



TSMC 2016-2017 Social Impact Valuation Report

About this Report

To understand the impact of its business operations on stakeholders, Taiwan Semiconductor Manufacturing Company, Limited (hereafter referred to as TSMC or we) has collaborated with PricewaterhouseCoopers (PwC) Taiwan in using the monetization framework of the Social Return on Investment (SROI) methodology to evaluate the impact of TSMC's efforts in energy conservation and quality education on the stakeholders in 2016 and 2017.

Establishing Scope:

- Geographical region: TSMC operating locations in Taiwan
- Time period: 2016 – 2017
- Topics: Energy Conservation and Quality Education
- Methodology: Social Return on Investment (SROI), 2012 edition.



1. Why We Chose Energy Conservation and Quality Education

TSMC is the world's first dedicated IC foundry. Energy management and talent cultivation are not only the key factors to TSMC's sustainable development, but are material issues of Corporate Social Responsibility (CSR)¹ as well. They also simultaneously respond to two of the United Nation's (UN) seventeen Sustainable Development Goals (SDGs)², Climate Action and Quality Education.

In considering the aforementioned CSR material issues and the UN's SDGs along with TSMC's seven Sustainable-Management Competencies³, we have chosen energy conservation and quality education as the two major areas of which to apply the Social Return on Investment (SROI) methodology. This framework identifies the positive and negative impacts of TSMC's operations and its management activities on the society through the perspective of the stakeholders by involving and engaging them. These impacts are then measured in monetary terms.

¹ According to TSMC's materiality analysis of sustainable topics in 2017, 17 material issues have been identified. Some of which include Innovation Management, Climate Change, Sustainable Product, Energy Management, Supplier Sustainability Management, Talent Development, and Talent Attraction and Retention.

² In 2017, TSMC conducted a comprehensive study of the relationship between the SDGs and its operations and concluded that SDG 1 (No Poverty), SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions) are the main goals to which TSMC can work towards.

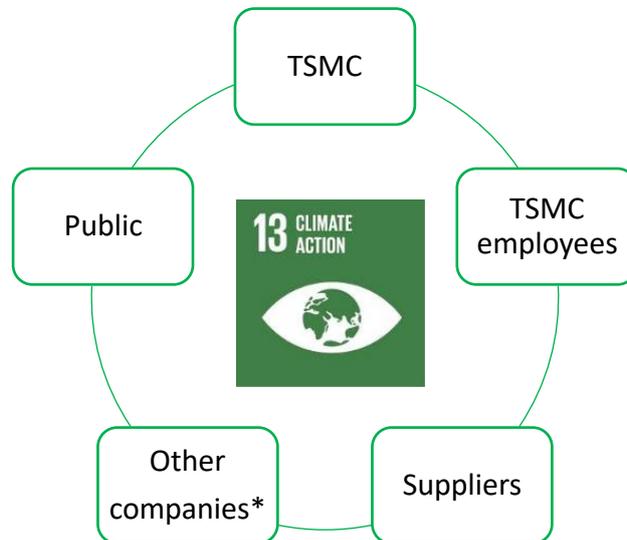
³ TSMC's seven Sustainable-Management Competencies include Corporate Ethics Management, Innovation Research Management, Customer Relationship Management, Supply Chain Management, Environmental Management, Human Resource Management, and Stakeholder Engagement.

1.1 Energy Conservation

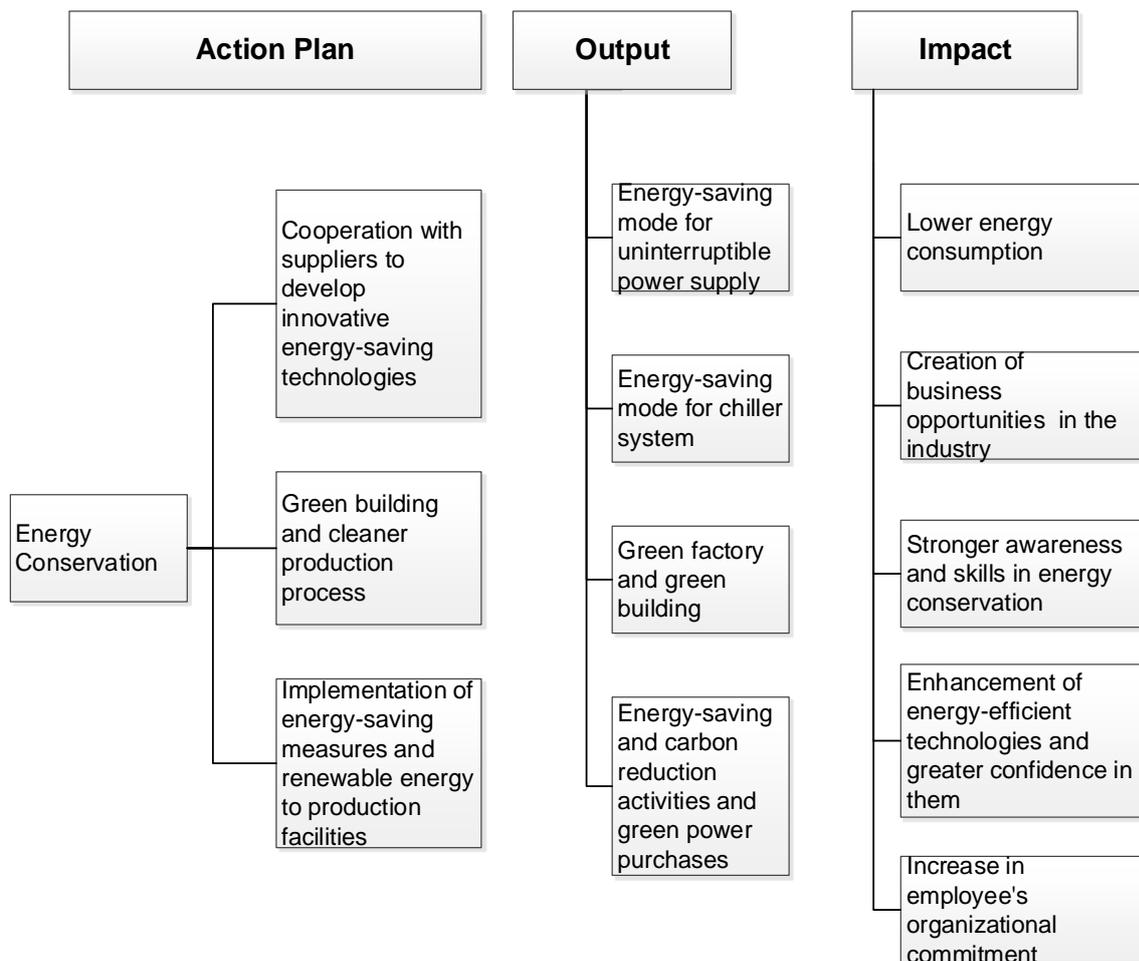
For the semiconductor industry, stable energy is a key factor to sustainable operations. Through its Energy and Carbon Reduction Committee, TSMC sets reduction targets, activities of which are carried out by the energy and carbon reduction team within each fab. A list of our energy conservation activities within the scope of our impact valuation in response to TSMC's operational needs during 2016 and 2017 is shown below:

Operational Need	Manufacturing integrated circuits requires a stable supply of energy
Corresponding Material Issues	<ol style="list-style-type: none"> 1. Energy management 2. Sustainable product 3. Supplier sustainability management 4. Climate change
Corresponding SDG	SDG 13 Climate action
TSMC's Energy Conservation Action Plan	<ol style="list-style-type: none"> 1. Cooperation with suppliers to develop innovative energy-saving technologies 2. Green building and cleaner production process 3. Implementation of energy-saving measures and renewable energy to production facilities

➤ TSMC's Energy Conservation Stakeholders and Impact Pathway in 2016 and 2017



*Primarily companies that participated in TSMC's energy conservation action plan.



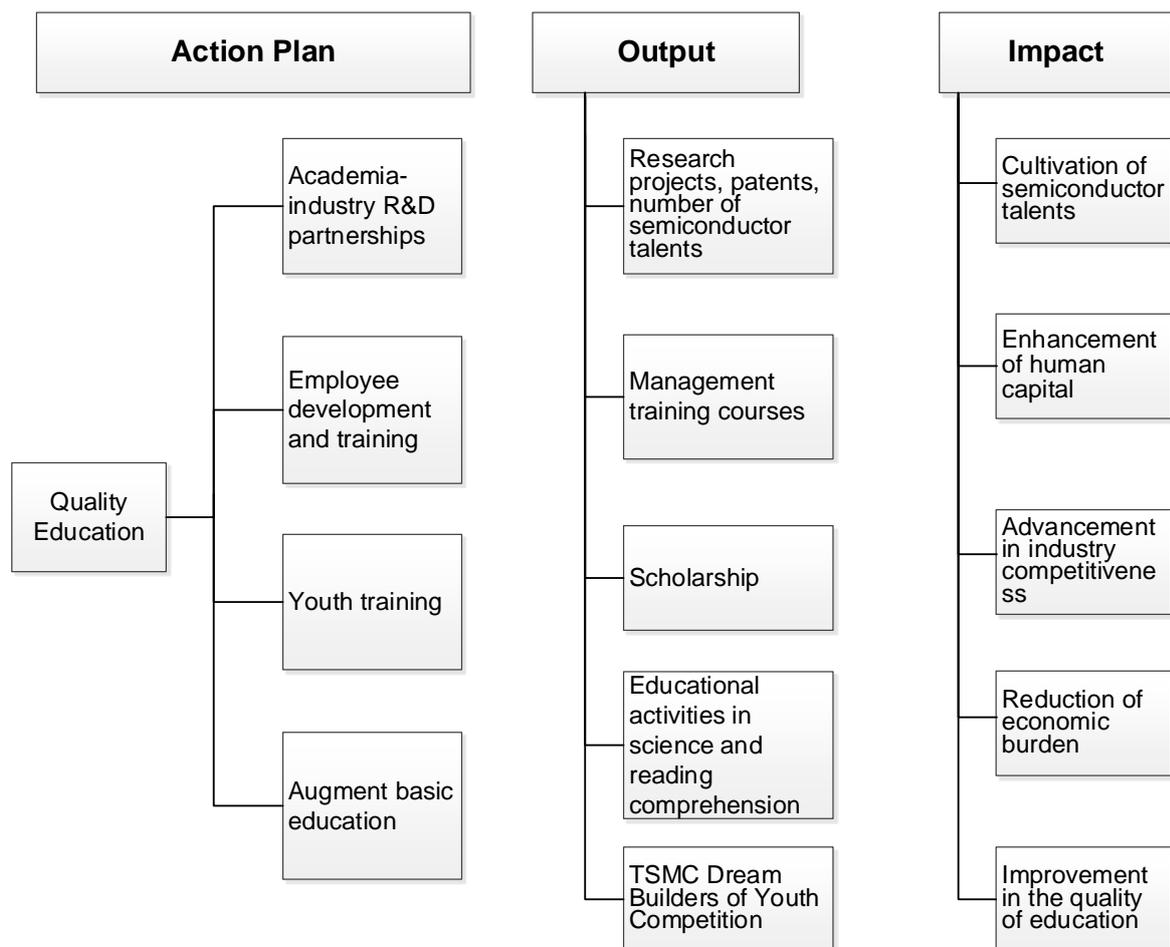
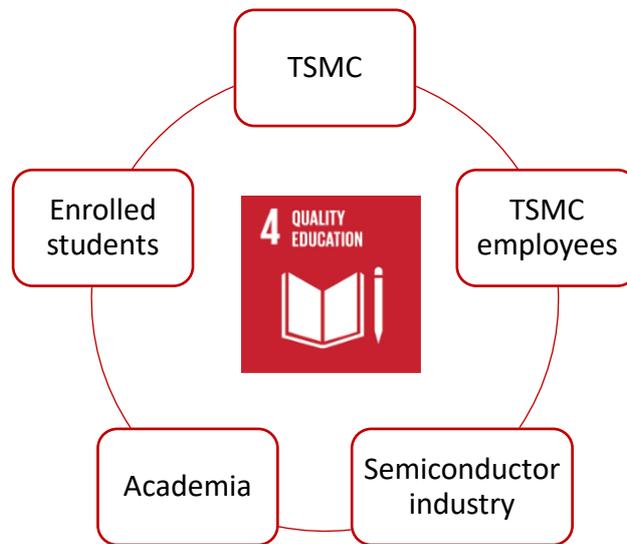
1.2 Quality Education

Innovation Research Management and Human Resource Management are part of TSMC's seven Sustainable-Management Competencies, and talent attraction, retention, and development are indispensable elements to creating sustainable values. TSMC has invested significant manpower and resources in the field of education, hoping to generate more sustainable values and achieve social impact. A list of our quality education efforts within the scope of our impact valuation in response to TSMC's operational needs during 2016 and 2017 is shown below:

Operational Needs	<ol style="list-style-type: none"> 1. Cultivate technological and managerial talents needed by the semiconductor industry 2. Encourage academia to pursue semiconductor research
Corresponding Material Issues	<ol style="list-style-type: none"> 1. Innovation management 2. Talent attraction and retention 3. Talent development
Corresponding SDG	SDG 4 Quality education
TSMC's Quality Education Action Plan	<ol style="list-style-type: none"> 1. Academia-industry R&D partnerships 2. Employee development and training 3. Youth training⁴ 4. Augment basic education

⁴ Youth Training refers to activities such as case competitions or scholarships that empower youths to develop the abilities to take control of their lives, therefore improving themselves and the society.

➤ TSMC's Quality Education Stakeholders and Impact Pathway in 2016 and 2017



2. Assessment Results

2.1 Energy Conservation

In 2016 and 2017, TSMC actively pushed forward its energy conservation efforts through three major action plans. The scope of this assessment focuses on measuring the social impacts, such as reduced energy consumption and business opportunities created, brought about to the stakeholders by these action plans. The assessment also serves as the basis of engaging with our stakeholders and impact valuation. As for the external impacts, such as improved human health and reduced crop loss, arising from carbon reduction as a result of our energy conservation efforts, they have been monetized and included in the greenhouse gas item under TSMC's sustainable values⁵ and are not counted in this impact valuation report. Below is an explanation of our inputs, action plans, outputs, and impacts:

Inputs	
Funds	Primarily purchases for green power and investments made in developing energy-saving technologies
Manpower	Primarily the cost of labor associated with developing energy-saving technologies and holding training courses in energy conservation and carbon reduction

Action Plans
Cooperation with suppliers to develop innovative energy-saving technologies
Green building and cleaner production process
Implementation of energy-saving measures and renewable energy to production facilities

Outputs		
	Item	Metrics
Energy-saving mode for uninterruptible power supply (UPS)	Energy-saving technologies developed	1
	Reduced energy consumption	120 million kWh

⁵ For the social impact created by TSMC's carbon emissions, please refer to the assessment explanation on page 17 of the TSMC 2017 CSR report.

Outputs		
Item		Metrics
Energy-saving mode for chiller system	Energy-saving technologies developed	1
	Reduced energy consumption	56 million kWh
Green factory and green building	Number of factories that obtained the Green Factory Label	18
Energy-saving and carbon reduction activities and green power purchases	Number of energy conservation and carbon reduction training sessions	9
	Number of energy conservation and carbon reduction training participants	357
	Number of visits held to green buildings	61
	Number of visitors to green buildings	2,210
	Amount of green power purchased	300 million kWh

Impacts (TWD Million)	
Item	2016 – 2017 Total
Lower energy consumption	2,587
Creation of business opportunities in the industry	260
Stronger awareness and skills in energy conservation	41
Enhancement of energy-efficient technologies and greater confidence in them	17
Increase in employees' organizational commitment	1
Total impact	2,906

The total impact, in monetary terms, of our energy conservation efforts in 2016 and 2017 is TWD 2,906 million. In performing sensitivity analysis according to the SROI methodology by adjusting important model parameters, we arrive at a total impact ranging between TWD 1,938 million and TWD 2,913 million. Please refer to 3. Method of Evaluation for further explanation.

The total impact of our energy conservation efforts in 2016 and 2017 are TWD 449 million and TW 2,457 million, respectively.

2.2 Quality Education

In measuring the social impact of its quality education endeavors in 2016 and 2017, TSMC begins with assessing four of its major action plans: academia-industry R&D



partnerships, employee development and training, youth training, and augment basic education – all of which form the basis of our impact valuation and engagement with stakeholders. Below is an explanation of our inputs, action plans, outputs, and impacts:

Inputs	
Funds	Primarily the funds provided for TSMC's University Collaboration Programs and employee development and training
Resources	Primarily the manufacturing costs associated with TSMC's University Collaboration Programs
Manpower	Primarily the cost of labor related to employee development and training and academia-industry R&D partnerships

Action Plans
Academia-industry R&D partnerships
Employee development and training
Youth training
Augment basic education

Outputs		
	Item	Metrics
Research projects, patents, number of semiconductor talents	Number of projects	120
	Number of patents obtained	45
	Number of students fostered	900
	Number of professors in collaboration	100
Management training courses	Number of trainees	2,382
Scholarship	Number of student recipients	29
Educational activities in science and reading comprehension	Number of science fair contestants	1,305 students
		282 teachers
	Number of schools that participated in science fair competitions	186

Outputs		
Item		Metrics
Educational activities in science and reading comprehension	Number of communication and empowerment workshops	8 sessions
	Number of books donated	40,000
	Number of book fair buses	4
	Online community reading platforms created	1
	International Reading Education Forum	2 sessions
	Reading camps held for principals and teachers	4 sessions
	Number of tablets donated	265
	Number of schools and students serviced by volunteers	8 schools
		737 students
Total volunteer service hours	8,457 hours	
TSMC Dream Builders of Youth Competition	Number of student contestants	500
	Number of participating teams	166
	Number of winning projects supported	8

Impacts (TWD Million)	
Item	2016 – 2017 Total
Cultivation of semiconductor talents	890
Enhancement of human capital	857
Advancement in industry competitiveness	454
Reduction of economic burden	90
Improvement in the quality of education	38
Total Impact	2,329

The total impact, in monetary terms, of our quality education efforts in 2016 and 2017 is TWD 2,329 million. In performing sensitivity analysis according to the SROI methodology by adjusting important model parameters, we arrive at a total impact ranging between TWD 1,887 million and TWD 2,503 million. Please refer to 3. Method of Evaluation for further explanation.

The total impact of our quality education efforts in 2016 and 2017 are TWD 1,190 million and TW 1,139 million, respectively.

3. Method of Evaluation

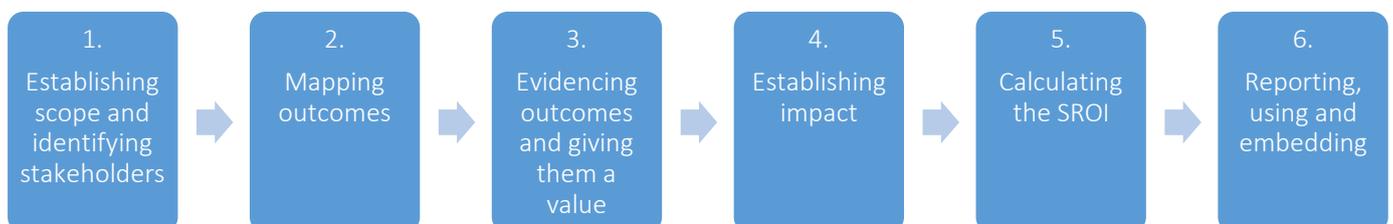
3.1 Methodology

This report uses the Social Return on Investment (SROI) framework as its methodology in measuring and valuing impacts. The SROI framework consists of six stages and seven principles, as summarized below:

1. Six stages

The guide to SROI is initially prepared by the Office of the Third Sector based in the Cabinet Office of the UK Government for the purposes of measuring and accounting for a much broader concept of value – one that incorporates the social, environmental, and economic aspects of tangible and intangible impacts and changes caused by corporations and institutions. By converting this value into monetary terms, the framework seeks to understand the linkage between inputs and outcomes.

Performing a SROI analysis involves six stages, as shown in the diagram below.



2. Seven principles

In applying this framework, the following seven principles must be strictly adhered to.

1. Involve stakeholders
2. Understand what changes
3. Value the things that matter
4. Only include what is material
5. Do not over-claim
6. Be transparent
7. Verify the result

TSMC's 2016-2017 social impact valuation follows the six stages involved in conducting a SROI analysis and adheres to the seven principles. By engaging



stakeholders in the form of interviews and surveys – discussing their impact maps, outcomes, and financial proxies with them – we have derived the value of the impact resulting from TSMC's actions in energy conservation and quality education and have disclosed it publicly.

3.2 Important Assumptions and Constraints

Due to the limited sample size of stakeholders engaged and the reliance on their subjective judgment in parts of our computations, the same actions on different stakeholders may result in different outcomes and impacts. Even when the outcomes are similar, the choice of financial proxies and their values may vary according to differences in stakeholders' experiences and how the actions affect them. In order to deliver a more objective and comprehensive report, we have performed sensitivity analysis as required by the SROI framework by adjusting key parameters including, but not limited to, displacement factors, drop-off factors, financial proxies, and the amount of change. The results of our sensitivity analysis are also publicly disclosed.

To enhance the integrity and validity of our report, we use primary data to the extent possible in conducting our impact valuation, and supplement our analysis with secondary data, such as research publications. However, due to circumstantial limitations or a lack of research publications, we are unable to collect concrete data for parts of our impact map and certain financial proxies.

Below is a table showing the type of data used in establishing impact maps and financial proxies.

Type of Data ⁶	Impact Maps		Financial Proxies	
	Energy Conservation	Quality Education	Energy Conservation	Quality Education
Primary data	V	V	V	V
Extrapolations from Primary data	V	V	V	V
Secondary data			V	V
Extrapolations from Secondary data			V	V

3.3 Engagement of Stakeholders

1. Identifying stakeholders

Stakeholders are defined as people or organizations, internal or external that experience change or affect the activity as a result of the activity being analyzed. Therefore, before engaging stakeholders, it is necessary to account for all stakeholders (including direct and indirect stakeholders) that might affect or be affected in our action plans. After generating a comprehensive list of these stakeholders, we decide which stakeholders to include based on the materiality principle, excluding those with relatively immaterial impacts and involving those with significant impact. If the same group of stakeholders exhibit distinct differences in outcomes, they must then be further divided into subgroups. There are many ways to involve stakeholders. Examples include, and are not limited to, face-to-face interviews, phone interviews, or surveys. Through these two-way communications and interactions, we can understand, more clearly and thoroughly, the status of our projects and the changes among their inputs, outputs, and outcomes.

2. Method of engagement and sample size

⁶ Primary data: data collected first-hand from stakeholders' feedback without further revision or selection. Extrapolations from Primary data: questionnaires designed and created based on stakeholders' feedback. Secondary data: data collected from highly similar research papers that are directly applicable to the project's activities. Extrapolations from Secondary data: data from similar research papers that are adjusted to apply to the project's activities.



Topic	Stakeholders	People Engaged	Sample Size	Method of Engagement
Energy Conservation	TSMC	TSMC's employees	287	Face-to-face interviews, phone interviews, and surveys
	TSMC's employees			
	Supplier	Supplier's employees	13	
	Other companies	Other companies' employees	28	
	Public	Green building visitors	5	

Topic	Stakeholders	People Engaged	Sample Size	Method of Engagement
Quality Education	TSMC	TSMC's employees	177	Face-to-face interviews, phone interviews, and surveys
	TSMC employee			
	Academia	Faculty	128	
	Semiconductor industry	TSMC's employees and academics	130	
	Enrolled students	Students	1,041	
	Other partners	Person in charge of the partnership	4	

4. Public Disclosure

TSMC has publicly disclosed its sustainable values in the economic, environmental, and social dimensions in its 2017 CSR Report (refer to page 17 of the TSMC 2017 CSR Report). After excluding the impact values of "Lower Energy Consumption" and "Creation of Business Opportunities in the Industry" due to an overlap in scope with sustainable values, the remaining impact in 2016 have been included in "Employee Development and Training" and "Talent and Community Development", amounting to TWD 322 million and TWD 831 million, respectively.