



# Y2018 SMIC Environmental Reporting

Semiconductor Manufacturing International Corporation

May 2019

## Assurance Statement

SMIC (Semiconductor Manufacturing International Corporation) has ensured all the data in the report is accurate and authentic; this data has also been certified by the following third parties, which have no conflict of interest in this matter. The data showed in the report involves SMIC Shanghai, Beijing, Tianjin and Shenzhen plants:

- Data on waste gas emissions was monitored by qualified testing institutes
- Data on hazardous waste was checked by treatment vendors and the government via bills
- Data on energy consumption was verified by the related energy management agencies
- Data on greenhouse gas emissions was certified via 3<sup>rd</sup> party ISO 14064 certification

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# 1 Environmental Footprint

Semiconductor Manufacturing International Corporation is one of the leading semiconductor foundries in the world and the largest and most advanced foundry in mainland China. SMIC provides integrated circuit (IC) foundry and technology services on process nodes from 0.35 micron to 28 nanometer. Headquartered in Shanghai, China, SMIC has an international manufacturing and service base. In China, SMIC has a 300mm wafer fabrication facility (fab) and a 200mm fab in Shanghai; a 300mm fab and a majority-owned 300mm fab for advanced nodes in Beijing; 200mm fabs in Tianjin and Shenzhen; and a majority-owned joint-venture 300mm bumping facility in Jiangyin; additionally. SMIC also has marketing and customer service offices in the U.S., Europe, Japan, and Taiwan, and a representative office in Hong Kong.

# 2 Environmental Protection Policy

In its early days, SMIC established the environmental protection and safety and health policies based on ISO 14001 environmental management system and OHSAS 18001 occupational health and safety management system. Based on the continuously improved concept, by optimizing and revising the policy, SMIC gradually develops the following new management policies:

**SMIC Environmental Protection, Safety and Health Policy**

Established in 2000, SMIC provides high-quality wafer foundry services. In our daily operations, we focus on product innovation and quality control while putting emphases on preventing environmental pollution, using energy/natural resources effectively, protecting our human resources and forestalling accident loss. We believe this is vital to employee well-being as we raise environmental protection, safety, and health (ESH) standards for every employee at SMIC. We are striving to be environmentally responsible through continuous improvements. We aim to strengthen our operational risk management to ensure future growth of SMIC.

To achieve the above goals, SMIC is committed to:

1. Following ESH regulations and international protocols while fulfilling customer requirements.
2. Enhancing environmental quality and promoting employee safety and health as a primary responsibility for every SMIC manager.
3. Carrying out site ESH management through employee's ownership and teamwork.
4. Establishing a green supply chain, implementing green manufacturing and providing customers green products.
5. Strengthening accident prevention measures, emergency response capabilities and recovering abilities.

Approved by:  Date: 2017/6/2

Haijun Zhao, CEO

To achieve environmental protection objectives in the management policy, the company takes the following environmental management measures:

- Plan and take environmental protection measures and promote energy saving and emission reduction projects
- Classify, collect and recycle wastes
- Supervise and manage transfer, safety treatment and manufacturer qualification identification of hazardous wastes
- Control the content of hazardous substances in the product
- Carry out regular environmental monitoring and carbon emission check and disclose the results

### **3 Environmental Protection Management**

Under the guideline of environmental management systems, laws, regulations and standards, SMIC systematically and normatively integrates the environmental management project into the whole process of production and operation in the areas such as organizational structure, document control, operational control, supervision and management, improvement and enhancement, by planning, implementing and operating environmental management projects.

#### **3.1 Management Team and Capital Investment**

SMIC sets up a separate environmental management sector consisting of members with professional environmental management knowledge and skills. The environmental management sector works with other functional divisions to jointly implement environmental management projects with clear responsibilities, to ensure the realization of environmental objectives and make sure that ISO 14001, ISO 14064, QC 080000 and other environmental management systems run effectively. In 2018, the company invested more than USD 80 million for operation, reconstruction and expansion, monitoring and third-party audit of the environmental protection facilities for waste water, waste gas and waste materials.

#### **3.2 Cleaner production**

In order to minimize and even eliminate the impact of the production process on humans and the environment, we implement cleaner production measures. These measures include reduction of pollution sources, increase of resource utilization, reduction and elimination of pollution in the links from production and maintenance to product use.

In accordance with regulatory requirements, SMIC regularly implements cleaner production audits and implements cleaner production improvement plan according to the expert audit suggestions. In 2018, SMIC implemented 38 cleaner production improvement programs with an investment of more than RMB 29 million.

### **3.3 Product Hazardous Substances Control**

In accordance with QC 080000 hazardous substances control system, the company controls hazardous substances risks in the whole production process, so that the products meet the Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products; Registration, Evaluation, Authorization and Restriction of Chemicals; Halogen-Free; Sony GP standards and other domestic and international hazardous substances control standards, to reach the green product level.

Source control---promote green supplier evaluation mechanism and control hazardous substances from the source; select the suppliers that meet the requirements for green supplier evaluation, conduct regular documentation and site audits of suppliers, request the raw material suppliers to provide a statement of no hazardous substance; and require suppliers to provide periodic test reports of no hazardous substances for high-risk substances.

Process control---strictly implement production process control and put the equipment under isolation management; provide training for operators to prevent the production process from pollution by external hazardous substances.

Product test---monitor the content of hazardous substances in the products, conduct hazardous substances test for the products produced each year to verify the content of hazardous substances contained in the products is under control.

## **4 Greenhouse Gas Management**

The climate change caused by greenhouse gas emissions has a great impact on the global ecological environment, human life and health and economy, so it is an environment issue receiving great concern from the United Nations, governments, society and business circles.

### **4.1 Climate Change Policy**

SMIC is actively responsible for mitigating climate change, and it develops climate change policies and implements the measures to reduce greenhouse gas emissions.

## SMIC Climate Change Policy

SMIC conducts business with the wellbeing of our environment, our community and our next generation in mind. Concerned about global climate change, SMIC remains committed to save resources, reduce disaster losses caused by extreme weather, slow down and reverse the effect of climate change to achieve sustainable development and leave behind a cleaner and more stable environment. To achieve these objectives, SMIC commits to:

1. Decrease Greenhouse Gases emissions;
2. Reduce product energy consumption;
3. Lower product water consumption;
4. Pursue green production and energy saving products; and
5. Enhance the ability to prevent, respond, and recover during adverse weather conditions.

Approved by:



Date:

2017/6/1

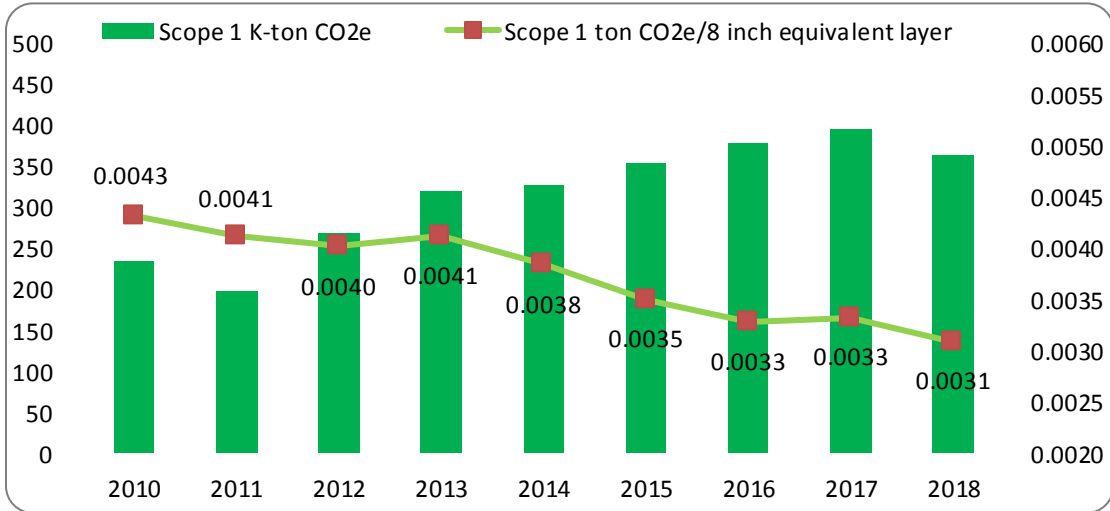
HaiJun Zhao, CEO

## 4.2 Verification of Greenhouse Gases

In accordance with international standard ISO 14064, SMIC establishes a greenhouse gas verification mechanism. It calculates the greenhouse gas emissions in the operating factory on a regular basis each year, to acquire the company's greenhouse gas emissions and implement emission reduction measures as planned. The total of greenhouse gas emissions decreased by 5% in 2018 to 1,441,561 tons.

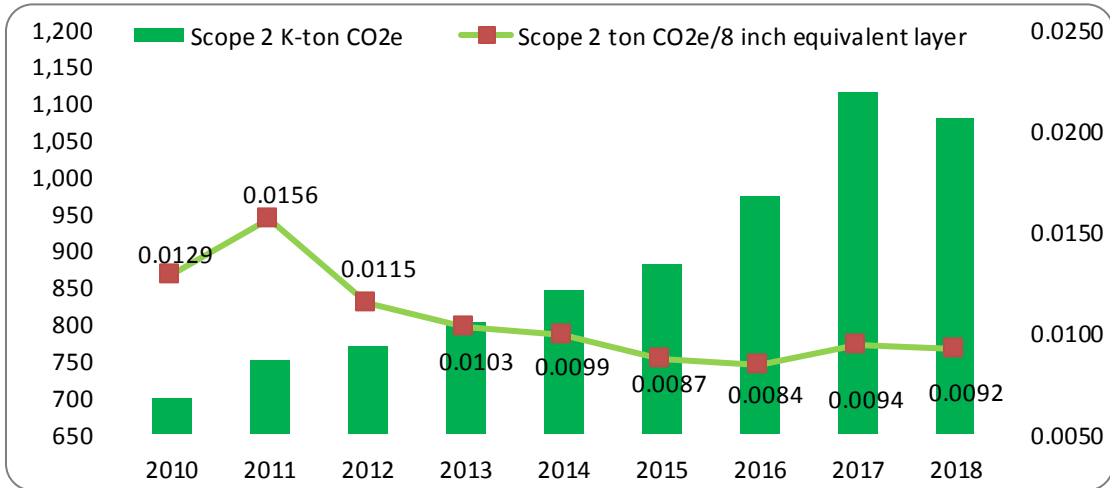
### 4.2.1 Direct Emissions of Greenhouse Gas

Direct greenhouse gas sources: combustion of gasoline, diesel, natural gas and other fossil fuels, perfluorinated compounds gas in the process of chemical vapor deposition and dry etching, organic exhaust combustion, refrigerant fugitive emissions, wastewater treatment system emissions and pure water system fugitive emissions, etc.



### 4.2.2 Indirect Emissions of Greenhouse Gas

Indirect greenhouse gas sources: greenhouse gas emissions of outsourced power, steam, heat and other energies.

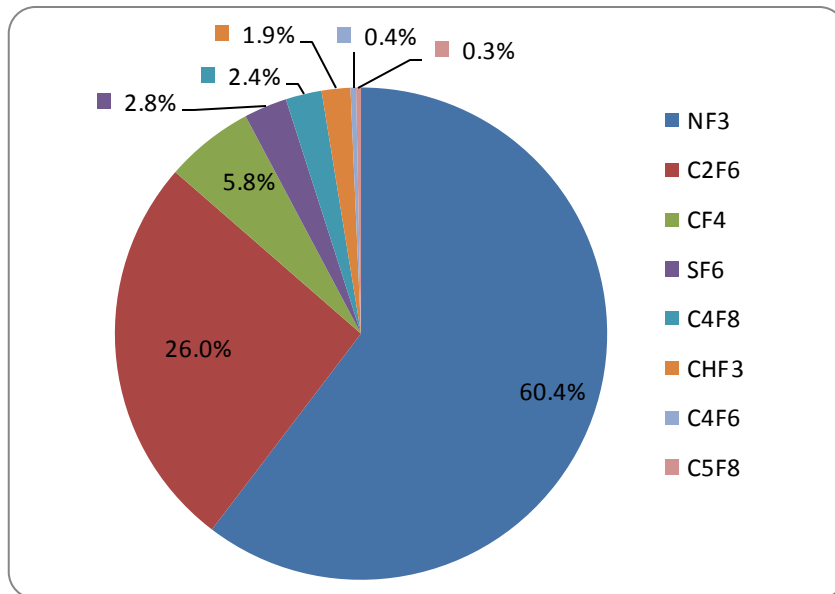


### 4.2.3 Perfluorinated Compounds Greenhouse Gas Emissions

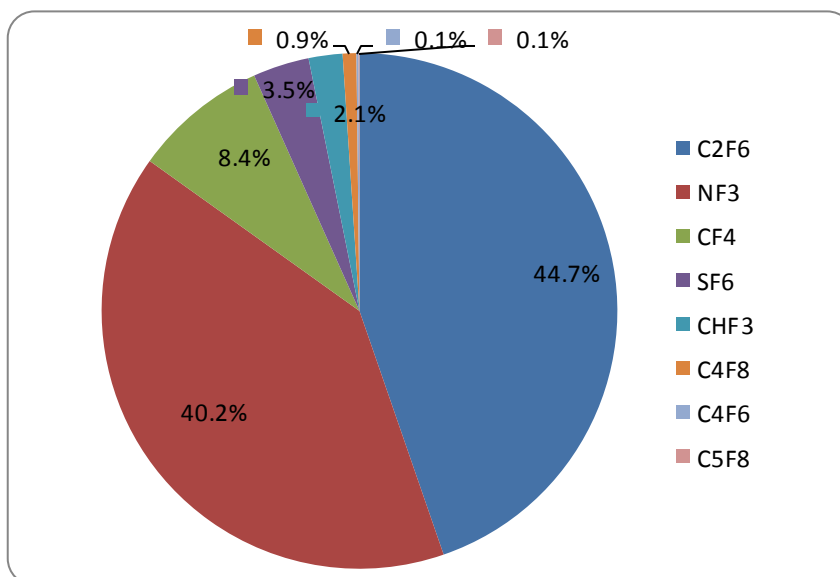
As an important member of China Semiconductor Industry Association, SMIC provides annual perfluorinated compounds greenhouse gas emission information to the Association, which then report it to the World Semiconductor Council (WSC). SMIC is actively implementing the agreement developed by WSC on voluntary greenhouse gas emission reduction of perfluorinated compounds (PFC), trying to implement the best practice emission reduction technology advocated by WSC and reduce the emission of PFC greenhouse gas.

2018 PFC gas consumption information is shown in the following figure:





Information of CO<sub>2</sub> from PFC emission in 2018 is shown in the following figure:



SMIC has been following WSC's goal which is equivalent to a 30% Normalized Emission Rate (NER) reduction from the 2010 aggregated baseline to 2020. The NER in 2018 is 0.628 kg/cm<sup>2</sup> which achieved 51% reduction from the 2010 baseline with 1.29 kg/cm<sup>2</sup>. But the great efforts are still being made to achieve the WSC's NER absolute reduction goal with 0.22kg/cm<sup>2</sup>. (The NER value calculated via WSC's computation method).

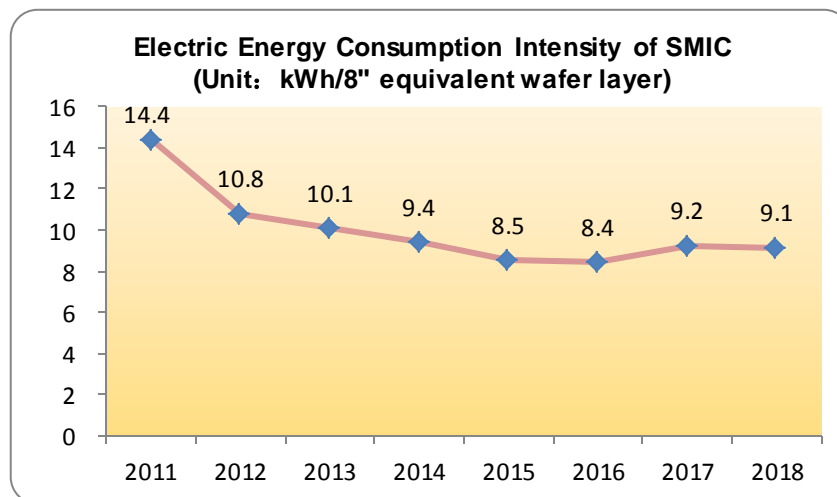
## 5 Energy Management

SMIC actively responds to national energy-saving and emission reduction calls, establishes energy management organizations and continues to implement energy-saving

and emission reduction projects, achieving a double win for economic and environmental benefits.

## 5.1 Consumption of Energy

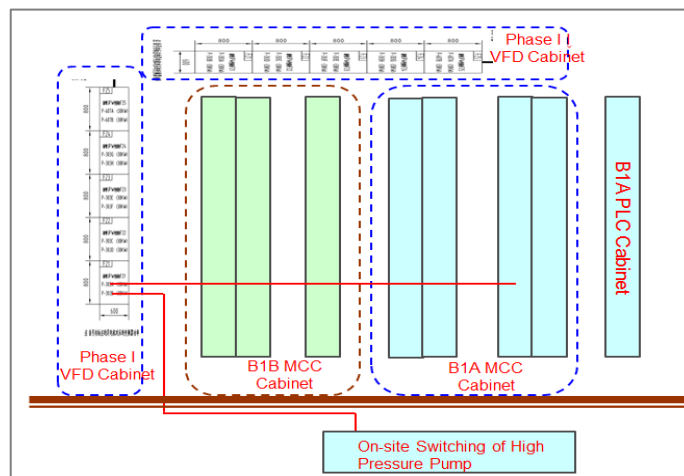
Compared with 2017, the energy consumption intensity per unit output presented an steady trend in 2018.



## 5.2 Main Energy Saving Projects in 2018

### 5.2.1 UPW System Soft Start is transformed into Frequency Converter Energy Saving Project in Beijing Plant

The SMIC Beijing plant UPW pretreatment system water pump and UPW system raw water pump are currently installed with soft start, and the pump outlet hand valve is used to adjust the flow and pressure requirements. Bench mark UPW system phase1 improvement case, the soft starting of the existing water pump in SMIC Beijing plant UPW system is transformed into a frequency converter, which will effectively reduce the operating current, reduce energy consumption and save electricity costs 544,935 RMB/Y. There are 28 soft starting pumps in the SMIC Beijing plant UPW system that need to be transformed into frequency converters, and 10 in the first phase, which will be completed in May 2018. The second phase of 18 units will be completed in Nov. 2018.



System Diagram of Project

## 5.2.2 Other Energy-saving Projects

Plant	Project Name	Brief Description of Project	Energy-saving Performance
Beijing	Natural gas Energy-saving Project	High frequency magnetic field, far infrared ray, nano-catalyst coating and natural gas fuel analysis group are used to refine the molecular group. The refined molecular group can be fully contacted with combustion aids (oxygen) in the combustion chamber of VOC equipment after entering the combustion chamber, so as to improve the combustion efficiency	Natural gas: 37,857.4stere
Beijing	Energy-saving Technology Reform Project of Steam condensate heat recovery	In winter, there is a large demand for heat energy and a large amount of steam condensate water (90 C). Plate heat exchanger is used to absorb the residual heat of condensate water and heat UPW raw water to reduce the amount of steam needed for UPW raw water heating.	Steam: 3,086.7 ton

<b>Beijing</b>	Energy-saving Renovation Project of Heat Pump Ice Machine	A new heat pump ice machine is added to fully recover the heat in the refrigerated water, and the recovered heat is reused for hot water backwater heating to reduce the steam consumption required for hot water heating	Steam: 6,403 ton
<b>Shenzhen</b>	Energy-saving Renovation Project of Central Air-conditioning System	The 590 FCU temperature controllers in the office area were transformed from constant speed, constant temperature and manual start-stop to centralized control of temperature and running time, so as to improve energy utilization and reduce energy consumption	Power: 1,702,570kWh
<b>Shenzhen</b>	Energy-saving Renovation Project of HPM7/CW7	Six OAHU equipment in HPM7/CW7 GHVAC system are equipped with frequency converter, which reduces the operating frequency of the equipment from 50 Hz to 40-45 Hz and realizes energy saving	Power: 91,713 kWh
<b>Shenzhen</b>	Energy-saving Renovation Project of CLF3 heating system	Close CIF3 cylinder heat sytem when the weather temperature is higher than 18 degrees, the heating system was shut down for nine months in 2018	Power: 124,922 kWh
<b>Shenzhen</b>	Energy-saving Renovation Project of Lighting System	Replace 1000 36-watt fluorescent lamp tubes with 18-watt LED lamp tubes in PMD office area to meet lighting requirements and save energy	Power: 165,039 kWh
<b>Shenzhen</b>	Energy-saving Renovation Project of Lighting System	An 80-watt energy-saving lamp was replaced by a 30-watt LED lamp in the street lamp lighting system in the factory to save electricity.	Power: 91,713 kWh
<b>Shenzhen</b>	Energy-saving Renovation Project of Wastewater Reuse System	The aeration of wastewater reuse system was changed from 35 kW blower aeration to compressed air aeration (free use of compressed air), so as to save energy	Power: 391,147 kWh
<b>Shanghai</b>	Energy-saving Renovation Project of Grinding Wastewater System	CMP buffer tank use gravity flow instead of pump into raw water adjustment tank, so as to save energy	Power: 7,800 kWh
<b>Tianjin</b>	Energy-saving Renovation Project of Process Cooling Water System	The passivated heat exchanger plate is cleaned to improve the sealing condition, improve the heat transfer efficiency and save the operation cost	Power: 707,812 kWh

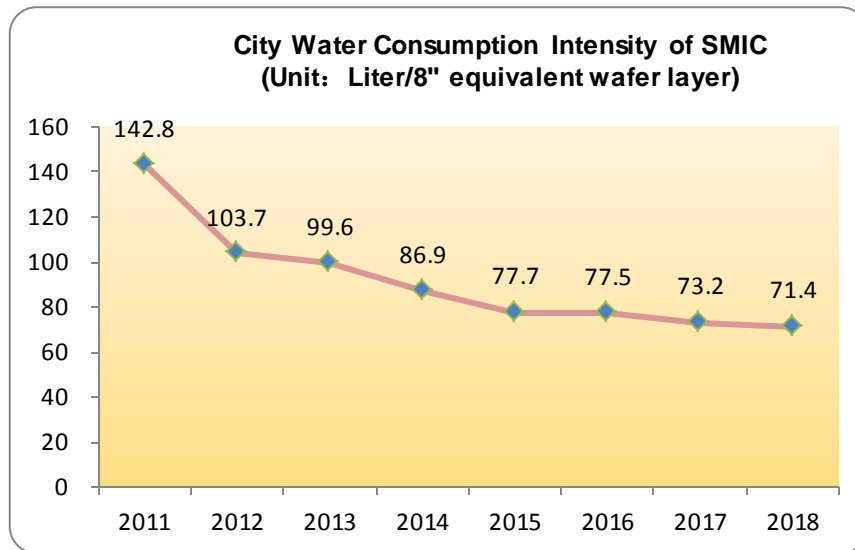
## 6 Water Resource Management

SMIC's factories are located in different areas, where there are differences in the conditions of the available water resources. We measure local conditions and implement management measures to conserve water resources.

### 6.1 Water Consumption Status

SMIC manages water resources to save water consumption, increase water resources usage efficiency and reduce waste water discharge. See water consumption data of SMIC

in 2018 in the following figure. Compared with 2017, the unit water consumption presented a decreasing trend in 2018.



## 6.2 Main Water Saving Projects in 2018

### 6.2.1 Wastewater Recycling Project in Shenzhen Plant

Originally, the condensed water of air-conditioning system is discharged into the rain and sewage pipelines in Shenzhen plant, resulting in the waste of water resources and increasing the amount of sewage treatment. In order to achieve the reuse of water resources, the condensed water can be collected and reused to cooling tower of ice system after analysis and research. It is can supplement evaporation and self-damage water.

Project achievement: In 2018, the project saved a total of 14,400 tons of city water.

### 6.2.2 Process Water System Optimization Project in Shenzhen Plant

Ammonia nitrogen wastewater is treated by blowing ammonia nitrogen and entered into the recycling system. After ACF + RO treatment, the RO outlet water is collected in the RO tank and reaches the UPW treatment system filtration tank when reaching the standard.

CMP wastewater is treated with chemical coagulation, mixed with general acid-alkali wastewater, adjusted pH value, and entered aerobic tank aeration treatment, then enters MBR. After ACF+RO treatment, MBR water enters RO water tank, then enters UPW after reaching the standard. Treatment system filter tank.

Project achievement: In 2018, the project saved a total of 14,901 tons of city water.

## 6.3 Water Pollution Prevention and Control

According to the nature of production wastewater, SMIC constructs a number of waste water treatment facilities to treat production wastewater and domestic sewage, so that discharged wastewater meet national or local standards. Besides, we strictly implement wastewater discharge monitoring requirements to conduct real-time or regular monitoring of the concentration of pollutants in wastewater to ensure that all wastewater meets discharge standards. For specific monitoring data, see the information published on: <http://www.smics.com/eng/about/esh.php>.



## 7 Air Pollution Prevention and Control

SMIC is concerned about the air quality in its business locations and attaches great importance to the treatment of the company's exhaust gas. All emitted gas is treated and meets national or local standards. Data on waste gas emissions are as following:

Data Name	Total
<b>Total Emission of Exhaust Gas (Million Cubic Meter)</b>	32,378
<b>Emissions of Nitrogen Oxides (ton)</b>	52
<b>Emissions of Sulfur Dioxide (ton)</b>	8
<b>Emissions of Volatile Organic Solvents (ton)</b>	34

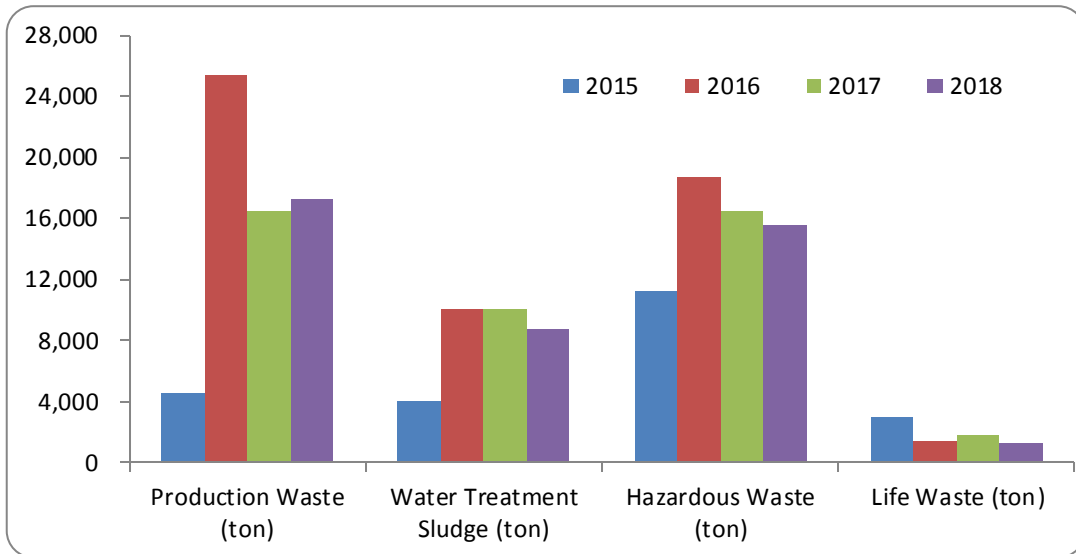
The company employs two- levels waste gas treatment at the console end and the central processing end, respectively. In the production process, the waste gas emitted from the console end is first treated by the local waste gas treatment system to meet the stipulated standards and then sorted into the main pipes for exhaust gas collection. The main pipes for exhaust gas collection fall into acidic, alkaline, organic and general types, where acidic and alkaline waste gas enters the acid central washing tower via the main pipes and enters the alkaline central washing tower for retreatment, while organic waste gas enters the zeolite runner system for burning. The waste gas processed by the central system is discharged into the atmosphere by the exhaust pipe conforming to the requirements of the State. To verify emission compliance, we regularly entrust third party agencies to monitor emissions and all test results meet national requirements. For specific monitoring data, see the information published on: <http://www.smics.com/eng/about/esh.php>.



## 8 Waste Management

SMIC establishes a sound waste management system and strictly complies with the national regulations in treatment of the produced waste. The waste produced in the workshop is subdivided into acidic, alkaline, toxic, oxidizing, natural, flammable and general substances, which are distinguished with the recycling buckets in different colors. The classified waste substances are collected on a regular basis and transported to the hazardous waste warehouse for temporary storage, before being delivered to the firms with hazardous waste treatment qualification. The waste liquid produced in the workshops is transported to the temporary waste tank by an independent pipeline, and then treated by the firms with the corresponding qualification. The waste treatment plants must be under strict management and all waste treatment firms need to have a government-approved qualification and meet our company's waste management evaluation scores to sign the contract; during the cooperation, the Environmental, Safety and Health Division will conduct on-site or vehicle-following examination of the waste treatment firms; for hazardous waste, strict implementation of the waste transferring table system is required. Production of various types of waste in 2018 is as follows, which presented an increasing trend in 2018, it is due to many tools and facilities were installed in Beijing and Shenzhen plants newly:



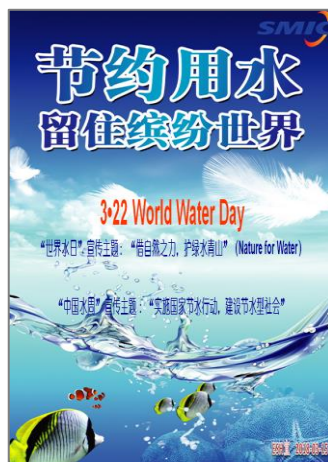


## 9 Promotion of Environmental Awareness

In 2018, the company continued to hold environmental awareness advocacy activities to enhance employees' awareness of environmental protection in the form of posting posters, sending initiative mails to all employees, displaying promotional documents on the company's internal website, organizing special events such as second-hand market, garbage cleanup, tree planting, and species conservation activity and so on.

### 9.1 Theme Day Activities

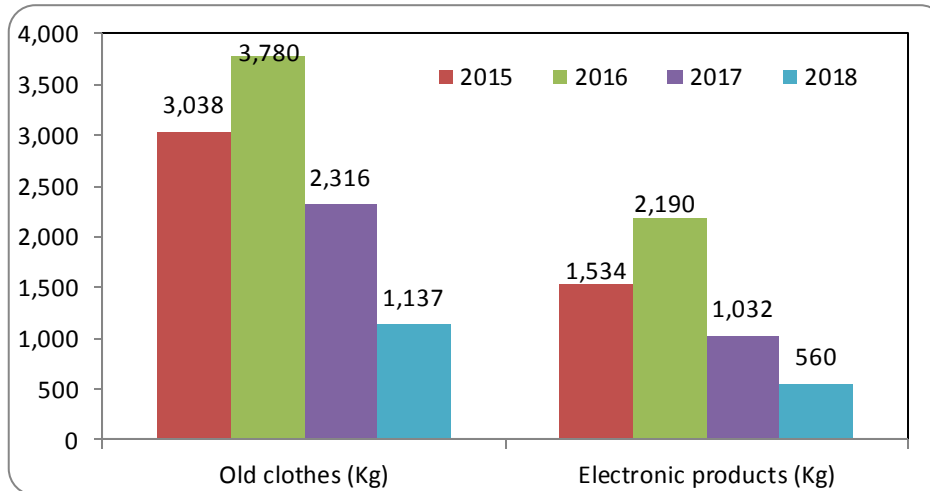
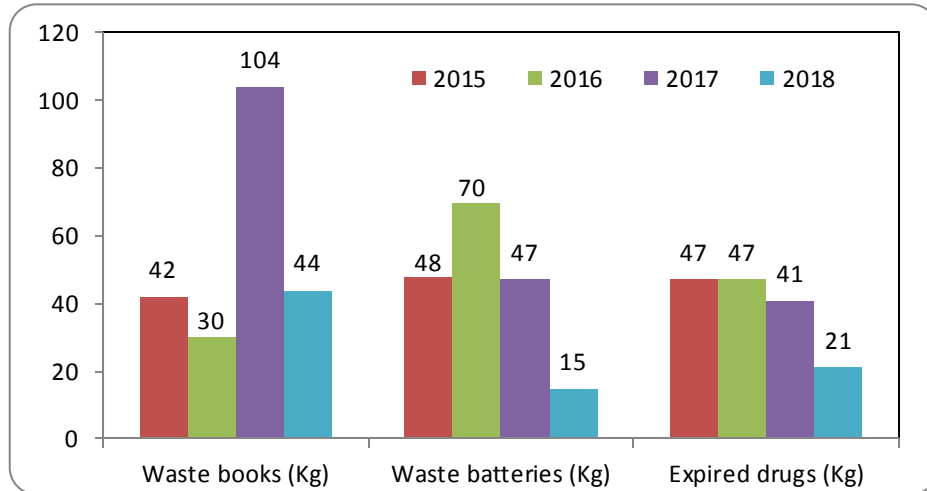
- Publicize "World Water Day" on March 22, calls all employees to participate to save water.
- Publicize "World Earth Day" on April 22, calls all employees to practice low carbon life and save resources.





## 9.2 Second-hand Market

In 2018, our Shanghai Plant, Beijing Plant, Tianjin Plant and Shenzhen Plant held a number of special second-hand market activities to promote waste utilization. The number of people involved and the results were more than last year.



### 9.3 Tree Planting Activity in Inner Mongolia

Tree planting activity in Inner Mongolia began in 2007, which is a joint program launched by "Root and Bud" association and the Environmental Protection Club of SMIC Shanghai Private School, aiming to enhance environmental awareness and show the way to reduce the impact of personal behaviors on the environment. The program gives people the opportunity to grow trees in Inner Mongolia. It was the 12th year in 2018 for SMIC Shanghai Private School to participate in the program and the Environmental Protection Club raised money to fund 3,000 trees. Students and teachers went to Inner Mongolia to plant the trees, where students received environmental education in the real environment.



### 9.4 Conservation of Shanghai Native Species

On May 5, 2018, the company launched the "Yi" rising environmental protection public welfare activity --" Conservation of Shanghai Native Species" jointly with its businessman partners. More than 70 volunteers came to the Shanghai Species Conservation Base to participate in the protection of the ecological environment. In this activity, one group of volunteers cleared dead branches, leveled the land, collected wild roses, transplanted local aquatic plants and snails, built frog ladders and put aquatic organisms into the water; the other group learned and appreciated to grow fleshy plants. All volunteers had a clear division of labor under the guidance of professionals, united and helped each other, and successfully completed the activities plan against the wind and rain, contributing to the protection of local biodiversity.

