resin transformers, a significant improvement from 2018 after the special project to prevent faults in cast resin transformers was launched. Other events were standalone events that involved lithium batteries, lightning conductors, etc. and all of which have been corrected.

- The power outage in 2020. The mitigation measure was to send power equipment to Taipower for review, expand relay settings, and monitor electricity load in real-time.

Reduce Chemical Leakage

There were four chemical spills in 2020, mainly caused by damaged or loose components. Mitigation measures were to strengthen how chemical pipelines are secured to prevent the joints from loosening due to vibrations; TSMC is also inspecting critical valves on the chemical pipelines daily to ensure early failure detection.

- There was one power outage in 2020. The mitigation measure was to send power equipment to Taipower for review, expand relay settings, and monitor electricity load in real-time.

Prevent Power Outages from Sudden Surge in Energy Consumption
The definition for occupational accidents is in accordance with the Occupational Safety and Health Act and important disabling injury indicators issued by the Global Reporting Initiative which uses Disabling Severity Rate (SR) and Disabling Injury Frequency Rate (FR) as primary indicators. In 2020, TSMC reviewed the Occupational Safety and Health Act stipulating that only work-related injuries shall be counted towards SR/FR. Other non-work injuries such as falling in the cafeteria or parking lot due to other reasons shall not be counted towards occupational injuries but should be investigated and resolved. Employee vacation, medical insurance, and insurance disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dust, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. The table above details data from the past 5 years based on the new definition.

Note 1: Figures from TSMC fabs in Taiwan, TSMC (China), TSMC (Nanjing), and VisEra.

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

Note: Please refer to "Improvement Highlights in 2020" for details of falling.
In 2020, TSMC experienced 37 non-work-related injuries. Falling accounted for the highest percentage with 24 cases, resulting in a loss of 485 working days.

### Cause Analysis and Prevention for Falls

#### Personal

22 Falls from Other Reasons: Not paying attention when walking, losing balance while turning, tripping on shoelaces, misstep in the stairways, tripping when getting out of car, slipping on rainy days, or fainting from discomfort

**Improvements**

- Continue to optimize fall-prone areas, place posters to raise awareness, and remind employees to pay attention to personal safety

#### Office

2 Falls from Failing to Follow Through with Cleaning Procedures

**Improvements**

- Review cleaning and waxing processes, establish measures to put up construction fences for safe operations, prohibit other employees from entering the premises while cleaning
- Use chemical sorbent pads to clean oil stains on the floor to prevent falls
- Add cleaning and waxing processes into monthly training courses for cleaning staff

### Disabling Injury Frequency Rate by Injury

- Fall: 18.6%
- Crush, collision: 16.3%
- Ergonomic injuries: 11.6%
- Others: 7%

### Disabling Severity Rate by Injury

- Personal: 35.7%
- Office: 28.6%
- Others: 21.5%

### Non-work-related Injuries Rate
Comprehensive Health Management

Work-related diseases and personal health issues undermine productivity and may significantly impact the Company's operation. A comprehensive health management plan identifies health risks in the workplace, takes responsive measures, prevents occupational diseases, and promotes physical and mental health among employees.

Prevent Occupational Diseases

Moving beyond traditional approaches to occupational health, TSMC has been committed to building a safe and healthy workplace where each work item is assessed with risk identification to uncover five major potential risks, including chemical, physical, ergonomic, biological, and social/psychological, and to design preventive measures accordingly. In 2020, TSMC continued to work with Professor Peng-Chi Tsai from National Cheng Kung University to monitor chemical workstations and analyze results.

In January 2020, in response to the global COVID-19 pandemic, TSMC established the Disease Control Committee and set up a real-time disease control section on the Company's internal website so employees have immediate access to the latest updates and measures.

<table>
<thead>
<tr>
<th>Prevention Measures &amp; Achievements against Occupational Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ergonomic</strong></td>
</tr>
<tr>
<td>On-site Inspections with Occupational Physicians</td>
</tr>
<tr>
<td><strong>Sustainable Measures</strong></td>
</tr>
<tr>
<td>• Arranged occupational physicians to visit loading sites at TSMC fabs in Taiwan and request feedback</td>
</tr>
<tr>
<td>• The ergonomic risk assessment form was streamlined to ensure instant risk level assessment</td>
</tr>
<tr>
<td>• Computerized ergonomic risk assessment systems used to identify operations with high-ergonomic risks</td>
</tr>
<tr>
<td>• Health centers conducted questionnaire surveys, tracked employees who apply for pain relief patches, and arranged meetings with occupational physicians</td>
</tr>
<tr>
<td>• 6 on-site visits from occupational physicians with 2 feedbacks, including annual employee training, and redesign of poorly designed handles, etc. All necessary changes were made with a 100% completion rate</td>
</tr>
<tr>
<td>• Computerized assessments were conducted on 10 employees with above-average height. Office chairs were raised and foot mats were provided to maximize comfort levels. Target employee satisfaction rate stood at 100%</td>
</tr>
<tr>
<td>• 185 employees were impacted by soreness and participated in the ergonomic risk exposure survey. Upon assessment from occupational physicians, 7 of these 185 employees were suspected to be impacted by ergonomic risk factors and received support in the form of adjusted work duties</td>
</tr>
<tr>
<td>• Employees affected by soreness were cross-checked with the computerized ergonomic risk assessment system. None were found to be working in areas or potential areas of ergonomic risks</td>
</tr>
</tbody>
</table>
Social/Psychological

Carry out Cerebrovascular and Cardiovascular Disease Prevention and Management Program

New Measures in 2020

▪ Used IT system to integrate data from employee health check-ups (including historical data) to ensure the screening of more employees into the program for continuous management, and combine with a reminder mechanism to daily monitor working hours of high-risk operators

Sustainable Measures

▪ Conduct employee health risk assessment and divide into different levels for management after annual checkups. Health information and medical support are also provided

▪ Physicians will recommend adjustment to employee work hours and job contents

Achievements

▪ The number of employees under current management has grown to 2,738. TSMC has taken advice from the occupational physician to inform the employees, employee’s supervisor, and HR representatives to adjust the employees’ workload to reduce risks of cerebrovascular and cardiovascular diseases

▪ Integration with In-Out system to remind employees, supervisors, and HR representatives for long working hours, or rearrange an assessment with occupational physician

Biological

Track CDC Updates to Provide Employees with the Latest Health Information

New Measures in 2020

▪ Continued to track communicable epidemics domestically and abroad and establish preventive/response measures for notifiable epidemics

▪ Established Epidemics Control Committee to develop COVID-19 countermeasures and reporting mechanisms for non-notifiable epidemics

Sustainable Measures

▪ Employees on business trips to areas with disease outbreaks will be briefed and provided with disease prevention toolkits

▪ Provide up-to-date information on seasonal flu and Dengue Fever

Achievements

▪ Handled 5,937 high-risk cases in compliance with COVID-19 control measures

▪ A total of 401 cases of notifiable epidemics and non-notifiable epidemics were effectively managed to contain the spread

▪ A total of 295 epidemics prevention toolkits were distributed to employees on official business trips

Physical

Better Identification of Physical Hazards

New Measures in 2020

▪ Compiled the Laser Source Calibration Guidelines and added special eye test

Sustainable Measures

▪ Develop measurement system for ionizing radiation levels to monitor the radiation protection of all equipment, maintain a record of non-ionizing radiation levels of all relevant equipment, ban individuals with cardiac pacemakers operating such equipment and warn before hiring

▪ Process equipment is tested for non-ionizing radiation levels every six months

Achievements

▪ Conducted special eye test on one operator whose results were normal

▪ No cases of radiation exposure

▪ All equipment tested normal for non-ionizing radiation levels
In 2020, in response to the global COVID-19 pandemic, TSMC established the TSMC Disease Control Committee with members from the Corporate Environment Safety Health Division, HR, Operations, Materials Management, Customer Service, Public Relations, and offshore subsidiaries. The Senior Vice President of Information Technology and Materials Management & Risk Management is the commander for disease prevention and is responsible for disease prevention/control measures and emergency response; taking stock of required labor and resources and allocating accordingly; and making necessary announcements on disease prevention/control measures in TSMC. The Corporate Environment Safety Health Division Director is the executive secretary of the committee, responsible for gathering and compiling local disease prevention policies from regions where TSMC has fabs or subsidiaries; follow up on domestic and overseas situations and suggest disease prevention measures to the commander; work with the Wellness Center for the high-risk employee list; and establish the Disease Prevention Guidelines for TSMC. All TSMC fabs in Taiwan, domestic subsidiaries, and offshore subsidiaries were required to adhere to relevant disease prevention/control measures to ensure effective control over the pandemic, guarantee employee safety, and maintain day-to-day operations.

Epidemic Risk Management Process

1. Cloud Controller
   - Through cloud services, TSMC has developed a body temperature feedback system with smartphone IM functions for all personnel entering the Company. The system is connected to the ACS and can effectively manage entry authorizations for high-risk personnel. Every day, the cloud controller reports suspicious temperatures to prevent high-risk personnel from entering TSMC.

2. Self-management in Employees and Contractors
   - People are required to wash hands, check body temperatures, and confirm identity when entering TSMC. Everyone must report body temperatures, complete the Health Declaration Form, wear masks in public spaces, maintain a safe social distance, and comply with strict dining rules.

3. Investigation and Emergency Response to Confirmed Cases
   - TSMC has established a comprehensive investigation process and emergency response structure with defined roles according to the company’s Disease Prevention Guidelines. In 2020, TSMC had one confirmed COVID-19 case and immediately organized an emergency response team within an hour to investigate the confirmed case. In addition to guidelines from the National Health Command Center (NHCC), TSMC has initiated additional quarantine measures for an expanded list of contacts and disinfected workstations. TSMC also offered support to the employee confirmed to have Covid-19 and his/her contacts for medical follow-ups, COVID-19 related health measures, and assistance in daily life.
Assist Employees in Health Management, Including Health Risk Management & Health Care

Occupational Health Risk

Health Risk Management
TSMC’s occupational health risk management plan covers both occupational hazards and personal health, which need to be improved to protect employees’ health.

- Special Health Examination Management
  - 1,739 Employees
  - In accordance with legal regulations on occupational safety and health, all employees involved in operations with special health examinations, a total of 4,953 individuals, completed special health examinations.

- Cerebrovascular and Cardiovascular Disease Prevention and Management Program
  - 2,738 Employees
  - Mid/high risk employees will receive medical advisories and work hour management.

- Medical Evaluation for the Use of RPE (Respiratory Protective Equipment)
  - 12,672 Employees
  - In compliance with the Respiratory Protection Program and Management Guidelines, TSMC is conducting medical evaluations to determine respiratory protection needs.

- Material Health Management Plan
  - 663 Employees
  - Conducted workplace evaluations for 643 expecting/new mothers and gifted 1,788 baby career gift sets.

- High Stress Support Plan
  - 1,245 Employees
  - Employees with high perceived stress levels were offered psychological counseling.

- Occupational Musculoskeletal Disorder Prevention Plan
  - 209 Employees
  - Employees who were absent for more than four days due to musculoskeletal pain were assessed to determine whether adjustments to work were necessary.

- General Employee Healthcare
  - 54,100 Employees
  - A total of 9,882 employees received moderately and highly abnormal health check results, and all of them were closely monitored.

Relevance to Work

Health Care
Offer employees a supportive environment and a variety of health care programs to maintain employee health.

- Health and Wellness Programs in 2020
  - 46,801 Participants

  - Cancer Screening
    - 8,631 Employees
    - Received fecal occult blood tests, Pap smears, or breast/gynecologic ultrasonography

  - Clinic Services
    - 17,581 Outpatients
    - Including employees, family members, vendors, and visitors

  - Health Promotion Programs
    - 18,981 Participants
    - Joined events such as online Health Speeches, Health Quiz, Healthy Diet Tips, and Weight Control Competition. Health Promotion Programs were taken online or e-Learning in consideration of the COVID-19 pandemic. Interactive online speeches welcomed twice as many participants as traditional lectures did in the past. Through sharing real-life case studies, TSMC urged employees to make lifestyle changes.

  - Massage Service
    - 231 Users
    - Received massages service performed by resident masseurs

  - Physical and Mental Health Lectures
    - 1,377 Participants
    - Joined lectures on disease prevention, exercise, dieting or stress management

  - Sports Center
    - 129,375 Users
    - Employees were encouraged to exercise regularly. TSMC Sports Centers and all TSMC facilities come with gyms, aerobics classrooms, and multifunctional ball courts to provide employees with a supportive environment and multiple options for exercise. The services, including swimming pools, yoga classes, and spinning bike classes, can be accessed by employees and their dependents.

  - Assistance for Employees
    - 3,704 Users of the free consulting service
    - TSMC has a long-term partnership with professional psychologists, lawyers, and accountants to provide employees with free consulting services and help employees deal with stress and mental issues.
Internal-External Alliance

As a leader in the global semiconductor industry, TSMC exerts an ever-greater influence on societies and industries. Therefore, TSMC recognizes its obligations in creating a healthy workplace together with its vendors and contractors. In the first half of 2020, TSMC reduced and restricted face-to-face exchanges with outside parties to share our experience in safety and health. When the pandemic eased in the second half of the year, TSMC reinitiated training and consultations. We worked with our business partners, the industry, the government, academia, and all of society to reduce safety and health risks from vendors and contractors.

Work with External Parties to Optimize Work Environment

TSMC regularly attends the Joint Steering Committee ESH Working Group of the World Semiconductor Council on behalf of the Taiwan semiconductor industry to conduct exchanges with overseas peers on occupational safety and health. In 2020, the ESH Working Group was held online in response to the COVID-19 pandemic. The goal was to share experiences on managing a safe and healthy workplace while eliminating the risk that comes with public gatherings.

Training Programs for Contractors

Sustainable Measures in 2020

▪ TSMC dispatched its occupational physicians to inspect on-site contractor operations and analyze the risks of chemical exposure
▪ Asked contractors to report to TSMC any abnormal results from special health examinations
▪ Continued updating the Contractor ESH Bluebook with vendor feedback

Disabling Injuries in Contractors

Achievements

▪ On-site contractors were guaranteed zero risks of chemical exposure in TSMC
▪ 0 reported cases of abnormal health examination results
▪ The Contractor ESH Bluebook has been updated per vendor feedback to ensure readers have the latest information
TSMC is committed to creating a better workplace environment and therefore launched the On-Site Supplier Support Program in 2020 to support on-site supplier working at entry-level positions in Taiwan fabs. In addition to minimum wage and legal work hour guarantees, TSMC is planning a 2-stage workplace upgrade program that will benefit 7,000 people.

In 2020, TSMC interviewed cleaning staff, cafeteria staff, and security service staff to gain more insight into their daily work and subsequently outlined ways to improve their work situations as part of the Support Program. As of now, TSMC has added rest areas, made communication tools accessible, and ensured health check-ups in all employees. In 2021, TSMC will commence the second stage of the support program to target tank truck drivers and truck drivers. We are looking to create a friendly supplier workspace by improving their workflows and offering better workplaces/facilities.

### Stage/Targets

<table>
<thead>
<tr>
<th>Stage One</th>
<th>Identify Problems</th>
<th>Implement Change</th>
<th>Fabs</th>
<th>Completion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onsite cleaning staff, cafeteria staff, and security service staff</td>
<td>Lack of rest areas</td>
<td>Added rest areas in new fabs; reserved conference rooms as rest areas for existing fabs</td>
<td>Taiwan Facilities</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Cannot bring personal cellphones into the workplace due to fab regulations</td>
<td>Offered free company-regulated mobile phones to all suppliers who need the phones</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>Failed to offer health checkups to all suppliers on a shift system</td>
<td>Required all fabs to ensure all suppliers have received health check-ups and to confirm in the Fab Work Permit System</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage Two</th>
<th>Identify Problems</th>
<th>Implement Change</th>
<th>Fabs</th>
<th>Completion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank truck drivers and truck drivers</td>
<td>Long waiting time during deliveries</td>
<td>Evaluate the system to reduce waiting time by adopting technologies such as license plate identification and computerized operations</td>
<td>Ongoing</td>
<td>Ongoing</td>
</tr>
<tr>
<td></td>
<td>Cannot use mobile phones or rest areas while waiting during deliveries</td>
<td>Optimize rest areas to include beds or similar facilities, and specific areas for using personal mobile phones</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Strengthen Safety Guidance at Construction Sites

To ensure construction workers’ safety during fab construction, TSMC is working with contractors to build a safe construction site and strengthen safety management organizations of the construction sites. Contractors, construction site safety committee, and TSMC are working together in a three-level management system to guarantee safety on construction sites.

In 2020, TSMC invited senior executives from third-level contractor companies to participate in the TSMC Construction Contractor Worksite Safety Symposium in an effort to strengthen their resolve in construction site safety management. During the meeting, all parties signed the Declaration of Construction Site Safety and invited a team of outside experts to improve safety awareness and knowledge in frontline safety supervisors. The experts offered insight into the three main stages of risk identification, safety oversight, and inspections. Based on risk identifications, the experts then offered suggestions to each contractor to help build a more robust safety management system.

TSMC regularly works with 5 civil engineering contractors and 3 steel structure contractors that engage in a higher percentage of high-risk operations. To ensure safety of the construction sites, TSMC invited outside experts in 2020 to conduct a 3-month, high-intensity on-site evaluation. The results and recommendations are provided to the responsible unit for future improvements. Construction site safety failures were compiled into training materials based on operations, techniques, and regulations. A three-hour training was then held at a Construction Office; 300 frontline safety personnel and supervisors attended.

Beginning in 2021, TSMC will strengthen control measures on openings to reduce risks of construction workers falling into floor holes. During the same time, TSMC will also launch the Contractor Self-Management Program for Construction Safety and invites a team of outside experts to improve safety awareness and knowledge on-site supervision by increasing the professionalism and training efficacy of contractors.

Construction Site Safety Measures

1. Risk Identification
   - Compile 170 items for safety analysis on 36 Safety Guidance Programs and then develop 163 SOPs based on safety analysis.

2. Management Guidance
   - TSMC guides contractors through safety analyses so that contractors become familiar with the approach and can extend it to other projects and ensure construction risk control.

3. On-site Evaluation
   - Invite outside experts and contractor managers to work safety meetings to review construction risks identified.

Note 1: Senior executives from contractors were required to sign a Declaration of Construction Site Safety during the Construction Contractor Worksite Safety Symposium in 2020.

Note 2: TSMC commissioned the Safety and Health Technology Center in 2020 to assist safety trainings and guide contractors to design and implement safety plans.
Construction Site Safety Efforts and Achievements

New Measures in 2020

- Increased professionalism and trainings of construction safety officers. Construction workers were required to receive construction site safety trainings before getting work permits.
- Invited outside experts to instruct contractors and increase safety awareness and knowledge in frontline site safety supervisors.
- Required contractors to establish a certification system for health management systems and occupational safety and health.

Substantial Measures

- Require all high-risk operation contractors to obtain occupational safety and health management system certifications.
- Confirm that contractor owners are aware of his/hers responsibilities detailed in the Occupational Safety and Health Act and has personally participated in the Occupational safety and health Committee to improve previous oversight.
- Authorize on-site construction site safety officers to suspend construction work when necessary to prevent occupational accidents.

Achievements

- All construction workers received construction site safety training; 10 trainings were held for construction site safety officers from contractors.
- 1 new contractor received certification and all of the 34 high-risk operation contractors received ISO certification for occupational safety and health management; the target for all contractors to receive certification was met.

TSMC Construction Contractor Worksite Safety Symposium — Safety Declaration by Senior Executives from Contractor Companies

Construction Site Safety Guidance Program — On-site Inspections by Experts

Double Hook Safety Harness Training
Power to Change Society

Based in Taiwan, TSMC has flourished with support from all sectors of society. TSMC believes that giving back to the community has been critical to our success. We’ve been caring for the disadvantaged, helping youth education, supporting arts and culture through the TSMC Education and Culture Foundation and TSMC Charity Foundation to give back and create common values.

- **80.55 Million (NT$)**
  - Invested into liberal arts and science education for youth and to strengthen the equality of educational right

- **10,855 Services**
  - Collaborated with 15 medical and care centers, providing 10,855 services to seniors through the Network of Love

- **37,071 Beneficiaries**
  - 92 organizations supporting the disadvantaged regularly benefit from the Cherish Food Program, with a total of 37,071 beneficiaries
TSMC is committed to its ESG Policy, and focuses on SDGs and social needs, and works to reduce resource gaps between rural and urban areas through public welfare activities to achieve the goal of common good. The TSMC Education and Culture Foundation strives to cultivate youths, and promotes diversified education by focusing on education for disadvantaged youth and providing students with various platforms outside of the formal education system. TSMC is also growing the seed of love for the arts in society to work towards the goal of SDG 4—Quality Education. Moreover, the TSMC Charity Foundation is committed to long-term volunteer service. In order to achieve the targets of SDG 1, 3, and 4, which cover No Poverty, Good Health and Well-being, and Quality Education, respectively, the charity foundation serves the disadvantaged as well as elder people living alone, and promotes filial piety and environmental protection.

Our Social Contributions

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-kind Giving</td>
<td>76.4%</td>
</tr>
<tr>
<td>Cash Contribution</td>
<td>13.4%</td>
</tr>
<tr>
<td>Management Overheads</td>
<td>11.0%</td>
</tr>
<tr>
<td>Time</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

*Note: Social contributions include related activities from TSMC (University Cooperation Program), TSMC Education and Culture Foundation, TSMC Charity Foundation and TSMC staff (volunteer service, charity donation), and TSMC Welfare Committee.*
### TSMC Education and Culture Foundation

#### 2030 Goals

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cultivate Young Generation</strong></td>
<td>• Ensure the participant number of youth competition events is higher than the previous year</td>
</tr>
<tr>
<td>Hold educational events; provide diversified educational platforms</td>
<td></td>
</tr>
<tr>
<td><strong>Educational Collaboration</strong></td>
<td>• Hold at least six popular semiconductor science activities</td>
</tr>
<tr>
<td>Cooperate with educational organizations to narrow the gap in educational resources</td>
<td>• Donated exhibition hall &quot;The World of Semiconductors&quot; to the National Museum of Natural Science as to promote popular science education</td>
</tr>
<tr>
<td><strong>Promote Arts and Culture</strong></td>
<td>• Hold at least ten popular semiconductor science activities</td>
</tr>
<tr>
<td>Hold art festivals to foster local art groups</td>
<td>• Held five TSMC Journeys of Female Scientist Lectures</td>
</tr>
</tbody>
</table>

#### 2021 Targets

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2020 Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure overall competition participation is higher than the previous year</td>
<td></td>
</tr>
<tr>
<td>• Hold at least ten popular semiconductor science activities</td>
<td>• Youth Competition events attracted a total of 1,581 participants, an increase of 47 participants from 2019</td>
</tr>
<tr>
<td>• Continue to cooperate with educational organizations, investing in resources of more than NTS$15 million</td>
<td>Target: The number of youth event participants is higher than the previous year</td>
</tr>
<tr>
<td>• Offer scholarships for underprivileged students to five universities</td>
<td></td>
</tr>
<tr>
<td>• Sponsored education funding to the Public &amp; Private Experimental Emei Bilingual Junior High School</td>
<td>• Provided a total of NTS$7 million in scholarship to 70 underprivileged students from five universities</td>
</tr>
<tr>
<td>• Sponsor ten local talented artists or art groups</td>
<td>Target: Offer scholarships for underprivileged students to 5 universities</td>
</tr>
<tr>
<td>• Organize at least 15 humanities lectures in college</td>
<td>• Sponsored education funding to the Public &amp; Private Experimental Emei Bilingual Junior High School</td>
</tr>
<tr>
<td>• Continuously organize the TSMC Hsin-Chu Art Festivals and sponsor at least five talented local artists or groups annually</td>
<td>Donated 100 infrared body temperature imagers to the Ministry of Education during Covid-19</td>
</tr>
<tr>
<td>• Organize at least four TSMC Lectures</td>
<td></td>
</tr>
<tr>
<td>• Continuously organize at least four TSMC Lectures</td>
<td></td>
</tr>
</tbody>
</table>

#### Achieved • Exceeded — Missed Target

<table>
<thead>
<tr>
<th>2030 Goals</th>
<th>2021 Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure overall competition participation is higher than the previous year</td>
<td>• Ensure the participant number of youth competition events is higher than the previous year</td>
</tr>
<tr>
<td>• Hold at least ten popular semiconductor science activities</td>
<td>• Hold at least six popular semiconductor science activities</td>
</tr>
<tr>
<td>• Continue to cooperate with educational organizations, investing in resources of more than NTS$15 million</td>
<td>• Offer scholarships for underprivileged students to five universities</td>
</tr>
<tr>
<td>• Offer scholarships for underprivileged students to five universities</td>
<td>• Provided a total of NTS$7 million in scholarship to 70 underprivileged students from five universities</td>
</tr>
<tr>
<td>• Sponsor ten local talented artists or art groups</td>
<td>• Sponsored education funding to the Public &amp; Private Experimental Emei Bilingual Junior High School</td>
</tr>
<tr>
<td>• Organize at least 15 humanities lectures in college</td>
<td>• Sponsored NSO Music Educational Program</td>
</tr>
<tr>
<td>• Continuously organize the TSMC Hsin-Chu Art Festivals and sponsor at least five talented local artists or groups annually</td>
<td>• TSMC Hsin-Chu Art Festivals cancelled due to Covid-19</td>
</tr>
<tr>
<td>• Organize at least 15 humanities lectures in college</td>
<td>Target: Continuously organize at least 4 TSMC Lectures</td>
</tr>
<tr>
<td>• Continuously organize at least four TSMC Lectures</td>
<td></td>
</tr>
</tbody>
</table>

**Overview**

**ESG Feature Stories**

**Sustainable Business Practice**

**Operations and Governance**

**Appendix**

---

2020 Corporate Social Responsibility

2020 Corporate Social Responsibility

---

167
To fulfill TSMC Company’s corporate social responsibility, TSMC Education and Culture Foundation, established in 1998, contributed NT$99.85 million in 2020 into 3 engagements: "Cultivate Young Generation", "Educational Collaboration", and "Promote Arts and Culture". The Foundation worked hand-in-hand with educational organizations from both the public and private sectors to care for young generation and hope to cultivate well-rounded talents in this new era; through various competitions and popular science education programs, the Foundation endeavored to lead youths toward self-exploration and pursuit of their dreams. The Foundation also held cultural events and sponsored local art groups to contribute to the community as well as enrich the public’s appreciation for the arts.

For further information about the events and the sponsorships, please refer to the official website of the TSMC Education and Culture Foundation.

<table>
<thead>
<tr>
<th>Core Engagement</th>
<th>Contribution Details</th>
</tr>
</thead>
</table>
| **Educational Collaboration** | - Collaborate with public schools  
- Collaborate with non-profit educational organizations |
| **Promote Arts and Culture** | - Promote online cultural activities in response to the impact of COVID-19  
- Promote the Humanities and Chinese Classics |
| **Cultivate Young Generation** | - Promote popular science to nurture science talents in the future  
- Establish diversified platforms to encourage the youth to explore themselves and enrich their humanistic quality |

---

**Sponsorship from the TSMC Education and Culture Foundation between 2016-2020**

<table>
<thead>
<tr>
<th>Year</th>
<th>Contributed Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>NT$7,581 million</td>
</tr>
<tr>
<td>2017</td>
<td>NT$7,679 million</td>
</tr>
<tr>
<td>2018</td>
<td>NT$7,681 million</td>
</tr>
<tr>
<td>2019</td>
<td>NT$9,699 million</td>
</tr>
<tr>
<td>2020</td>
<td>NT$9,985 million</td>
</tr>
</tbody>
</table>

Unit: NT$ ten thousand
Cultivate Young Generation

Our Actions

- Promote Popular Science to Foster Science Talents in the Future
- Establish Diversified Platforms to lead the Youth toward Self-Exploration and the Humanities

What We Want to Solve

Due to the absence of literary, aesthetics, science, and self-exploration curriculum in the current high school and higher education, young students lack the opportunities to dig out and embody their talents.

How We Respond

In 2020, the Foundation contributed a total of NT$40.86 million to hold various competitions, camps, lectures to inspire students’ interest in science and the humanities as well as to lead them toward self-exploration and pursuit of their dreams.

How We Respond

In 2020, the Foundation contributed a total of NT$40.86 million to hold various competitions, camps, lectures to inspire students’ interest in science and the humanities as well as to lead them toward self-exploration and pursuit of their dreams.

Promote Popular Science to Foster Future Science Talent

Donate the Exhibition Hall The World of Semiconductors to the National Museum of Natural Science

To promote popular science education, lead the general public to learn about the IC industry, and to cultivate future semiconductor talents, the Foundation sponsored the exhibition hall The World of Integrated Circuit to the National Museum of Natural Science in 1997. In 2002 and 2011, TSMC Education and Culture Foundation again sponsored the renovation of the exhibition hall. The exhibition hall, renamed The World of Semiconductors in 2011, keeps providing knowledge on semiconductors to visitors since then.

How We Respond

In 2020, the Foundation contributed a total of NT$40.86 million to hold various competitions, camps, lectures to inspire students’ interest in science and the humanities as well as to lead them toward self-exploration and pursuit of their dreams.

The new exhibition hall features five major sections: Discovery, Application, Progress, Innovation, and Imagination. With the latest interactive display and AR technique the exhibits lead the general public to realize the science knowledge of semiconductors as well as the prospect and history of the industry. The tour services at the exhibition hall are provided by volunteers from the TSMC Charity Foundation, encouraging TSMC retirees to take part in the volunteer program. Along with the exhibitions, the TSMC volunteers continued to contribute to the society by sharing the knowledge in the semiconductors.

Organize the TSMC Journeys of Female Scientists Lectures

To inspire female students’ interest in semiconductors, in 2020, the Foundation held five Female Scientists lectures for five girls’ senior schools, 200 female students in total, at National Museum of Natural Science. Apart from having female employees from TSMC to provide tour services, acclaimed female scientists, such as Physics Professor Ming-Feng Tai form National Tsing Hua University etc. were invited to share their trajectories of study and careers. The Foundation hope that the tour could inspire female students to unlock their potential and then embark on the study of science. The Foundation will extensively invite 12 girls’ senior schools to join in the tour in 2021.

> NT$40.86 million was contributed for popular science education

"I’m grateful for having the opportunity to give back to society after retirement. Volunteering at the National Museum of Natural Science has given profound meaning to my retirement."

—Ming-Chieh Guan, TSMC retiree & exhibition volunteer

"There is no gender difference when one shines in their professional field. Women can be equally accomplished as men."

—Participant from Stella Matutina Girl’s High School

Promote Popular Science to Foster Future Science Talent

Donate the Exhibition Hall The World of Semiconductors to the National Museum of Natural Science

To promote popular science education, lead the general public to learn about the IC industry, and to cultivate future semiconductor talents, the Foundation sponsored the exhibition hall The World of Integrated Circuit to the National Museum of Natural Science in 1997. In 2002 and 2011, TSMC Education and Culture Foundation again sponsored the renovation of the exhibition hall. The exhibition hall, renamed The World of Semiconductors in 2011, keeps providing knowledge on semiconductors to visitors since then.

How We Respond

In 2020, the Foundation contributed a total of NT$40.86 million to hold various competitions, camps, lectures to inspire students’ interest in science and the humanities as well as to lead them toward self-exploration and pursuit of their dreams.

The new exhibition hall features five major sections: Discovery, Application, Progress, Innovation, and Imagination. With the latest interactive display and AR technique the exhibits lead the general public to realize the science knowledge of semiconductors as well as the prospect and history of the industry. The tour services at the exhibition hall are provided by volunteers from the TSMC Charity Foundation, encouraging TSMC retirees to take part in the volunteer program. Along with the exhibitions, the TSMC volunteers continued to contribute to the society by sharing the knowledge in the semiconductors.

Organize the TSMC Journeys of Female Scientists Lectures

To inspire female students’ interest in semiconductors, in 2020, the Foundation held five Female Scientists lectures for five girls’ senior schools, 200 female students in total, at National Museum of Natural Science. Apart from having female employees from TSMC to provide tour services, acclaimed female scientists, such as Physics Professor Ming-Feng Tai form National Tsing Hua University etc. were invited to share their trajectories of study and careers. The Foundation hope that the tour could inspire female students to unlock their potential and then embark on the study of science. The Foundation will extensively invite 12 girls’ senior schools to join in the tour in 2021.

> NT$40.86 million was contributed for popular science education

"I’m grateful for having the opportunity to give back to society after retirement. Volunteering at the National Museum of Natural Science has given profound meaning to my retirement."

—Ming-Chieh Guan, TSMC retiree & exhibition volunteer

"There is no gender difference when one shines in their professional field. Women can be equally accomplished as men."

—Participant from Stella Matutina Girl’s High School
Establish Diversified Platforms to Lead the Youth toward Self-Exploration and the Humanities

Organize the 5th TSMC Youth Dream Building Project to Encourage the Young Generation Care about Environmental Sustainability

Since 2016, the Foundation has been funding TSMC Youth Dream Building Project, providing an annual 3-million grant for dream building projects and encouraging college students to care about social issues, embark on a journey of self-discovery, and provide creative solutions. A total of NTS3 million Award is granted to help students make their dreams come true.

The fifth Youth Dream Building Project was held in 2020. Apart from inviting students from Taoyuan, Hsinchu, Miaoli, and Tainan areas to submit their projects, the competition further invited students from Taichung area to participate. Under the theme of circular economy, the competition attracted 102 groups of students from 36 universities to submit their proposals. The proposals presented by the teams cover various areas in our society: from creating a popular science column on “I want to express my gratitude to the TSMC Education and Culture Foundation for putting so much effort in organizing the activities. ‘Care for the Earth through Small Acts’ was a successful learning-through-play project. The activities catered to children’s interest and level of literacy, and were able to help children form habits of recycling and waste reduction.” —Mei-Lan Tsai, Principal of TSMC Preschool

Aesthetic Cycle” Glass Art Installations, designed by the design team led by professor Yi-Ying Chiang, Department of Arts and Design, NTHU.

Teams selected in the first round of the fifth Youth Dream Building Project visit TSMC Museum of Innovation.

“I want to express my gratitude to the TSMC Education and Culture Foundation for putting so much effort in organizing the activities. ‘Care for the Earth through Small Acts’ was a successful learning-through-play project. The activities catered to children’s interest and level of literacy, and were able to help children form habits of recycling and waste reduction.” —Mei-Lan Tsai, Principal of TSMC Preschool

In order to resonate better with young people and the TSMC employees on the theme of “circular economy”, the Foundation initiated a special pilot project of “Aesthetic Cycle.” A special glass recycling machine was set up by the Foundation at the headquarters of TSMC to encourage employees to recycle glass waste created from their daily life. Over a thousand pieces of family glass waste were collected through the machine in two months. The project invited Spring Pool Glass and Design Lab led by Prof. Beatrice Chiang of National Tsing Hua University to recycle glass waste into recycled bottles and created an art installation of “Aesthetic Cycle.” The installation displays icons of Taiwanese landscape and signifies the core concept of “loving nature and respecting the humanity” and is displayed currently at the square of TSMC Museum of Innovation.

In addition, the Foundation invited the Daidai Rebag team, two times winning team from the Youth Dream Building Project competition, to run a series of environment protection activities at the TSMC Preschool, not only through illustrated books reading and game playing to promote the idea of environmental education in 2020, but through repurposing the children’s own old clothes into bags. Hence the children learn how to classify and recycle waste. The Foundation expects our next generation would grow to be environmentally friendly through small acts in everyday life and put the new generation concepts of environmental education into action.

102 groups of students participated TSMC Youth Dream Building Project

“I'm very grateful that the TSMC Youth Dream Building Project provided us with the opportunity to pursue our dreams. The future is unforeseeable, but from this experience, I have gathered a little bit more of courage to believe in my dreams and in turn embark on this long, bumpy journey.” —Hsuan Chen, a team member from “The Bridge of Tails”, one of the selected teams in the fourth Youth Dream Building Project

Children at TSMC Preschool transformed used-clothes into recycle bags.
Fund PackAge Plus to Become A Social Enterprise

In 2019, the TSMC Education and Culture Foundation participated in the ATCC Case Competition. PackAge Plus, the TSMC representative team, won second place in the final round of the competition. Through providing reusable packaging service, PackAge Plus endeavors to establish a plastic-free online shopping reward mechanism and later set up a social enterprise after the competition. To assist the team in continue to their dreams and promoting the idea of circular economy, the Foundation sponsored PackAge Plus NT$1 million startup funds. PackAge Plus changed the existing e-commerce packaging practices by successfully producing ten thousand pieces of reusable packaging in 2020 and it will continuously expand its influence on environmental sustainability.

Calligraphy and Literature Contests

To enrich the youth’s humanistic quality, the TSMC Foundation provides all kinds of educational platforms for young students to shine, such as the 17th TSMC Youth Literature Award and the 13th TSMC Calligraphy and Seal-Carving Competition in 2020. Through these competitions, the Foundation hopes to encourage young students to throw themselves into literature and calligraphy.

The 17th TSMC Youth Literature Award, with the theme Before Becoming an Adult, attracting a total of 831 submissions, up 12 percent from the previous year. The Foundation also organized 4 campus lectures, where Taiwan’s renowned writers shared their abundant writing experiences and gave guidance to students on writing techniques and ways of perception. The Foundation also used social media to raise people’s interest in literature. For instance, the TSMC Youth Literature Facebook Page gained nearly 14 thousand followers, and an individual work was shared by over 3 thousand times.

In 2020, the theme of 13th TSMC Calligraphy and Seal-Carving Competition was “Antidote”, which incorporated Chinese herbal medicine into visual design and Chinese calligraphy. An walking tour event—“Medicine Cures the Body, Calligraphy Cures the Heart” was organized for the opening of the competition. The activity invited Chinese calligraphy artist Mr. Gu Yao-Hua to take students and teachers to Chinese herbal medicine pharmacies on Di-hua Street. In addition to learning about traditional Chinese herbal medicine and tools, the students also realized the history of these pharmacies as well as got a chance to appreciate the plaques collection, prescriptions and vintage accounting books, written by famous calligraphers. Those events attracted a total of 607 participants.

Exclusive Sponsorship—Kenneth Hsien-Yung Pai Literature Lectures: Dream of the Red Chamber

Dedicated to promoting Chinese Classics, in 2020 the Foundation initiated its exclusive sponsorship for the Hsien-Yung Pai Literature Lecture Series on Dream of the Red Chamber at National Tsing Hua University and co-designed the course with Department of Chinese Literature. The course aimed to deepen students’ humanistic literacy, and to give NTNU, a top-notch university in science and engineering, a more humane touch. The 3-month course, comprising of 17 lectures, invited Hsien-Yung Pai, a literary master in Taiwanese Literature, writers, and scholars from Taiwan and abroad to talk about the classic novel from their area of research focus—literature, aesthetics, gender, drama, and modern technology and many more, and share their perspectives on Dream of the Red Chamber. Students were guided to appreciate the human nature and sensibility of Dream of the Red Chamber and to gain a better understanding of Chinese culture. The course attracted over 500 students to enroll, and a limited number of seats were reserved for students from National Hsin-Chu Senior High School and National Hsinchu Girls’ Senior High School to audit the lectures. In compliance with the COVID-19 prevention measures, the first three classes lectures were physical lectures, and the rest 14 lectures were conducted online. The complete lectures course can be accessed via NTHU OpenCourseWare and the official website of TSMC Education and Culture Foundation at viewers’ convenience.

Reactive Pack designed by PackAge Plus.

Students from Chengyuan High School at Huang Yung-Sheng Chinese Herbal Medicine Pharmacy.

Students from Chengyuan High School at Chien-Yuan Chinese Herbal Medicine Pharmacy.

Writer Kenneth Hsien-Yung Pai in a lecture.
Collaborate with Public Schools
Continuously to Provide Scholarship and Digital Learning Equipment for Disadvantaged College Students

Dedicated to assisting outstanding yet economically disadvantaged students, the Foundation sponsored NT$7 million to 70 disadvantaged students from five universities including: Sunrise Program Scholarship (National Tsing Hua University), Sunflower Program Scholarship (National Central University), Star Program Scholarship (National Cheng Kung University), South Star Program Scholarship (National Sun Yat-sen University), Chia Star Program Scholarship (National Chung Cheng University) in 2020. The scholarship programs ease students’ financial burden, offer life and academic support, and help students focus in school. In 2020, for the first time, the Foundation provided 25 scholarship freshman recipients with a laptop computer each to assist them in educational needs.

Donate 100 Thermal Imagers to Schools to Confront COVID-19
As many schools around Taiwan couldn’t get facilities that can take multiple body temperature simultaneously, and in turn worried that students would be affected by such pandemic prevention and control loophole, the Foundation contacted the Ministry of Education and donated 100 thermal imagers. The imagers were distributed to 25 universities, 45 high schools, and one junior school, and were prioritized for usage in 3 large-scale examinations—the Comprehensive Assessment Program for Junior High School Students, TVE (Technological & Vocational Education) Joint College Entrance Examinations, and College Advanced Subject Test, to increase efficiency in body temperature monitoring of test students.

"It was heartwarming to have received a laptop computer. I never thought I could be using the kind of laptop computer my classmates are using. I would like to thank the TSMC Education and Culture Foundation for helping me."

—Ms. Chang, Recipient of Sunrise Program Scholarship
Collaborate with Nonprofit Educational Organizations

Funding to turn over the Experimental Education at Emei Junior High School, Hsinchu County

The Foundation has long been caring for rural education in Taiwan. In 2020, the Foundation joined hands with the Cheng Zhi Foundation to realize a shared vision of providing rural areas with equal access to education resource. A three-year education funding sponsorship was provided to Emei Junior High School, the first KIST (Knowledge-Is-Power-Program Inspired Schools in Taiwan, KIST) school to give students a more equal right to education in Hsinchu area. The Foundation also organized music education courses to cultivate the students’ art appreciation.

Junyi Digital Education Platform Program 2.0

As the New K-12 Compulsory Education Curriculum took effect in 2019, the Foundation launched a media survey with the United Daily News-Vision Project in the same year, targeting teachers and students from 1,500 junior and senior high schools to understand teacher’s needs in three areas: teacher qualification, teaching materials, and classroom hardware and software facilities. Survey results were then used as the basis for “Critical Thinking Ability Training”, the online literacy course jointly designed by the Foundation and the Junyi Academy Foundation. The online course has reached more than 120 thousand views with a video completion rate of 90 percent by December, 2020. In the meantime, to familiarize teachers with course content, teaching material and teaching method, 26 workshops involving 518 teachers in total were held. In addition, the Foundation also collaborated with 3 after-school classes for the disadvantaged in holding 5 workshops titled "Critical Thinking Teaching Workshop", where students were taught to cultivate critical thinking.

>120,000 views of Critical Thinking Ability Training Online Program

"Thanks to the TSMC Education and Culture Foundation’s joint effort in driving Taiwan’s education technology development, and children are able to grow and improve in their learning process.”

—an excerpt from Junyi Academy Foundation 2020 Winter Issue
Promote Online Arts and Culture Events in Response to the Pandemic

The TSMC Foundation has been holding the Hsin-Chu Art Festival for 17 consecutive years since 2003, with a different theme for each year. Major art events are held regularly in Hsinchu, Taichung, and Tainan to lead the public experience the beauty of arts. In 2020, in response to the government’s Covid-19 precaution regulations, the Foundation had to cancel the art festival. As the pandemic showed signs of slowing down in the second half of the year, two concerts were held and livestreamed, enabling art to reach wider corners during the pandemic.

**What We Want to Solve**

Taiwan local art groups, without sufficient resources in common, need more stages to perform and support from public; meanwhile, impacted by internet entertainment media, traditional arts and culture inheritance both face critical challenges.

**How We Respond**

In 2020, the Foundation planned to contribute NT$37 million to organize high-quality arts and culture exhibitions and performances to support art groups. Due to the impact from COVID-19, however, many exhibitions and activities were canceled under such concerns. As the pandemic showed signs of slowing down in the second half of 2020, the Foundation contributed NT$7.23 million to sponsorships of arts education programs and online streaming program. With the help of technology, the Foundation could be able to continue and to expand the promotion of arts.

---

**NSO Music Educational Program**

The TSMC Education and Culture Foundation initiated the NSO Music Educational Program together with National Symphony Orchestra (NSO) and Public Television Service (PTS). The program invited Ray Chen, a world-class Chinese violinist, to host a master class at the National Concert Hall, so that students in Taiwan had the opportunity to broaden their horizons in music. The master class was live-streamed globally with the help of technology, benefiting music students that couldn’t attend classes in person. The online program has attracted 73,000 views.

---

**Sponsorship to Celloist Yo-Yo Ma and Pianist Kathryn Stott’s Recital Concert "Songs of Comfort and Hope"**

The Foundation sponsored the concert tour Songs of Comfort and Hope, featuring celloist Yo-Yo Ma and pianist Kathryn Stott. The first concert was held at Tainan, where one of TSMC Fab sites is located. A total of 1,600 music fans were attracted to the concert to enjoy these two world-renowned masters’ performance.

---

**TSMC Education & Culture Foundation Supports Local & International Art Groups**

Note: Data accumulated from 1998 to 2020.
**Promote Humanities Classics**

**Sponsor Radio Lecture Series on the Classics of Chinese Literature, and Published Audio Books Professor Xin Explains Laozi**

The Foundation has long been devoted to promotion and revitalization of the Chinese Classics Literature, and has sponsored Professor Yi-Yun Xin’s production of radio program series “Chinese Classic” for 10 consecutive years. In 2020, Professor Xin recorded and aired the 52 episodes of “Professor Xin Explains the Book of Songs”, reaching a total of 800 thousand audience. In the same year, Professor Xin Explains Lao-Zhi audio book series was published and donated to 130 high schools in Taiwan, hoping more students in Taiwan can be exposed to such content. Furthermore, an accumulated total of 3,000 sets of all published audio book series were donated to Chinese literature-related departments in 60 universities.

**3,000 sets of audio book on the Classics of Chinese Literature was donated**

**TSMC Lectures**

Since 2014, the Foundation has held the TSMC Lectures to promote humanities and philosophy from the East and the West. In 2020, due to COVID-19’s enormous impact on our lives, the Foundation invited Dr. Ming-Ke Wang, an Academician of Academia Sinica, to speak on Virus, Anti-Virus, and Witch Hunt: Collective Fear and Violence within Human Communities from an anthropological perspective to plow through the origin and cause of fear in different regions of different periods throughout history. Four lectures were organized, with a total of 442 participants.

**Sponsor 16 Years Old Festival x TSMC Youth Theater Project**

The Foundation has sponsored “16 Years Old Festival”, organized by the Cultural Affairs Bureau, Tainan City Government, for four consecutive years. The festival derives from the 16-year-old rite of passage, a traditional ceremony practiced in the Tainan City, and has been working to establish a platform for youths to participate in arts and culture events through three approaches: Plays watching, Plays production, and Plays acting. The festival is open to registration for youth with an age from 16 to 18, who are interested in art performance and hope to express themselves through performing.

Each year, the “16 Years Old Festival” selects 50 youths as participants, and as of 2020, over 30 participants have chosen drama and theater related majors in university. In 2020, the Festival was themed “Tshut Thuat” (to be a promising youth), and had attracted more than 1,000 participants to the performances, interactive lectures, workshops, Youths Act in Plays Project, and Assistant in black dress (volunteering work at the Festival).
### Care for the Disadvantaged

- We care about the inequality of educational resources and emergency aid in Taiwan and offer support when necessary.
- Over 50,000 annual cumulative beneficiaries of the Cherish Food Program each year.
- Over 4,000 cumulative beneficiaries of the Cherish Food Program.
- Over 3,701 cumulative beneficiaries of the Cherish Food Program.
- Over 5,060 hours of reading services each year.
- Over 1,200 times of environmental protection services each year.
- Over 1,300 million to the disadvantaged each year.
- Over 1,044 times of environmental protection services.
- Over 1,000 times of environmental protection services.
- Reading service exceeded 5,060 hours.
- Reading service exceeded 4,000 times.
- Reading service exceeded 3,701 times.
- Target: 25,000 beneficiaries.
- Target: 8,500 hours.
- Target: 1,000 times.
- Target: 2,000 children.
- Target: 8,500 hours.
- Target: 1,000 times.
- Target: 2,000 children.

#### Environmental Protection

- We aim to reduce waste through the Cherish Food Program. We also promote environmental protection and energy conservation through our energy-saving volunteers, eco-volunteers, and corporate volunteers.
- Over 50,000 annual cumulative beneficiaries of the Cherish Food Program each year.
- Over 40,000 cumulative beneficiaries of the Cherish Food Program.
- Over 37,071 cumulative beneficiaries of the Cherish Food Program.
- Over 1,200 times of environmental protection services each year.
- Over 1,000 times of environmental protection services.
- Over 1,044 times of environmental protection services.
- Target: 25,000 beneficiaries.
- Target: 1,044 times.
- Target: 1,000 times.

#### Care for Elders Living Alone

- We work with hospitals across Taiwan through the Networking of Love system and provide a variety of medical resources to support medical care for elderly citizens living alone.
- Over 10,000 services to elderly citizens living alone through Networking of Love.
- Over 10,000 services to elderly citizens living alone through Networking of Love.
- Over 4,000 children with the remote education program.
- Over 2,000 children.
- Target: 10,000 services.
- Target: 10,000 services.
- Target: 2,000 children.

#### Promote Filial Piety

- We collaborate with the Ministry of Education, schools, media, and other enterprises to promote filial piety education at schools.
- Promote filial piety education in 120 educational institutions.
- Promote filial piety education at 60 educational institutions.
- Promoted filial piety education at 57 educational institutions.
- Target: 50 institutions.
- Target: 60 institutions.
- Target: 57 institutions.

#### Note

- In response to the COVID-19 pandemic, volunteer activities were suspended in accordance with related policies in the first half of 2020.
- The amount includes donations from TSMC volunteers and the Sending Love Forward project. These are cash donations, excluding goods donation, repair services or other donations.
Since its founding in 2017, the TSMC Charity Foundation has dedicated itself to four major areas: Caring for the Disadvantaged, Taking Care of Elder People Living Alone, Promoting Filial Piety, and Environmental Protection. In 2020, with Caring for the Disadvantaged as the main direction, TSMC Foundation also made Education in Remote Areas and Disadvantaged Aid the primary target, aiming to create complete plans for remote areas and help children acquire needed skills in the workplace. It is hoped that rural flight and talent gap issues could thereby be addressed.

As the COVID-19 pandemic ravaged the world, the TSMC Charity Foundation called on TSMC’s employees to donate money and industrial-grade protective equipment to support frontline health workers. The TSMC Charity Foundation also invited other charity partners to create a positive force within a society rocked by the pandemic.

Note: Including cash donations, goods donation, repair services or other indirect donations.

<table>
<thead>
<tr>
<th>Social Contribution</th>
<th>3,825 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteers</td>
<td>10,451</td>
</tr>
<tr>
<td>Volunteer Service Times</td>
<td>26,077</td>
</tr>
<tr>
<td>Service Hours</td>
<td>64,779</td>
</tr>
<tr>
<td>Beneficiaries</td>
<td>73,786</td>
</tr>
</tbody>
</table>

Note: Including cash donations, goods donation, repair services or other indirect donations.
Donations by the TSMC Charity Foundation

What We Donated

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>NT$29,815,361</td>
</tr>
<tr>
<td>Goods &amp; Services</td>
<td>NT$18,435,671</td>
</tr>
<tr>
<td>Time</td>
<td>NT$81,427,203</td>
</tr>
</tbody>
</table>

How We Donated

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Activities</td>
<td>3.2% NT$3,820,586</td>
</tr>
<tr>
<td>Community Investment</td>
<td>72.7% NT$87,034,341</td>
</tr>
<tr>
<td>Charitable Donations</td>
<td>24.1% NT$28,823,308</td>
</tr>
</tbody>
</table>

Projects We Supported

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoting Filial Piety</td>
<td>3.7%</td>
<td>NT$34,370,920</td>
</tr>
<tr>
<td>Environment Protection</td>
<td>8.5%</td>
<td>NT$50,223,741</td>
</tr>
<tr>
<td>Caring for Elders</td>
<td>12.9%</td>
<td>NT$15,392,358</td>
</tr>
<tr>
<td>Living Alone</td>
<td>3.2%</td>
<td>NT$4,370,920</td>
</tr>
<tr>
<td>Corporate Activities</td>
<td>3.3%</td>
<td>NT$3,820,586</td>
</tr>
<tr>
<td>Community Investment</td>
<td>72.7%</td>
<td>NT$87,034,341</td>
</tr>
<tr>
<td>Charitable Donations</td>
<td>24.1%</td>
<td>NT$28,823,308</td>
</tr>
<tr>
<td>Caring for the Disadvantaged</td>
<td>74.9%</td>
<td>NT$87,691,216</td>
</tr>
</tbody>
</table>

Accumulated Volunteer Headcount

<table>
<thead>
<tr>
<th>Year</th>
<th>Headcount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>7,838</td>
</tr>
<tr>
<td>2017</td>
<td>8,776</td>
</tr>
<tr>
<td>2018</td>
<td>10,266</td>
</tr>
<tr>
<td>2019</td>
<td>8,174</td>
</tr>
<tr>
<td>2020</td>
<td>10,451</td>
</tr>
</tbody>
</table>

Accumulated Service Times

<table>
<thead>
<tr>
<th>Year</th>
<th>Service Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>16,570</td>
</tr>
<tr>
<td>2017</td>
<td>24,612</td>
</tr>
<tr>
<td>2018</td>
<td>27,590</td>
</tr>
<tr>
<td>2019</td>
<td>17,593</td>
</tr>
<tr>
<td>2020</td>
<td>12,177</td>
</tr>
</tbody>
</table>

Accumulated Volunteer Service Hours

<table>
<thead>
<tr>
<th>Year</th>
<th>Service Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>93,423</td>
</tr>
<tr>
<td>2017</td>
<td>106,176</td>
</tr>
<tr>
<td>2018</td>
<td>109,059</td>
</tr>
<tr>
<td>2019</td>
<td>83,797</td>
</tr>
<tr>
<td>2020</td>
<td>64,779</td>
</tr>
</tbody>
</table>

Note 1: TSMC has categorized activities into cash, time, and goods & services according to the Dow Jones Sustainability Index and then converted all forms of donations into a monetary unit (NT$) in order to calculate their percentage; time = volunteered hours*average wages; goods & services = the monetary amount of the goods & services donated by TSMC.

Note 2: TSMC has categorized donations based on the Dow Jones Sustainability Index into charitable donations, community investments, and commercial initiatives, converting all donations into a monetary amount (NT$) in order to calculate their percentage.

Note 3: Volunteers attending activities organized by the TSMC Charity Foundation include TSMC's current, former and retired employees, family members of TSMC employees, and volunteers from cooperative companies.
Care for the Disadvantaged

Our Actions
- Close the Urban/Rural Divide with Empowerment Projects for Education in Remote Areas
- Offer Financial Support and Better Living Spaces for Higher Quality of Life

What We Want to Solve
According to statistics from the Ministry of Education in 2019, a total of 1,377 schools are located in remote areas, accounting for nearly 30% of total schools in Taiwan. Those schools are facing instability from turnovers, population migration, and gaps in educational resources, therein affecting the children’s right to quality education.

How We Respond
The TSMC Charity Foundation listed Character Education, Subject-based Education, and Vocational Education as the three primary focuses. We hope to uncover student potential by providing educational resources based on their needs. TSMC volunteers are also collaborating with local schools that implement University Social Responsibility (USR) to build confidence in students and empower them to give back to their hometowns in the future.

Close the Urban/Rural Divide for Education in Remote Areas through Empowerment Projects

Character Education — For Adaptive Development
Reading Volunteers Regularly Visit and Serve Children in Remote Areas

Reading volunteers visit eight primary schools in remote areas of Hsinchu, Taichung, and Tainan every semester to read stories, teach English and math, and provide scholarships to motivate students to learn. In 2020, reading volunteers served a total of 1,012 times and provided over 5,060 hours of reading service.

TSMC supports the Junyi Academy through regular employee donations to strive towards education equality. Volunteers from the Advanced Packaging Technology and Service Organization, Product Development Organization, Quality and Reliability Organization, and Fab 3 utilize online education resources to help children from Anding Elementary School in Tainan, Ruei Yuan Elementary School in Taoyuan, and Meihu Elementary School, Hexing Elementary School and Taoshan Elementary School in Hsinchu. In addition, the Corporate & Compliance Division of the Legal Organization regularly travels to Yuandong Elementary School in Hsinchu and utilizes practical teaching materials and games to trigger children’s interest in learning English. In 2020, reading volunteers totaled 689 times.

Family Support
“Emergency Aid for the Disadvantaged” and “Ten Thousand Dollar Per Household”

Three Strategies for Rural Education

Learning Accompany
Implement University Social Responsibility (USR) Resources; Invest in with Teachers & Volunteers

Knowledge Subject-based Education
- Math
- English
- Science
- Photography
- Music

Skill Vocational Education
- Computer Repair
- Air-conditioning Repair
- Hair Design

Equipment
Solar panels, cars, fuel, air-conditioning, Internet, repairs, freezers, computer tablets

Food Support
Support/donation from caring food manufacturers

Note 1: In response to the COVID-19 pandemic, volunteer activities were suspended in accordance with related policies in the first half of 2020.

Note 2: Refer to Promoting Filial Piety to learn more about filial piety event of Character multicultural education.
Eyes on Us
Volunteers with background in photography from Fab 2 and Fab 5 are long-term volunteers to Yufeng Elementary School and Shilei Elementary School in Hsinchu County, teaching photography, holding exhibitions, and encouraging students to participate in national photography competitions to boost their confidence. A total of 224 children have benefited from this program. In 2020, volunteers started teaching children how to use drones to record their lives and beautiful surroundings.

Influence Society through Music
Fab 14 cooperates with the Junyi Academy (which has continued to advocate for education in remote areas) and Teach for Taiwan to co-host charity concerts. The net profit of the 2 concerts held last year, which attracted 5,232 people, has been applied to foundation operations. Fab 2 and Fab 5 supported Holy Family for Special Education by inviting their team to perform at TSMC year-end parties and offering them a platform to showcase their talents.

Subject-based Education—Paving the Way

Enrich Learning Materials with Software & Hardware Resources
The TSMC Charity Foundation collaborated with Junyi Academy and TutorABC to bring in software, hardware, and online courses to provide more diversified materials for rural students. In 2020, a total of 96 tablet PCs, 180 used computers, and 210 hours of online English tutoring classes were provided. After the death of Chen Junlang, the founder of Kid’s Bookhouse, the TSMC Charity Foundation took the initiative and began assisting the bookhouse, matching local resources, and inviting teachers and students from Senior Health & Care Management Indigenous Department of the National Taitung University’s. Every week, students of the department will visit Kid’s Bookhouse to tutor, educate high-potential students, and close the education gap.

Work with Universities to Promote Smart IoT & Improve Information Education in Primary Schools
In response to the information education trend promoted by the Ministry of Education, the TSMC Charity Foundation joined hands with the Strategy Development Office of the National Yang Ming Chiao Tung University to develop the first smart IoT teaching materials for primary schools in Taiwan so as to enrich their current courses. In 2020, following TSMC’s strategies, providing scholarships to students from National Yang Ming Chiao Tung University as teaching assistants to serve at five schools recommended by the Hsinchu City Government Education Department. At the end of the same year, 31 primary schools joined this program; teachers and students that participated gained further knowledge in utilizing information technology.

Organize AI Camps to Broaden Students’ Horizons
Artificial Intelligence (AI) is one of the main axes that the TSMC Charity Foundation focuses on in developing science education. In addition to continuing the program in cooperation with Microsoft Taiwan Corporation, the Foundation further cooperated with AI4kids and Kneron to arrange AI training courses for TSMC volunteers. In the same year, the Product Engineering department also invested in volunteer services, organizing a two-day AI camp for a total of 16 hours at Hexing Elementary School in Hsinchu. At the camp, students learned how to code an automatic parking lot identification system and a voice assistant for mobile phones; the exercises helped students learn that AI could be used in daily life. The camp further guided students to design AI modules on their own and strengthened their ability for scientific applications.
Vocational Education—Develop Children's Skills

Cross-field Cooperation: Enterprises Supporting Vocational Training

By cooperating with the Pingtung County Government and Daikin Industries, Ltd., the TSMC Charity Foundation promotes vocational education and provides a 30-hour air-conditioning cleaning and maintenance course for students aged over 16 in Pingtung County. After training, students can get certifications and start working. Graduates are also encouraged to provide services to charity organizations as a way to give back to society. The Foundation further invited companies to join the program by organizing 2 courses in 2020 to a total of 58 students. This year, Happy Hair is planning to provide training and opportunities to students interested in the hair salon industry. In addition, the Foundation called on TSMC's information system hardware contractors to jointly organize 3 vocational activities for students in the Changhua and Nantou rural areas, with a total of 60 students participating.

Educate Students on Diverse Career Paths & Help Find a Path for Them

In 2020, in order to unlock rural students' potential and let them know more about different careers, by cooperating with 104 Corporation, the TSMC Charity Foundation invited 100 craftsmen from different fields to film videos introducing their work and its required skills, encouraging young people to explore different careers. The Intelligent Manufacturing Center, Fab 8, and the Quality and Reliability Organization provided support to the St. Francis' Maiden's House, Hsinchu City Renai Children's Home, and Miaoli St. Francis Nursery. The goal was to "Explore Skills for New Career Possibilities", which hopes to inspire confidence and interest in career development among students through the TSMC career event day, practical agricultural career experiences, and DIY activities; 116 students benefitted from the program.

Offer Financial Support and Better Living Spaces for Higher Quality of Life

Financial Support for the Disadvantaged

In 2020, the TSMC Charity Foundation continued its efforts with the "Ten Thousand Dollar Per Household" and "Emergency Aid for the Disadvantaged" programs by providing financial support to disadvantaged families and families facing big challenges. By working with the different government social welfare departments, the Foundation visited disadvantaged families to understand their needs.

Upgrade Campus Environment and Equipment

The Corporate Planning Organization has long been volunteering in after school classes in Zhudong, Erchongpu, and Xinpu of Hsinchu County. They discovered that most of the after school classes were short of funds and much of the teaching equipment was outdated. Therefore, the Organization provided new tables and chairs and replaced old monitors to ensure a safe learning environment. In 2020, the TSMC Charity Foundation assisted in the renovation of three classrooms to provide a comfortable environment for teachers and students.

<table>
<thead>
<tr>
<th>2020</th>
<th>Donated NT$16.18 million to the disadvantaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>1,321</td>
</tr>
<tr>
<td>2018</td>
<td>2,000</td>
</tr>
</tbody>
</table>

(Larger amounts of outside donations in 2018 for disaster relief in Hualien)

Caring for the Community; Volunteers Help the Elderly and the Young

Hsinchu Veterans Home and St. Teresa Children Center are TSMC’s long-term partners and TSMC volunteers visit the two organizations to bring warmth and joy through regular activities. In 2020, TSMC volunteers served the two organizations 503 times with 3,521 hours of service.

Build a Safe Home to Give the Disadvantaged Security

In 2020, through the introduction and recommendation of the World Vision Taiwan, the Advanced Packaging Technology and Service Organization assisted in repairing 4 disadvantaged family houses in Yongkang District and Liuying District in Tainan, addressing the problems of water leakage and exposed pipelines.
Support Local Social Welfare Organizations to Overcome COVID-19 Challenges

Volunteers from the Human Resource Organization, Fab 6, Fab 8, Fab 12A, Fab 12B, Fab 14, the Intelligent Manufacturing Center, and the Product Development Organization assisted Luway Opportunity Center, Sylin-Lu Social Welfare Foundation, Taiwan Fund for Children and Families, and Shandao Academy in raising funds for daily operations during the pandemic. The Product Development Organization helped St. Camillus Center for Intellectual Disability raise NT$1 million for its equipment. Through TSMC i-Charity Platform, Fab 6 invited TSMC employees to support the World Vision Taiwan, raising NT$1.09 million. The Quality and Reliability Organization assisted a private child-care nursing home in Miaoli in raising NT$180,000, which flattened the donation gap caused by the pandemic.

Case Study

TSMC Charity Foundation's Education Demonstration Sites in Rural Areas

The TSMC Charity Foundation promotes rural education demonstration sites and, together with the Changhua County Government, introduced the three main strategies: Multicultural Education, Subject-based Education, and Vocational Education into 17 after-school classes, benefitting a total of 937 disadvantaged students.

In terms of Multicultural Education, volunteers from Fab 15A and Fab 15B visit BOYO Changhua Center, Dazhuang Community After School Care Class, and Maxing Community After-school Care Class every other week to help students with their studies. To ensure sustainability, the Junyi Academy provides online teacher training to let more volunteers participate. As for Subject-based Education, the TSMC Charity Foundation has worked with the BOYO Social Welfare Foundation, also avid education advocates, to establish a location for after-school classes, benefiting a total of 937 disadvantaged students.

In terms of Multicultural Education, volunteers from Fab 15A and Fab 15B visit BOYO Changhua Center, Dazhuang Community After School Care Class, and Maxing Community After-school Care Class every other week to help students with their studies. To ensure sustainability, the Junyi Academy provides online teacher training to let more volunteers participate. As for Subject-based Education, the TSMC Charity Foundation has worked with the BOYO Social Welfare Foundation, also avid education advocates, to establish a location for after-school classes, benefiting a total of 937 disadvantaged students.

“Aiming for the common good, TSMC contributes not only to Taiwan’s economy but also to Taiwan’s rural education.”

—Lai Ching-te, Vice President of the Republic of China

Vice President Lai Ching-te went to the Changhua Center to learn more about TSMC’s investment in rural education.
Networking of Love Partners Create Services to Better Serves Cross-industry Sharing to Expand the Supply of Elderly Care Services

In 2020, the Networking of Love organized a cross-industry sharing event for the first time, inviting public welfare partners from the food, education, energy, and other industries to share their experiences and inspire each other. They cared for the elderly living alone through online platforms and improved resource efficiency. With 70 participants, the event opened up more opportunities for cooperation.

Strengthen Medical Care and Repairs to Improve Convenience and Safety

Provide Sarcopenia Meters and Shuttles to Improve the Quality of Medical Treatment

Inconvenient traffic and insufficient medical resources impact the quality of medical care in remote areas and the elderly’s willingness to seek medical attention. In 2020, the TSMC Charity Foundation received a request from the Zhudong Branch of the National Taiwan University Hospital, stating that the hospital needs portable Sarcopenia meters. The Foundation therefore invested NT$550,000 to support the hospital’s need so that the elderly can get proper care at home. In addition, the Foundation spent NT$900,000 on purchasing shuttle buses for the Longchang Cultural and Health Station in Dulan Village, Taitung County, which will be used to pick up physically challenged elders, overcoming the long distance between hospitals and their homes.

Purchased equipment for 2 rural hospitals and small long-term care institutions

Repair Houses to Provide a Safe Living Environment for the Elderly

The TSMC Charity Foundation and the Hualien Mennonite Foundation, through rigorous assessments, utilized their engineering experience of post-disaster reconstruction to help 7 elders living alone repair their houses to offer a safe living environment.

7 houses of disadvantaged elders repaired

"As a member of the Networking of Love, we will narrow the social gap together with TSMC. With technology, we can show that we care and help them feel loved. OLD YES!"

—Ms. You Lili, Chief Director of the Old Five Old Foundation

"We appreciate the TSMC Charity Foundation for bringing and spreading love across Taiwan. Together we can create more good and make love infinite!"

—Lihua Yang, Associate Director of China Medical University
TSMC Volunteers Serve Elders to Enrich Their Lives

Celebrate the Chinese New Year with Joy

In 2020, volunteers from the Quality and Reliability Organization, Fab 3, Fab 15B, Fab 12A, and Fab 12B sent food and clothes to agencies that offer geriatric care such as the Stella Matutina Social Welfare Foundation, Huashan Foundation, Old Five Old Foundation, and Hsinchu Catholic Social Service Center. The foods were dishes that are commonly eaten during reunion dinners; through cooking activities, elders were able to get active, socialize, and stay young.

Accompany Elders on Dragon Boat Festival and Moon Festival

For the Dragon Boat Festival, volunteers from Fab 12B visited 78 elders, giving them Zongzi and nutritional oats. Volunteers also prepared Wormwood soap, which symbolizes good luck and dispels evil, as gifts to celebrate the festival. Before the Moon Festival, Fab 12A and Fab 15B raised 197 gift boxes and 40 boxes of moon cake for the elderly living alone served by the Huashan Foundation and the Old Five Old Foundation to warm their hearts.

“Simply being there is the best support that we can provide. Through listening and caring, our society could achieve the common good.”
— Frankie Tsai, Dep. Manager of Fab 12A

“I feel different all day when I could really help. I find myself capable and willing to give more!”
— TSMC Employees’ Children Who Participated in Quality & Reliability Org Volunteering Activities

Go Shopping and Create Good Memories Together

Together with the Mennonite Social Welfare Foundation, volunteers from the Material Supply Chain Management Division took the elderly in Hualien to visit the Taipei Zoo, embarking on an urban adventure through the Taipei MRT system. Volunteers from Fab 15B accompanied physically challenged elders to purchase daily necessities, helping them step out from their homes and connect with society again. Volunteers from Fab 12A made scallion pancakes with the elders of the Hsinchu Veterans Home. Through social events like DIY cooking, they hoped that elders can go out more and stay physically and emotionally young.

“It is wonderful to have the opportunity to serve the elders. During the process, we can learn to help others and further realize the beauty of sharing.”
— Handy Ko, Director of Material Supply Chain Management

Volunteers from the Material Supply Chain Management accompanied elders living alone to Taipei Zoo.
Online Teaching Materials to Promote Filial Piety

The TSMC Charity Foundation cooperated with the Filial Piety Resource Center under the K-12 Education Administration in 2020 to hold 4 filial piety parent-child workshops to around 123 participants. In order to promote filial piety, the Foundation, based on their past experience, created online teaching materials, including workshop introductions, operating manuals, and teaching demonstration videos. These are available for free download on the Filial Piety Resource Center’s website.

Actions to Promote Filial Piety

1. Online Teaching Materials to Promote Filial Piety
2. Promote Filial Piety & Strengthen Civic Morality
3. Filial Piety Story-reading to Raise Awareness
4. Let the Seeds of Filial Piety Sprout Awareness
5. Supporting the MOE Warmth Project

What We Want to Solve

According to statistics from the Ministry of Health and Welfare, Taiwan’s society is now an aging society and the percentage of elders living alone continues to rise. Considering the limited social resources, the TSMC Charity Foundation is hoping to strengthen concepts of filial piety and family communications to tackle the challenge from the source.

How We Respond

The TSMC Charity Foundation believes that, by cooperating with governments, enterprises, and schools, we can cushion the impact from an aging society through diverse events raising awareness for filial piety, promoting a parent-children relationship filled with understanding and care, increasing awareness on filial piety among our youth, and ensuring that our seniors are cared for.

Actions to Promote Filial Piety

- Cooperate with the Ministry of Education for the "Filial Piety Heart Project"\(^{Note1}\)
- Work with the Filial Piety Resource Center of the K-12 Education Administration
- Support the "Warmth Project" promoted by the K-12 Education Administration\(^{Note2}\)
- Hold filial piety parent-child workshops
- Volunteers visit schools to promote filial piety
- Hold filial piety parent-child activities in fabs

Note 1: In response to the filial piety concept advocated by Chairperson Sophie Chang of the TSMC Charity Foundation, the Ministry of Education provided filial piety courses, encouraging students to practice filial piety in their daily lives. The project includes essay-writing events, micro-films, and flash mobs. The MOE also established the Filial Piety Resource Center to strengthen filial piety courses and teaching.

Note 2: The "Warmth Project" is included in the series of MOE filial piety activities, encouraging students to express love to their families and pass on the taste of home through activities. Starting from the curriculum, the value of family can be deepened and let children give back to their families.
Filial Piety Story-reading to Raise Awareness

In 2020, TSMC’s filial piety volunteers held story-readings on filial piety in school, organized activities revolving around filial piety, and prepared fun, interactive lessons to imbue teachings of filial piety into the curriculum so as to sow the seeds of filial piety. We are currently working with 15 schools through 122 filial piety volunteers.

Fab 15B has been teaching filial piety at Taichung Beishi Elementary School through sharing filial piety stories and worksheets, encouraging students to think about their interactions with their elders and impressing in them the concept of filial piety; a total of 510 students participated in filial piety education at Taichung Beishi Elementary School.

Let the Seeds of Filial Piety Sprout

Fab 12A invited colleagues to take photos of their family members and convey their love through post-it notes; Fab 15A visited BOYO Social Welfare Foundation in Changhua to help children make Mother’s Day cakes and read related books to encourage children to express gratitude to their mothers.

“Long-term collaboration with the TSMC Charity Foundation gives me insight into their kind hearts. It seems that they will never get tired of learning and promoting filial piety.”
—Yuyun Liao, Curriculum Supervisor, Filial Piety Resource Center of the K-12 Education Administration, Ministry of Education

Supporting the MOE Warmth Project

In 2020, the K-12 Education Administration under the MOE promoted a series of teaching plans to increase parent-child interactions by getting students to knit, cook lunch boxes, and write autobiographies of their elders. The Quality and Reliability Organization showed support for the project by visiting Baoshan Elementary School-Lake Branch in Hsinchu County to teach students how to make nutritious and delicious meals so that they can understand the hard work their parents do.

Far 14B taught Tainan Municipal Jingliao Junior High School’s students to assist their elders in completing their autobiography through interviews, so as to promote mutual understanding among family members.

“We appreciate the TSMC Charity Foundation for promoting and practicing filial piety to make our society better.”
—Chongzhe Xu, Acting Principal of Wagor International Senior High School

“The Warmth Project is doing great, thanks to the TSMC Charity Foundation’s support. Thank you for your dedication and effort to create a good society.”
—Li Jinyang, Principal of Filial Piety Resource Center of the K-12 Education Administration, Ministry of Education
Cherish Food Program Continues to Grow

In 2020, the TSMC Charity Foundation worked with Chi Mei Food, Laurel Corporation, Hsin Tung Yang, Hunya Foods Co., Ltd., Lian Hwa Foods Corporation, and Shih Chen Foods Co., Ltd. to expand the scope of the Cherish Food Program by regularly sending goodwill foods to 92 agencies that serve the disadvantaged in 13 cities and counties in Taiwan, benefitting 37,071 people. In addition, 20 freezers were donated to charity agencies to ensure that foods remain fresh.

Distributing Goodwill Food to Locations Across Taiwan

Six Companies Offer Fresh Goodwill Products

Launch the Cherish Food Program
TSMC Offers Freezers and Subsidizes Shipping Costs

Has helped a total of 92 locations
37,071 people

2020
37,071 people benefitted from the Cherish Food Program

2020
2019
37,071
21,791

TSMC Charity Foundation collaborated with Hsin Tung Yang to organize a volunteer chef activity which supplied a delicious feast to residents of Shuangxi District in the New Taipei City.
Volunteers Help Improve Energy Efficiency

TSMC's energy conservation volunteers are committed to promoting water and energy conservation knowledge. Fab 6 assisted two rural schools in Tainan to inspect the status of water and electricity use and conduct safety tests to ensure maximum energy efficiency. At the same time, they also use interactive teaching and self-made teaching aids to educate students on energy and water conservation. In 2020, energy conservation volunteers served a total of 52 times to provide over 520 hours in energy-saving services.

Eco-volunteers Sending the Green Message

TSMC is striving to recover ecosystems surrounding TSMC fabs and make sure that the ecosystem is conducive to biodiversity. It opened the green ecological parks at Fab 12B, Fab 15, and Fab 14 to student tours. Students are able to experience cleanroom suits, engage in DIY activities, and conduct scientific experiments to strengthen their understanding and participation in environmental protection. In addition, eco-volunteers from TSMC serve regularly at the Shuhu Ecological Education Park to share the environment and the beauty of nature with the public. In 2020, eco-volunteers served a total of 392 times in providing over 3,968 hours in tours.

Tour Volunteers are the Bridge Connecting the Public with Semiconductors

TSMC believes that sharing technological knowledge is one of the most important ways to give back to society. TSMC not only provides tour services to The World of Semiconductors at the National Museum of Natural Science and TSMC’s Museum of Innovation for the general public to better understand the semiconductor industry and its applications. In 2020, The World of Semiconductors has been updated to make it comprehensive and up-to-date. There have been 2,565 volunteers that served over 10,260 hours in guiding participants to learn about the chip production process and semiconductor development through interactive games.

Promote Environmental Protection through Playlets

Volunteers from Fab 12A have been accompanying students from the Baoshan Elementary School in Hsinchu. They arranged playlets to teach students how to cherish food and the environment. Environmental protection books were also donated to schools to raise environmental awareness among students.

"Life is like an integrated circuit with different paths and choices. We hope that children can learn in a fun way. Their laughers prove that they are having fun when learning and inspire us a lot.”

—Wenquan Liang, TSMC Tour Volunteer

Assist in Setting Up Solar Panels

In 2020, the Facility Division donated over NT$1.2 million to the Taichung St. Coletta Catholic Training Center for Special Needs and the Maria Wufeng Caring Home for solar panels. The donation was to support renewable energy and helped the two organizations gain financial support by selling their green electricity.

Table

<table>
<thead>
<tr>
<th>Year</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>1,044</td>
</tr>
<tr>
<td>2019</td>
<td>771</td>
</tr>
<tr>
<td>2018</td>
<td>653</td>
</tr>
</tbody>
</table>
Operations and Governance

Corporate Governance  190
Financial Performance  194
Tax Policy  196
Corporate Information Security  197
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 of overseeing and providing guidance to the Company’s comprehensive sustainable management strategies. TSMC’s Chairman chairs the ESG Steering Committee, and the Chairperson of the ESG Committee serves as its Executive Secretary and reports semi-annually to the Board of Directors on the implementation results and the future work plan. Starting from 2021, the reporting frequency to the Board of Directors has been increased to a quarterly basis.

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

Nomination and Election of Directors
The Board of Directors established the “Guidelines for Nomination of Directors”, which describes the procedures and criteria for the nomination, qualification and evaluation of candidates for Directors. In addition, TSMC envisions its Board to be composed of a majority of independent directors, with the independence of each independent director candidate considered and assessed under relevant laws.

Board and Audit Committee Performance Evaluations
TSMC implemented Board performance evaluations in 2020. Through self-assessment surveys via questionnaire, performance evaluations are completed annually by the Board as a whole, by individual directors and by the Audit Committee. For the results of the 2020 performance evaluations, please refer to the 2020 Annual Report.
Based on both its corporate vision and its long-term, sustainable responsibility to both industry and society, TSMC operates an enterprise risk management (ERM) program to integrate and manage potential sustainability risks including strategic, operational, financial and hazardous risks (e.g. climate change, utility supply, earthquake, fire, chemical spill, etc.) that represent potential negative consequences to operations and financial results. The TSMC risk management organization is composed of the RM Steering Committee, RM Executive Council, RM Program and RM Task Force.

The risk management framework (including risk identification and assessment, risk control and mitigation, risk response, risk monitoring and reporting) is applied to identify and prioritize risk controls, and to implement various controls and risk treatment. The risk management organization briefs the audit committee each year on the ever-changing risk environment facing TSMC, the focus of the Company’s enterprise risk management, and risk assessment and mitigation efforts. The audit committee’s chairperson also reports on the risk environment and risk mitigation actions to be taken. For more details of Risk Management, please refer to TSMC’s 2020 Annual Report “6.3 Risk Management”.

<table>
<thead>
<tr>
<th>The Board of Directors is assessed on the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Involvement in the Company’s operation</td>
</tr>
<tr>
<td>2. Enhancement of the quality of the board’s decision-making</td>
</tr>
<tr>
<td>3. Makeup and structure of the board</td>
</tr>
<tr>
<td>4. Election of board members and continuing knowledge development</td>
</tr>
<tr>
<td>5. Internal controls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The individual directors are assessed on the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understanding of the Company’s goals and mission</td>
</tr>
<tr>
<td>2. Awareness of director’s duties</td>
</tr>
<tr>
<td>3. Involvement in the Company’s operations</td>
</tr>
<tr>
<td>4. Internal relationship and communication</td>
</tr>
<tr>
<td>5. Director’s professionalism and continuing knowledge development</td>
</tr>
<tr>
<td>6. Internal controls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Audit Committee is assessed on the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Involvement in the Company’s operation</td>
</tr>
<tr>
<td>2. Awareness of the audit committee’s duties</td>
</tr>
<tr>
<td>3. Enhancement of the quality of the audit committee’s decision-making</td>
</tr>
<tr>
<td>4. Makeup of the audit committee and election of its members</td>
</tr>
<tr>
<td>5. Internal controls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Management Organization Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board of Directors/ Audit Committee</td>
</tr>
<tr>
<td>RM Steering Committee</td>
</tr>
<tr>
<td>RM Executive Council</td>
</tr>
<tr>
<td>RM Task Force</td>
</tr>
<tr>
<td>Materials Management and Risk Management</td>
</tr>
<tr>
<td>RM Program</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enterprise Risk Management Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Identification and Assessment</td>
</tr>
<tr>
<td>Risk Control and Mitigation</td>
</tr>
<tr>
<td>Risk Monitoring and Reporting</td>
</tr>
<tr>
<td>Risk Response</td>
</tr>
</tbody>
</table>
Ethics and Regulatory Compliance

Integrity is TSMC’s most important core value. Based on this value, TSMC has established its ethics and regulatory compliance system, including a sequence of regulatory identification, compliance policy and procedure formulation, implementation and execution, self-assessment and examination, as well as open reporting channels and whistleblower protection. The Company’s management team acts in accordance with our Ethics Code and fosters a robust ethics and regulatory compliance through its tone from the top. The ethical culture of TSMC is continuously strengthened through comprehensive education, training and promotion provided to its employees. At the same time, TSMC works hand in hand with its customers and supply chain to serve the mutual benefit of the industry, and serves as a trustworthy partner to its stakeholders.

Zero tolerance for corruption

TSMC holds zero tolerance for corrupt practices and strictly prohibits any behavior of bribery, fraud, blackmail, misuse or misappropriation of the Company’s assets, or impairment of the Company’s interest for personal gain. TSMC Ethics and Business Conduct Policy (the Ethics Code) is the guideline for implementing the aforementioned core values. Every employee is required to exercise self-discipline by complying with the highest ethical standards and substantially implements integrity, equality, and transparency in daily operations. In view of the importance of compliance with the Ethics Code, the Company’s management team regularly 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 investigation and disciplinary action for reported incidents. At the same time, suppliers are an important part of the implementation of the Ethics Code and regulatory compliance. TSMC established the “Supplier Code of Conduct” bringing the core value of integrity into our supply chains and demonstrating it in business behavior; and published TSMC’s Anti-Corruption Commitment on TSMC’s webpage, enabling stakeholders to recognize TSMC’s core value of integrity.

Regulatory Identification and Policy Formulation

TSMC identifies potential risks and impacts arising from regulatory changes by regularly tracking such changes. According to the results of regulatory identification, TSMC assesses whether internal regulations align with the changes to ensure that relevant policies and regulations are applicable and appropriate. In 2020, TSMC updated its export control policy to be in line with the latest export control regulatory changes.

Implementation and Execution – Training and Promotion

TSMC requires all of its organizations, subsidiaries and employees to ensure their business operations are compliant with laws, Company policies, and regulations when doing business. Through an annual Control Self-Assessment (CSA), employees examine their own compliance performance and are open for audit by the Internal Audit organization. This is an important part of TSMC’s effort to implement regulatory compliance.

To raise employee awareness of ethics and regulatory compliance, TSMC provides a variety of training courses for all employees based on relevant job responsibilities. The training courses include face-to-face courses and promotions as well as mandatory and elective online courses. Through posters around our facilities, guidelines and FAQs on regulatory compliance on the Company’s intranet, internal email distributions, and promotional articles, TSMC ensures that all employees have timely access to new information on regulations and have a deeply-ingrained awareness of various issues.

In 2020, TSMC provided an “Annual Ethics and Compliance Training Course”, a mandatory online training course including topics such as ethics and anticorruption, avoiding and reporting conflict of interest, export control, privacy and personal data protection, and antitrust laws, to a total of 50,482 employees, reaching 99.7% completion rate. TSMC additionally offered more than 20 face-to-face compliance training courses and online courses on subjects regarding export control and antitrust laws to employees in relevant functions - a total of 1,272 employees completed our online course on export control, and another 841 on anti-trust. In 2020, we held both a sustainable supply chain experience exchange and our annual Responsible Supply Chain Forum to share and exchange practical experience on topics such as the Ethics Code, labor rights, environmental protection, and occupational safety. In total, 518 attendees from 337 suppliers participated in these activities.
Assessment and Examination

To implement the Ethics Code and to avoid potential conflicts, TSMC requires every newly-hired employee to complete a conflict of interest declaration upon arrival. Employees with specific job grades or positions need to complete the declarations annually. In 2020, 18,235 TSMC employees completed the Annual Conflict of Interest Declaration to which all declarants agreed to comply with the Ethics Code. Internal Audit performs an audit according to the annual audit plan approved by the Board of Directors and reports the results and follow-up improvement plans to the Board and management. Internal Audit will also administer the CSA and assess its fulfillment by each fab/division to ensure effectiveness and for internal self-assessment.

In addition, every two years, TSMC performs anonymous surveys to suppliers and employees in turn to regularly evaluate the effectiveness of ethics and regulatory compliance promotion. To closely track employee feedback for ethics and regulatory compliance, in 2020, according to annual employee survey results, 88.7% of employees trust the confidentiality measures of the reporting channel, and 92.5% of employees are willing to use the reporting channel to report misconduct.

Reporting and Protection

TSMC has established and published 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 to protect the rights and interests of stakeholders and the company. All reported incidents collected from reporting channels inside or outside of TSMC are properly recorded and traced. TSMC also prohibits any form of retaliation by providing proper protection for any individual who in good faith reports a suspected violation or participates in an investigation. In 2020, the Ethics Committee held a total six meetings to examine major reported incidents under investigation.

TSMC investigates each individual case according to its characteristics through specific divisions, and treats every received case seriously, carefully, and effectively to ensure the accuracy of the investigation. Each investigated case confirmed to be true will receive discipline, up to and including dismissal, termination of the business relationship, and legal prosecution as appropriate. The TSMC Ethics Committee will evaluate each case to determine whether it is an exceptional case or whether it results from systemic issues of insufficient awareness in ethics. This will allow TSMC to continue evaluating whether it is necessary to improve its management and internal control procedures. Activities such as emails to employees that disclose the violations and disciplinary actions in each quarter are conducted to promote employees’ awareness and avoid recurrence of similar incidents.

In 2020, we did not receive any reports related to finance, accounting or antitrust matters, nor did we receive any complaints concerning breach of customer privacy and loss of customer data, or any material regulatory violations (where a fine exceeds NT$1 million).

In 2020, the incidents reported through the Audit Committee Whistleblower System, Ombudsman System, and Irregular Business Conduct Reporting System totaled 246. Among them, 155 cases were related to employee relations, 69 cases were categorized as others (e.g. asking personal questions or private matters), and 22 cases were related to ethics. Six incidents were verified upon investigation and determined for disciplinary action by the Ethics Committee. In 2020, TSMC leveraged the six violations to strengthen ethics promotion for all employees in supplier-related activities.

Historical Incidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Incidents</th>
<th>Incidents Related to Ethics</th>
<th>Verified Incidents Upon Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>16</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2017</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2018</td>
<td>20</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2019</td>
<td>14</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2020</td>
<td>22</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Unit: Cases

Note: For reported cases related to sexual harassment, please refer to An Admired Employer in this Report.
Financial Performance

A solid financial foundation is the key to corporate sustainability. With good financial performance, prudent business plans, and disciplined capital management, TSMC is able to maintain a solid financial foundation to weather industry cyclicality. TSMC pursues good financial performance mainly through revenue growth and consistent improvement in profitability to create greater economic value for its stakeholders, including shareholders/investors, employees, customers, suppliers, government, society, and others.

To communicate TSMC’s long-term investment value with investors, in 2015 TSMC set clear strategic financial objectives: (1) average return on equity (ROE) to be at least 20% across cycles; (2) compound annual growth rate (CAGR) of net income to be between 5% and 10% for the years 2015 through 2020. Concluding 2020, TSMC delivered (1) average ROE of 24.4% and (2) net income CAGR of 11.1% for the years 2015 through 2020, both exceeding the prior targets.

As the multi-year megatrends of 5G and HPC-related applications are expected to fuel strong demand for TSMC’s advanced technologies in the next several years, the Company is entering a period of higher growth from 2020. Therefore, TSMC further expects (1) its long-term revenue growth, in US dollar terms, to be 10% to 15% CAGR from 2020 to 2025, with (2) minimum ROE of 20% across cycles.

Given the funding requirement of the growth opportunities, macroeconomic uncertainties, the current low interest rate environment, and ability to diversify funding sources, TSMC issued a total of NT$120 billion in NT dollar denominated and US$4 billion in US dollar denominated corporate bonds with favorable pricing terms. After the bond issuances, TSMC continues to maintain the semiconductor industry’s highest credit ratings.

Four Strategies to Increase Long-term Investment Value

- Continue to invest in process technologies and capacity
- Maintain or improve profitability and investment returns
- Maintain trusting relationships with customers
- Pursue revenue and market share growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (NT$ Billion)</th>
<th>Net Income (NT$ Billion</th>
<th>ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>427</td>
<td>134</td>
<td>22%</td>
</tr>
<tr>
<td>2012</td>
<td>506</td>
<td>166</td>
<td>25%</td>
</tr>
<tr>
<td>2013</td>
<td>597</td>
<td>188</td>
<td>24%</td>
</tr>
<tr>
<td>2014</td>
<td>763</td>
<td>244</td>
<td>28%</td>
</tr>
<tr>
<td>2015</td>
<td>843</td>
<td>307</td>
<td>27%</td>
</tr>
<tr>
<td>2016</td>
<td>948</td>
<td>334</td>
<td>26%</td>
</tr>
<tr>
<td>2017</td>
<td>977</td>
<td>343</td>
<td>24%</td>
</tr>
<tr>
<td>2018</td>
<td>1,031</td>
<td>351</td>
<td>22%</td>
</tr>
<tr>
<td>2019</td>
<td>1,070</td>
<td>345</td>
<td>21%</td>
</tr>
<tr>
<td>2020</td>
<td>1,339</td>
<td>518</td>
<td>30%</td>
</tr>
</tbody>
</table>
Supported by the Company’s strengthening industry position, growth potential, and solid operating performance, TSMC’s share price, adjusted for cash dividends, increased 64.7% in 2020, marking 12 consecutive years of annual growth. Since the Company went public in 1994, TSMC has been profitable every year and TSMC’s market capitalization has been growing steadily. As of December 31, 2020, TSMC’s market capitalization reached NT$14.2 trillion, or US$498.5 billion.

TSMC’s solid financial performance enables the Company to distribute profits to shareholders in the form of cash dividends.

TSMC’s Board of Directors approved quarterly cash dividends of NT$2.5 per share per quarter in 2020. TSMC’s shareholders received a total of NT$10 per share in cash dividends in 2020. From 2004 to 2020, TSMC has paid out a total of NT$1.9 trillion, or US$62.4 billion, in cash dividends.

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

A complete dividend history can be found on TSMC’s website.
**Tax Policy**

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

### Eight Commitments

01 Act at all times in compliance with all applicable laws and regulations

02 Inter-company transactions are based on the arm’s length principle, in compliance with internationally accepted transfer pricing guidance published by the OECD

03 Be transparent in financial reporting. Disclosures are made in accordance with applicable regulations and reporting requirements

04 Do not use tax havens or tax structures whose sole purpose is for tax avoidance

05 Do not transfer value created to low-tax jurisdictions

06 Develop strong, mutually respectful relationships with tax authorities based on transparency and trust

07 Always consider tax as part of major business decisions

08 Analyze the operating environment and assess tax risk through a corporate management mechanism

---

### Tax Risk Management

TSMC is subject to tax laws and regulations in various jurisdictions in which it operates or conducts business. Any unfavorable changes in tax laws and regulations in these jurisdictions could increase the Company’s effective tax rate and have an adverse effect on its operating results. In order to effectively manage tax risks, TSMC follows internal control processes, identifies, assesses, and manages tax risks from regulatory changes and its business transactions, accounts for them appropriately, and implements and monitors controls over them.

Tax risk management is incorporated in TSMC’s enterprise risk management (ERM) program. The risk management organization regularly briefs TSMC’s Audit Committee on the ever-changing environment facing TSMC, the focus of the Company’s enterprise risk management, and risk assessment and mitigation efforts. For more details on risk management, please refer to “Risk Management” section in TSMC’s 2020 Annual Report.

### Tax Governance

The ultimate responsibility for taxation management for TSMC and its subsidiaries rests with the Chief Financial Officer, who delegates day-to-day responsibility to the Controller. A team of qualified and experienced tax professionals supports the Controller to meet TSMC’s tax obligations. In addition, TSMC also leverages external tax service providers for complementary expertise.

TSMC’s Audit Committee is delegated by the Board to oversee the quality and integrity of the accounting, auditing, reporting, and financial control practices of the Company through periodic review of certain major matters, including accounting policies and procedures, internal control systems, legal compliance, and corporate risk management, etc. Among these, tax compliance is included as part of the Company’s legal compliance.

### Effective Tax Rate

TSMC’s effective tax rate in 2020 was 11.5%, unchanged from 2019. The effective tax rate in 2020 was lower than the R.O.C. statutory corporate income tax rate of 20%, primarily due to a five-year tax exemption for capital investments made in previous years, and tax credit for research and development expenditures according to the R.O.C. Statute for Upgrading Industries and the Statute for Industrial Innovation.

---

**2020 Tax Breakdown**

<table>
<thead>
<tr>
<th>Income Tax Paid</th>
<th>51.4 Billion (NT$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan R.O.C.</td>
<td>97.0%</td>
</tr>
<tr>
<td>Asia (excluding R.O.C.)</td>
<td>1.8%</td>
</tr>
<tr>
<td>North America</td>
<td>1.2%</td>
</tr>
<tr>
<td>Others</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Profit Before Tax</th>
<th>584.8 Billion (NT$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan R.O.C.</td>
<td>94.7%</td>
</tr>
<tr>
<td>Asia (excluding R.O.C.)</td>
<td>3.4%</td>
</tr>
<tr>
<td>North America</td>
<td>0.5%</td>
</tr>
<tr>
<td>Others</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Note: TSMC categorizes its profit before tax and taxes paid geographically based on the country in which TSMC and subsidiaries are located.
Corporate Information Security

Information security and Proprietary Information Protection are commitments from TSMC to customers, shareholders, and employees. We are proactive in carrying out our information security management system and in setting related policies, management procedures and regulations. In 2020, the TSMC Information Security Declaration was published to declare our resolution and objectives in information security protection—to maintain TSMC’s competitive advantage and safeguard customers and business partners’ interests.

Corporate Information Security

The Corporate Information Security (CIS) organization, established in 2019, is in charge of information security policy formulation, implementation, risk management, and compliance audits, with the Proprietary Information Protection Division and the Information Technology Security Division under its supervision. Reports on information security management performance, related issues and directions are delivered every six months by CIS’s highest-level supervisor to the Board of Directors and Audit Committee. As the Audit Committee is responsible for monitoring corporate information security, TSMC’s information and cybersecurity management mechanisms are evaluated by Sir Peter L. Bonfield, chairman of the Audit Committee, who possesses a strong information security background.

The Proprietary Information Protection Committee was established to implement information security strategies formulated by CIS and ensure related guidelines, procedures, and regulatory compliance are carried out internally. The Committee is chaired by the senior vice president of Information Technology and Materials Management and Risk Management, and vice presidents of Legal, Human Resources, Research and Development, and Operations serve as committee members. In addition, the highest-level supervisor from CIS acts as the executive secretary, and the highest-level supervisor from Internal Audit as an observer. The committee meets each quarter to review and resolve on guidelines and policies, and carry out formulated information security measures.

Strategies and Framework of Corporate Information Security

The Corporate Information Security let the concept of information security take root in the Company through TSMC Proprietary Information Protection (PIP) Working Committee. The PIP Working Committee, which covers all organizations by all functions, convenes monthly meetings to keep track of situations on the ground and discuss PIP measures such as information protection, compliance, and policy applicability utilizing the Plan-Do-Check-Act (PDCA) cycle to ensure thorough management of information security. Reports on implementation results are delivered to the Proprietary Information Protection Committee regularly.

Structure of TSMC Corporate Information Security

![Diagram of TSMC Corporate Information Security Structure](image-url)
The "planning" stage of the PDCA cycle focuses on information security risk management to minimize systemic, technological, and procedural corporate information security threats by establishing a comprehensive Information Security Management System (ISMS), and ISO certification (ISO/IEC 27001 and ISO/IEC 15408) across fabs. Enable the best proprietary information protection to fulfill customers' needs. The doing stage focuses on implementation of multilayered information security defense. TSMC continuously adopts innovative information protection technology and integrates the security control solution with daily operations including maintenance of software and hardware facilities, and supplier information security management. Systematically monitoring information security measures to protect the confidentiality, integrity, and availability of TSMC assets. Proactive monitoring on security management performance is carried out in the "checking" stage, where related indicators and quantitative analyses are used to evaluate effectiveness of security defense, and information security maturity is assessed through regular drills on information security attacks. In the "action stage", security measures are regularly reviewed and activities are planned for continuous improvement. Continue to monitor and audit to ensure security control effectiveness and sustainability. When employees are found violating information security protection and PIP procedures, penalties consistent to the severity of damage caused by their violations are given (including annual employee assessment and legal actions when necessary). In addition, based on security KPI and maturity assessment report, improvement activities for training programs, promotion campaigns and security control mechanism are constantly reviewed and planned to prevent breaching of TSMC proprietary information.
2020 Corporate Information Security New Measures

**Multilayered Information Security Protection**

- **Network Security**
  - Adopted new technology for vulnerability scan and fulfill system and software continuously updates
  - Strengthened firewall and network access control to prevent the spreading of computer viruses across devices and TSMC facilities

- **Device Security**
  - Designed advanced virus scanning tools to prevent fabs from installing virus-infected tools
  - Installation of anti-virus and advanced malware detection solutions across our computer devices

- **Application Security**
  - Defined security self-check forms, assessment standards and improvement goals
  - Enhanced application security controls and integrated the security controls in development process and platform

- **Supply Chain Information Security**
  - Supplier security defense self-examination mechanism established
  - Latest regulations and announcements on information security delivered regularly to TSMC suppliers

- **Strengthening of Data Security Protection Technology**
  - Advanced information protection tools developed; document classification and information protection are strengthened through labeling
  - Control and tracking of documents and encrypted data
  - Control of out-going emails

- **Reviews and Improvement Activities**
  - Enhancement of employees’ awareness of email phishing and social engineering, and drills on phishing emails carried out
  - Regular drills on threat identification organized to raise employee information security awareness

**Information Security Performance Monitoring**

- Regular network and information security assessments carried out by external experts (from information security audit organizations, and cybersecurity and information security risk assessment institutes)
- Third-party verified results and threat profiles integrated for risk analysis to strengthen information security management

**Third-party Evaluation Results on TSMC’s Information Security in 2020**

<table>
<thead>
<tr>
<th>Month</th>
<th>TSMC Average</th>
<th>Industry Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Feb.</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>Mar.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Apr.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>May</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Jun.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Jul.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Aug.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Sep.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Oct.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Nov.</td>
<td>99</td>
<td>90</td>
</tr>
<tr>
<td>Dec.</td>
<td>99</td>
<td>90</td>
</tr>
</tbody>
</table>

In 2020, TSMC’s external audits concluded that no major information security flaws, major violations, incidents of customer data breach and regulatory fines occurred. Moreover, there has been zero complaints concerning breach of customer privacy and loss of customer data from either third parties or regulatory bodies resulting in judicial action.
## 2020 Corporate Information Security Measures Enforcement Report

### Policies
- **10 Regulations**
  - Newly created or revised 10 information security regulations
  - 2020: 10
  - 2019: 12
  - 2018: 17

### Certifications
- **300 mm Fab**
  - Areas include: Client Silicon IP merge, mask manufacturing and production, inventory management and related IT management applied to support 12-inch wafer manufacturing (Tainan)

- **3 Fabs Achieved ISO/IEC 15408 Certification**
  - Fabs 14A, 15B, and 12B were successfully certified by the German Federal Office for Information Security (BSI) for ISO/IEC 15408- EAL6 under Common Criteria (Site Certification)

### Training programs/Promotion campaigns
- **100%**
  - All new employees, a total of over 5,000 individuals, completed information security and protection training courses
  - 2020: 100%
  - 2019: 100%
  - 2018: 100%

- **32 Posters**
  - A total of 32 posters were created to promote important regulations and announcements regarding information protection and information security
  - 2020: 32 posters
  - 2019: 24 posters
  - 2018: 30 posters

- **52,818 Employees**
  - 52,818 employees completed the annual information security online refresher e-learning course
  - 2020: 52,818 employees
  - 2019: 47,397 employees
  - 2018: 45,989 employees

### Survey
- **95 Points**
  - Average score of 95 for employee approval of information protection-related policies
  - Conducted an information protection engagement survey in 2020, collected over 43,000 surveys with over 82% response rate
  - 2020: 95 points
  - 2019: 95 points
  - 2018: 95 points

### Events/Violations
- **0.05%**
  - Of employees were found violating information security protection and PIP procedures and penalized consistent to the severity of damage caused by their violations

Corrective measures:
- Strengthened employee training programs and promotion campaigns
- Set improvement measures and implemented monitoring on employees

### Note:
2020 PIP performance indicators cover TSMC’s Taiwan facilities and overseas subsidiaries.
Appendix

About this Report  202
Participation in Industry Associations and Non-profit Organizations  205
ESG Performance Summary  206
GRI Standards Comparison Table  208
Climate Change Management Framework  225
Sustainability Accounting Standards Board  227
Independent Third Party Assurance Statement  229
Contact Information  230
Working towards sustainability, TSMC strives for a better future along with its employees, shareholders and investors, customers, suppliers and contractors, the government, society, and all other stakeholders. TSMC has issued non-financial reports for 22 consecutive years. In accordance with the standards set by the Global Reporting Initiative (GRI), Task Force on Climate-related Financial Disclosures (TCFD), and Sustainability Accounting Standards Board (SASB), the reports present the expectations and feedback given by various stakeholders regarding the Company’s daily operations. The reports have become an important tool for managing sustainability efforts, disclosing sustainability strategies and measures, and sharing achievements. TSMC is committed to making positive changes for a better future.

Reporting Period
The reporting period is between January 1, 2020 and December 31, 2020. The report is published in June 2021 in both English and Chinese, and is available on TSMC’s ESG website. It mainly covers the major topics of interest to stakeholders as well as TSMC’s practices in the economic, environmental, and social dimensions. Visit the following links for more data and information.

Primary Changes in the 2020 ESG Disclosures
New Case Studies from 2020 in accordance to the Five Major ESG Trends

Developed TCFD and SASB disclosure principles on the GRI foundation to ensure full disclosure of ESG performances

Units for unit product indicators in Green Manufacturing have been updated from 8-inch wafer equivalent to 12-inch wafer equivalent; the energy consumption of gas plant suppliers neighboring TSMC fabs are deducted from the unit product energy consumption and total energy consumption; figures for disabling injury frequency rate/disabling severity rate are from work-related injuries and excludes non-work-related injuries in compliance with the law

Disclosure boundaries for sustainability topics have now expanded to include new fabs and subsidiaries

Issue 2020 CSR Report Highlights and Video

TSMC publishes new case studies on corporate sustainability every week to provide real-time updates on the Company’s progress towards sustainability
## Data Collection Boundaries for Sustainable Development Issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Taiwan Facilities</th>
<th>WaferTech</th>
<th>TSMC (China)</th>
<th>TSMC (Nanjing)</th>
<th>VisEra</th>
<th>Other Subsidiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation Management</td>
<td>●</td>
<td>—</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Product Quality</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Customer Service</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Supplier Sustainability Management</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Climate Change and Energy Management</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Water Management</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Waste Management</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Air Pollution Control</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Talent Attraction and Retention</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Talent Development</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Human Rights</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Occupational Safety and Health</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Social Participation</td>
<td>●</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note 1: TSMC’s facilities in Taiwan include corporate headquarters, wafer fabs, testing and assembly facilities.*

*Note 2: TSMC subsidiaries or offices in North America, Europe, Japan, South Korea, and other countries.*
ESG Standards
- GRI Standards: Comprehensive Option
- TCFD Framework
- SASB Standards
- AA 1000 Accountability Principles
- IFRSs approved and issued by the Financial Supervisory Commission (FSC)
- Regulations Governing the Preparation of Financial Reports by Securities Issuers

Certification Organization
- DNV GL Business Assurance Co. Ltd.

If you have any feedback, advice, or suggestion on this report or TSMC’s sustainable development, please feel free to contact us. For more information about TSMC’s latest sustainability practices, please subscribe to TSMC’s ESG Newsletter.

Note 1: DNV GL VeriSustain™ Protocol is consistent with AA 1000 Accountability Principles (AA1000AP) and ISAE 3000.
Note 2: For the United Nations Global Compact (UNGC) Comparison Table and other related certification and verification documents, please visit TSMC’s ESG website.
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. With the threat and challenges brought by the COVID-19 pandemic around the world, TSMC applied our unique knowledge and resources to provide aid and relief. TSMC provided aid to areas most in need of resources, including Taiwan, Europe, the United States, and Mainland China to fight against pandemic and save lives. Following the announcement to build and operate an advanced semiconductor fab in the United States, TSMC expanded participation in industry associations and chambers of commerce in the United States. In 2020, TSMC participated in more than 100 industry associations and non-profit organizations at home and abroad, with expenditures of over NT$40.19 million. Total expenditures in the past five years (2016-2020) were about NT$139.74 million.

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:

Industry Dialogue and Development

TSMC strives for the development of the global and domestic semiconductor industry. In addition to participating in the main industry associations in the field of semiconductors, the Company also makes policy suggestions to the government in areas including land, water, electricity, talent, intellectual property protection, and other areas related to the competitiveness of the industry. Industry associations that TSMC participates in to steer industry development include:

- Taiwan Semiconductor Industry Association (TSIA)
- Semiconductor Industry Association (SIA)
- Semiconductor Equipment and Materials International (SEMI)
- Global Semiconductor Alliance (GSA)
- The Allied Association for Science Park Industries
- Information Technology Industry Council (ITC)
- Information Technology and Innovation Foundation (ITIF)
- The Allied Association for Science Park Industries
- Chinese National Association of Industry and Commerce, Taiwan
- Taiwan Electrical and Electronics Manufacturers’ Association
- Monte Jade Science & Technology Association of Taiwan

TSMC Chairman Mark L. Liu has served as Chairman of the TSIA since 2013. Senior Vice President Y.P. Chin currently serves as chairperson of SEMI’s Energy Committee, and Director Fuqiang Lin currently serves as chairperson of TSIA’s Environment, Safety and Health Committee. Senior Director Tsu-Hsia Chuang currently serves as chairperson of SEMI’s MEMS & Sensors Committee, Senior Director Major Arthur Huang currently serves as chairperson of SEMI’s High-Tech Facility Committee, Director John Lin currently serves as chairperson of SEMI U.S. Committee, and Director M.D. Chen currently serves as chairperson of SEMI’s Materials Committee. Senior Vice President Rick Cassidy currently serves as a member of the Board of Directors at GSA. Senior Vice President Y. P. Chin currently serves as standing director of The Allied Association for Science Park Industries, and Vice President Connie Ma currently serves as a standing director of The Allied Association for Science Park Industries.

Note 1: Non-profit organizations in the areas of charity and education are not included here. For details of TSMC’s participation in the TSIA Charity Foundation and TSMC Education and Culture Foundation, please see pages 166 to 188 of this report.

Note 2: By law, TSMC is not permitted to make political donations as the Company is majority-owned by foreign shareholders. TSMC has always followed this legal requirement and maintained political neutrality, but encourages employees to fulfill their civic duty.

Note 3: The three largest membership fees paid or donations made by TSMC in 2020, in descending order, are:

2) Taiwan Semiconductor Industry Association (TSIA)/NT$5,010,984
3) Semiconductor Industry Association (SIA)/NT$4,797,440

TSMC participates in the TSIA to support Taiwan’s semiconductor industry and develop consensus on the development of the industry through the association’s activities and promote healthy growth for the sector through cooperation amidst competition.

Note 3: Total expenditures of membership fees paid or donations made by TSMC in 2020 were NT$139.74 million.

Note 4: TSMC’s expenditures of membership and donation for industry associations and non-profit organizations between 2016 and 2020 were NT$36,296,334, with expenditures of over NT$40.19 million in 2020. Total expenditures in the past five years (2016-2020) were about NT$139.74 million.

Technology Innovation

Technology innovation is the key driving force moving the technology industry forward. TSMC not only cares for and invests in technology innovation and participates in the definition of technical standards, it also calls on the government and private sector to protect the results of innovation together so that it can gain appropriate economic value and encourage further innovation, creating a fair competitive environment. TSMC participates in industry associations and in the area of technology innovation including:

- Epoch Foundation
- Taiwan Association for Trade Secrets Protection (TATSP)
- Peripheral Component Interconnect Special Interest Group (PCISIG)
- JEDIC

TSMC Vice President and General Counsel Sylvia Fang jointly founded the Taiwan Association for Trade Secrets Protection (TATSP) in 2015, and served as its Chairman for the first two terms to help promote legal reform of Taiwan’s trade secret laws and regulations. Currently she is a standing executive director of the TSP.

Corporate Governance

The robustness of a company’s corporate governance not only affects that company’s development, it can also affect the economic stability of a region. TSMC places great importance on corporate governance and has received invitations to speak on our principals and methods for corporate governance, as well as discuss the results of TSMC’s 33 years of corporate governance. TSMC participates in industry associations and in the area of corporate governance including:

- Asian Corporate Governance Association (ACGA)
- Asia Business Council
- Taiwan Corporate Governance Association (TGSA)

TSMC Vice President and General Counsel Sylvia Fang currently serves as a member of the Board of Directors at GSA. Senior Vice President Y. P. Chin currently serves as standing director of The Allied Association for Science Park Industries, and Vice President Connie Ma currently serves as a standing director of The Allied Association for Science Park Industries.

Human Rights and Supply Chain Management

TSMC is an official member of the Responsible Business Alliance, and in addition to meeting the alliance’s requirements in auditing suppliers regarding labor, safety and health, environment, ethics, and management systems, we have also led our suppliers to join this alliance to expand its effectiveness. TSMC also requires all suppliers to commit to the “Assurance to Comply with TSMC’s Code of Ethics and Business Conduct” ensuring that TSMC employees and suppliers follow high ethical standards. TSMC participates in industry associations in the area of human rights and supply chain management including:

- Responsible Business Alliance (RBA)
- Responsible Minerals Initiative
## ESG Performance Summary

### Key Indicators

<table>
<thead>
<tr>
<th>Economic</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue (NT$ billion)</td>
<td>948</td>
<td>977</td>
<td>1,031</td>
<td>1,070</td>
<td>1,339</td>
</tr>
<tr>
<td>Net Income (NT$ billion)</td>
<td>334</td>
<td>343</td>
<td>351</td>
<td>345</td>
<td>518</td>
</tr>
<tr>
<td>Income Tax Expense (NT$ billion)</td>
<td>52</td>
<td>53</td>
<td>46</td>
<td>45</td>
<td>67</td>
</tr>
<tr>
<td>R&amp;D Expenditures (NT$ billion)</td>
<td>71</td>
<td>81</td>
<td>86</td>
<td>91</td>
<td>109</td>
</tr>
<tr>
<td>Capital Expenditures (NT$ billion)</td>
<td>328</td>
<td>331</td>
<td>316</td>
<td>460</td>
<td>507</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse Gas Emission (Metric Ton–CO₂ equivalent)</td>
<td>7,413,953</td>
<td>8,156,140</td>
<td>8,475,367</td>
<td>8,769,614</td>
<td>9,910,209</td>
</tr>
<tr>
<td>Scope 1 (Metric Ton–CO₂ equivalent)</td>
<td>2,035,510</td>
<td>2,075,928</td>
<td>2,125,725</td>
<td>2,071,743</td>
<td>2,450,354</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>1,648,628</td>
<td>1,640,532</td>
<td>1,705,746</td>
<td>1,678,754</td>
<td>2,150,339</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>387,242</td>
<td>435,396</td>
<td>419,977</td>
<td>392,989</td>
<td>300,015</td>
</tr>
<tr>
<td>Scope 2 (Metric Ton–CO₂ equivalent)</td>
<td>5,378,443</td>
<td>6,080,212</td>
<td>6,349,642</td>
<td>6,673,235</td>
<td>7,429,851</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>5,030,647</td>
<td>5,702,511</td>
<td>6,325,931</td>
<td>6,773,235</td>
<td>7,429,851</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>347,796</td>
<td>377,701</td>
<td>23,711</td>
<td>24,637</td>
<td>29,905</td>
</tr>
<tr>
<td>Scope 3 (Metric Ton–CO₂ equivalent)</td>
<td>3,767,411</td>
<td>4,242,521</td>
<td>4,315,497</td>
<td>5,307,028</td>
<td>5,511,486</td>
</tr>
<tr>
<td>Fluorinated Greenhouse Gas Emission (Metric Ton–CO₂ equivalent)</td>
<td>1,259,527</td>
<td>1,194,136</td>
<td>1,185,433</td>
<td>1,081,212</td>
<td>1,311,530</td>
</tr>
<tr>
<td>NOₓ Emissions (Metric Tons)</td>
<td>60.54</td>
<td>82.5</td>
<td>118.82</td>
<td>116.67</td>
<td>170.36</td>
</tr>
<tr>
<td>SO₂ Emissions (Metric Tons)</td>
<td>33.08</td>
<td>43.87</td>
<td>39.71</td>
<td>32.18</td>
<td>38.13</td>
</tr>
<tr>
<td>VOC Emissions (Metric Tons)</td>
<td>163.6</td>
<td>170.8</td>
<td>168.4</td>
<td>102.1</td>
<td>106.8</td>
</tr>
<tr>
<td>Energy Consumption (GWh) (Including electricity, nature gas and diesel)</td>
<td>9,848</td>
<td>12,016</td>
<td>13,167</td>
<td>14,323</td>
<td>16,919</td>
</tr>
<tr>
<td>Direct Energy Consumption (GWh) (Including nature gas and diesel)</td>
<td>489</td>
<td>628</td>
<td>726</td>
<td>747</td>
<td>861</td>
</tr>
<tr>
<td>Indirect Energy Consumption (GWh) (Electricity)</td>
<td>9,358</td>
<td>11,388</td>
<td>12,441</td>
<td>13,576</td>
<td>16,058</td>
</tr>
<tr>
<td>Water Consumption (Million Metric Tons)</td>
<td>42.0</td>
<td>48.9</td>
<td>56.8</td>
<td>64.3</td>
<td>77.3</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>38.6</td>
<td>45.2</td>
<td>51.6</td>
<td>58.0</td>
<td>70.6</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>3.4</td>
<td>3.8</td>
<td>5.7</td>
<td>6.3</td>
<td>6.7</td>
</tr>
<tr>
<td>Process Water Recycling Rate (%)</td>
<td>87.4</td>
<td>87.5</td>
<td>87.5</td>
<td>86.7</td>
<td>86.4</td>
</tr>
<tr>
<td>Total Water Saving (Million Metric Tons)</td>
<td>94.3</td>
<td>103.4</td>
<td>129.0</td>
<td>133.6</td>
<td>173.0</td>
</tr>
</tbody>
</table>

(Continued on next page)
### Key Indicators

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultra-Pure Water Usage (Million Metric Tons)</td>
<td>68.8</td>
<td>79.7</td>
<td>85.1</td>
<td>90.1</td>
<td>102.4</td>
</tr>
<tr>
<td>Tetramethylammonium hydroxide (TMAH)</td>
<td>16.3</td>
<td>12.9</td>
<td>13.1</td>
<td>7.9</td>
<td>6.3</td>
</tr>
<tr>
<td>Copper ion (Cu²⁺)</td>
<td>0.19</td>
<td>0.22</td>
<td>0.18</td>
<td>0.09</td>
<td>0.07</td>
</tr>
<tr>
<td>Waste Generated (Metric Tons)</td>
<td>298,761</td>
<td>369,745</td>
<td>393,784</td>
<td>416,715</td>
<td>575,740</td>
</tr>
<tr>
<td>General Waste Generated (Metric Tons)</td>
<td>163,584</td>
<td>201,114</td>
<td>213,840</td>
<td>219,584</td>
<td>277,340</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>158,899</td>
<td>196,077</td>
<td>208,340</td>
<td>212,465</td>
<td>269,640</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>4,685</td>
<td>5,037</td>
<td>5,501</td>
<td>7,119</td>
<td>7,000</td>
</tr>
<tr>
<td>Hazardous Waste Generated</td>
<td>137,157</td>
<td>168,631</td>
<td>179,944</td>
<td>197,131</td>
<td>298,400</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>133,085</td>
<td>165,891</td>
<td>169,427</td>
<td>183,015</td>
<td>280,635</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>2,092</td>
<td>2,740</td>
<td>10,516</td>
<td>11,176</td>
<td>17,765</td>
</tr>
<tr>
<td>Waste Recycling Rate (%)</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>96</td>
<td>95</td>
</tr>
<tr>
<td>Taiwan Facilities</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>96</td>
<td>95</td>
</tr>
<tr>
<td>Subsidiaries</td>
<td>79</td>
<td>80</td>
<td>83</td>
<td>74</td>
<td>77</td>
</tr>
<tr>
<td>ISO 14001 Certified Facilities</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numbers of Employee</td>
<td>46,968</td>
<td>48,602</td>
<td>48,752</td>
<td>51,297</td>
<td>56,831</td>
</tr>
<tr>
<td>Employee Training Hours</td>
<td>623,711</td>
<td>639,852</td>
<td>540,408</td>
<td>741,178</td>
<td>926,379</td>
</tr>
<tr>
<td>Women in Workforce (%)</td>
<td>40.1</td>
<td>39.3</td>
<td>38.7</td>
<td>37.8</td>
<td>37.1</td>
</tr>
<tr>
<td>Females in Management (%)</td>
<td>11.7</td>
<td>12.3</td>
<td>12.6</td>
<td>12.7</td>
<td>12.5</td>
</tr>
<tr>
<td>Females in Senior Management (%)</td>
<td>12.8</td>
<td>13.6</td>
<td>13.7</td>
<td>13.6</td>
<td>13.0</td>
</tr>
<tr>
<td>Females in Top Management (%)</td>
<td>20.0</td>
<td>20.0</td>
<td>18.5</td>
<td>11.1</td>
<td>10.0</td>
</tr>
<tr>
<td>Turnover Rate (%)</td>
<td>4.3</td>
<td>4.2</td>
<td>4.5</td>
<td>4.9</td>
<td>5.3</td>
</tr>
<tr>
<td>Voluntary Turnover Rate (%)</td>
<td>4.2</td>
<td>4.1</td>
<td>4.3</td>
<td>4.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Safety–Injury Frequency Rate (Total hours)</td>
<td>0.29</td>
<td>0.35</td>
<td>0.47</td>
<td>0.52</td>
<td>0.42</td>
</tr>
<tr>
<td>Safety–Injury Severity Rate (Injury Number x 1:000,000/Total hours worked)</td>
<td>0.3</td>
<td>0.3</td>
<td>0.7</td>
<td>0.9</td>
<td>4</td>
</tr>
<tr>
<td>Fatalities–Employees</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Fatalities–Contractors</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cash Donation (NT$ million)</td>
<td>89.1</td>
<td>30.1</td>
<td>199.0</td>
<td>163.5</td>
<td>144.4</td>
</tr>
</tbody>
</table>

**Note 1:** Figures from all Taiwan 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:** Figures from all Taiwan facilities of TSMC.

**Note 4:** Safety –Injury Frequency Rate = Injury Number × 1,000,000/Total hours worked.

According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate (FR)/Disabling Severity Rate (SR) are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. Target has been amended according to new definition. See Statistical Analysis of Disabling Injuries for detailed information.

**Note 5:** Safety –Injury Severity Rate = Lost Work Days × 1,000,000/Total hours worked.

According to the Occupational Safety and Health Act, Disabling Injury Frequency Rate (FR)/Disabling Severity Rate (SR) are defined as any diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes. Other unrelated injuries in the workplace such as falling in the cafeteria or parking lot due to various reasons are not considered as work injuries. Target has been amended according to new definition. See Statistical Analysis of Disabling Injuries for detailed information.

**Note 6:** Cash donation is the amount of cash donations by TSMC, TSMC Education and Culture Foundation, TSMC Charity Foundation, TSMC employees and TSMC Employee Welfare Committee.

**Note 7:** In response to the government’s renewable energy policy, TSMC purchased 100 GWh green power in 2017, which was the main reason for the increase in annual cash donations. The government’s green power purchase plan was terminated at the end of 2017. TSMC is proactively searching for renewable energy.
## GRI Standards Comparison Table

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-1</td>
<td>Name of the organization</td>
<td>About TSMC</td>
<td>6</td>
</tr>
<tr>
<td>102-2</td>
<td>Activities, brands, products, and services</td>
<td>About TSMC</td>
<td>6</td>
</tr>
<tr>
<td>102-3</td>
<td>Location of headquarters</td>
<td>About TSMC</td>
<td>6</td>
</tr>
<tr>
<td>102-4</td>
<td>Location of operations</td>
<td>About TSMC</td>
<td>6</td>
</tr>
<tr>
<td>102-5</td>
<td>Ownership and legal form</td>
<td>About TSMC; Please refer to 2020 TSMC Annual Report (II) Financial Statements</td>
<td>6</td>
</tr>
<tr>
<td>102-6</td>
<td>Markets served</td>
<td>About TSMC</td>
<td>6</td>
</tr>
<tr>
<td>102-7</td>
<td>Scale of the organization</td>
<td>About TSMC; Please refer to 2020 TSMC Annual Report (II) Financial Statements</td>
<td>6</td>
</tr>
<tr>
<td>102-8</td>
<td>Information on employees and other workers</td>
<td>An Admired Employer: Talent Attraction and Retention - Shared Visions and Values- Workforce Structure All employee number has been disclosed in &quot;Workforce Structure&quot;, the number of contractors has also disclosed in the note In 2020, there were 2,605 non-employee workers conducted preventive maintenance tasks for facility systems.</td>
<td>131</td>
</tr>
<tr>
<td>102-9</td>
<td>Supply chain</td>
<td>A Responsible Purchaser: Supplier Sustainability Management - Sustainability Risk Management/Local Procurement Optimization Details please refer to 2020 TSMC Annual Report 5.3.5</td>
<td>83</td>
</tr>
<tr>
<td>102-10</td>
<td>Significant changes to the organization and its supply chain</td>
<td>About TSMC; Please refer to 2020 TSMC Annual Report (II) Financial Statements A Responsible Purchaser: Supplier Sustainability Management</td>
<td>6</td>
</tr>
<tr>
<td>102-11</td>
<td>Precautionary Principle or approach</td>
<td>The risk management organization regularly briefs the audit committee on the ever-changing risk environment facing TSMC, the focus of the Company’s enterprise risk management, and risk assessment and mitigation efforts. The audit committee’s chairperson also reports on the risk environment and risk mitigation actions to be taken. TSMC and its subsidiaries are committed to proactively and cost effectively integrating and managing strategic, operational, financial and hazardous risks together with potential consequences to operations and financial results. TSMC operates an enterprise risk management (ERM) program and apply a risk map considering likelihood and impact severity to identify and prioritize corporate risks. Various risk treatment strategies are also adopted in response corporate risks as they are identified. Refer section 6.3 Risk Management of 2020 TSMC Annual Report for details of implementation of ERM (Enterprise Risk Management)</td>
<td>73</td>
</tr>
<tr>
<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); Participated in RE100; TCFD (Task Force on Climate-related Financial Disclosures) Supporter, committed to evaluating and publicly disclosing climate change risks and opportunities</td>
<td></td>
</tr>
<tr>
<td>102-13</td>
<td>Membership of associations</td>
<td>Appendix: Participation in Industry Associations and Non-profit Organizations</td>
<td>205</td>
</tr>
<tr>
<td>102-14</td>
<td>Statement from senior decision-maker</td>
<td>Sustainable Business Practices: ESG Implementation Framework, ESG Management Platform Letter from the ESG Steering Committee Chairperson, Letter from the ESG Committee Chairperson</td>
<td>17</td>
</tr>
<tr>
<td>102-15</td>
<td>Key impacts, risks, and opportunities</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>4</td>
</tr>
<tr>
<td>Disclosure Number</td>
<td>Disclosure Title</td>
<td>Report Contents or Explanation</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>--------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>102-16</td>
<td>Values, principles, standards, and norms of behavior</td>
<td>Operations and Governance: Corporate Governance-Ethics and Regulatory Compliance Please refer to 2020 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance</td>
<td>192</td>
</tr>
<tr>
<td>102-17</td>
<td>Mechanisms for advice and concerns about ethics</td>
<td>Operations and Governance: Corporate Governance-Ethics and Regulatory Compliance Please refer to 2020 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct 3.6 Regulatory Compliance 5.5.6 Employee Engagement/Employee Communication</td>
<td>192</td>
</tr>
<tr>
<td>102-20</td>
<td>Executive-level responsibility for economic, environmental, and social topics</td>
<td>Letter from the ESG Steering Committee Chairperson; Letter from the ESG Committee Chairperson Sustainable Business Practices: ESG Management Platform</td>
<td>4</td>
</tr>
<tr>
<td>102-21</td>
<td>Consulting stakeholders on economic, environmental, and social topics</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication Operations and Governance: Corporate Governance Please refer to 2020 TSMC Annual Report: 3.4 Taiwan Corporate Governance Implementation as Required by the Taiwan Financial Supervisory Commission/Assessment Item 5</td>
<td>21</td>
</tr>
<tr>
<td>102-22</td>
<td>Composition of the highest governance body and its committees</td>
<td>Operations and 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. TSMC established its Audit Committee and Compensation Committee in 2002 and 2003, respectively, both of which are now composed entirely of independent directors. Please refer to 2020 TSMC Annual Report: 2.4.1 Information Regarding Board Members 3 Corporate Governance</td>
<td>21</td>
</tr>
<tr>
<td>102-23</td>
<td>Chair of the highest governance body</td>
<td>The Chair of the highest governance body is not an executive officer</td>
<td></td>
</tr>
</tbody>
</table>
In 2019, TSMC established “Guidelines for Nomination of Directors”, which describes the procedures and criteria for the nomination, qualification and evaluation of candidates for Directors. Please refer to our website.

TSMC envisions 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 is 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.

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 2020 TSMC Annual Report:
2.4.1 Information Regarding Board Members
4.1.4 Major Shareholders
4.1.8 Related Party Relationship among TSMC’s 10 Largest Shareholders
5.3.5 Raw Materials and Supply Chain Management-Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement
5.4 Customer Trust-Customers Accounted for at Least 10% of Annual Consolidated Net Revenue
8.1 Subsidiaries

Please refer to Consolidated Financial Statements for 2020:
Note 38: Additional Disclosures
Table 6 - Total Purchases from or Sales to Related Parties of at Least NT$100 Million or 20% of the Paid-in Capital
## Role of highest governance body in setting purpose, values, and strategy

Please refer to 2020 TSMC Annual Report:

Quarterly management reports and semi-annual CSR reports develop and enhance the Board of Directors’ collective knowledge of economic, environmental and social topics.

## Collective knowledge of highest governance body

Please refer to 2020 TSMC Annual Report:

Quarterly management reports and semi-annual CSR reports develop and enhance the Board of Directors’ collective knowledge of economic, environmental and social topics.

## Evaluating the highest governance body’s performance

Please refer to 2020 TSMC Annual Report:
3.1 Corporate Governance/2020 Corporate Governance Awards and Ratings
3.2 Board of Directors/Director’s Compensation
3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission/Assessment Item 3 - (3)

6.3 Risk Management
7 Corporate Social Responsibility/ESG Management/Stakeholder Engagement

## Identifying and managing economic, environmental, and social impacts

Please refer to 2020 TSMC Annual Report:
3.2 Board of Directors
The Board of Directors considers economic, environmental and social topics and their impact, risks and opportunities, and stakeholder opinions, when resolving important company matters, for example, when approving capital appropriations. The Board will also review the corporate strategies proposed by TSMC management, evaluate the prospects of these strategies, review their progress, and provide guidance to TSMC management when needed.

3.2.1 Audit Committee
3.2.2 Compensation Committee
3.4 Taiwan Corporate Governance Implementation as Required by Taiwan Financial Supervisory Commission/Assessment Item 5

6.3 Risk Management
7 Corporate Social Responsibility/ESG Management/Stakeholder Engagement
<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-30</td>
<td>Effectiveness of risk management processes</td>
<td>Please refer to 2020 TSMC Annual Report: 6.3 Risk Management</td>
</tr>
<tr>
<td>102-32</td>
<td>Highest governance body's role in sustainability reporting</td>
<td>Please refer to 2020 TSMC Annual Report: 3. Corporate Governance (This report is reviewed and approved by the Company’s functional heads and Chairperson of the ESG Committee)</td>
</tr>
</tbody>
</table>
| 102-33            | Communicating critical concerns                                   | In addition to holding regular meetings, TSMC management will regularly provide to the Board of Directors material company reports and information:  
▪ Accounting department: monthly financial information and quarterly financial statements  
▪ Internal Audit department: quarterly internal audit report  
▪ Public Relations department: press releases  
In addition, the Board maintains a regular line of communication with TSMC management, which will remain open if an event of critical concerns occurs.  
Please refer to 2020 TSMC Annual Report: 3.2.4 Director and Committees Members' Attendance/Audit Committee Meeting Status |
| 102-34            | Nature and total number of critical concerns                       | Please refer to the material information the Company has disclosed on Market Observation Post System (MOPS), which indicates the total number and nature of critical concerns.  
Please refer to 2020 TSMC Annual Report: 6.3 Enterprise Risk Management Framework: TSMC and its subsidiaries adopt risk management strategies corresponding to risk level through implementing an Enterprise Risk Management (ERM) system that weighs strategic, operational, financial and hazardous risks that may disrupt the Company's operations or financial results. If any events of critical concerns occur, the Company can resolve the event by using existing risk management mechanisms. |
| 102-35            | Remuneration policies                                             | Please refer to 2020 TSMC Annual Report: The extent and value of the services provided for the management of the Corporation and operating performance includes objectives for economic, environmental, and social topics.  
2.4.2 Remuneration Paid to Directors  
2.5.2 Compensation Paid to CEO and Vice Presidents  
2.5.3 Employees' Profit Sharing Bonus Paid to Management Team  
Pension funded according to applicable law and there is no difference with other employees.  
And also, 2020 CSR Report: An Admired Employer: Talent Attraction and Retention-Compensation and Benefits-Benefits Better Than Statutory Regulations, Solid Pension System. Our compensation is above the industry peers, and our benefit program also exceeds statutory requirements. |
<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-36</td>
<td>Process for determining remuneration</td>
<td>An Admired Employer: Talent Attraction and Retention-Competitive Compensation Package</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please refer to 2020 TSMC Annual Report: 3.2.2 Compensation Committee</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2.4 Director and Committees Members’ Attendance/ Compensation Committee Meeting Status</td>
<td></td>
</tr>
<tr>
<td>102-37</td>
<td>Stakeholders’ involvement in remuneration</td>
<td>Please refer to 2020 TSMC Annual Report: 4.1.12 Compensation to Directors and Profit Sharing to Employees</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Based on TSMC’s Articles of Incorporation, before paying dividends or bonuses to shareholders, TSMC shall set aside not more than 0.3% of its annual profit to directors as compensation and not less than 1% to employees as a profit sharing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TSMC’s Articles of incorporation shall be approved by the shareholders and the annual employees’ profit sharing and directors’ compensation will be reported in the next AGM.</td>
<td></td>
</tr>
<tr>
<td>102-38</td>
<td>Annual total compensation ratio</td>
<td>An Admired Employer: Talent Attraction and Retention-Competitive Compensation Package</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Median of global employees annual total compensation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Annual total compensation ratio between CEO and median</td>
<td></td>
</tr>
<tr>
<td>102-39</td>
<td>Percentage increase in annual total compensation ratio</td>
<td>An Admired Employer: Talent Attraction and Retention-Competitive Compensation Package</td>
<td>135</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>
<td></td>
</tr>
<tr>
<td>102-40</td>
<td>List of stakeholder groups</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSMC values employee opinions/interests and therefore offers several communication channels. The highest-level executives of the HR organization are responsible for many of the channels, ensuring that matters are handled in an efficient and confidential manner as we continue to strive towards an open and transparent environment for employees/managers and colleagues to communicate. Furthermore, TSMC respects employees’ right to take part in collective bargaining and peaceful rallies. In accordance with legal requirements in Taiwan, the Company regularly holds labor-management meetings to brief employees on Company operations and invite employees to engage in discussions on labor conditions and benefits.</td>
<td></td>
</tr>
<tr>
<td>102-42</td>
<td>Identifying and selecting stakeholders</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td>102-43</td>
<td>Approach to stakeholder engagement</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td>102-44</td>
<td>Key topics and concerns raised</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td>102-45</td>
<td>Entities included in the consolidated financial statements</td>
<td>About TSMC; Please refer to 2020 TSMC Annual Report (II) Financial Statements</td>
<td>6</td>
</tr>
<tr>
<td>102-46</td>
<td>Defining report content and topic boundaries</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appendix: About This Report</td>
<td>202</td>
</tr>
<tr>
<td>102-47</td>
<td>List of material topics</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td>102-48</td>
<td>Restatements of information</td>
<td>• TSMC’s production is primarily measured in 12-inch wafers. The unit product indicators mentioned in the ‘A Practitioner of Green Power’ are calculated based on 12-inch equivalent wafers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Only work-related injuries shall be treated as SR/FR, unrelated injuries in the workplace are not considered.</td>
<td></td>
</tr>
<tr>
<td>102-49</td>
<td>Changes in reporting</td>
<td>Appendix: About This Report</td>
<td>202</td>
</tr>
<tr>
<td>102-50</td>
<td>Reporting period</td>
<td>Appendix: About This Report</td>
<td>201</td>
</tr>
<tr>
<td>Disclosure Number</td>
<td>Disclosure Title</td>
<td>Report Contents or Explanation</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>102-51</td>
<td>Date of most recent report</td>
<td>June, 2020</td>
<td></td>
</tr>
<tr>
<td>102-52</td>
<td>Reporting cycle</td>
<td>Appendix: About This Report</td>
<td>202</td>
</tr>
<tr>
<td>102-53</td>
<td>Contact point for questions regarding the report</td>
<td>Appendix: About This Report</td>
<td>202</td>
</tr>
<tr>
<td>102-54</td>
<td>Claims of reporting in accordance with the GRI Standards</td>
<td>Appendix: About This Report</td>
<td>202</td>
</tr>
<tr>
<td>102-55</td>
<td>GRI content index</td>
<td>Appendix: GRI Standards Comparison Table</td>
<td>208</td>
</tr>
<tr>
<td>102-56</td>
<td>External assurance</td>
<td>Appendix: Independent Third Party Assurance Statement</td>
<td>229</td>
</tr>
<tr>
<td><strong>GRI 103 : Management Approach</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103-1</td>
<td>Explanation of the material topic and its Boundary</td>
<td>Sustainable Business Practices: Materiality Analysis and Stakeholder Communication</td>
<td>21</td>
</tr>
<tr>
<td>103-2</td>
<td>The management approach and its components</td>
<td>Please refer to the contents of related topics</td>
<td></td>
</tr>
<tr>
<td>103-3</td>
<td>Evaluation of the management approach</td>
<td>Please refer to the contents of related topics</td>
<td></td>
</tr>
<tr>
<td><strong>GRI 201 : Economic Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201-1</td>
<td>Direct economic value generated and distributed</td>
<td>Sustainable Business Practices: Sustainability Impact</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An Admired Employer: Talent Attraction and Retention - Compensation and Benefits</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operations and Governance: Financial Performance/Tax Policy</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appendix: ESG Performance Summary</td>
<td>206</td>
</tr>
<tr>
<td>201-2</td>
<td>Financial implications and other risks and opportunities due to climate change</td>
<td>A Practitioner of Green Power: Climate Change and Energy Management-Climate Risks Identification, Climate Risks Matrix, Climate Financial Risk Analysis</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appendix: Climate Change Management Framework</td>
<td></td>
</tr>
<tr>
<td>201-3</td>
<td>Defined benefit plan obligations and other retirement plans</td>
<td>An Admired Employer: Talent Attraction and Retention-Compensation and Benefits-Solid Pension System -Pension Allocation and Preparation</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSMC’s defined contribution plan recognized expenses of NT$2,809,484 thousand for the years ended December 31, 2020. 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>
<td></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 2020, TSMC enjoyed a tax benefit of NT$47.1 billion from five-year tax exemption for capital investments made in previous years. (Our wafer fabs in China received subsidies from the local government, but according to the agreement, TSMC can not disclose the content and amount.)</td>
<td></td>
</tr>
</tbody>
</table>
An Admired Employer: Talent Attraction and Retention - Compensation and Benefits - Competitive Compensation Package

In 2020, the average overall salary of a TSMC new engineer with a master’s degree is more than NT$1.8 million. The salary includes 12-month base salary, two-month year-end bonus, cash bonus and profit sharing. The average overall salary of direct employees is higher than NT$1 million, which is 4 times of the minimum wage in Taiwan. 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.

Operations and Governance: Corporate Governance - Ethics and Regulatory Compliance

TSMC assesses anti-corruption risk by function rather than by geographical region since more than 90% of TSMC employees work in Taiwan. Based on the TSMC core value of Integrity, our anti-corruption risk assessment incorporates applicable regulations, classifies corruption by type, accounts for our business operation procedures and specifications, requires full compliance and implementation by all employees, mandates annual self-assessments and examinations, and establishes open reporting channels (internal and external) and whistleblower protection. An objective of our anti-corruption risk assessment is to detect abnormal incidents early and effectively prevent the occurrence of corruption. Based on TSMC 2020’s training regimes and awareness campaign, employee ethics survey, annual CSA (Control Self-Assessment) Reports received from each division, and a review of the reported anti-corruption incidents from our reporting channels and the results of subsequent investigations thereto, our corruption risk is appropriately controlled and no significant corruption risk was identified.

A Responsible Purchaser: Local Procurement Optimization

In the 2020 TSMC Annual Report, 2.5.1 Information Regarding Management Team, we disclosed that 19 out of 25 members of the management team are local, accounting for 76.0%.

Definition:
Senior management: management team is disclosed in 2020 TSMC Annual Report, 2.5.1 Information Regarding Management Team
Local: defined by nationality
Important base: defined as where the headquarter located and where the majority of employees work.

A Practitioner of Green Power

Power to Change Society: TSMC Charity Foundation. Contents including donation, in-kind giving, construction services, repair services, volunteers services, etc.

In total, TSMC deployed 281 distinct process technologies, and manufactured 11,617 products for 510 customers in 2020 to continue to bring significant contribution to the advancement of modern society.

Sustainable Business Practices: Sustainability Impact

Operations assessed for risks related to corruption

TSMC assesses anti-corruption risk by function rather than by geographical region since more than 90% of TSMC employees work in Taiwan. Based on the TSMC core value of Integrity, our anti-corruption risk assessment incorporates applicable regulations, classifies corruption by type, accounts for our business operation procedures and specifications, requires full compliance and implementation by all employees, mandates annual self-assessments and examinations, and establishes open reporting channels (internal and external) and whistleblower protection. An objective of our anti-corruption risk assessment is to detect abnormal incidents early and effectively prevent the occurrence of corruption. Based on TSMC 2020’s training regimes and awareness campaign, employee ethics survey, annual CSA (Control Self-Assessment) Reports received from each division, and a review of the reported anti-corruption incidents from our reporting channels and the results of subsequent investigations thereto, our corruption risk is appropriately controlled and no significant corruption risk was identified.

Please refer to 2020 TSMC Annual Report:
3.5 Code of Ethics and Business Conduct
3.6 Regulatory Compliance
### Operations and Governance: Tax Policy

- **205-2** Approach to tax
  - Tax governance, control, and risk management

- **206-1** Legal actions for anti-competitive behavior, anti-trust, and monopoly practices
  - Please refer to 2020 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct

- **207-3** Stakeholder engagement and management of concerns related to tax
  - Please refer to 2020 TSMC Annual Report: 3.5 Code of Ethics and Business Conduct

- **207-4** Country-by-country reporting
  - The Organization for Economic Cooperation and Development (OECD) developed a country-by-country reporting system in which the Taiwan R.O.C. government participates. This reporting process was developed in part to aid tax authorities in their audit selection processes. Under the OECD agreement, this reporting information is kept with tax authorities who have the tax expertise to understand and assess this business-sensitive tax information. TSMC supports the business information provided as part of the country-by-country reporting system remaining exclusively with government tax authorities.

### Communication and training about anti-corruption policies and procedures

- **205-3** Confirmed incidents of corruption and actions taken
  - Operations and Governance: Corporate Governance-Ethics and Regulatory Compliance
  - Integrity is the most important value of TSMC’s culture. TSMC publishes the “TSMC Anti-Corruption Commitment” to reiterate that TSMC take a zero-tolerance approach toward corruption, meanwhile elaborating the regulations regarding avoiding conflicts of interest, political and charitable contributions, and whistleblower channel. Please refer to our [website](#).
  - TSMC provides anti-corruption and ethics training when each new colleague. For the current colleagues, TSMC provides a variety of training courses in the form of face-to-face courses, communication meetings, online compulsory and elective courses, and provides regulatory compliance guidelines and FAQs through the factory posters, company’s internal website, internal e-mails, and education propaganda articles, etc., to ensure colleagues access to new knowledge of regulations and deepen their knowledge of various issues.
  - In 2020, TSMC provided current colleagues with “Annual Ethics and Compliance Training Course” (mandatory 0.5 hour online course). The completion rate of each operating base is as follows: 99.7% in Taiwan, and Asian regions outside Taiwan (Mainland, Japan, South Korea), North America (U.S., Canada), and Europe are all 100%.
  - Please refer to 2020 TSMC Annual Report: 3.2.1 Audit Committee
  - 3.5 Code of Ethics and Business Conduct
  - 3.6 Regulatory Compliance

### Country-by-country reporting

- **GRI 206**: Anti-Competitive Behavior
  - **206-1** Legal actions for anti-competitive behavior, anti-trust, and monopoly practices
    - Please refer to 2020 TSMC Annual Report: 6.3.3 Operational Risks/Risks Associated with Litigious and Non-litigious Matters

### Table

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>205-2</td>
<td>Communication and training about anti-corruption policies and procedures</td>
<td>Operations and Governance: Corporate Governance-Ethics and Regulatory Compliance</td>
</tr>
<tr>
<td>205-3</td>
<td>Confirmed incidents of corruption and actions taken</td>
<td>Operations and Governance: Corporate Governance-Ethics and Regulatory Compliance</td>
</tr>
<tr>
<td><strong>206-1</strong></td>
<td>Legal actions for anti-competitive behavior, anti-trust, and monopoly practices</td>
<td>Operations and Governance: Tax Policy</td>
</tr>
<tr>
<td><strong>207-3</strong></td>
<td>Stakeholder engagement and management of concerns related to tax</td>
<td>Operations and Governance: Tax Policy</td>
</tr>
<tr>
<td><strong>207-4</strong></td>
<td>Country-by-country reporting</td>
<td>Operations and Governance: Tax Policy</td>
</tr>
</tbody>
</table>

---

**Page References**

- 192
- 196
<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>302-1</td>
<td>Energy consumption within the organization</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>302-2</td>
<td>Energy consumption outside of the organization</td>
<td>A Practitioner of Green Power: Climate Change and Energy Management - GHG Emissions Inventory</td>
<td>94</td>
</tr>
<tr>
<td>302-3</td>
<td>Energy intensity</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>302-4</td>
<td>Reduction of energy consumption</td>
<td>A Practitioner of Green Power: Climate Change and Energy Management-Increase Energy Efficiency</td>
<td>97</td>
</tr>
<tr>
<td>302-5</td>
<td>Reductions in energy requirements of products and services</td>
<td>A Practitioner of Green Power: Climate Change and Energy Management - Increase Energy Efficiency Please refer to 2020 TSMC Annual Report: 7.2.2 Sustainable Products</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GRI 303: Water</td>
<td></td>
</tr>
<tr>
<td>303-1</td>
<td>Interactions with water as a shared resource</td>
<td>A Practitioner of Green Power: Water Management-Risk Management of Water Resources</td>
<td>104</td>
</tr>
<tr>
<td>303-3</td>
<td>Water withdrawal</td>
<td>A Practitioner of Green Power: Water Management-Risk Management of Water Resources It is necessary to disclose the proportion of the water withdrawal to the total water withdrawal of the water area in the high or extremely high water stress risk area according to the World Resources Institute (WRI) water stress evaluation. TSMC (China) is a high-risk area of water stress. Its water withdrawal area is the Jinze Reservoir, which supplies 2.56 million tons per day. TSMC (China) uses 0.6 million tons of water per day, accounting for 0.2% of its water withdrawal area.</td>
<td>104</td>
</tr>
<tr>
<td>Disclosure Number</td>
<td>Disclosure Title</td>
<td>Report Contents or Explanation</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>GRI 305 : Emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>305-1</td>
<td>Direct (Scope 1) GHG emissions</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>305-2</td>
<td>Energy indirect (Scope 2) GHG emissions</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>305-3</td>
<td>Other indirect (Scope 3) GHG emissions</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>305-4</td>
<td>GHG emissions intensity</td>
<td>Appendix: ESG Performance Summary (Environmental Dimension)</td>
<td>206</td>
</tr>
<tr>
<td>305-6</td>
<td>Emissions of ozone-depleting substances (ODS)</td>
<td>TSMC does not use Montreal Protocol restricted ODS.</td>
<td>95</td>
</tr>
<tr>
<td>305-7</td>
<td>Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions</td>
<td>A Practitioner of Green Power: Air Pollution Control Emissions in 2020: NOx: 170.36 tons SOx: 38.13 tons</td>
<td>122</td>
</tr>
<tr>
<td>GRI 306 : Effluents and Waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>306-1</td>
<td>Waste generation and significant waste-related impacts</td>
<td>A Practitioner of Green Power: Waste Management</td>
<td>112</td>
</tr>
<tr>
<td>306-2</td>
<td>Management of significant waste-related impacts</td>
<td>A Practitioner of Green Power: Waste Management</td>
<td>112</td>
</tr>
<tr>
<td>306-3</td>
<td>Waste generated</td>
<td>A Practitioner of Green Power: Waste Management</td>
<td>112</td>
</tr>
<tr>
<td>306-4</td>
<td>Waste diverted from disposal</td>
<td>A Practitioner of Green Power: Waste Management</td>
<td>112</td>
</tr>
<tr>
<td>GRI 307 : Environmental Compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>307-1</td>
<td>Non-compliance with environmental laws and regulations</td>
<td>Company has no significant fines and non-monetary sanctions for non-compliance of environmental laws and regulations 2020.</td>
<td>112</td>
</tr>
<tr>
<td>GRI 308 : Supplier Environmental Assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>308-1</td>
<td>New suppliers that were screened using environmental criteria</td>
<td>A Responsible Purchaser: Supplier Sustainability Management-2020 Goals and Achievements 100% new suppliers compliant and signed &quot;TSMC ethics and supplier code of conduct.&quot;</td>
<td>73</td>
</tr>
<tr>
<td>308-2</td>
<td>Negative environmental impacts in the supply chain and actions taken</td>
<td>TSMC requires suppliers to meet its sustainability standards through the &quot;TSMC Supplier Code of Conduct&quot;, which includes environmental impact issues, and requires Tier 1 suppliers to complete a sustainability self-assessment questionnaire. In 2020, a total of 1,144 responses to the questionnaire (including operating units in Taiwan and China) were collected in the 2020. If the supplier has potential risks, they will be required to follow up with improvement.</td>
<td>81</td>
</tr>
</tbody>
</table>
An Admired Employer: Talent Attraction and Retention - Shared Visions and Values - Talent Recruitment - Campus Recruitment

▪ Approximately 90% of TSMC employees are located in Taiwan. Overseas employees are mostly located in Asia, which is only 6.9% of all employees; the proportion of other regions is lower.

▪ In 2020, to align with the Company’s growth, TSMC expanded recruitment and introduced 7,322 new hires in Taiwan and 8,193 new hires around the world. Among them, 79.5% of all new hires are below the age of 30.

Note: TSMC provides localized leave and insurance programs to employees in overseas regions. We grant additional days of annual leave to employees in Taiwan, China, North America and Europe. As for insurance programs, the comprehensive life and medical insurance programs are also designed in consideration of local regulations, industry practices and local conditions for each overseas region.

Benefits provided to full-time employees that are not provided to temporary or part-time employees

An Admired Employer: Talent Attraction and Retention-Compensation and Benefits-Parental Benefits

▪ Any significant issues and changes will be announced in quarterly meetings. Extraordinary meetings may be held when necessary.

▪ If the employment relationship with some employees needs to be terminated due to major operational changes, the Company will notify employees in advance abide by the law.

In order to implement occupational safety and health management and control, TSMC established an executive organization with the division of roles and responsibilities. In response to the requirements and expectations of TSMC from internal and external stakeholders, in 2020, in addition to continuing to improve the existing safety culture promotion and risk management measures and in response to expansion plans, the number of contractors entering TSMC has reached 39,470 people per day. TSMC has standardized contractor operational safety and health management procedures, established the "Contractor Environmental Safety and Health Blue Book", strengthened the safety management system, and cooperated with contractors to create a safe and friendly environment. The corporate-level Safety and Health Committee is hosted by the Corporate ESH Director, percentage of total workforce represented is 44%.

The definition for occupational accidents is in accordance with the Occupational Safety and Health Act and important disabling injury indicators issued by the Global Reporting Initiative which uses Disabling Severity Rate (SR) and Disabling Injury Frequency Rate (FR) as primary indicators. In 2020, TSMC reviewed the Occupational Safety and Health Act stipulating that only work-related injuries shall be counted towards SR/FR. Other non-work injuries such as falling in the cafeteria or parking lot due to other reasons shall not be counted towards occupational injuries but should be investigated and resolved. Employee vacation, medical insurance, and insurance shall remain the same. In 2020, there were 43 disabling injuries among employees with 422 working days lost. Of the 43 disabling injuries, 29 were from men with 308 working days lost and 14 were from women with 114 working days lost. Men suffered from a higher number of work-related disabling injuries and working days lost than women did. Aside from falling, the main causes were crushing injuries, cuts, scrapes, and punctures during maintenance. Improvement measures include: Implemented LOTO (Lock out Tag out) measures that require employees to lock out and tag out all moving parts during maintenance. In 2020, 2,577 operations were completed and added to the Maintenance Procedures. Safety and health training materials now contain chapters on when and how to use protective gear for cuts/scrapes/punctures.
TSMC’s occupational health risk management plan covers both occupational hazards (including the five major hazards: chemical, physical, ergonomic, social/ psychological, and biological) and personal health (including pregnancy, poor cerebrovascular/ cardiovascular functions, muscle and bones, stress management, etc.), which need to be improved to protect employees’ health. In accordance with legal regulations on occupational safety and health, all employees involved in operations with special health examination, a total of 4,753 individuals, completed 100% special health examinations.

### Disclosure Number | Disclosure Title | Report Contents or Explanation | Page
--- | --- | --- | ---
403-3 | Occupational health services | TSMC’s occupational health risk management plan covers both occupational hazards (including the five major hazards: chemical, physical, ergonomic, social/ psychological, and biological) and personal health (including pregnancy, poor cerebrovascular/ cardiovascular functions, muscle and bones, stress management, etc.), which need to be improved to protect employees’ health. In accordance with legal regulations on occupational safety and health, all employees involved in operations with special health examination, a total of 4,753 individuals, completed 100% special health examinations. | 153

#### GRI 404: Training and Education

**404-1** Average hours of training per year per employee

- An Admired Employer: Talent Development-Fulfill Talent Development-Diverse and Equal Opportunities for Learning and Development
  - The current design of the training system does not include the average hours of training per employee per year based on gender
  - Reveal the average hours of training per employee each year
  - 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

- An Admired Employer: Talent Development-Fulfill Talent Development
  - Although it does not provide transition assistance programs for employees who have ended their careers due to retirement or termination of employment relationships, the company’s “talent development” goals have always been focused on ensuring that employees can keep up with the times to support the company’s long-term growth and meeting the needs of employees for lifelong learning. In other words, as long as employees continue to learn step by step under the company’s talent development system, they will be well prepared for their career development after leaving the job.
  - If employees who are leaving the company have individual needs, they can also get professional counseling services in psychological, legal and financial aspects through “Consultation and Consultation”
### GRI 405: Diversity and Equal Opportunity

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
</table>
| 405-1             | Diversity of governance bodies and employees | Operations and Governance: Corporate Governance - Board of Directors and Committees  
Please refer to 2020 TSMC Annual Report  
2.4.1 Information Regarding Board Members  
TSMC’s Board is comprised of a diverse group of professionals from different backgrounds in industries, academia, law, etc. These professionals include citizens from Taiwan, Europe and the U.S. with world-class business operating experience. One of whom is female (the ratio is 10%).  
An Admired Employer: Talent Attraction and Retention - Shared Visions and Values - Talent Recruitment  
TSMC’s Board is comprised of a diverse group of professionals from different backgrounds in industries, academia, law, etc. These professionals include citizens from Taiwan, Europe and the U.S. with world-class business operating experience. In 2020, a total of 8,193 employees were hired, including members of younger generations, overseas elites, and the physically and mentally handicapped. |
| 405-2             | Ratio of basic salary and remuneration of women to men | An Admired Employer: Talent Attraction and Retention - Workforce Structure - TSMC Compensation Ratio by Gender |

### GRI 406: Non-discrimination

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
</table>
| 406-1             | Incidents of discrimination and corrective actions taken | An Admired Employer: Human Rights  
- Act in accordance with the TSMC Human Rights Policy and the (RBA) Responsible Business Alliance Code of Conduct  
- Formulate implementation policies and management methods - Each operating base has a dedicated unit to form a “planning, execution, inspection, and action” cycle  
- Require employees to participate in human rights protection training |
TSMC abides by local laws and regulations, and takes actions according to TSMC Human Rights Policy and Responsible Business Alliance Code of Conduct. We treat all workers, including regular, contract, and temporary employees, and interns, with dignity and respect, and reduce every kind of risk to protect our employees. More details on TSMC Human Rights Policy.

A Responsible Purchaser: Supplier Sustainability Management - Sustainability Risk Management

TSMC requires suppliers to meet sustainability standards through the “TSMC Supplier Code of Conduct”, which includes a no child labor policy, and requires Tier 1 suppliers to complete a sustainability self-assessment questionnaire. In 2020, a total of 1,144 responses to the questionnaire (including operating units in Taiwan and China) were collected in 2020. If the supplier has potential risks, they will be required to follow up with improvement.

Operations and suppliers at significant risk for incidents of child labor

TSMC abides by local laws and regulations, and takes actions according to TSMC Human Rights Policy and Responsible Business Alliance Code of Conduct. We treat all workers, including regular, contract, and temporary employees, and interns, with dignity and respect, and reduce every kind of risk to protect our employees. More details on TSMC Human Rights Policy.

A Responsible Purchaser: Supplier Sustainability Management - Sustainability Risk Management

TSMC requires suppliers to meet sustainability standards through the “TSMC Supplier Code of Conduct”, which includes a no child labor policy, and requires Tier 1 suppliers to complete a sustainability self-assessment questionnaire. In 2020, a total of 1,144 responses to the questionnaire (including operating units in Taiwan and China) were collected in 2020. If the supplier has potential risks, they will be required to follow up with improvement.
<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 409: Forced or Compulsory Labor</td>
<td>409-1</td>
<td>Operations and suppliers at significant risk for incidents of forced or compulsory labor</td>
<td>145</td>
</tr>
</tbody>
</table>
|                   |                  | TSMC abides by local laws and regulations, and takes action according to “TSMC Human Rights Policy” and “Responsible Business Alliance Code of Conduct”.  
• Formulate implementation policies and management methods: Each site of operations has a dedicated unit to form a “planning, execution, inspection, and action” cycle  
• Each site of operations has a dedicated unit to form a “planning, execution, inspection, and action” cycle  
• Require employees to participate in human rights protection training  
• Formulate “Working Hours Management Measures” that comply with laws and regulations. Except for the unanimous agreement of supervisors and colleagues, overtime pay or compensatory time off is required to extend working hours.  
• In addition to setting up a reminder function for supervisors and employees in the “attendance system and overtime reporting system”, and reviewing and controlling them month by month, they also carefully check their opinions and complaints | 146  |
| GRI 412: Human Rights Assessment | 412-1 | Operations that have been subject to human rights reviews or impact assessments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 146  |
|                   |                  | An Admired Employer: Human Rights  
TSMC abides by local laws and regulations, and takes action according to “TSMC Human Rights Policy” and “Responsible Business Alliance Code of Conduct”.  
• Use the standardized risk assessment template (SAQ) designed by the “Responsible Business Alliance” to identify the highest social, environmental and moral risks in the business  
•Entrust a third-party organization with special training in social and environmental audits to continuously implement the “Verification Audit Process” (VAP) of the Responsible Business Alliance for all fabs  
• The results of the evaluation in 2020 are the same as those in the past few years, and both are in a “low risk” state |
### GRI 414: Supplier Social Assessment

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>414-1</td>
<td>New suppliers that were screened using social criteria</td>
<td>A Responsible Purchaser: Supplier Sustainability Management - 2020 Goals and Achievements New suppliers signed the TSMC Supplier Code of Conduct for a completion rate of 100% and conducted risk assessment</td>
<td>72</td>
</tr>
<tr>
<td>414-2</td>
<td>Negative social impacts in the supply chain and actions taken</td>
<td>A Responsible Purchaser: Supplier Sustainability Management - Sustainability Risk Management Please refer to the “Protection of Labor Rights” action plan in the &quot;Responsible Supply Chain&quot; chapter, TSMC manages supplier employees working in TSMC’s factory sites in Taiwan through reminders, audits, contracts and penalties and related actions to address issues such as working hours/safety/labor</td>
<td>80</td>
</tr>
</tbody>
</table>

### GRI 416: Customer Safety and Health

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>416-1</td>
<td>Assessment of the health and safety impacts of product and service categories</td>
<td>There is no significant safety and health impacts for the products and services that TSMC provided to customers.</td>
<td>68</td>
</tr>
<tr>
<td>416-2</td>
<td>Incidents of non-compliance concerning the safety and health impacts of products and services</td>
<td>Not applicable</td>
<td></td>
</tr>
</tbody>
</table>

### GRI 418: Customer Privacy

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>418-1</td>
<td>Substantiated complaints concerning breaches of customer privacy and losses of customer data</td>
<td>An Innovation Pioneer: Customer Service-customer’s Virtual Fab (no customer complaints regarding information leakage)</td>
<td>68</td>
</tr>
</tbody>
</table>

### GRI 419: Socioeconomic Compliance

<table>
<thead>
<tr>
<th>Disclosure Number</th>
<th>Disclosure Title</th>
<th>Report Contents or Explanation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>419-1</td>
<td>Non-compliance with laws and regulations in the social and economic area</td>
<td>Company has no significant fines and non-monetary sanctions for non-compliance in social and economic areas in 2020</td>
<td>68</td>
</tr>
</tbody>
</table>
Climate Change Management Framework

The Board of Directors regularly reviews risks and opportunities related to climate change.

- **ESG Steering Committee**: The ESG Steering Committee is TSMC’s top organization in climate change management. The ESG Steering Committee is chaired by the Chairman of TSMC, and the chair of the ESG Committee serves as the secretariat. It reviews TSMC’s climate change strategies and goals every six months and reports to the Board of Directors. (The CSR Executive Committee was renamed as the ESG Steering Committee in 2021 and the meeting frequency has increased from biannually to quarterly)

- **Energy Saving and Carbon Emission Reduction Committee**: The Energy Saving and Carbon Emission Reduction Committee is the Company’s management organization for taking action on climate change risk and opportunity. It is chaired by the Senior Vice President of Fab Operations. Every quarter, this Committee formulates management plans, reviews implementation status, and discusses future plans.

- **RM Steering Committee**: The RM Steering Committee reports to the Audit Committee annually on the risk environment, primary risk management items, risk assessment, and response measures. The Audit Committee then reports and discusses major items with the Board of Directors.

- Interdepartmental discussions and identifying short-, mid-, and long-term climate risks and opportunities

- Assess the potential financial impact on TSMC from major climate risks and opportunities

- Conduct scenario analysis and assess Net Zero Emission targets & actions

- According to interdepartmental discussions on climate risks and opportunities, the Committee identified 8 opportunities and 11 risks. For more details, please refer to the Climate Change Risk and Opportunity Matrix section of this report.

- Completed qualitative assessment on the financial impact of climate risk and opportunities and formulated risk mitigation measures accordingly (for more details, please refer to the Financial Impact Analysis of Climate Change section of this report); also implemented quantitative assessment of the financial impact from major climate risks.

- Based on the 2-degree scenario of global warming set forth by the Intergovernmental Panel on Climate Change (IPCC), the committee analyzed climate risks in production & operation processes and formulated mitigation measures in compliance with the Climate Risk Adaptation Standards; also established TSMC’s climate change strategy to strive towards Net Zero Emission.
### Corporate Management Strategies & Actions

<table>
<thead>
<tr>
<th>Category</th>
<th>2020 Enforcement Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Management</td>
<td></td>
</tr>
<tr>
<td>- Use the TCFD framework to develop a process for identifying climate risks</td>
<td>- Held TCFD workshops and, through interdepartmental discussions, jointly identified, prioritized, and assessed the financial impact of climate risks/opportunities.</td>
</tr>
<tr>
<td>- Formulate response measures based on the risks/opportunities identified and prioritized</td>
<td>- Reported the assessment results of the climate risk/opportunities and relevant action plans to the ESG Committee Chair.</td>
</tr>
<tr>
<td>- Integrate climate risks identification and assessment in the Enterprise Risk Management (ERM) process</td>
<td>- For more details, please refer to the 6.3 Risk Management section in the 2020 TSMC Annual Report.</td>
</tr>
<tr>
<td>Indicators and Targets</td>
<td></td>
</tr>
<tr>
<td>- Set management metrics related to climate change</td>
<td>- Established the following as climate change performance indicators: GHG emissions per unit product, environmental footprint per unit product, amount of renewable energy purchased, total amount of electricity saved, improved production efficiency, and days of production interruption due to climate disasters. For more details, please refer to the Climate Change and Energy Management Strategies, Goals, and Outcomes section of this report.</td>
</tr>
<tr>
<td>- Review impact on TSMC operations based on carbon inventory, carbon footprint, and life cycle analysis; also evaluated Scope 1, 2 &amp; 3 risks and corresponding mitigation strategies</td>
<td>- In accordance with carbon inventory results, the risks of Scope 1 emissions were reduced effectively because of continuous implementation of carbon reduction actions; the risk of Scope 2 indirect GHG emissions due to electricity consumption and the risk of Scope 3 due to supplier indirect emissions continue to increase. For more details, please refer to the Greenhouse Gases (GHG) Inventory section of this report.</td>
</tr>
<tr>
<td>- Set climate change management targets and review progress &amp; performance</td>
<td>- Set climate change and energy management goals for 2030 in accordance with climate change performance indicators; senior executives performed regular reviews on implementation performance. For more details, please refer to the section entitled Climate Change and Energy Management Strategies, Goals, and Achievements and GHG Reduction Best Practices sections of this report.</td>
</tr>
</tbody>
</table>
Sustainability Accounting Standards Board

<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
<th>Accounting Metric</th>
<th>Category</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
</table>
| Greenhouse Gas Emissions      | TC-SC-110a.1 | • Gross global Scope 1 emissions  
• Total emissions from perfluorinated compounds | Quantitative              | • 2,450,354 metric tons CO₂-e  
• 664,974 metric tons CO₂-e                                                                 |
|                               | TC-SC-110a.2 | • Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets | Discussion and Analysis   | • Please see Climate Change and Energy Management: Low-carbon Manufacturing                      |
| Energy Management in Manufacturing | TC-SC-130a.1 | • Total energy consumed  
• Percentage grid electricity  
• Percentage renewable | Quantitative              | • 60,908,400 Gigajoules  
• 95% of energy consumed was supplied from grid electricity  
• 7.3% of energy consumed was renewable energy  
Please see Climate Change and Energy Management                                                 |
| Water Management              | TC-SC-140a.1 | • Total water withdrawn  
• Total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress | Quantitative              | • 77,257 thousand m³; from regions with High or Extremely High Baseline Water Stress: 4%  
• 72,255 thousand m³; from regions with High or Extremely High Baseline Water Stress: 1%  
Please see Water Management: Water Resource Risk Management                                     |
| Waste Management              | TC-SC-150a.1 | • Amount of hazardous waste from manufacturing, percentage recycled | Quantitative              | • 440,714 metric tons; 98% recycled  
• The amount of hazardous waste includes 142,314 metric tons of in-house recycled hazardous waste  
Please see Waste Management                                                                       |
<p>| Employee Health &amp; Safety      | TC-SC-320a.1 | • Description of efforts to assess, monitor, and reduce exposure of employees to human health hazards | Discussion and Analysis   | • Please see Occupational Safety and Health                                                 |
|                               | TC-SC-320a.2 | • Total amount of monetary losses as a result of legal proceedings associated with employee safety and health violations | Quantitative              | • Company has no significant monetary losses as a result of legal proceedings associated with employee safety and health violations |</p>
<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
<th>Accounting Metric</th>
<th>Category</th>
<th>Report Contents or Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruiting &amp; Managing a Global &amp; Skilled Workforce</td>
<td>TC-SC-330a.1</td>
<td>Percentage of employees that are (1) foreign nationals and (2) located offshore</td>
<td>Quantitative</td>
<td>Please see Talent Attraction and Retention</td>
</tr>
<tr>
<td></td>
<td>TC-SC-410a.1</td>
<td>Percentage of products by revenue that contain IEC 62474-declarable substances</td>
<td>Quantitative</td>
<td>0.16%</td>
</tr>
<tr>
<td></td>
<td>TC-SC-410a.2</td>
<td>Processor energy efficiency at a system-level for: (1) servers, (2) desktops, and (3) laptops</td>
<td>Quantitative</td>
<td>TSMC is working with customers to innovate with new generations of chips and create more energy efficient electronic products. Please see Sustainable Products by TSMC Facilitates Global Energy Conservation</td>
</tr>
<tr>
<td>Materials Sourcing</td>
<td>TC-SC-440a.1</td>
<td>Description of the management of risks associated with the use of critical materials</td>
<td>Discussion and Analysis</td>
<td>Please see Supplier Sustainability Management: Sustainability Risk Management</td>
</tr>
<tr>
<td>Intellectual Property Protection &amp; Competitive Behavior</td>
<td>TC-SC-520a.1</td>
<td>Total monetary losses as a result of legal proceedings associated with anti-competitive behavior regulations</td>
<td>Quantitative</td>
<td>Please see 2020 TSMC Annual Report: 6.3.3 Operational Risks/ Risks Associated with Litigious and Non-litigious Matters</td>
</tr>
</tbody>
</table>
Independent Third Party Assurance Statement

Scope and Approach
Taiwan Semiconductor Manufacturing Company ("TSMC" or "the Company") externalized its independent assurance of the 2020 Corporate Social Responsibility Report ("Report") for the year ended 31 December 2020.

We performed work for the Purpose of External Assurance ("PUEA"), which is based on our professional expertise, international assurance practice and international standards on assurance engagements. Our independent assurance report includes all significant changes in our operations and financial statements for the year ended 31 December 2020. Our assurance work was carried out in China, and we reviewed processes and systems for preparing the key sustainability data and implementation of sustainability strategy.

We conducted an independent assurance engagement of TSMC's Sustainability Reporting Standards ("SRS") and assessed its requirements. We evaluated the performance data using the reliability principle together with TSMC's data protocols for how the data are measured, recorded and reported. The performance data scope is against TSMC's significant environmental, social and governance ("ESG") issues and the 2020 sustainability commitments and the topics set forth in the GRI standards.

We understand that the required financial data and information are based on data from TSMC's Annual Report and financial reports, which are subject to a company's independent audit process. The review of financial data taken from the annual report and accounts is out of the scope of our work.

We planned and performed our work to obtain the evidence we consider necessary to provide a basis for our assurance opinion. We are providing a "reasonable" level of assurance.

Responsibilities of the Directors of TSMC and of the assurance provider

The Directors of TSMC have sole responsibility for the preparation of the Report. In performing our assurance work, our responsibility is to the management of TSMC; however, our statement represents our independent assurance work is intended for a wide range of TSMC stakeholders. DNV was not involved in the preparation of any statements or data included in the Report except for this Assurance Statement.

DNV provides a range of other services to TSMC, none of which constitute a conflict of interest with this assurance work.

TSMC's assurance engagements are based on the assumption that the data and information provided by the assurance provider have been prepared in good faith to the extent possible, that they are reliable, and that they have been reviewed by a person or an entity with the knowledge required to undertake the assurance work.

Basis of our opinion

A multi-stakeholder panel of sustainability and assurance specialists performed work at headquarters and site level. We understand the following activities:

- Review of the current sustainability issues that could affect TSMC and are of interest to stakeholders;
- Review of TSMC approach to stakeholder engagement and risk assessment;
- Review of information provided to by TSMC regarding the risk and management processes relating to the risk;
- Review of the governance structure and organizational structure that is related to the assurance engagement;
- Review of the data source reliability and completeness.

We have reviewed the data and information that were provided to us by the assurance providers and assessed the data, and used our judgment in forming our opinion.

We have performed a reasonable assurance engagement in accordance with the ISAE 3000 (2010) standard.

Observations

Without effecting our assurance opinion, we also provide the following observations.

The following is an excerpt from the observations and recommendations received by the management of TSMC:

- TSMC has developed its own data management system for capturing and reporting its ESG performance, in accordance with the VASlP Protocol requirements for a moderate "limited assurance" level of assurance engagement, we conclude that no systemic errors were detected which cause us to believe that the specific sustainability data and information presented in the Report is not reliable.

Compliance

The Report has fairly presented the data and analyses to present the issues and impacts of the Report. The independent assurance report and the assurance process are in line with the GRI standards and are reliable. The assurance process is in line with the GRI standards and is reliable.

The data, information and conclusions presented in the Report are consistent with the information presented in the Report.

The assurance process is in line with the GRI standards and is reliable.
Contact Information

Taiwan Facilities

**Wafer Fabs**

**Corporate Headquarters & Fab 12A**
8, Li-Hsin Rd. 6, Hsinchu Science Park,
Hsinchu 300-096, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-5637000

**R&D Center & Fab 12B**
168, Park Ave. 2, Hsinchu Science Park,
Hsinchu 300-091, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-6687827

**Fab 2, Fab 5**
123, Park Ave. 3, Hsinchu Science Park,
Hsinchu 300-096, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-5781546

**Fab 3**
9, Creation Rd. 1, Hsinchu Science Park,
Hsinchu 300-092, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-5781548

**Fab 6**
1, Nan-Ke North Rd., Southern Taiwan Science Park,
Taiwan 741-014, Taiwan, R.O.C.
Tel: +886-6-5056088 Fax: +886-6-5052857

**Fab 8**
25, Li-Hsin Rd., Hsinchu Science Park,
Hsinchu 300-094, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-5620051

**Backend Fabs**

**Advanced Backend Fab 1**
6, Creation Rd. 2, Hsinchu Science Park,
Hsinchu 300-093, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-5773628

**Advanced Backend Fab 2**
1-1, Nan-Ke North Rd., Southern Taiwan Science Park,
Taiwan 741-014, Taiwan, R.O.C.
Tel: +886-6-5056088 Fax: +886-6-5051262

**Advanced Backend Fab 3**
101, Longyuan 6th Rd., Longtan Dist.,
Taoyuan City 325-002, Taiwan, R.O.C.
Tel: +886-3-5636688 Fax: +886-3-4804250

**Advanced Backend Fab 5**
5, Keya W. Rd., Central Taiwan Science Park,
Taichung 428-303, Taiwan, R.O.C.
Tel: +886-4-27026688 Fax: +886-4-25609631

**Subsidiary**

**TSMC North America**
2851 Junction Avenue,
San Jose, CA 95134, U.S.A.
Tel: +1-408-3828000 Fax: +1-408-3828008

**TSMC Europe B.V.**
World Trade Center, Zuiderplein 60, 1077 XV
Amstelveen, The Netherlands
Tel: +31-20-3059900

**TSMC Japan Limited**
21F, Queen’s Tower C, 2-3-5, Minatomirai,
Nishi-ku, Yokohama, Kanagawa, 222-6221, Japan
Tel: +81-45-6820670

**TSMC China Company Limited**
4000, Wen Xiang Road, Songjiang,
Shanghai, China (Postcode: 201616)
Tel: +86-21-57768000 Fax: +86-21-57762525

**TSMC Nanjing Company Limited**
16, Zifeng Road, Pukou Economic Development Zone,
Nanjing, Jiangsu Province, China (Postcode: 211806)
Tel: +86-25-57686000 Fax: +86-25-57712395

**TSMC Korea Limited**
15F, Ann-Jay Tower, 208, Teheran-ro,
Gangnam-gu, Seoul 06220, Korea
Tel: +82-2-26511688

**TSMC Design Technology Japan, Inc.**
10F, Minatomirai Grand Central Tower, 4-6-2, Minatomirai,
Nishi-ku, Yokohama, Kanagawa 220-0012, Japan
Tel: +81-45-6644500

**TSMC Design Technology Canada Inc.**
353 Leggett Dr., Suite 600, Kanata,
ON K2K 3B8, Canada
Tel: +1-613-576-1990 Fax: +1-613-576-1999

**TSMC Technology, Inc.**
2851 Junction Avenue,
San Jose, CA 95134, U.S.A.
Tel: +1-408-3828000

**WaferTech L.L.C.**
5509 N.W. Parker Street Camas,
WA 98607-9299 U.S.A.
Tel: +1-360-8173000 Fax: +1-360-8173009

**TSMC Arizona Corporation**
2510 W. Dunlap Avenue,
#600, Phoenix, AZ 85021, U.S.A.
Tel: +1-602-567-1688

**VisEra Technologies Company Limited**
12, Dusin Rd. 1, Hsinchu Science Park,
Hsinchu 300-096, Taiwan, R.O.C.
Tel: +886-3-666-8788 Fax: +886-3-666-2858