UNLOCKING SOUTH-SOUTH TRADE IN ENVIRONMENTAL GOODS AND SERVICES IN JIANGSU PROVINCE, CHINA

(Technical Note)

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Executive Summary

The 2030 Agenda for Sustainable Development identifies trade as a cross-cutting means of implementation for the Sustainable Development Goals (SDGs). International trade, especially trade in environmental goods and services (EGS), can be a principal driver of the transition to a green economy and in the fight against climate change. In recent decades, the global market for Environmental Goods has been growing rapidly, with China being one of the fastest growing producers and traders, as well as a key player in South-South trade. As a leading province in production and export of Environmental Goods and Services in China, Jiangsu's experience in integrating into global value chains offers valuable insights into green trade and the transition towards an Inclusive Green Economy.

This project, titled *the Role of Trade in the Transition to a Green Economy in Jiangsu, China,* is part of the Partnership for Action on Green Economy (PAGE) project in China. It aims to assess Jiangsu's trade in Environmental Goods and Services with developing countries, identify major challenges, and summarize good practices, in order to inform policy makers and trade practitioners who are interested to further explore South-South trade in Environmental Goods and Services.

The research methods applied in the study include literature review, questionnaire survey, policy analysis, focus group interviews and case studies. Seven workshops were organized, and four field trips were conducted in five cities in Jiangsu. Around 19 government departments, 4 industrial associations, 18 companies and 3 civil society groups were interviewed (see Annex 2).

Key findings

(1) Trade in Environmental Goods and Services has been growing rapidly in Jiangsu, with solar PV and wind energy products being key exports. Export of PV products reached USD 6.51 billion in 2016, accounting for 46% of China's total PV exports.

(2) Jiangsu's trade with developing countries in environmental goods and services remained limited. Key trading partners from the developing world included India, Thailand, Turkey, Panama, and Ethiopia.

(3) At international level, growing market of Environmental Goods and Services, including in many developing countries in Asia and Africa provided

opportunities to Jiangsu's environmental companies. At national and provincial levels, policies aiming at strengthening trade and investment cooperation with Belt and Road countries, building up environmental and new energy industries, improving trade facilitation, will also help to unlock trade with developing countries in Environmental Goods and Services.

(4) Challenges remain, including high tariffs in some developing markets on certain environmental goods, technical barriers such as standards, certifications, local content requirements, as well as market access challenges to environmental services, visa requirements for foreign technicians and engineers, and lack of capacity and knowledge to explore international market.

(5) Good practices adopted by Jiangsu at sub-provincial level and corporate level in trading with developing countries in renewable energy products included: establishing industrial clusters with production networks, improving technological competitiveness through R&D and innovation, complying with international standards and actively participating in development of technical standards, investing overseas to outsource production and thus overcome trade barriers.

1. Introduction

1.1 Background

The 2030 Agenda for Sustainable Development identified international trade as a cross-cutting means of implementation for the Sustainable Development Goals (SDGs). Trade also plays a key role in implementing the Paris Agreement on Climate Change. International trade, especially trade in environmental goods and services (EGS), including renewable energy products, can be a principal driver of the transition to an Inclusive Green Economy and climate change adaptation and mitigation.

The global market for Environmental Goods and Services has been growing rapidly. China is one of the fastest growing trading nations in Environmental Goods and Services. Jiangsu is one of the leading provinces in the production and export of environmental goods in China. In 2016, the total export of photovoltaic (PV) products in Jiangsu mounted to USD 6.51 billion, ranking the top in China.

Jiangsu is making great effort in transition to a green economy. In 2015, Jiangsu joined the Partnership for Action on Green Economy (PAGE), a project initiated by five UN agencies – UN Environment, the UN Development Programme (UNDP), the UN Industrial Development Organization (UNIDO), the International Labour Organization (ILO), and the UN Institute for Training and Research (UNITAR). PAGE advances the 2030 Agenda for Sustainable Development by supporting nations and regions in re-framing economic policies and practices towards sustainability. PAGE also represents a mechanism to coordinate UN action on green economy and to assist countries in achieving and monitoring the SDGs.

As part of the PAGE framework, and in response to the request from the local government, the Environment and Trade Hub of UN Environment initiated the project titled *The Role of Trade in the Transition to a Green Economy in Jiangsu, China*, with the following goas:

- to increase understanding and capacity in harnessing trade opportunities in environmental goods and services in Jiangsu province;

- to enhance South-South cooperation of Jiangsu province in trade and investment in environmental goods and services, including renewable energy products;

- to contribute to Jiangsu's transition to an Inclusive Green Economy through green trade and investment.

As part of the project, this Technical Note aims to take stock of Jiangsu's trade with developing countries in Environmental Goods and Services, summarize good practices, while exploring opportunities and challenges to further unlock trade in this area, as a way to accelerate Jiangsu's transition to an Inclusive Green Economy. It also benefited from the workshop held in Nanjing, Jiangsu, on 5 June 2017 titled "Unlocking South-South Trade in Environmental Goods and Services in Jiangsu". More than 50 participants joined the workshop and shared their views on global and national trends in trade in Environmental Goods and Services (EGS), Jiangsu's experience in trade in renewable energy and environmental technologies, implications of rising global value chains, as well as opportunities and challenges of expanding green trade with developing countries.

1.2 Methodology

Literature review and policy review: A number of key literature and policy papers were reviewed, including academic papers on trade in Environmental Goods and Services, Jiangsu Statistical Yearbooks, national and provincial policies related to South-South trade, trade in renewable products, environmental industries, and trade liberalization in environmental goods through bilateral and plurilateral agreements.

Questionnaire survey: A questionnaire survey was developed and distributed to local producers and suppliers of environmental goods and services in Jiangsu, with support from Department of Environmental Protection and Department of Commerce of Jiangsu Province.

Stakeholder consultation: Seven workshops were held to consult with stakeholders, collect information, and improve understanding and knowledge of trade in environmental goods and services. Participants came from government ministries, local trade and environment authorities, business associations, research institutes, think tanks, and local environmental NGOs. More information about the workshops can be found in Annex I.

Interviews: 19 government departments, 4 Industrial Associations, 18 companies, and 3 NGOs were interviewed. The list of interviewees can be found in Annex 2.

Expert review: An expert review was conducted after the first draft of this study was accomplished. More than 30 experts contributed to the review, including members of the Green Trade Taskforce of Jiangsu, PAGE country team, as well as national and international experts on trade in Environmental Goods and Services.

Field trips: Four field trips were conducted in Nanjing, Wuxi (Yixing), Changzhou, Yancheng and Suzhou, as leading export clusters of environmental goods and services in Jiangsu.

Green trade taskforce in Jiangsu province: The green trade taskforce of Jiangsu was established for the project, with the purpose of 1) providing guidance and support in the design and implementation of the project; 2) engaging with different stakeholders for project delivery; 3) strengthening communication and cooperation among different experts on green trade. Detailed information of the Taskforce can be found in Annex 4.

1.3 Environmental Goods and Services

Environmental Goods and Services were defined by the Organization for Economic Cooperation and Development (OECD) as “goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems” (OECD

and Eurostat, 1999). The UN System of Environmental-Economic Accounting, defined it as “all products that are produced, designed and manufactured for purposes of environmental protection and resource management are within the scope of the environmental goods and services sector (EGSS)” (UN et al., 2014).

Liberalizing EGS trade was included in the WTO Doha Ministerial Declaration (WTO, 2001), which called for negotiations on “the reduction or, as appropriate, elimination of tariff and non-tariff barriers to *environmental goods and services*”. However, no explicit definition of EGS was given at the WTO.

Leaders of 21 Asia-Pacific economies endorsed a list of 54 environmental goods (EG) for which they aim to reduce applied tariff rates [1] to 5% or less by the end of 2015 (APEC, 2012).

Table 2-1 Distribution of the APEC list of EG by product category

Product Category	Subheadings		Examples
	Number of EG	Share of EG	
Environmentally Preferable Products[2]	1	1.9%	Bamboo flooring panels
Air Pollution Control	5	9.3%	Filtering and purifying machinery and apparatus for gases
Management of Solid and Hazardous Waste and Recycling Systems	12	22.2%	Furnaces, ovens and incinerators to destroy solid waste and pollutants
Renewable Energy Production	15	27.8%	Products for the generation of wind, solar, biomass, biogas, geothermal energy

[1] According to the WTO’s definition, applied tariff or applied rates means duties that are actually charged on imports. These can be below the bound rates. More details could be found at https://www.wto.org/english/thewto_e/glossary_e/applied_tariff_e.htm

[2] Environmentally Preferable Products (EPP) are sustainability and marketing terms referring to goods that claim reduced, minimal, or no harm upon ecosystems or the environment. More details could be found at https://en.wikipedia.org/wiki/Environmentally_friendly#References

Waste Water Management and Potable Water Treatment	5	9.3%	Sludge driers, water filters, water purification machines, parts of UV disinfection ozonizers
Natural Risk Management	1	1.9%	Surveying instruments and appliances
Environmental Monitoring Analysis and Assessment Equipment	15	27.8%	Manometers, gas and smoke analyzers, spectrometers, chromatographs, microtomes
Total	54	100%	-

Source: Kuriyama, 2012.

Build on this list, 18 WTO members (including China) negotiated on the Environmental Goods Agreement since 2014, hoping to eliminate tariffs on selected environmental goods agreed among the parties. Different lists were presented by negotiating parties, covering more than 600 HS codes. Yet due to difficulties in reaching consensus on the list, negotiations stalled after the talk in Dec 2016 in Geneva.

In China, there is no official definition of Environmental Goods and Services. EGS generally falls within the context of environmental industry, and relevant concepts such as the Energy Conservation and Environmental *Protection Industry* as defined in several policies and regulations[3]. In 2010, the Energy Conservation and Environmental Protection Industry was identified as one of the seven *Strategic Emerging Industries* by the State Council (General Office of the State Council, 2010), and the 12th Five Year Plan defines the *Energy Conservation and Environmental Protection Industry* as an industry that provides material basis and technical support to save energy resources, develop a circular economy, and protect the environment (State Council, 2012). It includes equipment, goods and services associated with energy conservation and environmental protection. Table 2-3 below illustrates a more specific

[3] The policies and regulations reviewed here include those led by the State Council, Ministry of Environmental Protection, Ministry of Commerce, etc. Wide discussion on EGS can be found in the environmental sector, while little information exists in the commerce sector.

classification system in the catalog of Strategic Emerging Industries published by the National Bureau of Statistics.

Table 2-2 Classification of the energy conservation and environmental protection industry in China

Tier 1 Classification	Tier 2 Classification
Energy Efficient Industry	Energy efficient general equipment manufacture
	Energy efficient special equipment manufacture
	Energy efficient electrical machinery and equipment manufacture
	Energy efficient industrial control devices manufacture
	New building materials manufacture
Advanced Environmental Protection Industry	Environmental protection special equipment manufacture
	Environmental protection monitoring equipment and electronic equipment manufacture
	Environmental pollution treatment of pharmaceutical materials manufacture
	Environmental assessment and monitoring services
	Environmental protection and pollution control service
Resources Recycling-based Industry	Comprehensive utilization of mineral resources
	Industrial solid waste, waste gas and waste liquids recycling and utilization
	Comprehensive utilization of urban and rural domestic waste
	Agriculture and forestry waste utilization
	Water resources recycling and conservation
Energy Conservation and Environmental Protection Integrated Management Services	Energy conservation and environmental protection scientific research
	Energy conservation and environmental protection project survey and design
	Energy conservation and environmental protection project construction
	Energy conservation and environmental protection technology promotion service

	Energy conservation and environmental protection quality assessment

Source: National Bureau of Statistics, 2012.

It is worth noting that the above-mentioned classification of Energy Conservation and Environmental Protection Industry does not contain any renewable energy industry such as solar power, wind power, etc. The renewable energy industry is separately included in the *New Energy Industry*, which was also identified as one of the seven Strategic Emerging Industries.

Since China's environmental accounting is at an early stage, there is no regularly updated statistics for EGS. Official reports on environmental protection-related industries developed by the Ministry of Environmental Protection have only been released four times in the year of 1993, 2000, 2004 and 2011. Figure 2-1 below shows the different scopes of each report.

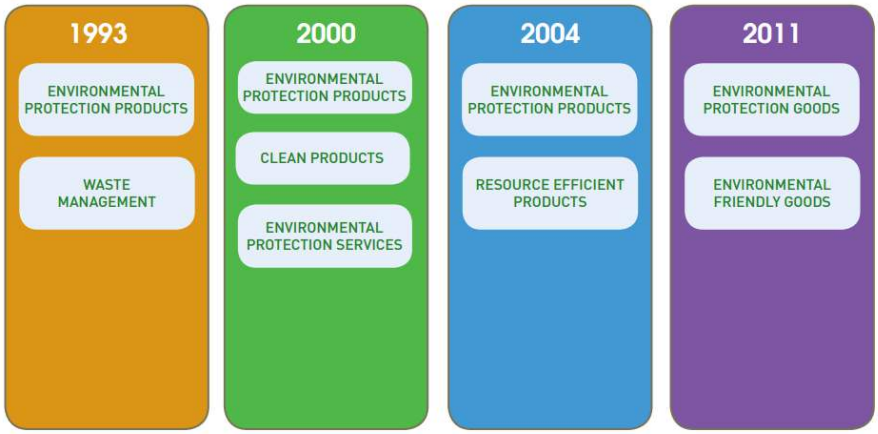

Figure 2-1 Scope of China's report on environmental protection-related industries

Source: UNEP, 2014.

1.4 Scope of the study

Given the lack of universally acknowledged definition of Environmental Goods and Services, and taking into consideration of the national and provincial context, this study focused on *energy conservation and environmental protection industry* and the *new energy industry* as defined by Chinese government and Jiangsu provincial government.

2. South-South Trade in EGS in Jiangsu Province

2.1 Overview of Jiangsu province

Jiangsu province is located at the Yangtze River Delta in eastern China and covers a land area of 107,200 square kilometers, 1.12% of China's territorial area. It is one of the most economically well-developed provinces in China. In 2016, the total GDP of the province reached USD 1,145 billion.

Sustained economic growth and industrial optimization.

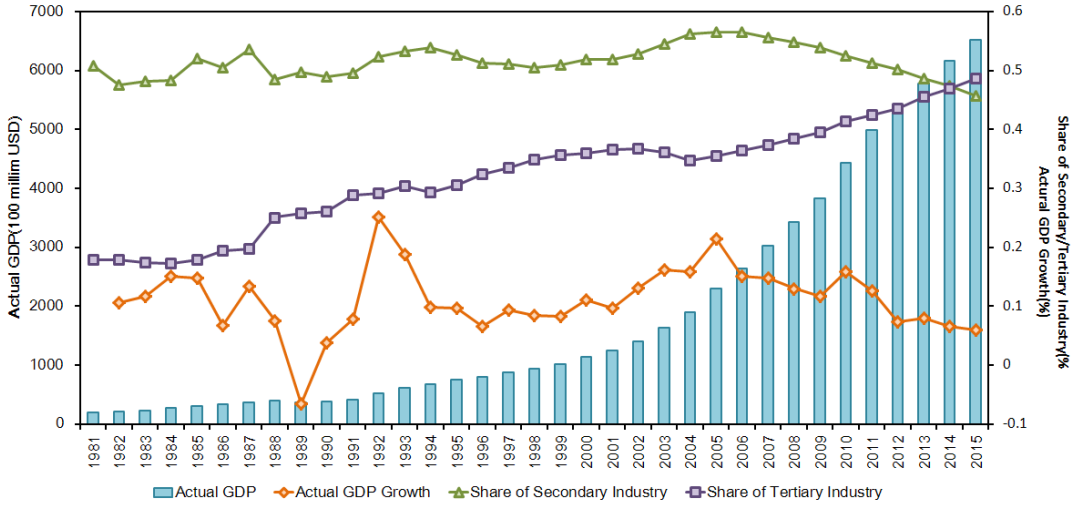

Figure 3-1 GDP growth and industrial structure of Jiangsu (1981-2015)

Source: Jiangsu Provincial Statistics Bureau, 2012-2016.

International trade. In 2015, Jiangsu's total value of trade reached USD 545.6 billion (with exports USD 338.7 billion and imports USD 206.9 billion). From 1985 to 2015, the average annual growth rate was 20.1%, higher than the national average (14.4%). Jiangsu's exports to the ASEAN, Africa and Latin America maintained a stable increase over recent years (with an average growth rate of 8.5% from 2010 to 2015). Yet the share of exports to developing countries in the total exports remained relatively low. In 2015, Jiangsu's exports to Association of Southeast Asian Nations (ASEAN), Africa, and Latin America accounted for 10.3%, 2.6% and 5.6% of total exports respectively.

The ratio of trade value to total GDP in Jiangsu province was 51.7%, much higher than the national average of 36%.

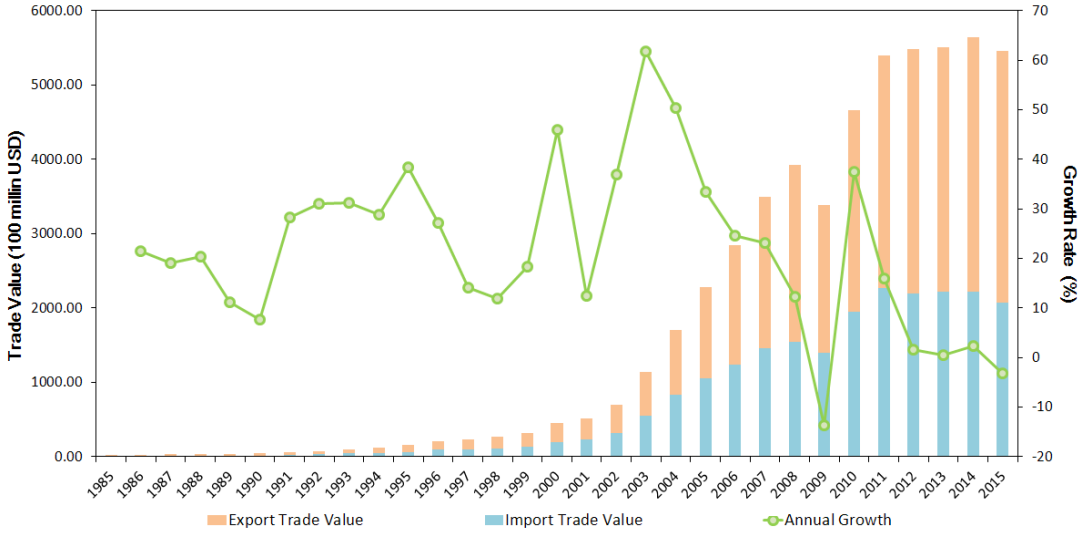

Figure 3-2 Trade value and growth rate of Jiangsu (1985-2015)

Source: Jiangsu Provincial Statistics Bureau, 2012-2016.

Environmental Quality: The total energy consumption of Jiangsu province increased from 88.8 million tons coal equivalent (tce) in 2001 to 319 million tce in 2014. Meantime, energy consumption per USD 1,000 of GDP dropped from 0.78 tce to 0.3 tce, with a decrease of 62%.

Table 3-1 Comparison between Jiangsu province and China on economic and social development (2015)

Category	Indicators	Jiangsu	China
Economy	Per capita GDP (USD)	13247.7	7526.3
	Ratio of secondary industry (%)	45.7	41.1
	Ratio of tertiary industry (%)	48.6	50.4
	Ratio of heavy industry (%)	74.1	74.6
	Urbanization level (%)	65.2	54.8
Trade	Ratio of exports of goods (% of GDP)	32.1	20.7
	Ratio of imports of goods (% of GDP)	19.6	15.3
	Ratio of service trade (% of total trade)	12	11.5
	Ratio of EG trade (% of total trade in goods)	11.5	4.6
Energy and Environment	Energy consumption per unit of GDP (tons / 1,000 USD)	0.3	0.49

	COD discharge per unit of GDP (tons/10 million USD)	10.06	21.47
	NH_3-N discharge per unit of GDP (tons/10 million USD)	1.30	2.23
	SO_2 discharge per unit of GDP (tons/10 million USD)	8.28	18.47
	NO_X discharge per unit of GDP (tons/10 million USD)	11.28	19.44

Source: National Bureau of Statistics of China, 2016a. 29. National Bureau of Statistics of China, 2016b. Jiangsu Provincial Statistics Bureau, 2012-2016.

2.2 Development of Environmental Goods and Services in Jiangsu province

Jiangsu's EGS industry [4] plays a leading role in China. The industrial scale of Jiangsu's EGS ranked the first in China and accounted for 18% of the national total in 2016. In 2015, the revenue of EGS in Jiangsu province reached CNY 1.1 trillion, among which the revenue of *energy conservation and environmental protection* and *renewable energy* reached CNY 750 billion and CNY 388 billion respectively (Jiangsu Yearbook Periodical Office, 2011-2016). The revenue of EGS in Jiangsu province increased 78% during the period of 2012 to 2015 at an average growth rate of 16%. The annual average growth rate of Environmental Services (ES) in Jiangsu province exceeded 20% since 2008, mounting to CNY 30 billion in 2015, with a growth rate of about 30% from 2008 to 2015.

[4] EGS means the energy conservation and environmental protection industry as well as new energy industry.

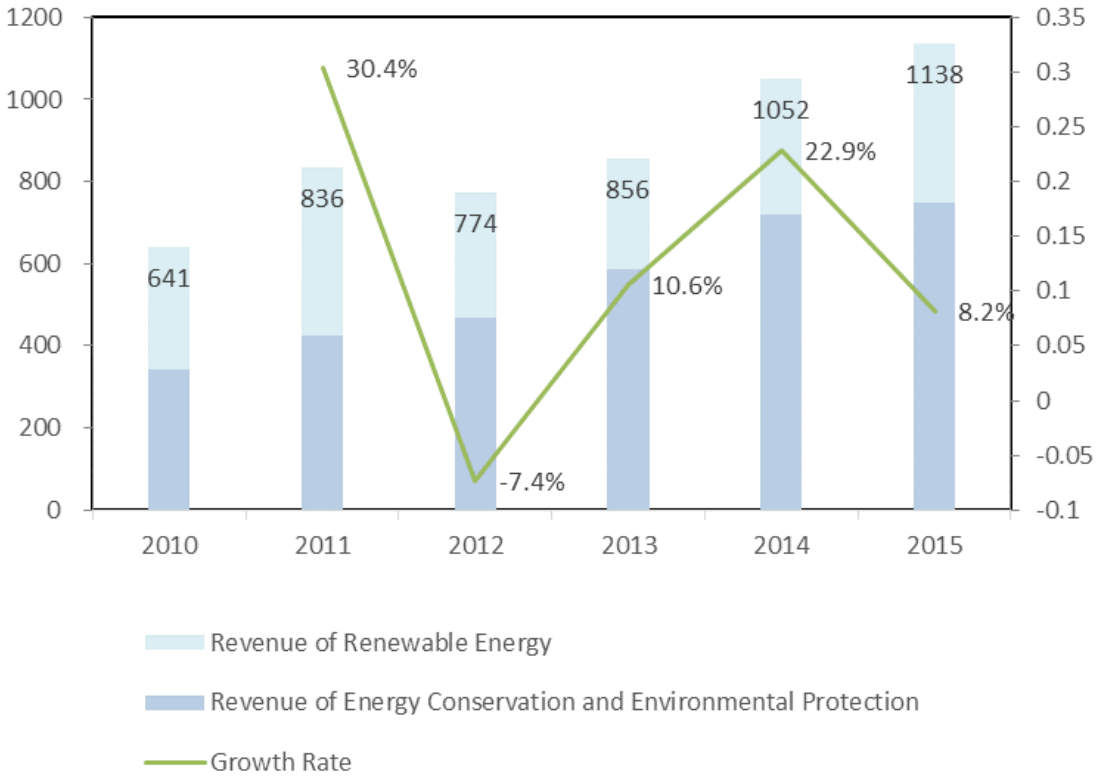

Figure 3-3 Revenue and growth rate of environmental industries in Jiangsu (2010-2015)

Source: Jiangsu Yearbook Periodical Office, 2011-2016

A complete value chain of Environmental Goods and Services was established. More than 2,000 kinds of environmental goods were manufactured in Jiangsu province, in sectors such as sewage treatment, air pollution control, solid waste disposal, noise abatement, wind power equipment and solar PV. Several clusters of Environmental Goods and Services were established in Nanjing, Suzhou, Wuxi, Changzhou, Yixing and Yancheng (see Figure 3-4).

Figure 3-4 EGS industry clusters in Jiangsu

Solar power

About 80 thousand tons of polysilicon and 26 GW (Gigawatts) of silicon were produced in Jiangsu province in 2016, accounting for over half of the whole country's output. The revenue of the PV industry in Jiangsu province reached CNY 265.1 billion in 2015. The output value of PV in Jiangsu province ranked the top in China, representing 22% of global output.

Wind power

The revenue of the wind power industry in Jiangsu province reached CNY 47 billion in 2015 (Jiangsu Yearbook Periodical Office, 2011-2016). There were more than 70 wind power enterprises in the province. Jiangsu's output value of the whole wind turbine, high speed gear box and blades took up 20%, 65% and 58% of China's total respectively in 2016. Five of the top six wind manufacturers in China located in Jiangsu, including Titan Wind Company, Envision Company, United Power, Haizhuang Wind Power, and Shanghai Electric.

2.3 South-South trade in Environmental Goods and Services in Jiangsu province

Trade in environmental goods in Jiangsu reached USD 63.3 billion in 2012, accounting for 11.5% of the province's total trade in goods and one third of trade in environmental goods in China.

Table 3-2 Trade in environmental goods in Jiangsu province in 2012 (billion USD)

Product	Export	Import	Total trade	Share in total EG trade (%)
Sewage treatment products	40.6	21.2	61.8	9.76
Environmental monitoring and analysis products	26.2	32.7	58.9	9.30
Solid waste disposal products	7.02	13.9	20.92	3.30
Renewable energy equipment	230.6	196.2	426.8	67.42
Air pollution management products	21.3	11.0	32.3	5.10
Energy conservation products	7.84	3.68	11.52	1.82
Remedial and elimination products	1.23	0.73	1.96	0.31
Water supply system products	1.95	2.30	4.25	0.67
Reusable equipment	1.11	1.22	2.33	0.37
Clean/resource efficient equipment	0.043	0.176	0.219	0.03
Noise and vibration elimination equipment	7.18	4.52	11.7	1.85
Environmental friendly product	0.2	0.0014	0.21	0.03
Total	345.3	287.7	633	100

Source: Zhang Xia, 2014.

Solar energy products

In 2016, total export of PV products in China declined to USD 14.02 billion, 10.3% less than the previous year (China Photovoltaic Industry Association, 2017). Jiangsu's export of PV products in was recorded at USD 6.51 billion, ranking first in China and accounting for 46.4% of China's total export of PV products. Trina Solar, Canadian Solar, Hanhwa Solar One and GCL New Energy are the leading PV exporters, whose export made up over half of Jiangsu's PV exports. Japan, the U.S, India, Korea, Thailand, and Turkey were major export destinations.

Table 3-3 Major overseas markets for Jiangsu's top PV companies

Company Name	Export (Million USD)	Share of Jiangsu's PV Export %	Major overseas market	Share of the Company's Export %
Trina Solar	1140	17.5	India	37.0
			USA	21.8
			Japan	14.0
			Thailand	5.9
Canadian Solar	893	13.7	USA	29.3
			India	26.4
			Japan	21.6
Hanhwa Solar One	848	13.0	Japan	38.3
			India	28.8
			Turkey	15.9
			Korea	8.9
GCL New Energy	443	6.8	Chinese Taipei	37.0
			Korea	18.8
			Malaysia	12.6
			Thailand	10.9

Source: China Customs, 2017.

Wind power products

In 2014, Jiangsu exported wind power generators equivalent to 223.25 MW, with an annual average growth rate of 97% from 2008 (see Figure 3-8). Major destinations for Jiangsu's wind power products included Australia, the US, and Ethiopia (see table 3-5). The main export products included the whole turbine, cylinder, blade, and gear box.

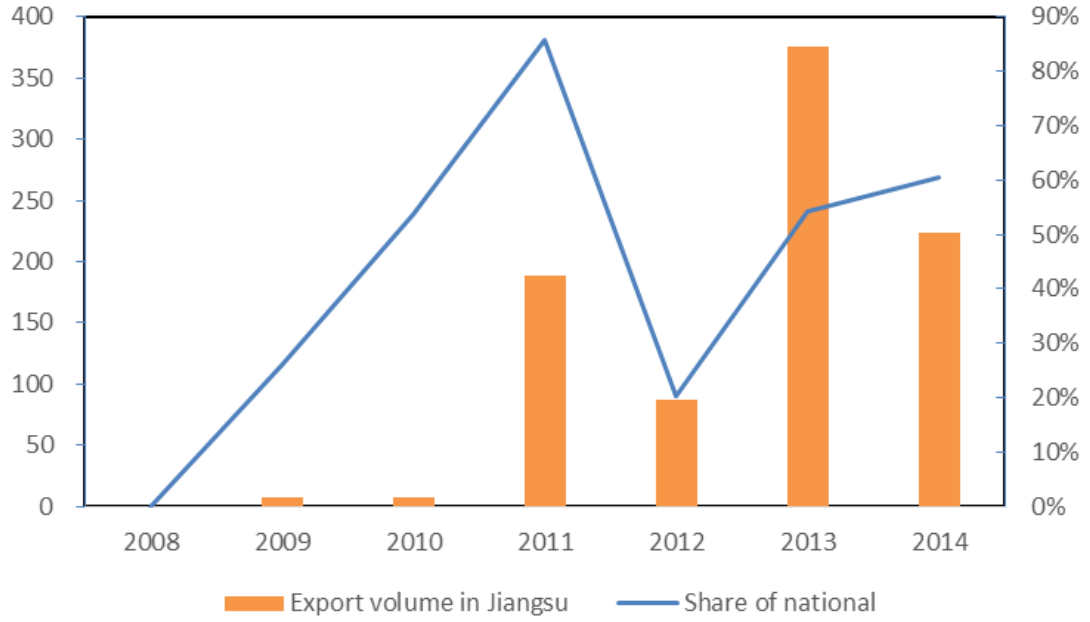

Figure 3-5 Jiangsu's export of wind power generators and its share of national total (Unit: MW, %)

Source: CREIA, 2014-2015. CEEIA, 2015.

3. Opportunities for South-South Trade in EGS in Jiangsu Province

3.1 Market-oriented factors

Fast development of global market of Environmental Goods and Services: The global market for environmentally goods and services currently amounts to USD 1 trillion, and is projected to grow to USD 2 trillion by 2020. According to a study by UN Environment, developing countries became net exporters of renewable energy products. South-South trade in renewable energy grew faster than global average.

Growing capacity and competitiveness in global market:
There are six industrial clusters in Jiangsu, covering a broad range of environmental goods and services. By the end of 2016, there were 297 solar PV companies in Jiangsu with medium productive capacity and 6 leading producers with an annual output above RMB 10 billion. Companies with annual output above RMB 5 billion accounted for more than half of the solar industry in Jiangsu. Apart from growing capacity, companies are also improving technological innovation and know-how. According to the SooPAT database, up to 2017, Yixing Environmental Science and Technology Industrial Park owned 935 Chinese patents. Companies are also increasing their investment in developing countries such as India, Philippine, Malaysia, and Vietnam, aiming for expanded value chain cooperation.

Increasing government investment in environmental sector: China Statistical Yearbook on Environment showed that the total government investment in pollution control and management in Jiangsu province reached CNY 95.25 billion in 2015, accounting for 1.36% of Jiangsu's GDP, higher than national average (1.28%). Figure 4-1 showed the trends in investment in pollution control and management sector from 2011 to 2015 in Jiangsu.

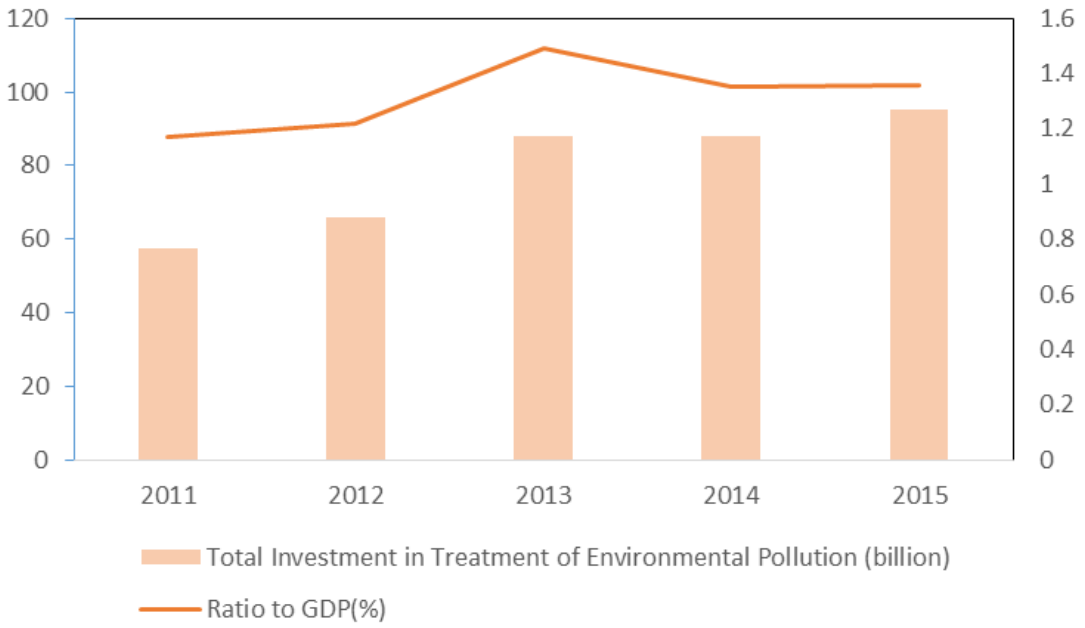

Figure 4-1 Total investment in treatment of environment pollution and its ratio in Jiangsu (Billion CNY, %)

Source: National Bureau of Statistics of China, 2016b.

3.2 Policy landscapes

At international level:

Removing trade barriers has become an important topic in international trade and sustainable development. In 2012, APEC released a list of 54 environmental goods and committed to reduce the applied tariff rates to 5% or less by the end of 2015. At global level, 18 WTO members negotiated on the Environmental Goods Agreement (EGA) since 2014, seeking to eliminate tariffs on selected environmental products. A number of regional trade agreements also included provisions on liberalizing trade and investment in Environmental Goods and Services and strengthen cooperation on environmental technology.

Box 4-1 *Environmental provisions for promoting cooperation on EGS in the China-Switzerland FTA*

Chapter 12 Environmental Issues

ARTICLE 12.3 Promotion of the Dissemination of Goods and Services Favouring the Environment

1. The Parties shall strive to facilitate and promote investment and dissemination of goods, services, and technologies beneficial to the environment.

2. For the purpose of paragraph 1, the Parties agree to exchange views and will consider cooperation in this area.

3. The Parties shall encourage cooperation between enterprises in relation to goods, services and technologies that are beneficial to the environment.

Source: China-Switzerland Free Trade Agreement.

At national and provincial levels:

Overarching strategy and plan for environmental industry. The *13th Five Year Plan* stressed the important role of environmental protection and the environmental industry in the national economy and social development. It defined environmental industry as a strategic emerging industry. The *Ecological and Environmental Protection Plan during the 13th Five-Year Plan Period* and *the 13th Five-Year Plan for the Development of Energy Conservation and Environmental Protection Industry*, underlined the need for supply-side structural reform through promoting the development of the environmental industry.

Jiangsu's plan for construction of an 'ecological civilization' (2013-2022) set a target that the revenue from the energy conservation and environmental protection industry to reach CNY 900 billion by the end of 2017. According to *Jiangsu's 13th Five Year Plan*, the onshore and offshore wind power generation provided to the national grid will reach 6.5 million KW and 3 million KW respectively in 2020.

Accelerating internationalization and enhancing cooperation. *Jiangsu's Trade Action Plan on Optimizing Exports and Imports (2016-2020)* pointed out that Jiangsu will promote the internationalization of emerging industries,

including the environmental industry. *The Planning Outline for Construction of an Ecological Province (2004)* proposed to further explore and develop overseas markets for environmental services. The national 13th Five Year Plan for Solar PV laid out plans to expand cooperation with Belt and Road countries, with the focus of Southeast Asia, West Asia, Latin America and Africa.

Moving up along the global value chains. The *Made in China 2025* strategy launched by Chinese government called for upgrading of the renewable energy industry. The Guidelines on Improving Position on Global Value Chains released jointly by 7 ministries in China outlined steps and actions to strengthen value chain cooperation and pushed for moving-up along the global value chains with improved value added in exports and production.

Improving trade facilitation. Jiangsu government has been working to simplify the customs procedures for trade in environmental goods, provide market information to environmental enterprises, and help companies especially SMEs participate in regional and international trade fairs. One example is the International Summit of New Environmental Protection Technology held annually in the capital city of Jiangsu. In 2017, the summit attracted more than 250 environmental enterprises locally and globally.

Providing incentives to trade and investment in environmental goods and services. *Jiangsu's Promotion Plan for Major Energy Conservation and Environmental Protection Technical Equipment and Products Industrialization (2015)* stated that special provincial funds can be used for energy conservation and emissions reduction, the development of strategic emerging industries, and the commercialization of research findings, aiming to help equipment and products reach advanced international standards. *The Jiangsu Provincial Government's Opinions on Promoting the Implementation of the Energy Conservation and Environmental Protection Industry (2013)* highlighted that government should promote and improve government procurement systems for environmental goods and services, increase energy efficiency levels and environmental protection standards for government procurement. *Jiangsu's Implementation Measures on New-Round Promotion of Solar PV Generation Supportive Policy (2012)* has introduced a Feed-in-Tariff scheme.

Encouraging overseas investment in developing countries. *The Belt and Road Initiative* and the *Strategy of Free Trade Zones,* created favorable conditions for trade and investment in environmental goods and services. The *Made in China 2025 Action Platform in Jiangsu (2015)* highlighted the importance of encouraging the energy conservation and environmental protection industry to strengthen foreign cooperation. It called major industries such as the solar PV industry to be the first to "go out" to global market. T*he Renewable Energy Industry Restructuring and Revitalization Plan for Jiangsu (2009)* supported competitive enterprises' overseas investment, through mergers and acquisitions, joint ventures and cooperation, leases, etc.

4. Challenges of South-South Trade in EGS in Jiangsu Province

4.1 Tariff barriers

The high tariffs remain the biggest challenge of South-South Trade in environmental goods and services. Taking the APEC list of environmental goods as an example, the global average bound tariff rate is about 22.78% (WTO, 2017), higher than the tariff rate of most manufactured products. The average bound tariff rate of APEC listed environmental products in non-OECD countries (excluding China) is 24.77%, much higher than in OECD countries (8.10%).

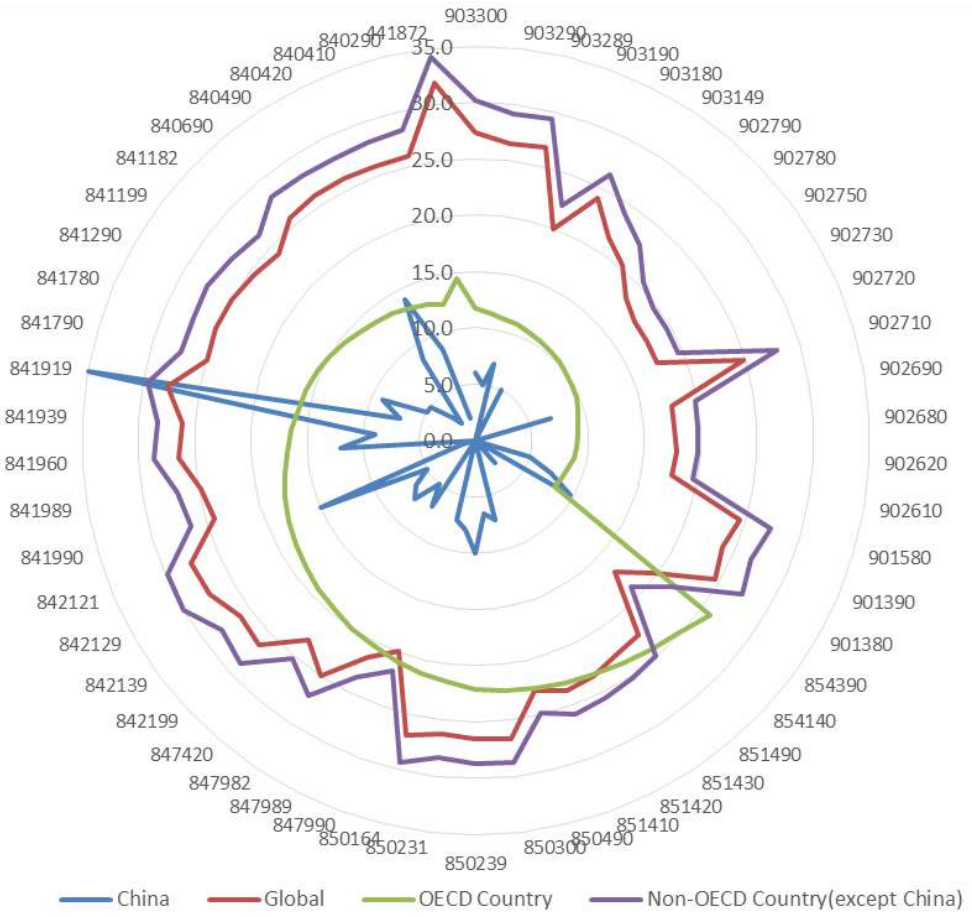

Figure 5-1 Bound tariff rate of EG on APEC list in different regions

Source: WTO, 2017.

Polycrystalline solar panels and wind turbine generators are the most important components for solar and wind power. The averages bound tariff rates for polycrystalline solar panels and wind turbine generator are 16.9% and 26.2% respectively. In some developing countries, it could be as high as 100%.

4.2 Non-tariff barriers

The term "non-tariff barriers" encompasses a range of government regulations or actions with regard to trade. UNCTAD defined non-tariff barriers as policy measures other than ordinary customs tariffs, including technical and non-technical measures. Technical measures may include SPS standards; rules for product weight, size, or packaging; ingredient or identity standards; mandatory labeling; shelf-life restrictions; and import testing and certification procedures. Non-technical measures may include bureaucratic restrictions, subsidies or other legal issues that hinder trade, such as failure to provide adequate and effective intellectual property protection.

From our research, major non-tariff barriers faced by Jiangsu's environmental companies include:

- **Restriction on the number of foreign suppliers or share of foreign equity.** Some developing countries have quantitative restrictions on the environmental service suppliers, including restriction on the number of suppliers or the proportion of foreign equity. According to the WTO database, only 82 WTO members had a schedule of market access commitment to the environmental services sector.

Box 5-2 *Limits to the number of environmental services suppliers*

In the schedule of commitments on market access for environmental services, the Republic of Korea allowed foreign suppliers to provide refuse water disposal services in

Korea with no limitation on equity, but the number of service suppliers is limited to twenty-five. [5]

Source: Korean schedule of commitments on market access of ES under GATS

Box 5-3 *Limitation on the proportion of foreign ES suppliers' equity* If water treatment suppliers want to enter the water treatment market in the Philippines, especially in the Manila metro area, they need to negotiate with the concessionaires, and can receive at most 40 percent foreign equity with a joint venture if they want to establish an environmental services company.

Source: The Philippines' schedule of commitments on market access of ES under GATS

- **Certification and standards.** Certification and qualification were required by many developing countries for import of environmental products such as solar PVs, wind turbines, and waste water treatment equipment. In many cases, only certification issued by international companies such as TÜV and DNV GL were accepted. To acquire certification needed for foreign markets, wind turbine producers in Jiangsu often sent their products and equipment to overseas texting centers for verification, which entails huge investment in time and cost. For certain environmental goods such as water management equipment, different standards were used in different countries. Lack of mutual recognition among countries means producers have to acquire a number of standards to enter into foreign markets. Based on the questionnaire survey, 22% of the surveyed enterprises regard qualification requirements as a big challenge.

- **Local content requirements (LCR).** Some developing countries require a certain percentage of intermediate goods used in the production processes of renewable products to be sourced from domestic manufacturers. LCRs are used in many developing countries as a precondition to access to loans

[5] During the Uruguay Round of negotiations (1986-1994) of WTO, participating countries made market-access commitments and exemptions on a number of services sectors at the same time. These commitments and exemptions are contained in their original services schedules.

or government support to renewable energy projects and public utility projects.

4.3 Other challenges

- **Trade disputes.** Trade disputes had a significant negative impact on trade in environmental goods. For example, following the anti-dumping and countervailing investigations launched by the US and the EU against the photovoltaic products from China, the export of solar PVs in Jiangsu decreased by 10.3% in 2016.

- **Difficulties in accessing financing and credit guarantee.** Many private environmental companies found it difficult to get credit guarantees or loans from banks for export and make investments overseas, especially in less developed markets.

- **Lack of information and understanding of developing market.** From our survey, 36% of respondents identified information asymmetry as one of the challenges to explore South-South trade in environmental goods and services. These include language and cultural differences, limited publicly available information on market development, access to information on local laws and regulations on trade and environment, as well as lack of skilled labor and talents to explore foreign markets.

5. Good Practices of South-South Trade in EGS in Jiangsu Province

This chapter aims to summarize good practices and successful experience in Jiangsu province on trade in Environmental Goods and Services with developing countries.

6.1 Yixing industrial park for environmental science and technology

Often referred to as the “Environmental Capital” of China, Yixing Industrial Park for Environmental Science and Technology (ES&TP) is located in Wuxi City, Jiangsu Province. The annual production value of this Industrial Park reached CNY 24.2 billion in 2016 (Yixing Yearbook, 2016), with an increase of 4.8% over the previous year. During the past 20 years, the Yixing industrial park has expanded from 4 square kilometers to 212 square kilometers, with over 1,500 environmental equipment manufacturers, 3,000 supporting enterprises, and 100,000 jobs.

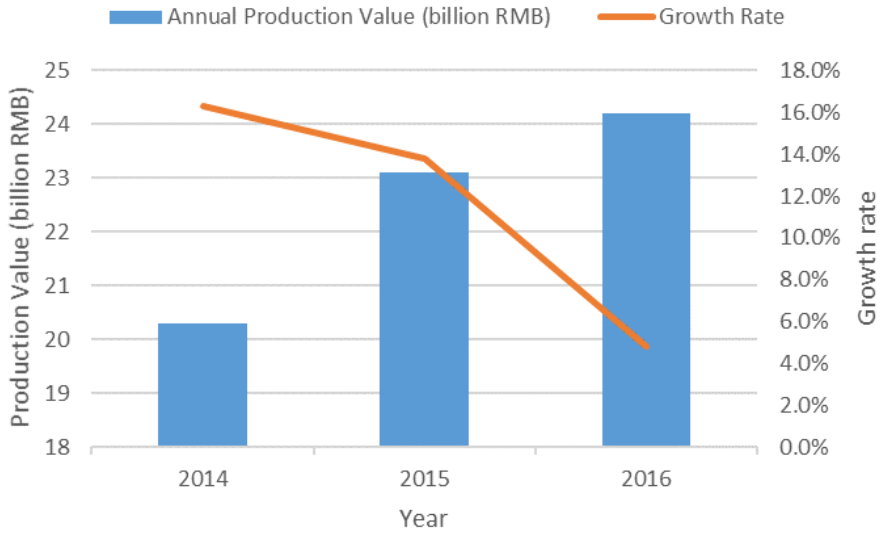

Figure 6-1 The annual production value and growth rate of ES&TP in recent years

Source: Yixing Yearbook, 2016.

In 2015, the China-ASEAN Environmental Protection Technology and Industry Cooperation Demonstration Base was established in the park. In the 13th Five-Year Plan period, it plans to build China-Africa and China-Cambodia Environmental Protection Technology Transfer Centers, organize high-quality enterprises to join the Belt and Road Initiative (Yixing Government, 2016).

Local governments adopted an integrated approach to the management of this park, focusing on five major areas – water, air, noise, solid waste and instruments. Building upon the innovative idea of "Environmental Hospital", different environmental protection companies are featured as "doctors" with unique expertise, while various environmental equipment providers serve as their "pharmaceuticals". This "hospital" can provide one-stop services tailored to specific environmental problems, and bring together big and small companies to form value chains and production networks. This helped companies located in the industrial park gain competitiveness in international market.

6.2 Trina Solar

Founded in 1997, Changzhou Trina Solar Co. Ltd is the world's leading total solution provider for solar energy. With headquarters based in Changzhou, Jiangsu, Trina Solar has manufacturing bases/marketing centers in 19 countries. The photovoltaic modules and other products manufactured by Trina Solar have found their way into more than 30 countries in Europe, Asia Pacific, the Middle East and Africa. By the end of 2016, the cumulative PV installation capacity reached 296 GW worldwide.

Trina Solar has integrated the protection of environment and sustainable development into every work process, including site selection, designing, construction and plant operation. For example, Trina Solar Changzhou has

established the ISO14001 Environment Management System in 2008, and strictly followed the rules and regulations to ensure its effectiveness and completion. In 2016, the amount of electricity consumption and water consumption per MW (megawatt) module decreased by 32% and 39% respectively in comparison with that of 2012.

Table 6-1 Environmental measures implemented in the production chains

Chains	Measures
Site Selection, Designing and Construction of Plants/PV Power Stations	• Environment Impact Assessment, evaluate the positive and negative impacts of the proposed projects on the community's environment; • Ensure the environmental protection facilities will be designed, constructed and put into use simultaneously with the main part of construction project; • Protect the community's environment and biological diversity.
Research & Development	• Incorporate the concept of environmental protection into R&D and improve product conversion efficiency.
Manufacturing	• Ensure sustainable use of resources; • Continuously promote energy efficiency; • Ensure that treated effluent and emission of waste gases meet national and local limits; • Promote recycling of resources; • Promote green office.
Packaging	• Reduce package materials without affecting package safety; • Utilize recycled and degradable package materials.
Logistics	• Develop a resourceful transportation route; • Choose the best mode of transportation; • Improve the utilization rate of containers.
Product Recycling	• Be a member of PV CYCLE and dispose the waste PV products in an environmental friendly way; • Be a member of the Glass Recycling Committee of Japan (GRCJ).

Source: Trina Solar, 2016.

Over the past few years, Tina Solar doubled its effort to explore developing market. In Thailand, a new manufacturing facility, with a designed capacity of producing 700 MW solar cells and 500 MW of solar modules, was successfully put into operation in 2015. In 2016, it completed its construction of a cell

manufacturing plant in Vietnam, with a capacity of 700 MW solar cells. Trina Solar also signed a Strategic Cooperation Agreement with one Sino-Sri Lanka Company in 2016 to jointly expand markets in global market.

6.3 Goldwind

Jiangsu Goldwind Co. Ltd, is a wholly-owned subsidiary of Goldwind, a manufacture of wind power equipment, services, and wind power farm development. Established in 2009 in Dafeng District, Yancheng city of Jiangsu, the company extended its business to more than 20 countries, with over 7,000 employees. With a total of 6.4 GW wind turbines installed globally in 2016, Goldwind ranked 3rd in wind turbine manufacturers worldwide (Bloomberg New Energy Finance, 2017). By the end of 2016, the accumulated installed capacity in international markets exceeded 1 GW, including many developing countries such as Pakistan, Thailand, Ethiopia, Chile and Ecuador (see Table 6-2).

Table 6-2 Accumulated installed capacity of Goldwind in international markets by 2016

No.	Country	Accumulated number of installed units	Accumulated installed capacity/MW
1	Panama	108	270
2	Pakistan	139	208.5
3	Australia	86	185
4	USA	113	176.5
5	Thailand	39	97.5
6	Ethiopia	34	51
7	Romania	20	50
8	Chile	22	33
9	France	23	17.25
10	Ecuador	11	16.5
11	Cuba	6	4.5
12	Bolivia	2	3
13	Turkey	1	0.75
Total		604	1113.5

Source: Goldwind

Goldwind has registered 33 projects under the Clean Development Mechanism (CDM), with a total of 17.90 million tons of carbon dioxide emissions and a reduction of 7.1 million tons of standard coal usage.

Goldwind is committed to becoming the world's leading supplier of clean energy and integrated provider of energy conservation and environmental protection solutions. The company actively engaged in applying international certification and standards as a way to improve global competitiveness. In 2016, two key models (GW109/2500 and GW121/2500) obtained certification from DNV-GL, an internationally well-known certification agency. So far, the company has a total number of 25 design assessment certificates and 11 type certificates.

The company adopted *the Environmental Protection and Soil & Water Conservation Management System* and *the Environmental Protection and Soil & Water Conservation Management Control Process* to comply with environmental management requirements from the national and provincial government. It set up the first national wind safety test points to improve standardization of safety operation. It also launched a program of green supply chain to improve sustainability of the whole industry value chain.

Annex 1 List of Workshops

Workshops	Date	Venue	Participants
Workshop on "The Role of Trade in the Transition to a Green Economy in Jiangsu, China"	February 23-24, 2017	Nanjing	Around 20 delegates including: representatives from Jiangsu local departments in charge of trade and environmental policy, business in EGS in Jiangsu, related academies in Jiangsu, an expert from UNIDO.
Workshop on "Unlocking South-South Trade in Environmental Goods and Services in Jiangsu"	June 5, 2017	Nanjing	Around 50 participants including: delegations from the Ministry of Commerce, the Ministry of Industry and Information Technology, Jiangsu Development and Reform Commission, the Department of Commerce of Jiangsu Province, the Environmental Protection Department of Jiangsu Province and embassies of developing countries in China. Representatives from universities, industrial associations, international organizations, NGOs and the private sector also participated in the workshop.
Workshop on green trade in Jiangsu	June 15, 2017	Changzhou	Environmental Protection Bureau of Changzhou, Statistical Bureau of Changzhou, Commerce Bureau of Changzhou, Industrial and Information Technology Bureau of Changzhou, etc.
Workshop on wind power industry	August 24, 2017	Dafeng District, Yancheng	Government of Dafeng, Environmental Protection Bureau of Dafeng, Dafeng Development and Reform Commission, Dafeng

			Development Zone, Goldwind, Jiangsu CRRC Electric Co., Ltd, etc.
Workshop on outline of the report	August 25, 2017	Nanjing	Department of Commerce of Jiangsu Province, Department of Environmental Protection of Jiangsu Province, Jiangsu International Environmental Develop Centre, etc.
Workshop on Expert Review	September 12, 2017	Beijing	Representatives from Thailand, Viet Nam, Malaysia, and experts from OECD, etc.
Workshop on green trade and investment	September 25, 2017	Beijing	Delegates from Goldwind International Holdings (Hong Kong) Co. Ltd. and PRCEE.

Annex 2 List of Interviewees

Category	Interviewees
Government Department	Ministry of Commerce, Ministry of Environmental Protection, Ministry of Industry and Information Technology; Jiangsu Development and Reform Commission, Department of Environmental Protection of Jiangsu Province, Department of Commerce of Jiangsu Province; Nanjing Municipal Department of Commerce, Nanjing Municipal Department of Environmental Protection, Yixing Department of Commerce, Yixing Industrial Park for Environmental Science and Technology, Changzhou Municipal Department of Environmental Protection, Changzhou Municipal Department of Commerce, Changzhou Municipal Statistic Department, Suzhou Industry Park; The People's Government of Dafeng District of Yancheng, Environmental Protection Bureau of Dafeng District of Yancheng, Development and Reform Commission of Dafeng District of Yancheng, Environmental Protection Bureau of Wujiang District of Suzhou, Comprehensive Enforcement Bureau of Shengze Town, Wujiang District of Suzhou.
Industrial Association	Association of Environmental Protection Industry in Jiangsu, Association of Photovoltaic Industry in Jiangsu, Association of Renewable Energy Industry in Jiangsu, Association of Wind Power Equipment in Nanjing
Company	Jiangnan Environmental Technology, Inc. (JET), Jiangsu JINYI Water Industry Equipment Co. Ltd, Sinoma Science & Technology Co. Ltd, FEILI Group, Jiangsu BODA Environmental Protection Co. Ltd, Changzhou Trina Solar Co. Ltd, JSTI Group, Jiangsu WELLE Environmental Co. Ltd, Jiangsu Dafeng Harbor Holding Limited, Jiangsu Goldwind Science & Technology Co. Ltd, Jiangsu CRRC Electric Co. Ltd, Jiangsu Fashifei Garment Co. Ltd, Wujiang YongShunDa Textile Co. Ltd, Suzhou Chosion fashion Textile Group Limited, Shenghong Holding Group, Suzhou Hiti Love Textile Co. Ltd, WuJiang XinWu Textile Co, Ltd, WuJiang Zhongwei Textile Co. Ltd.
NGO	WWF, International Institute for Sustainable Development (IISD), Institute for Global Environmental Strategies (IGES)

Annex 3 Questionnaire Survey on Environmental Goods and Services (EGS) in Jiangsu Province

In order to further understand the problems faced by the EGS industry in Jiangsu province, explore solutions for promoting trade in EGS, and promote trade in EGS to become a new growth point fo Jiangsu province, we have designed this questionnaire. In addition, we will select several successful enterprises in EGS to promote at international and national level.

We hope you can complete the form objectively. Thanks for your support and cooperation.

Instructions: Please put a tick ☑ in the box next to your choice(s) or write in the space provided.

1. Basic Information of Enterprises

1.1 Type of enterprise registration: ☐State-owned enterprise ☐Private enterprise ☐Wholly foreign-owned enterprise ☐Sino-foreign joint venture enterprise ☐ Other

1.2 Main business in EGS: ☐Waste gas treatment equipment ☐Sewage treatment equipment ☐Solid waste disposal equipment ☐Environmental monitoring equipment ☐Environmental services ☐Wind power ☐Solar power ☐Other

1.3 Destination countries of EGS exports:

1.3.1 Developed countries: ☐The United States ☐Canada ☐Japan ☐ European countries ☐Australia ☐New Zealand ☐other

1.3.2 Developing countries: ☐India ☐Chile ☐Peru ☐Brazil ☐Thailand ☐ Indonesia ☐ Viet Nam ☐ Malaysia ☐ Bangladesh ☐ African countries ☐Other

1.4 Sources of EGS imports:

1.4.1 Developed countries: ☐The United States ☐Canada ☐Japan ☐ European countries ☐Australia ☐New Zealand ☐Other

1.4.2 Developing countries: ☐India ☐Chile ☐Peru ☐Brazil ☐Thailand ☐ Indonesia ☐ Viet Nam ☐ Malaysia ☐ Bangladesh ☐ African countries ☐Other

1.5 Nature of your foreign trade: ☐Export independently ☐Export along with other enterprises ☐Export in the form of foreign aid ☐Other

1.6 The form of your foreign trade: ☐ Overseas investment ☐ Mergers and acquisitions ☐Exports of goods and services ☐Other

1.7 Level of competitiveness of your EGS: ☐World leading ☐World average ☐ Domestic leading ☐Other

2. Imports and Exports of EGS

2.1 Which policies are beneficial for your EGS exports? ☐One Belt One Road Initiative ☐Export rebates ☐Financial incentives ☐Green credit ☐Other

2.2 What challenges you have faced in your EGS exports? ☐Tariff ☐Visa barrier ☐ Technical barrier ☐ Equity restriction ☐ Quantitative restriction ☐ Qualification restriction ☐ Intellectual property restriction ☐ Information asymmetry ☐Industrial standard ☐Other

2.3 Strengths of your EGS exports: ☐ Price ☐ Technology ☐ Comprehensive advantages

2.4 Types of your EGS imports: ☐Core technology ☐Key components ☐Other

2.5 What challenges you have faced in your EGS imports? ☐Tariff ☐Visa barrier ☐ Technical barrier ☐ Equity restriction ☐ Quantitative restriction ☐ Qualification restriction ☐ Intellectual property restriction ☐ Information asymmetry ☐Industrial standard ☐Other

2.6 Scale of your EGS exports (in RMB): ☐Under 1 million ☐1-5 million ☐5-10 million ☐Over 10 million

2.7 How do you think the situation of EGS exports in China? ☐Good ☐Average ☐Bad

2.8 What are the main experience and measures of your EGS exports?

_____

_____

2.9 What are the main experiences and measures of your EGS imports?

_____

_____

3. Suggestions

What policies do you think should be implemented to promote the development of EGS?

_____

_____

_____

Information of respondents:

Company Name:

Department:

Position:

Privacy Statement: the information in the survey will only be used for project study, and we will keep your information confidential.

Signature:

Date:

Annex 4: Green Trade Taskforce in Jiangsu China

The Green Trade Taskforce was formally launched at the Green Trade Forum on June 5, 2017 in Nanjing, capital city of Jiangsu Province. The taskforce consists of 11 members in total, with two conveners from PRCEE and Jiangsu International Environmental Development Centre (JIEDC). Members come from local governments, industries and civil society.

Objectives of the Green Trade Task Force:

- Provide guidance and support to the design and implementation of the trade project under PAGE Jiangsu;
- Engage with different stakeholders for project delivery;
- Strengthen communication and cooperation among experts and government departments;
- Review and comment on the report of the green trade project.

List of members of the Green Trade Taskforce in Jiangsu

No	Name	Role	Organization	Title
1	Li Liping	Convener	Policy Research Center for Environment and Economy, MEP	Division Director
2	Liu Ming	Convener	Jiangsu International Environmental Development Centre	Vice Division Director
3	Zhang Bin	Secretary	Policy Research Center for Environment and Economy, MEP	Senior Engineer
4	Luo Yiqun	Secretary	Jiangsu International Environmental Development Centre	Official (PAGE Jiangsu focal point)
5	Yang Zhongfa	Member	Jiangsu Development and Reform Commission	Policy Officer
6	Chen Qingwei	Member	Department of Commerce of Jiangsu Province	Deputy Director
7	Gu Changqing	Member	Jiangsu Institute of Quality and Standardization	Vice Dean
8	Li Dewen	Member	Jiangsu Association of Environmental Protection Industry	Senior Engineer
9	Zhao Qiang	Member	Association of Machinery Industry for Environmental Protection	Deputy Director General
10	Wang Li	Member	China Council for the Promotion of International Trade	Division Director
11	Mao Xianqiang	Member	Beijing Normal University	Professor

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