8.3.4 Supply Chain Climate Change Management

TSMC not only engages in climate change management but also requests and assists suppliers to follow. Our measures are as below:

- **Energy saving and carbon reduction management:** TSMC's major raw material suppliers are required to collect carbon inventory data in their manufacturing plants, develop a product-based carbon footprint and provide carbon reduction performance data.

- **Water resources and water management:** TSMC's major raw material suppliers are required to collect water inventory data in their manufacturing plants to establish a water footprint, and to provide a specific water resource management plan.

- **Climate change risk management:** Due to the increased risk of storms, water shortage, flooding and transportation and communication disruption in recent years resulting from global climate change, we require our major raw material suppliers to prepare contingency plans, such as support from overseas production, to reduce the impact of such an event. Our first-tier suppliers are also required to manage their suppliers.

Note: our major raw material suppliers account for 80% of total raw materials purchased by TSMC.

8.4 Water Resource Management

Water resource management and allocation has become an important issue in many countries due to the impact of global climate change. The changes in rainfall in between dry and rainy seasons in Taiwan have become increasingly extreme since 2009, and the risk of droughts and floods has become increasing apparent. These developments have highlighted the importance of water resource management, water saving and water shortage emergency response programs. TSMC is aware that extreme rainfall is the result of global warming and climate change. These issues may require decades to resolve, and during that time, water resource management is a necessary part of TSMC's corporate climate change risk management and disaster adaptation. In addition, TSMC also acknowledges that water resource management requires greater collaboration with the government when compared to other climate change response measures. The combination of these factors has led TSMC to establish its water resource management policy and strategy.

TSMC Water Resource Management Policy and Strategy

TSMC's goal is to be a leading global company in water resource management. Our water resource management policy is to promote water savings to reduce water usage per unit of production, and to promote collaboration between industries, government and academia to ensure that water shortages do not occur. Our strategy for reaching this goal is both to save water in daily operations and to adapt to water shortages, and implement these measures both internally and in our supply chain. TSMC's daily water management is first to save water in the production process, followed by water reclamation and recycling measure. In addition, an effective real-time online water resource management platform helps TSMC significantly reduce water consumption.

TSMC's core water resource management activities are focused on:

- Collaborating with the central government to evaluate the climate change risk of Taiwan's Science Parks, and to adopt measures reducing the impact of extreme climate disasters, beginning with basic infrastructure.
- Collaborating with the local government, public utilities, and other companies to coordinate local water resource allocation, set up water saving goals, and share experience.
- Sharing TSMC's water saving experience to help other industries understand the importance of water resource risk and conduct water conservation together.
- Promoting internal and supply chain water inventories, conserving water, and establishing a water footprint.

Collaboration with Local Authorities in Water Allocation and Conservation

Since water resources are inherently local, TSMC shares its water-saving experiences with other semiconductor companies through the Association of Science Park Industries to promote water conservation. At the same time, TSMC collaborates with the Science Park Administration to discuss raw water allocation and emergency response plans for water shortages. TSMC has also successfully resolved many water quality issues, including wastewater ammonia nitrogen reduction. In addition, we continue to hold technical forums to discuss water reclamation and assist small facilities in the Science Park to perform good water resource management in order to achieve the Science Park's goals and ensure long-term balance of supply and demand.

Actively Sharing Experience with External Parties

In June 29, 2012, TSMC, the R.O.C. Ministry of Economic Affairs Water Resource Agency, and the Taiwan Water Environment Association (TWEA) jointly held a Water Resource Forum, a new industry-led initiative for adapting to global climate change. The forum was led by Minister of Economic Affairs Dr. Yen-Shiang Shih and TSMC Vice Chairman Dr. F.C. Tseng, who invited government officials and business leaders to discuss water resource development. In addition, Minister of the Interior Lee Hong-Yuan also spoke on clean production and strategies to respond to water resource risk.

The forum was attended by approximately 300 managers, scholars, and people in related fields. At the meeting, TSMC, China Steel Corp., and other experts in the field shared their experience in water resource recycling as well as developing and allocating water resources, aiming to build consensus and collaborate to lower Taiwan's water resource risk.

Proactively Identifying and Responding to Water Resource Risk

TSMC understands that climate change can cause flooding and drought. We took the following actions to respond to water resource risks:

- Identified short-term and long-term water resource risks of the science parks in northern, central and southern Taiwan, where our fabs are located.
- Developed and executed short-term and long-term water resource risk mitigation projects such as wastewater recycling.
- Continuing to conserve water consumption in each fab.

Water Conservation – Reduction and Recycling

TSMC's facilities collect process water discharges through independent drainages, and reuse the water for the manufacturing process or secondary uses after treatment. These secondary uses, which do not come into human contact, include make-up water of cooling towers and wet scrubbers, cleaning water for sludge dewatering filters in wastewater treatment systems, and toilet water. Secondary uses of water are also optimized to reduce make-up water quantity. In order to fully utilize water drainage from the manufacturing process, TSMC separates drain pipes into more than 20 categories based on their characteristics and more than 15 categories of treatment systems.

86.5%

TSMC's process water recycling rate reached 86.5% in 2012.

TSMC is a fast-growing company, and in addition to adopting a minimum process water recycling rate of 85%, we also select low water consumption process tools, implement process water drainage segregation, set up process water reclamation systems in new factory construction, and continue promoting water-saving measures after mass production. The purpose of these measures is to reduce our raw water demand.

TSMC also cooperates with industry experts to implement new technology for water reuse, such as reclaiming oxide slurry and reusing wastewater from refined oxide slurry.

Major Water Saving Measures in 2012

Since 2008, a number of TSMC fabs have achieved a process water recycling rate of higher than 90%, leading the global semiconductor industry. Our total process water recycling rate reached 86.5% in 2012, which met or exceeded the criteria set by the Science Park Administration and also exceeded the worldwide semiconductor industry standard. TSMC's major water saving measures are as follows:

Water Use Reduction

- Recycle Makeup Air Units' air washing water through a circulation-and-treatment system.
- Optimization of water usage for process tools, air pollution control wet scrubbers, and cooling towers.

- Change dosing chemical system for cooling towers, which greatly improves water quality and lowers water makeup frequency to reduce the quantity of makeup water.
- Use of water-saving faucets for employee hand-washing.
- 100% use of recycled water for toilet flushing.
- Control water use for external wall cleaning, landscaping and irrigation to avoid unnecessary consumption.

Water Recycling

- Recycle electroplating rinse water for secondary water use.
- Reclaim Backside Grinding wastewater through an immersion ultra filter system, a chemical-free process.
- Reclaim Chemical Mechanical Polish wastewater via chemical-free ultra filter. Both water and solid wastes are recycled in a zero emission system.
- Recycle backwash wastewater from active carbon tower and sand filter tower by filtration for secondary water use.
- Installation of ozone wastewater recycling system for secondary water use.
- Installation of organic/acid water recycling systems, separated collection according to water quality, recycling water to ultrapure water systems or secondary uses such as cooling towers.
- Installation of general and copper-containing CMP wastewater recycling systems, recycling wastewater for ultra-pure water systems or secondary water use.
- Installation of wet scrubber water recycling systems to recycle wet scrubber effluent after treatment.
- Installation of treatment system to treat caustic wastewater with ammonia, recycling wastewater for ultra-pure water systems or secondary water use.
- Recycling of air conditioning condensation for cooling tower use.
- Establishment of rainwater storage system on roofs to supply plant irrigation systems, toilets, and wet scrubber water use.

Water Saving Achievements and Process Recycling

In 2012, we saved a total of 53,370,000 cubic meters of water, which can provide a town with population of 500,000 with 1 year of water, or 1.7 times the volume of Hsinchu's Baoshan Reservoir II.

TSMC Water Conservation Performance

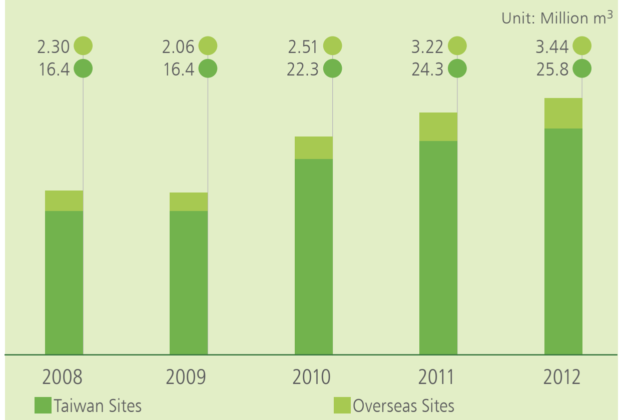
Item	2008	2009	2010	2011	2012
Average process water recycling rate (%)[1]	80.4%	83.4%	84.1%	84.6%	86.5%
Process water saved (Million m^3)	26.37	27.05	34.66	37.73	53.37
Water saved, measured by standard swimming pools[2]	10,548	10,822	13,866	15,094	21,347
Water saved, measured by the full capacity of Baoshan Reservoir II[3]	0.82	0.84	1.08	1.17	1.66

Note:
1. Average process water recycling rate is defined by the Science Park Administration.
2. A standard 50x25x2m swimming pool contains up to 2,500 cubic meter of water.
3. Baoshan Reservoir II is the major reservoir serving Hsinchu Science Park and the full capacity is 32.18 million tons.

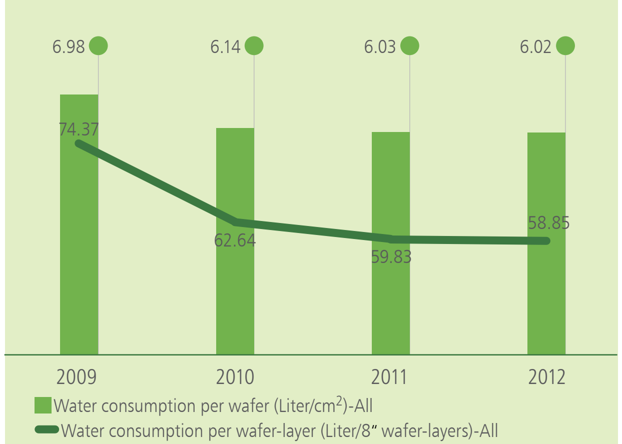
Utility Water Usage

TSMC's water use per 8-inch wafer equivalent per mask layer (Note 2) in 2012 decreased by 1.6% compared to 2011 from 59.8 liters to 58.9 liters.

TSMC Water Consumption



TSMC Unit Water Consumption



Note 1: The statistical data for water consumption includes all fabs in Taiwan, as well as all overseas fabs, packing and testing facilities, bumping, EBO, R&D, and water consumed by non-production activities.
Note 2: The statistical data for unit water consumption density is for the water usage of mass-production wafer fabs in Taiwan and overseas. Beginning in 2009, this index was rationalized by introducing a layer index due to product complexity.